CITY OF REDMOND
Community Development Department

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REDMOND URBAN AREA PLANNING COMMISSION

411 SW 9th Street-COUNCIL CHAMBERS Redmond, OR 97756

Wednesday, July 9, 2025 5:30 pm

Oral comments can be provided in-person or virtually. For those who plan to provide oral comments virtually during the meeting, pre-register at planredmond@redmondoregon.gov (must pre-register before 3:00 p.m. on July 9, 2025)

Stream the meeting live at: www.redmondoregon.gov/PlanningCommissionLive

Agenda

RUAPC Members

Tobias Colvin, Chair

Norman Schultz, Vice-Chair

Heather DeWolf

Mercedes Cook-Bostick

Michael Rogers

Tom Kuhn

Ben Schimmoller

Ex-Officio Vacant

I. CALL TO ORDER / INTRODUCTIONS

II. CITIZEN COMMENTS FOR ITEMS NOT ON THE AGENDA

III. APPROVAL OF MINUTES
a. May 21, 2025

IV. PUBLIC HEARINGS
a. Redmond Comprehensive Plan Amendment – Amended 2020 Transportation System Plan (File No. 711-25-000135-TA)
b. Redmond Comprehensive Plan Amendment – 2025 Wastewater Collection System Master Plan (File No. 711-25-000136-TA)

V. NEXT MEETING – July 23, 2025

VI. COMMISSIONER COMMENTS

VII. ADJOURN

Please note that these documents are also available on the City's website www.redmondoregon.gov; click on City Government, hover on Commissions and Committees, click on Urban Area Planning Commission. You may also request a copy from City Recorders Office 541-923-7751 or email Kelly.morse@redmondoregon.gov

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Redmond Urban Area Planning Commission **May 21, 2025**

Regular Meeting Minutes
Council Chambers & Remote Video Conferencing
https://www.redmondoregon.gov/RUAPC

CALL TO ORDER / INTRODUCTIONS
Vice Chair Schultz called the meeting to order at 5:30 pm.

Present:	Vice Chair Norman Schultz, Mercedes Cook-Bostick, Heather DeWolf, Tom Kuhn, Michael Rogers
Excused:	Chair Tobias Colvin, Ben Schimmoller
Staff Present:	Kyle Roberts, Planning Director; Morgan Snyder, Long Range Planner; Jamie Buddenbohn, Planning Permit Coordinator
Others Present:	Steven McDougal, Faith Decides, Roberto Ricalday, Tifany Lagos, Steve Curley

CITIZEN COMMENTS FOR ITEMS NOT ON THE AGENDA
There were none.

APPROVAL OF MINUTES
a. April 16, 2025

Commissioner Rogers moved to approve the April 16, 2025, minutes as presented. Commissioner Cook-Bostick seconded the motion, which passed 5 to 0. (Ayes: Schultz, Cook-Bostick, DeWolf, Kuhn, Rogers. Nays: None.)

PUBLIC HEARINGS
a. Redmond Comprehensive Plan Amendment (File No. 711-25-000092-TA)

Vice Chair Schultz opened the public hearing at 5:33 pm.

Steve Curley, Director, Redmond Economic Development Inc, presented via PowerPoint the Regional Large Lot Industrial Program, which falls under Section 9 of the Comprehensive Plan, and the updated 2025 Regional Economic Opportunities Analysis supporting document. He confirmed Economic Development for Central Oregon (EDCO) and East Cascade Works as partners helping attract organizations to the lots and area.

Vice Chair Schultz confirmed there was no public comment and closed the public hearing at 5:42 pm.

Commissioner Rogers moved to recommend the City Council approve the proposed Amendment to the 2040 Redmond Comprehensive Plan, adopting the 2025 Central Oregon Region Economic Opportunity Analysis as a Supporting Plan as presented in the Staff report. Commissioner Kuhn seconded the motion.

Ayes: Schultz, Cook-Bostick, DeWolf, Kuhn, Rogers
Nays: None
Motion Carried: 5 to 0

b. Cinderview West: Annexation, Master Development Plan, Tentative Subdivision (File Nos.: 711-24-000263-ANN, 711-24-000241-MD, 711-24-000242-SUB)

Vice Chair Schultz opened the public hearing at 5:43 pm.

Commissioner DeWolf recused herself from the public hearing.

Vice Chair Schultz opened the public hearing at 5:49 pm.

Long Range Planner Snyder presented the Staff report via PowerPoint, describing the Applicant's proposal and requested applications. Multiple written comments were received earlier in the day that had not yet been summarized but would be submitted to the Commission tomorrow. She addressed common concerns regarding transportation, water capacity, Central Oregon Irrigation District (COID) water and trails, construction impacts, the Applicant's schedule, Highway 97 access and impacts, and 10th Street and Pershall Way. Staff recommended approval of the application package subject to 19 conditions of approval.

Staff addressed Commissioner questions about construction traffic, garage sizes and locations, frontage sizes and maintenance, adequate parking, access, the telephone utility building, and the property's existing well and water rights.

Planning Director Roberts described the Oregon Department of Transportation's (ODOT's) plans to make improvements to the Highway 97/Pershall intersection starting next spring.

Vice Chair Schultz called for the Applicant's presentation.

Hayes McCoy, H.A. McCoy Engineering, stated that heavy excavating equipment will use 9th Street. The existing driveway off Pershall will likely be used for access. The existing home will be demolished. The domestic well on the property will be abandoned, and a well driller will prepare a well log and seal the well with concrete. Water rights are typically sold back to COID in similar rural subdivisions. He provided additional information about the COID easement to maintain its irrigation line, confirming that limited landscaping is generally allowed and that a trail is unlikely to conflict with COID's use.

Vice Chair Schultz called for public testimony.

Tifany Lagos, resident, asked why no outlet street from the new development to 10th Street was proposed and what the minimum spacing requirement is between streets.

Staff confirmed Walnut Avenue's location precludes additional outlet streets onto 10th Street and that a minimum of 660 ft is required between intersections, which would be the result of an outlet street connecting to 10th Street. Additional context was provided regarding major collector streets and intersections.

Commissioner Rogers noted the emergency exit on the east side by Lot 102 would function somewhat as an outlet street from the new development to 10th Street.

Vice Chair Schultz confirmed there was no addition public comment and closed the public hearing at 6:21 pm.

Commissioner Rogers moved to recommend the Redmond City Council approve the Cinderview West Project subject to the conditions presented in the Staff report. Commissioner Cook-Bostick seconded the motion.

Ayes: Schultz, Cook-Bostick, Kuhn, Rogers
Nays: None.
Motion Carried: 4 to 0

NEXT MEETING – TBD
Planning Director Roberts explained the June meeting will be canceled, as no business is scheduled for the Commission. He reviewed likely agenda items for the Commission's meetings on July 9th and July 23rd.

COMMISSIONER COMMENTS
Commissioner Rogers confirmed with Staff that the Commission would review the urban growth boundary (UGB) expansion likely next year.

ADJOURNMENT
The meeting adjourned at 6:25 pm.

Prepared by ABC Transcription Services
Reviewed by Kyle Roberts, Planning Director

APPROVED by the Redmond Urban Area Planning Commission and SIGNED by the Chair this _9th__ day of __July__ 2025.

_____
Tobias Colvin
Chair

ATTEST:

Kyle Roberts, staff
Planning Director

FINDINGS FOR ADOPTION OF THE AMENDED 2020 TRANSPORTATION SYSTEM PLAN AS THE TRANSPORTATION ELEMENT OF THE REDMOND COMPREHENSIVE PLAN

HEARING DATE: July 9, 2025, 5:30 PM, Redmond City Hall Council Chambers and via digital conference (GoTo Meeting)

HEARINGS BODY: Redmond Urban Area Planning Commission

FILE NUMBER: 711-25-000135-TA

FILE NAME: Redmond Comprehensive Plan Amendment (Amended 2020 Transportation System Plan)

REQUEST: A legislative amendment to adopt the Amended 2020 Transportation System Plan as the transportation element of the Redmond Comprehensive Plan

APPLICANT: City of Redmond

REVIEWING STAFF: Kyle Roberts, AICP, Planning Director
Jessica MacClanahan, PE, Director of Public Works / City Engineer

I. BACKGROUND

Summary:
Redmond's Comprehensive Plan 2040 is the blueprint for the City's future development over the next 20 years. The Comprehensive Plan serves as the primary land use planning document, establishing a series of goals and policies that guide future growth and development. City leaders use the Comprehensive Plan to manage expected population and employment growth, coordinate public investments and make decisions about new and existing businesses, housing and neighborhoods, transportation, parks and trails, infrastructure, and more.

A major supporting plan to the Comprehensive Plan is the Public Facilities Plan. The Public Facilities Plan identifies the major public infrastructure needed over the next 20 years to support the City of Redmond's Comprehensive Plan. The Public Facilities Plan contains the Capital Improvement Plans (CIP) for Transportation, Water, Wastewater, and Parks. Individual master plans for Transportation, Water, Wastewater, and Parks provide background, analysis, and justification for the CIPs imbedded in the Public Facilities Plan. Naturally, as growth occurs, frequent updates are made to the master plans, pertinent reports, and documents that ultimately support and implement the Redmond Comprehensive Plan.

Additionally, the series of goals and policies contained in the Comprehensive Plan are informed by a number of adopted supporting plans or reference documents. This Comprehensive Plan amendment involves adopting the Amended 2020 Transportation System Plan (TSP) – the transportation element to the Comprehensive Plan. The TSP identifies the transportation facilities and services to support the City's adopted Comprehensive Plan and fulfills the State's requirements for a local transportation plan as prescribed by Oregon Statewide Planning Goal 12. The TSP provides for a long-term community approach to accommodate new growth while maintaining and improving transportation facilities for all users over the next 20 years.

Proposal:
The City of Redmond is amending its existing 2020 TSP to reflect an increase in future employment growth in the Large Lot Industrial (LLI) lands in the southeast part of the city. This TSP Amendment will enable the City to work with the County and ODOT to identify, evaluate, and plan for the transportation infrastructure needed to support the development of these lands during the next 20 years. This amendment aligns with the City's broader goal of maintaining and planning for a safe and reliable

system that provides access to the Redmond Municipal Airport and other critical service areas that are part of the State's Resiliency Plan.

The City has coordinated with ODOT and the County on revised employment forecasts for the LLI lands as well as the transportation scenarios evaluated. The purpose of this amendment is to reevaluate the transportation needs associated with the increased employment and update the timing of needed projects to reflect these updated growth assumptions within the 20-year planning horizon. The amendment also recognizes ODOT's Alternate Mobility Targets for the intersections of US Highway 97/Evergreen Avenue and US Highway 97/Glacier Avenue, which will align regional transportation planning documents and provide consistency for development reviews.

Exhibits:
The following exhibits make up the record in this matter:

Exhibit A – Amended 2020 City of Redmond Transportation System Plan, May 2025
Exhibit B – Public comments

Noticing:
Noticing for the first evidentiary hearing scheduled for July 9, 2025, was noticed as follows:

- Per ORS 197.610, a notice of proposed change to an acknowledged comprehensive plan was submitted to the Department of Land Conservation and Development (DLCD) on June 2, 2025.
- Per Section 8.1110 of the Redmond Development Code, a public hearing notice for the July 9th Planning Commission hearing was published in the *Bend Bulletin* on June 27, 2025.

Applicable Criteria:
The following are the applicable sections from the Oregon Revised Statutes, Oregon Administrative Rules, and the Redmond Development Code:

- Oregon Revised Statutes (ORS) – Chapter 197
- Oregon Administrative Rules (OAR), Chapter 660:
  - Division 12, Transportation Planning
  - Division 15, Statewide Planning Goals and Guidelines
  - Division 18, Post-Acknowledgement Amendments
- City of Redmond Development Code:
  Article I – Zoning Standards
  - Section 8.760: Criteria for Amendments

II. FINDINGS & CONCLUSIONS

Findings:
Redmond Development Code, Article I – Zoning Standards: Amendments: Sections 8.750 through 8.770 set forth the procedure and standards for an amendment to the Redmond Comprehensive Plan. Specifically, Section 8.760 sets forth the four review criteria that must be met when evaluating amendment requests. Findings for each criterion are presented below.

8.760 Criteria for Amendments. The burden of proof is upon the applicant. The applicant shall show the proposed change is:

1. In conformity with all applicable State statutes;

FINDING: The following State statutes apply directly to this application:

ORS 197.610, *Submission of proposed comprehensive plan or land use regulation changes to Department of Land Conservation and Development*

ORS 197.610 requires local jurisdictions to submit proposed comprehensive plan or land use regulation changes to Department of Land Conservation and Development (DLCD). Notice of the proposed amendment to the Redmond Comprehensive Plan has been provided to DLCD more than 35 days in advance of the first evidentiary hearing concerning the amendments.

ORS 197.797, *Local quasi-judicial land use hearings; notice requirements; hearing procedures*

ORS 197.797 sets forth noticing requirements. The applicable RDC standards that address amendment and legislative procedures and noticing requirements (i.e., Sections 8.750-8.770 and 8.1100-8.1125) were developed in compliance with the applicable State statute regarding noticing and public hearings. The relevant findings, incorporated by reference herein, show compliance with the aforementioned statutes.

Notice of the proposed Comprehensive Plan amendment has been advertised in the local newspaper (public notice) as required by the RDC and State statute. Regarding statutory public hearing requirements, this proposal is legislative and not quasi-judicial. Sections 8.1100 through 8.1125 of the RDC implement the quasi-judicial statutory requirements in similar fashion and have been met. The Redmond Urban Area Planning Commission and City Council's public hearing and review processes meet the statutory requirements for the purpose of the review.

Based on the above discussion and finding, staff concludes that the proposed amendment complies with criterion #1.

2. In conformity with the State-wide planning goals whenever they are determined to be applicable;

FINDING: The following State-wide planning goals have been determined to apply directly to this application:

Goal 1 – Citizen Involvement - calls for the opportunity for citizens to be involved in all phases of the planning process. The Redmond Urban Area Planning Commission serves as the City's formal citizen advisory commission to fulfill Goal 1 and is made up of Redmond area residents.

Additionally, in terms of engagement, accompanying a press release, the amended TSP was published on the City's website a month in advance of the evidentiary hearings for public review. Additionally, City staff shared the document via an email distribution list comprised of engineers and developers. In mid-June, staff presented an overview of the document to the Central Oregon Builders Association (COBA) as well as to City Council in two separate workshops. Lastly, the agenda for the Planning Commission public hearing, where and when the proposed amendments are discussed, were provided in accordance with law. All documents were available for public review. Public notice advertising the July 9th public hearing was published in the *Bend Bulletin*.

Goal 2 – Land Use Planning – requires establishing a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions.

The Amended 2020 TSP will serve as a resource for future transportation and land use decision-making by providing: (1) Solutions to address existing and future transportation needs for biking,

walking, using transit, driving, freight, air, and rail; (2) A blueprint for investments in transportation projects and programs that improve safety and access for all travelers, improve Regional and State resilience, and support City and Regional economic development priorities; (3) A tool for coordination with regional and local agencies and governments; (4) Information to ensure prudent land use and transportation choices; (5) Order of magnitude cost estimates for transportation infrastructure investments needed to support economic development and growth, and possible sources of funding these improvements; (6) Function, capacity and location of future streets, sidewalks, bikeways, pathways, transit, and other transportation facilities; and (7) potential programs to help improve opportunities to travel by walking, bicycling and transit in the future.

Goal 3 – Agricultural Lands – is not applicable because there are no agricultural lands in the city limits.

Goal 4 – Forest Lands – is not applicable because there are no forest lands in the city limits.

Goal 5 – Natural Resources, Scenic and Historic Areas, and Open Spaces – is not applicable because the proposed amendment will not affect any regulation that implements Goal 5 and the City's acknowledged regulations implementing Goal 5 remain in effect with no change in applicability.

Goal 6 – Air, Water, and Land Resources Quality – is not applicable because the City's acknowledged regulations implementing Goal 6 remain in effect with no change in applicability.

Goal 7 – Areas Subject to Natural Hazards – is not applicable because the City's acknowledged regulations implementing Goal 7 remain in effect with no change in applicability.

Goal 8 – Recreational Needs – requires the City to satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts. This goal is not applicable as the amendment will have no effect on the availability of or access to recreational opportunities.

Goal 9 – Economic Development – requires the City to plan and zone enough land to meet the community's projected commercial and industrial needs. The City adopted an Economic Opportunities Analysis (EOA) in 2020. This document serves as the City's compliance document under Goal 9, OAR 660-009-0015, and ORS 197.712, and provides the basis for commercial and industrial development policies established in the Comprehensive Plan. Updated information in the amended TSP will help the City plan for and implement said policies. Lastly, an essential role of the TSP is to plan for the needs for the movement of goods and services to support industrial and commercial development.

Goal 10 – Housing – provides for the housing needs of citizens of the state. The City adopted a Housing Needs Analysis (HNA) in 2019. This document serves as the City's compliance document under Goal 10, OAR Chapter 660, Division 008, and ORS 197.296(3). This report concludes that Redmond should plan to accommodate development of 6,963 new dwelling units over the next 20 years in order to house the projected population growth. The proposed amended TSP will have no impact on lands needed for housing.

Goal 11 – Public Facilities and Services – requires the City to plan and develop a timely, orderly, and efficient arrangement of public facilities and services to serve as a framework for urban and rural development. Most notably, a revision to employment forecasts for the LLI lands has necessitated the need for an amendment to the 2020 TSP. As a result, the City is and will continue to partner with Deschutes County and ODOT to evaluate how the transportation capacity needs can be met given the updated growth assumptions within the 20-year planning horizon.

Goal 12 – Transportation – requires the City to provide and encourage a safe and convenient and economic transportation system. The development of a TSP is guided by OAR Chapter 660, Division 012. The City's 2020 TSP was adopted and acknowledged by DLCD. This proposal involves a post-acknowledgement amendment to the 2020 TSP. OAR 660-012-0060 requires cities to mitigate any significant effects on existing or planned transportation facilities resulting from changes in plans and land use regulations. The modal plan elements of the 2020 TSP are not changing and there are no underlying land use actions that have been included. The purpose of this TSP amendment is to align transportation projects and priority with shifting development priorities consistent with the City's Comprehensive Plan.

Goal 13 – Energy Conservation – is not applicable because the City's acknowledged regulations implementing Goal 13 remain in effect with no change in applicability.

Goal 14 – Urbanization – requires the City to provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities. The proposed amended TSP does not encourage uncoordinated development, sprawl, or lower targeted densities. The management of the City's land use inventories is unaffected by this amendment.

Goal 15 – Willamette River Greenway – is not applicable to the city of Redmond.

Goal 16 – Estuarine Resources – is not applicable to the city of Redmond.

Goal 17 – Coastal Shorelands – is not applicable to the city of Redmond.

Goal 18 – Beaches and Dunes – is not applicable to the city of Redmond.

Goal 19 – Ocean Resources – is not applicable to the city of Redmond.

Based on the above discussion and finding, the proposed amendment is consistent with the statewide planning goals and therefore complies with criterion #2.

3. In conformity with the Redmond Comprehensive Plan, land use requirements and policies; and

FINDING: The following Comprehensive Plan chapter and policies have been determined to apply directly to this amendment:

Chapter 1 of the Comprehensive Plan identifies goals and policies that address citizen involvement. Goal 1 speaks to engagement and the opportunity for the community to be informed and involved in all phases of the planning process. The Urban Area Planning Commission serves as the City's formal citizen advisory committee (as required by State Administrative Rule) and is made up of Redmond area residents. The Planning Commission is formally recognized through City Code and was appointed by the City Council. Thus, the Planning Commission is the appropriate public review and recommendation body to the City to meet this Comprehensive Plan policy.

Chapter 2 of the Comprehensive Plan identifies goals and policies that pertain to land use planning and procedures. Specifically, it speaks to establishing a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions. Most relevant to the proposed Comprehensive Plan amendment, Goal 3 of the chapter addresses implementation tools of the Comprehensive Plan. Policy 2-3-3 identifies the need to "Adopt updates to system plans, as required by state law or necessary to address changing community needs and incorporate these plans by reference in the Comprehensive Plan." As mentioned

earlier, employment forecasts for the LLI lands were in need of revision as well as the evaluation of transportation scenarios. The purpose of this amendment is to reevaluate the transportation needs associated with the increased employment and update the timing of needed projects to reflect these updated growth assumptions within the 20-year planning horizon. The amendment also recognizes ODOT's Alternate Mobility Targets for the intersections of US Highway 97/Evergreen Avenue and US Highway 97/Glacier Avenue, which will align regional transportation planning documents and provide consistency for development reviews.

Chapter 9 of the Comprehensive Plan identifies goals and policies that address economic development in Redmond. Goal 3 of the chapter identifies policies related to infrastructure planning. Policy 9-3-2 states that "The City will ensure that infrastructure planning is cost-effective, supports economic development, is consistent with the City's master plans for new area development, and supports cohesive development patterns across the City." To ensure consistency with this policy, a change in circumstances with the revision to employment forecasts for the LLI lands as well as recognition of ODOT's Alternate Mobility Targets for two major intersections has warranted this amendment to the 2020 TSP. This amendment will help ensure proper infrastructure planning given the updated forecasts and conditions.

Chapter 11 of the Comprehensive Plan addresses public facilities and services. In the planning for public facilities, which includes transportation, City staff coordinated frequently with Deschutes County and ODOT on the amended TSP. This is consistent with Policy 11-2-1, which states "Coordinate public facility planning for the Redmond UGB with participation and assistance from Deschutes County and [other entities and service providers, including ODOT]."

Chapter 12 of the Comprehensive Plan identifies goals and policies that pertain to transportation and identifies seven distinct goals with respective policies. All goals and policies in Chapter 12 come directly from the 2020 TSP. These goals and policies are not changing as part of the amended 2020 TSP.

Based on the above discussion and finding, staff concludes that the proposed Comprehensive Plan amendment complies with criterion #3.

4. That there is a change of circumstances, further studies justifying the amendment or mistake in the original zoning.

FINDING: The 2020 TSP modeled employment numbers in the LLI area that are not reflective of the actual development demand expected for this Regionally Significant Industrial Site. Based on current traffic data and development plans, the City needs to reevaluate the employment assumptions and utilize an updated regional Travel Demand Model to accurately plan for needed infrastructure based on growth in the 20-year planning horizon.

Based on the above finding, staff concludes that the proposed Comprehensive Plan amendment complies with criterion #4.

EXHIBIT A

City of Redmond TRANSPORTATION SYSTEM PLAN AMENDMENT

May 2025

CONTENT DRAFT

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DRAFT

In This Chapter

- What is included in the Transportation System Plan?
- What principles guided the development of the TSP?
- Who participated in the development of the TSP?

1 Introduction

Welcome to the Redmond Transportation System Plan (TSP). This document establishes a system of transportation facilities and programs to serve the City over the next 20 years. The TSP serves as the transportation element of Redmond's Comprehensive Plan and the amendment updates the TSP adopted in 2020.

The City's transportation system supports how people and goods move from one place to another and affects nearly every aspect of our lives. We import food, clothing, and building materials to our homes. A constant flow of freight supplies many aspects of our lives. We travel to work and school and move about to socialize and play. Streets, pathways, rail lines, and the Redmond Airport create the framework around which our City is built and helps define our livability. Our personal choices about how we travel affect our daily lives and our physical and mental well-being. Transportation is the backbone that supports our city as it continues to grow and accommodate new citizens.

The TSP articulates City policies and priorities and provides a list of construction projects and programs to ensure that the transportation system continues to support the City's needs and visions; promote an economically vital, healthy, and equitable community; and conform to state and regional policies. The TSP must remain relevant and responsive and will be revisited over time.

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TSP Organization

The City of Redmond's TSP is in two volumes. Volume 1 is the main document and includes the items that will be of interest to the broadest audience. Volume 2 contains the technical memoranda, data, and related transportation plans that enhance and support Volume 1.

Volume 1

Volume 1 includes the following:

- **Chapter 1:** A brief overview of the planning context for the TSP
- **Chapter 2:** Goals and policies that express the City's long-range vision for the transportation system
- **Chapter 3:** The transportation system deficiencies and needs as well as the process to develop the TSP's list of planned capital improvements and transportation programs
- **Chapter 4:** An overview of the recommended projects for the multimodal system (this chapter also serves as the Transportation Element of the Comprehensive Plan)
- **Chapter 5:** A list of the multimodal projects and the costs estimated for their construction
- **Chapter 6:** A summary of transportation funding and implementation, including estimated revenue stream, cost of 20-year needs, and potential funding sources

Volume 2

Volume 2 includes the following technical documents:

- **Appendix A:** Public Involvement Plan
- **Appendix B:** Plans and Policy Review
- **Appendix C:** Analysis and Assumptions Methodology
- **Appendix D:** Existing Conditions Analysis
- **Appendix E:** Future Systems Conditions
- **Appendix F:** Alternatives Analysis
- **Appendix G:** Redmond Airport Master Plan Update
- **Appendix H:** Identification of Preferred and Cost-Constrained Alternatives
- **Appendix I:** South Corridor Recommendations
- **Appendix J:** Cost Estimates
- **Appendix K:** Large Lot Industrial Lands Analysis
- **Appendix L:** ODOT Mobility Target Memo

While not all of Volume 2 is adopted as part of the TSP, all of the documents provide useful information regarding the basis for the decisions represented in Volume 1.

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Purpose

The TSP identifies transportation facilities and services to support the City's adopted Comprehensive Plan. This TSP provides for a long-term community approach to accommodate new growth while maintaining and improving transportation facilities for all users over the next 20 years.

The TSP also serves as a resource for future transportation and land use decision-making by providing:

- Solutions to address existing and future transportation needs for biking, walking, using transit, driving, freight, air, and rail;
- A blueprint for investments in transportation projects and programs that improve safety and access for all travelers, improve Regional and State resilience, and support City and Regional economic development priorities;
- A tool for coordination with regional and local agencies and governments;
- Information to ensure prudent land use and transportation choices;
- Order of magnitude cost estimates for transportation infrastructure investments needed to support economic development and growth, and possible sources of funding these improvements;
- Function, capacity, and location of future streets, sidewalks, bikeways, pathways, transit, and other transportation facilities; and
- Potential programs to help improve opportunities to travel by walking, bicycling, and transit in the future.

The TSP satisfies the State's requirements for a local transportation system plan as prescribed by Oregon Statewide Planning Goal 12: Transportation.

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Guiding Principles And Context

The TSP provides a flexible, adaptable framework for making transportation decisions in an increasingly unpredictable and financially constrained future. Decisions about the City's transportation system will be guided by the goals and policies contained in Chapter 2, but ultimately the decisions will be made within the overall context of the City's land use plans, support for local and regional economic development, and the City's role in the Oregon Resilience Plan. These guiding plans and principles provide a foundation for the TSP's goals, policies, and potential actions.

The Oregon Revised Statutes (ORS) require that the TSP be based on the Comprehensive Plan land uses and provide for a transportation system that accommodates the expected growth in population and employment.

Development of this TSP was guided by ORS 197.712 and the State's Transportation Planning Rule (TPR), as defined in Oregon Administrative Rule (OAR) 660-012.

Per the TPR, this TSP identifies multimodal transportation needs to serve users of all ages, abilities, and incomes. As such, solutions to address existing and future transportation needs for bicycling, walking, transit, motor vehicles, freight, and rail, and improved safety for all travelers are included. As required by the TPR, the TSP was amended in coordination with local, regional and state transportation plans.

Regional Coordination & Community Engagement

Because traffic and mobility needs do not stop at a city's borders, the City is and remains committed to coordinating transportation planning efforts within Central Oregon. This TSP was collaboratively developed and amended by the City and community members, businesses, ODOT, and Deschutes County. Opportunities for engagement included:

- A project website that included web-based surveys and all technical reports, draft goals and policies, meeting summaries, a document library stocked by members of the public, and links to other planning activities in the region;
- Monthly Project Management Team (PMT) meetings attended by City, ODOT, and County staff;
- Regular updates and work sessions with the Redmond Urban Area Planning Commission;
- Three Public Advisory Committee (PAC) meetings;
- Two public open houses co-led with the South Corridor Project;
- One virtual open house on the draft TSP;
- Targeted outreach with local community, neighborhood, and social service organizations;
- Technical Advisory Committee meetings for the Department of State Lands Infrastructure Master Plan; and
- City Planning Commission, City Council, and Deschutes County Board of Commissioners work sessions and public hearings.

Through these activities, the City provided community members with a variety of forums to identify their priorities for future transportation projects, programs, and policies.

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In This Chapter:

- What goals guide the 20-year Transportation System Plan?
- What policies will be set to carry out these goals?
- What is the difference between goals and policies?

2 Goals & Policies

The TSP Goals are intended to be broad statements that characterize the community's desires and vision for the future transportation system. The goals are intended to be aspirational and may not be fully attained within the 20-year planning horizon of this plan. The goals are intended to be supported by the policies as well as specific implementation items for the City to address in the future.

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TSP Goals

1. Provide a safe and efficient transportation network to complement key economic development priority areas; the comprehensive plan; recreational needs; and adopted state, regional, and local plans and policies.
2. Advance community and statewide emergency preparedness efforts through support of the Oregon Resiliency Plan.
3. Provide transportation choices and address the needs and safety of all travelers, including people of all ages, abilities, ethnicities, and incomes.
4. Provide comfortable, convenient, and safe pedestrian and bicycle facilities for all users.
5. Provide reliable and convenient transit service to Redmond's residents, its businesses, and its connection to surrounding cities, as well as special transit options for the City's elderly and disabled residents.
6. Ensure efficient and effective freight transportation infrastructure is developed and maintained to support local and regional economic expansion and diversification consistent with City and Regional economic plans and policies.
7. Implement the plan in a timely fashion and keep it up to date with respect to local and regional priorities.

Policies

Policies are statements adopted to provide a consistent course of action and move the community toward attainment of its goals. Policies in the TSP guide the work of City staff in formulating proposed changes to the Zoning Code and other regulatory documents, to guide other work programs and long-range planning projects, and to prepare the budget and the capital improvement program. These policies will not be used in determining whether the City shall approve or deny individual land use applications.

System Policies to Support Economic Development

Policy 1.1: Manage the City's street, bike, pedestrian, and transit system to facilitate economic growth of existing and future businesses in Redmond.

Policy 1.2: Consider environmental impacts of the overall transportation system and strive to mitigate negative effects and enhance positive features of the natural landscape and topography.

Policy 1.3: Provide a multimodal transportation system to help reduce reliance on single-occupancy vehicle travel and supports mixed-use areas, employment centers, recreation, commercial, residential, and public developments.

Policy 1.4: Manage the on-street parking system to preserve adequate capacity and turnover for access to businesses in the downtown area.

Policy 1.5: Facilitate prompt emergency responses by ensuring that fire and emergency response routes remain passable by design.

Policy 1.6: Coordinate underground capital improvement projects to coincide with needed transportation project expenditures.

Oregon Resiliency Plan Policies

Policy 2.1: Prioritize transit and roadway improvements that help ensure access to local schools and other public buildings that could be used during emergencies.

Policy 2.2: Prioritize roadway improvements that can be used as alternative routes to US 97 and OR 126 in the case of emergencies.

Policy 2.3: Prioritize roadway improvements that provide land-side access to the Redmond Municipal Airport and the BNSF Railway line.

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Multimodal Policies

Policy 3.1: Address the mobility and safety needs of motorists, transit users, bicyclists, pedestrians, freight, and the needs of emergency vehicles when planning and constructing roadway system improvements.

Policy 3.2: Consider safety first when making transportation decisions. Strive for zero transportation-related fatalities and severe injuries through design, operations, maintenance, education and enforcement.

Policy 3.3: Foster neighborhoods where all residents can meet many of their basic daily needs without an automobile by providing streets, sidewalks, bike facilities and access to transit in an environment where people feel safe and secure.

Policy 3.4: Expand existing Transportation Demand Management (TDM) programs related to carpooling, alternate work schedules, walking, bicycling, and transit use in order to reduce peak hour congestion and reliance on single-occupancy vehicles.

Bicycle and Pedestrian Policies

Policy 4.1: Maintain and preserve a safe and efficient bike and pedestrian system in Redmond.

Policy 4.2: Strive to increase the percentage of bicycle and pedestrian system users by planning, designing, and managing systems to support the needs of diverse populations and types of users, including meeting Americans with Disabilities Act (ADA) needs.

Policy 4.3: Ensure that there are safe, accessible, comfortable, and direct sidewalk connections between residential areas, schools, major destinations, and transit stops.

Policy 4.4: Improve community health by designing streets and paths to encourage increased physical activity by the public.

Policy 4.5: Prioritize improvements that complement and improve access to the Dry Canyon trail system.

Policy 4.6: Coordinate with Deschutes County and other agencies to provide additional trail extensions throughout the community including connections beyond the city limits.

Transit Policies

Policy 5.1: Coordinate with Cascades East Transit (CET) to increase the transit system's accessibility and convenience for all users, including the transportation-disadvantaged population.

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Policy 5.2: Prioritize improved transit service in areas with access to key employment and recreational areas.

Freight Policies

Policy 6.1: Manage traffic operation systems for efficient freight and goods movement along designated freight, truck, and rail routes in Redmond.

Policy 6.2: Facilitate efficient access for goods, employees, and customers to and from employment, commercial, and industrial lands, including freight access to the Redmond Municipal Airport.

Policy 6.3: Reduce conflicts between rail and street traffic.

Regional Coordination Policies

Policy 7.1: Coordinate the design of Redmond's transportation system with ODOT, Deschutes County, CET and other relevant local, regional, and state agencies.

Policy 7.2: Support development of a stable and flexible transportation finance system that provides adequate resources for transportation needs identified in the TSP.

Policy 7.3: Build and maintain public support for the TSP through open information, public participation, public discussion of the plan's effects on the community, and periodic reassessment of the plan's goals and policies.

Policy 7.4: Evaluate opportunities for providing Transportation System Management and Operations (TSMO) improvements that address safety and efficiency for all modes.

Policy 7.5: Coordinate with ODOT on the implementation of the South Corridor Plan, including local roadway connections and circulation.

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In This Chapter

- What is Redmond's transportation system like now?
- What types of projects will likely best meet current and future needs?

3 Needs Assessment & Evaluation

The TSP goals, policies, projects, and potential implementing actions are based on analysis by, and input received from, the community, City of Redmond staff, partner agency staff, and City policymakers. Their review included analysis of existing transportation conditions for all modes of travel, forecast deficiencies in the transportation system, and evaluation of possible system improvements that can meet the transportation needs for all users (including the transportation disadvantaged) and address the need for movement of goods and services to support local and regional economic development priorities. The list of recommended projects and programs was identified based on an analysis of the City's transportation needs and potential system alternatives, as well as a detailed review of relevant state, regional, and local plans, policies, and funding opportunities. The following sections outline the key findings from the existing and future needs analyses that helped shape the recommendations.

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Existing Transportation System Conditions

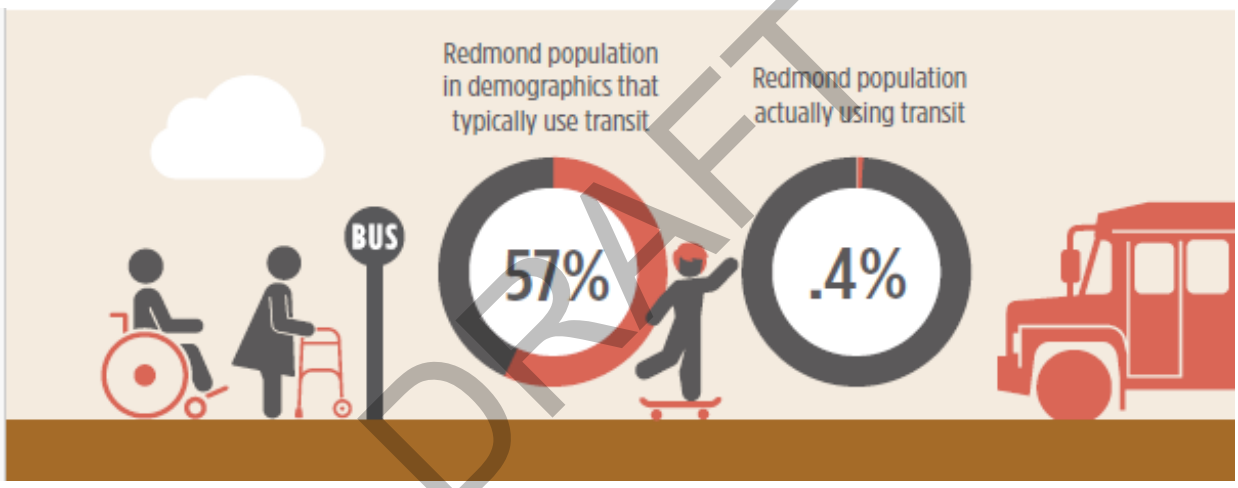
Existing transportation needs, opportunities, and constraints reflect an inventory of the multimodal transportation system characteristics conducted in 2017. This inventory included all major transportation-related facilities and services within the Urban Growth Boundary (UGB) at that time. Key roadway features, traffic conditions, safety performance, bicycle and pedestrian facilities, and transit service, among other topics, were analyzed. Detailed findings of the technical analysis are summarized in Volume 2, Appendix D: Existing Conditions Analysis. Key findings of this review are outlined below.

Key Findings

- Approximately 57 percent of Redmond's population consists of demographic groups related to age, disabilities, and income that typically rely on public

transportation in other communities; however, less than one percent of the population (0.4 percent) utilizes public transportation.

- Citywide, sidewalks are frequently missing on one or both sides of the street, there is a lack of consistent street lighting, and there are long distances between protected pedestrian crossings. Walking can be improved by filling gaps in the sidewalk network, improving buffers from traffic, and providing improved crossings and other safety measures.
- A number of arterial roadway corridors and key intersections could benefit from strategic capital improvements to the existing system to provide better connectivity, improved safety measures, and an improved walking and cycling effort.
- An increase in low-stress bicycle facilities is needed citywide.
- Freight access, particularly on the east side of town, is a critical component of the Redmond economy.



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Basis of Need Assessment

The TSP addresses the projects, programs, and policies needed to support growth in population and jobs within the Redmond UGB as well as the travel associated with regional and state economic growth between now and the year 2040. Over time, the City, Deschutes County, and ODOT will monitor the multimodal transportation needs and will periodically update the TSP to respond to changing conditions.

The needs assessment and resulting projects (set forth in Chapter 4) intended to meet Redmond's identified transportation needs are based upon the land use designations established by the City's adopted Comprehensive Plan. The TSP reflects Redmond policymakers' and community members' priorities to maintain existing facilities and reduce congestion, save money, and provide health benefits for the entire community by

providing alternatives to single occupancy vehicle travel and by making existing streets safer and more efficient without costly increases to automobile-oriented infrastructure.

2040 Population and Employment Forecasts

Table 1 shows the household and job growth forecasts within the City's UGB. The City of Redmond, in coordination with ODOT, allocated this growth to developable areas within the UGB consistent with the land use designations shown in the adopted Comprehensive Plan at the time the TSP was prepared.

Traffic Volume Development

Based on the geographic allocations of future job and household growth within the UGB, ODOT's Transportation Planning and Analysis Unit (TPAU) developed traffic volume forecasts for the City's collector and arterial street system using the Bend-Redmond regional travel demand model, which is a tool that is used to forecast future street volumes based on projected increases in jobs and housing as well as changing travel preferences. This model is calibrated to existing traffic volumes measured on streets and highways within the City. In addition to land use and street network inputs, the model also relies on information about existing traveler behavior and trip-making characteristics derived from surveys, and from research that forecasts how people might use the transportation system in the future.

The travel demand forecasts and measured traffic counts at 45 intersections within the City were used to calculate intersection and roadway volumes for use in the analyses of future system deficiencies. The future volume calculations were performed using the procedures outlined in ODOT's Analysis and Procedures Manual (APM).

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Table 1: City of Redmond Land Use Estimates*

	Year 2010	Year 2040	Growth
Households	10,061	22,433	12,372 (123%)
Employees	10,134	28,550*	18,416 (181%)

*As part of the Large Lot Industrial Lands Infrastructure Master Plan, the number of 2040 employees was estimated to increase to approximately 34,050 jobs based on an assumed increase in employment in South Redmond.

Baseline Streets and Intersections Analysis

Previously adopted plans and policies for the City, Deschutes County, and ODOT all identified a variety of street, pedestrian, bicycle, and transit projects that could be implemented in the future. The Baseline Analysis assumes the future population and employment forecast and the existing transportation system will not change by 2040 except for the construction of transportation improvements that have already been started or those for which funding is already allocated. At the time the TSP was prepared, there were no guaranteed funding sources for any major projects that will materially affect traveler behaviors and traffic volumes on the City's street network in the future with the exception of the 9th Street corridor project. This analysis informs the development of the project list reflected in Chapter 4.

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Identified Transportation Needs

The results of the future year analyses are summarized in Volume 2, Appendix E: Future Systems Conditions as well as Volume 2, Appendix K: Large Lot Industrial Lands Analyses.

Key Findings

- Several primary street corridors are anticipated to experience increased congestion in the future. Notable examples include OR 126 within the UGB, Maple Avenue between US 97 and Northwest Way, Yew Avenue between Airport Way and S 27th Street (including the US 97 interchange), the SE 9th Street corridor, and US 97 at and south of Evergreen Avenue (OR 126). Multimodal circulation and capacity improvements are needed to support continued economic growth and vitality within the city and to offer a variety of route and mode choices to help alleviate this congestion.
- Many of the arterial and collector intersections are anticipated to need geometric and/or traffic control modifications in the next twenty years to maintain a desired quality of service for future users.
- Several of the streets within the City lack sidewalks, especially in the neighborhoods to the west of US 97. The City should consider prioritization of new sidewalks and pathways that connect neighborhoods to schools, commercial areas, and other key destinations.
- Bicyclists are required to "share the road" on most streets within Redmond or ride on busier collector and arterial bike lanes, which are classified as "high-stress" under existing and future year conditions and are not suitable for riders of all ages and abilities. When bike lanes are provided, the facilities are often non-buffered and located on higher volume and/or higher speed roads, which typically offset the stress reducing attributes of the bike lane. Additional low-stress bike facilities to support commuting, recreational, and personal travel are needed.
- The bicycle trail system should be expanded to encourage greater access for all users.
- Increased transit options are needed to facilitate travel throughout the City.

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Evaluation Of Transportation System Alternatives To Address Identified Needs

The PAC, PMT, and participants at open houses and other community forums identified transportation system alternatives that had the potential to address existing and future transportation needs. These alternatives address all modes of travel and include programs that would reduce vehicular travel demand. Further, these potential system alternatives avoid principal reliance on any one mode of transportation and increase transportation choices for all users. The PMT developed these ideas into a potential project list that was screened by agency staff against the TSP's evaluation criteria and

ultimately identified for the 20-year list of projects reflected in Chapter 5. This multistep process is described below.

The potential alternatives were first screened against a set of key questions, including:

- Does the project address an identified transportation problem or opportunity?
- Is the project within the City's Urban Growth Boundary? Is it within the City's control, or the control of its partnering agencies, to implement?
- Is it technically feasible to construct and/or implement?
- Could the project be reasonably funded within the next twenty years?

If the answer to any question was "no," the project idea was not further considered. The remaining ideas were evaluated by the PMT against the criteria that are intended to help differentiate between alternatives. The criteria considered included:

- Balances impacts to developable parcels with system and community needs;
- Minimizes impacts to Goal 5 resources;
- Supports or enhances the ability to implement the Oregon Resiliency Plan and/or other key state or regional projects;
- Leverages future transportation investments to reduce access, economic, safety and health disparities between neighborhoods, particularly those areas with a higher percentage of the underserved population than the City as a whole;
- Addresses key connectivity needs on the collector and arterial street system;
- Addresses known safety issues;
- Supports enhanced multimodal access to major activity centers and/or economic development priority areas within the City as well as the region;
- Provides pedestrian and bicycle connectivity to key transit corridors;
- Provides pedestrian and bicycle connectivity to key routes to school;
- Addresses key gaps in the bicycle system;
- Addresses key gaps in the pedestrian system;
- Improves freight mobility on designated freight, truck, rail, and air routes;
- Improves mobility for through traffic on state highways; and,
- Leverages public and private investments.

The resultant 20-year project list is intended to address the identified transportation needs, meet the TSP goals, and reflect the criteria included in ORS 660-012-0035. The recommended multimodal transportation projects are organized into the following categories for implementation based on complexity, likely availability of funding, and assessment of need:

- Strategic Street Capacity Investment Corridors;
- New Planned Streets;
- Intersection Capacity Improvements;

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- Grade-Separated Intersection Improvements;
- Key Multiuse Pathways;
- Key Bicycle Corridors; and
- Key Pedestrian Improvements.

The draft project lists and a map of the project locations were posted to the City's website prior to adoption. The project lists are provided in Chapter 5.

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In This Chapter

- What types of facilities are needed to support people using different modes of transportation?
- What features characterize Redmond's pedestrian, motor vehicle, bicycle, freight, rail, air, pipeline, and waterway facilities?

4 Creating Multimodal Systems

The TSP is a coordinated set of multimodal policies, programs, and projects that address the transportation needs within Redmond's UGB over the next 20 years. This chapter provides an overview of these programs and projects; the detailed project list and associated cost estimates are shown in Chapter 5.

Planning for a network of "Complete Streets" that allow for safe travel by those walking, cycling, driving automobiles, riding public transportation, or delivering goods is an integral part of the TSP. Although automobiles will continue to be a primary mode of travel, and preservation and improvement of the existing street system remains important, the projects, policies, and programs highlight improvements that are designed to increase transportation choices, reduce reliance on the automobile by better accommodating and encouraging travel by foot and bike for short trips, improve safety for all street users, and provide for improved transit service. The TSP, in partnership with the City's adopted land use plans and regulations will ultimately result in land use patterns and transportation systems that make walking, cycling, and use of transit highly convenient so that, on balance, people need to and are likely to drive less than they do today.

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Vehicular Needs

The preliminary screening evaluation identified arterial and collector streets that experience or are projected to experience traffic congestion and delay and/or are lacking pedestrian and bicycle facilities that comfortably serve a broad range of users. To meet the identified street system needs, the TSP focuses strategies that improve connections between existing neighborhoods, employment, and commercial areas; provide connections to newly developed areas; improve safety for all travelers; and increase the efficiency of the existing system.

Functional Classification of Streets

The City's street functional classification system organizes the roadway network as a balanced hierarchy of mobility and access to, through, and between different types of land uses. Some factors that are considered in setting a roadway's functional classification are average daily traffic (ADT) volumes, street connectivity, spacing of streets, and the mix and amounts of different travel modes on a typical segment (e.g., bikes and cars). As the community continues to grow and mature, the City will revisit functional classifications periodically to ensure that particular street classifications are still appropriate. The functional classification of the roadway system in Redmond is shown in **Figure 1.**

The functional classification system is intended to provide more certainty for both private development investment expectations as well as for City construction processes. This system categorizes streets in the City as:



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Street Design Standards

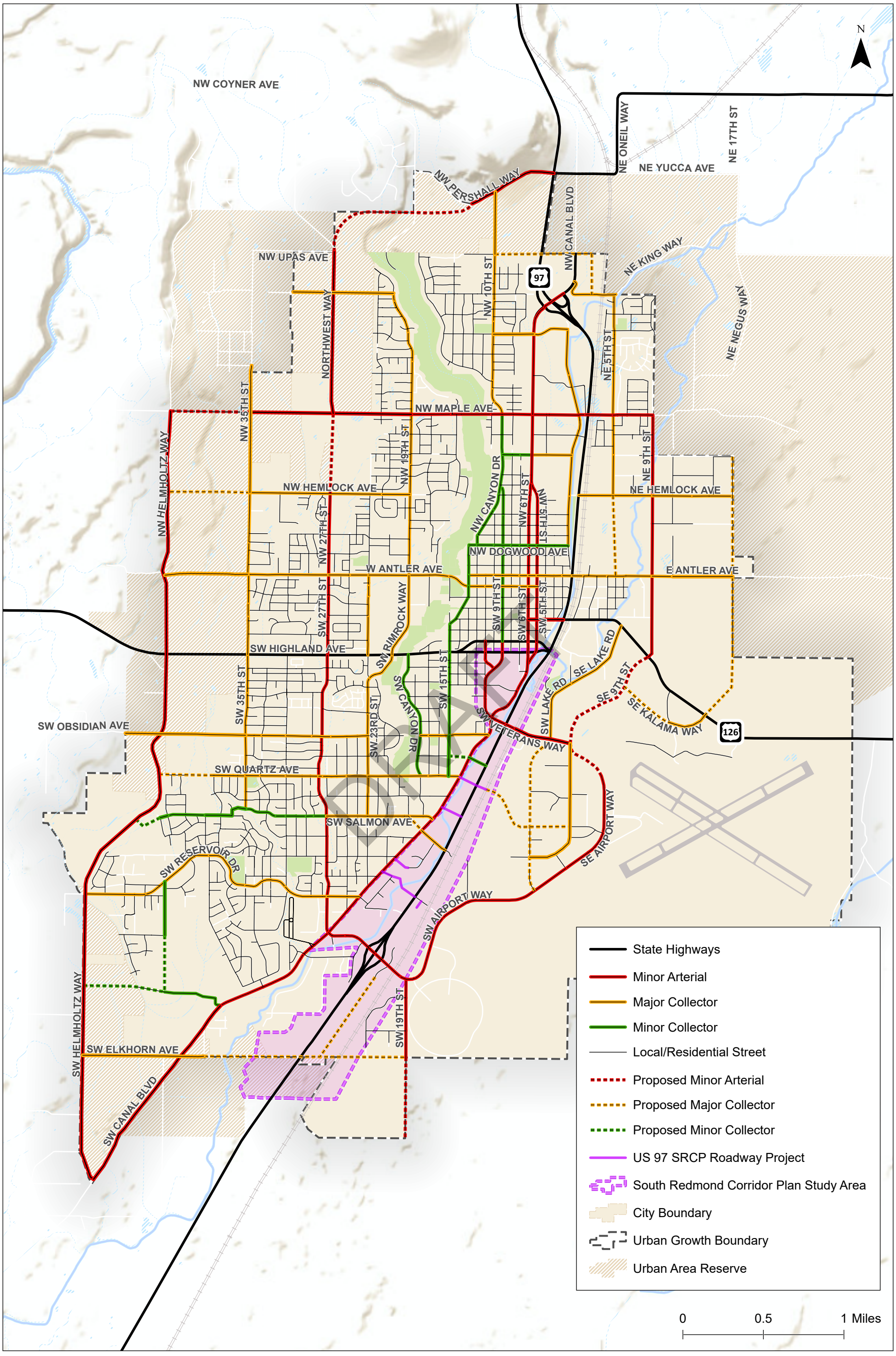
Street design standards provide information on how streets within each of the functional classifications look and feel. The City's Street Design Standards identify how existing streets can be modified and new streets can be constructed to accommodate the needs of people with disabilities, riding bicycles, using transit, walking, driving automobiles, and moving freight. In the past, most street design standards were primarily oriented toward moving vehicle traffic and providing rudimentary bike lanes and sidewalks for pedestrians. The TSP reflects design standards intended to ensure streets provide comprehensive and integrated transportation networks that serve all modes of transportation and create quality facilities that invite people of all ages and abilities to pursue active transportation.

Redmond Engineering Standards maintain more specific design elements for each of these sections, including applicable variances and pavement design requirements. The TSP provides general guidance for each functional classification on the right-of-way width requirements, number and type of vehicle lanes, the type and width of pedestrian facilities and the type and width of bicycle facilities. In some cases, additional features,

such as wider sidewalks, multiuse paths, medians, protected bike lanes and protected parking lanes, may be added on a case-by-case basis and per the direction of the City Engineer.

The typical sections are illustrated in **Figure 2** through **Figure 6**.

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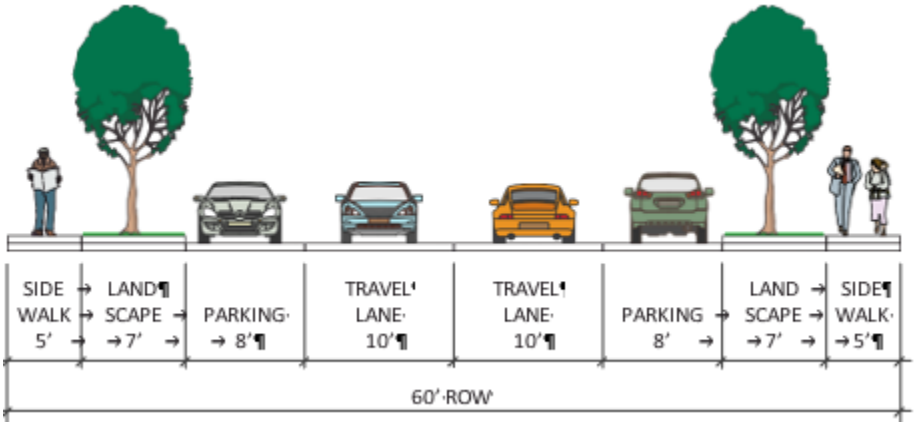
Functional Classification
Redmond, Oregon

Figure
1

Coordinate System: NAD 1983 Oregon Statewide Lambert Feet Intl

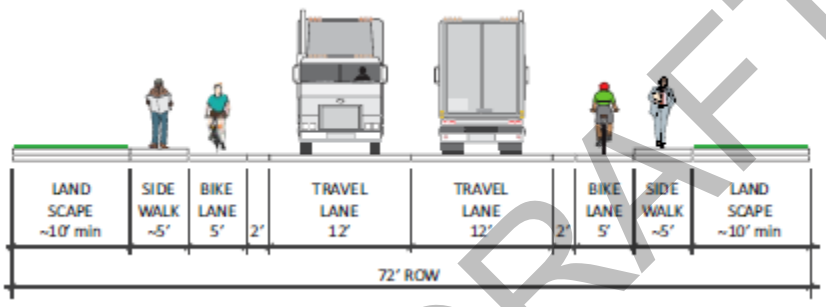
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Figure 2: Standard Local Residential Typical Section



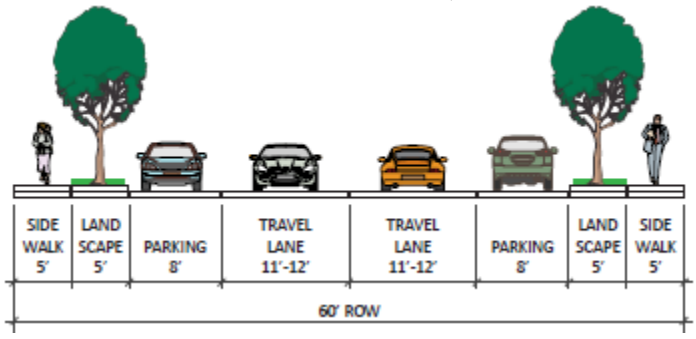
Note: Landscape & sidewalk width can be varied.

Figure 3: Industrial Street Typical Section



Note: Landscape & sidewalk width can be varied.

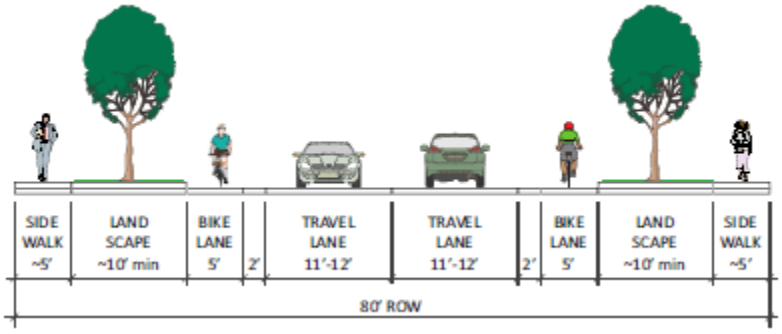
Figure 4: Minor Collector Typical Section



Note: Landscape & sidewalk width can be varied.

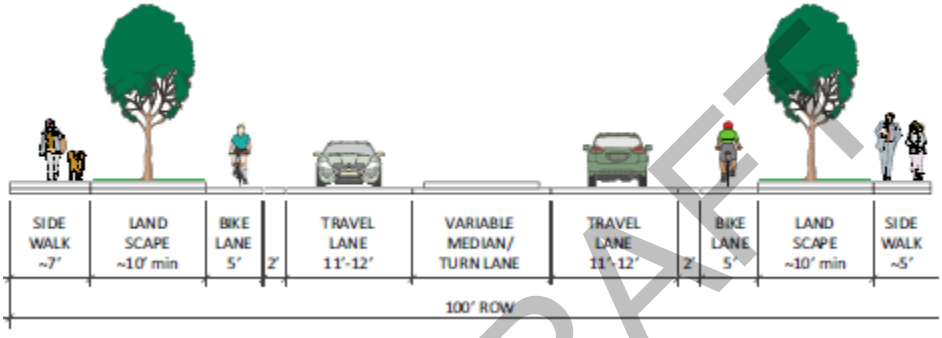
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Figure 5: Major Collector Typical Section



Note: Landscape & sidewalk width can be varied.

Figure 6: Minor Arterial Typical Section



Note: Landscape & sidewalk width can be varied.

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Street Capacity Improvements

The needs analysis identified arterial and collector streets that experience or are projected to experience traffic congestion and delay, lack pedestrian and bicycle facilities to comfortably serve a broad range of users, and/or could hinder implementation of the provision of future reliable transit services in a cost-effective manner. Seven corridors reflect the City's current strategic focus for capacity improvements, including: Pershall Way, Northwest Way, SW Helmholtz Way, OR 126 east of US 97, OR 126 west of the downtown, SE/NE 9th Street, and SW Veterans Way.

Roadway widening and similar improvements to these key corridors can help accommodate growth and economic development in the region and continue to shape the urban context for the City. Such improvements can improve mobility and connectivity as well as create opportunities to incorporate bicycle, pedestrian, and transit facilities where they do not exist.

New Planned Streets

A number of new streets are planned to improve connectivity between and within existing neighborhoods, employment, and commercial areas; to provide connections to newly developed or developing areas; and to provide alternative travel routes for all modes to existing streets. Twenty-three streets were identified for extension and/or providing new connections.

Intersection Capacity Improvements

Intersection capacity improvements are typically related to modifications that are lower in cost than a typical street corridor project and that generally do not often require significant right-of-way acquisition. The TSP is not inclusive of all of the intersection projects that the City will pursue over the next twenty years. Rather, the projects are those that the City can pursue to strategically improve the operational efficiency of specific intersections and important roadways. These projects can enhance system operations and can be completed as opportunities arise. In all cases, the City will review the appropriate intersection control options at the time of project development and delivery.

Graded-Separated Intersection Improvements

Three intersections were identified for grade separation to eliminate conflict points and improve traffic flows; one location was identified for future evaluation.

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Key Multiuse Pathways

Multiuse pathways are paved and separated from streets and are designed for both walking and bicycling. Where space allows, corridors with high usage may be developed with redundant paths to separate people walking from people biking. The paths for people walking or running may be unpaved depending on the intended use. The multiuse pathway system improves continuity for bicyclists and pedestrians to move freely throughout the transportation network and helps to eliminate north-south barriers for east-west access, particularly through the Dry Canyon and across US 97. Twenty-one new multiuse pathways were identified for inclusion into the TSP.

Key Bicycle Corridors

In addition to the multiuse pathways, new bike lanes, quiet streets, and protected bike lanes will serve the bicyclists of Redmond in the future. A brief definition of each is provided below.

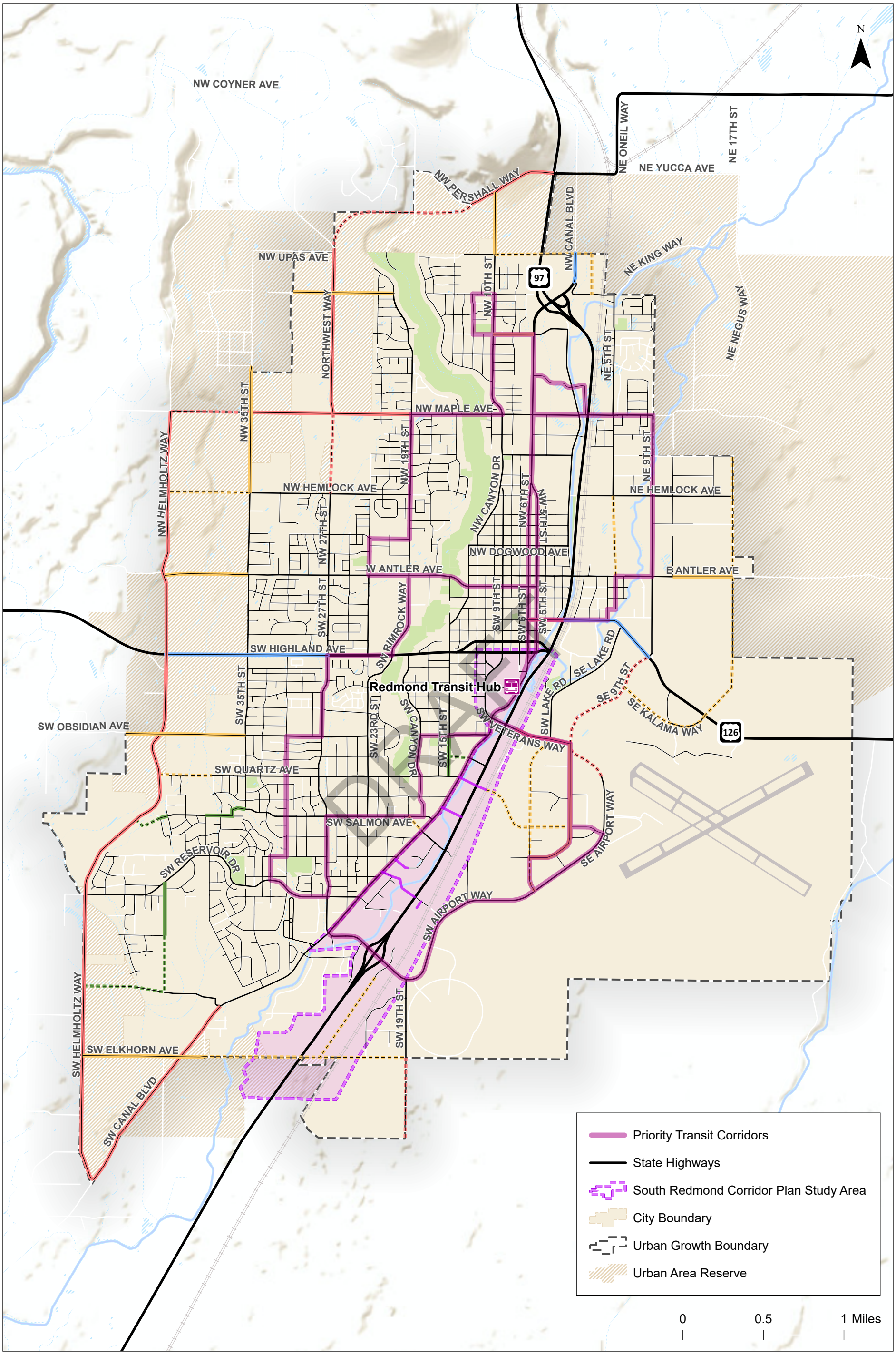
- A quiet street is a bike route on a low-volume, low-speed street that has been optimized for bicycle travel. These streets contain different features depending on adjacent land uses; however, they are all intended to contain wayfinding signs, pavement markings, and intersection treatments. Some may also feature diversion to reduce automobile volumes and traffic calming to slow motor vehicle speeds.
- A bike lane is a marked space along a length of roadway that is designated for use by people bicycling. Wheelchair users and some motorized scooters are allowed in bike lanes.
- Buffered bike lanes feature a buffer strip to provide space between the bike lane and the vehicle lane or parked cars.
- A protected bike lane, sometimes called a “cycle track,” is an exclusive bicycle facility adjacent to, but separated from, the roadway. Separation is generally achieved using planters, parked cars, curbs, or posts to separate people biking from people driving. Protected bike lanes are best on roads with few cross streets and driveways, particularly on roadways with high vehicle volumes and speeds. A protected bike lane provides a logical extension of a shared use path because it provides the sensation of riding on a path due to the separation from motorized traffic.

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Fifty-two bicycle corridors were identified for inclusion into the TSP.

Crossing improvements, though not specifically identified in the TSP, may be provided when bicycle facilities are constructed that cross major roads. The need for and type of crossing treatment will be evaluated at the time of project development and design.

The City of Redmond will consider upgrades to existing bicycle facilities (such as including a marked buffer) on a case-by-case basis. Such upgrades typically occur in conjunction with scheduled maintenance operations.



Future Transit Corridors
Redmond, Oregon

Figure **7**

Coordinate System: NAD 1983 Oregon Statewide Lambert Feet Intl

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Key Pedestrian Improvements

Sidewalks are paved walkways adjacent to streets. Sidewalks are particularly important for providing basic mobility for people with disabilities. Setback sidewalks (featuring a planted barrier between the sidewalk and travel way) can create more comfort and safety for people walking. All streets within the City are anticipated to have sidewalks over time. The identified TSP pedestrian improvements are intended to prioritize sidewalk facilities along ADA routes, as defined by the City of Redmond.

Crossing improvements, though not specifically identified, may be provided when pedestrian facilities are constructed that cross major roads. The need for and type of crossing treatment will be evaluated at the time of project development and design.

Key Transit Corridors

The provision of high-quality, available, and reliable transit service fundamentally supports the environment, economic development, and equity for all travelers. The TSP includes, as shown in **Figure 7**, both key north-south and east-west transit within all quadrants of the City's UGB between the downtown urban core, residential neighborhoods, existing and planned pedestrian and bicycle corridors, and places of interest. These corridors correlate with the Redmond Transit Hub located at the corner of SW Kalama Avenue and SW Canal Boulevard. Multimodal infrastructure along these corridors will be pursued by the City to enhance the accessibility of future transit service.

The City and CET will continue to work to refine these transit corridors and identify a program to implement more robust transit service within Redmond. Specifically, the City intends to explore various service options in partnership with CET to better serve the community, including the potential for implementing fixed-route service.

Key Freight Routes

The TSP and many state policies and plans recognize the important role that an efficient and reliable transportation system plays in supporting the region's economy, growth, and quality of life. Within the City, highways, city streets, airports, pipelines, and railways provide freight mobility. Trucks, rail, and air service must function together to ensure the efficient and timely movement of freight to, within, and through the community.

As part of the needs analysis, changes to the existing freight and truck routes were identified to ensure consistency with state and federal designations and guidance and in

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reflection of ongoing planning efforts. In particular, the TSP includes freight routes that provide alternative access points to the industrial lands east of US 97, both to the north and south of OR 126. These routes utilize SW Airport Way, SE 9th Street, and NE Hemlock Avenue.

Redmond Municipal Airport

The City of Redmond owns and operates Redmond Municipal Airport/Roberts Field for the tri-county area. The airport is located two miles southeast of downtown Redmond and provides passenger and commercial service, air cargo, and general aviation. The airport has two asphalt paved runways: 7,040 by 150 feet and 7,006 by 100 feet. The facility is designated as Category I (Commercial Service Airport) according to the Oregon Aviation Plan and the Redmond Municipal Airport Master Plan. The Oregon Aviation Plan defines Category I airports as airports that "support some level of scheduled commercial airline service in addition to a full range of general aviation aircraft." The flight destinations can be domestic and international.

Airport development is governed by its own Master Plan, which is included in Volume 2, Appendix G. The recently updated Master Plan includes recommendations to extend the runway, provide additional parking, and evaluate potential development opportunities on lands surrounding the airport. The City, County, ODOT, and the Airport will continue to coordinate on future transportation system improvements that support ongoing upgrades to the airport and that provide support for the Oregon Resilience Plan.

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Rail System

The needs analysis identified rail as an important, energy efficient mode of freight transportation. The TSP supports the continued use of freight rail tracks and service provided in the City by the BNSF Railway and Union Pacific Railroad. These rail services are and will continue to be significant drivers of economic opportunity for Redmond.

The two companies share use of track through Redmond, and the ability of Redmond freight shippers and receivers to use either carrier is a competitive privilege infrequently found elsewhere. The rail line interfaces with the Redmond community between US 97 and the industrial area near the airport. The TSP supports continued coordination between the rail providers, ODOT, the City, and Deschutes County to ensure multimodal

safety is provided in the future at the seven at-grade crossings of the railroad within the City as well as to ensure support of the Oregon Resilience Plan.

Waterways/Pipelines

Central Oregon Irrigation District (COID) maintains the Pilot Butte Canal, which runs north-south through the City of Redmond and connects to Terrebonne to the north and Bend to the south. This canal diverts water from the Deschutes River for a variety of purposes, including to provide water to the City of Redmond. The TSP supports the continued coordination with COID, the City of Bend, Deschutes County, and ODOT.

Vehicular System Performance

The City uses motor vehicle level of service (LOS) standards to evaluate acceptable vehicular performance on local, collector, and arterial streets. LOS standards are presented as grades A (free-flowing traffic conditions) to F (congested traffic conditions). ODOT uses mobility targets based on volume-to-capacity (V/C) ratios to evaluate acceptable vehicular performance on state facilities. As V/C ratios approach 1.0, traffic congestion increases.

In some cases, it may not be possible or desirable to meet the designated mobility target or LOS standard. In those cases, an alternative mix of strategies such as land use, transportation demand management, safety improvements or increased use of active modes may be applied.

The LOS and mobility targets to be applied in Redmond are listed below. ODOT mobility targets apply to state highways as well as to city streets near highway interchanges; the interchange influence area is generally defined as one-quarter mile from a ramp terminal or as the area between the ramp terminal and the first public street intersection. Appendix L includes a memo that details the alternative mobility targets adopted by ODOT.

The applicable performance targets include:

- **City signalized intersections:** LOS E.
- **City unsignalized intersections:** LOS E and V/C ratio less than 0.9 for critical approach.
- **US 97 and OR 126:** V/C ratio of 0.8 or 0.85, depending on location, except at the following locations:
  - US97/SW Veteran's Way – mobility target of 1.0.

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- US97/SW Pumice Avenue– mobility target of 1.0;
- US97/Quartz Street– mobility target of 1.0;
- US97/Reindeer Avenue/Salmon Avenue– mobility target of 1.0;
- US97/Odem Medo Way – mobility target of 1.0
- US97 Northbound Ramp Terminal/Yew Avenue – mobility target of 1.0;
- US97 Southbound Ramp Terminal/Yew Avenue – mobility target of 1.0;,
- US97/Wickiup Avenue– mobility target of 1.0;,
- US 97/SW Glacier/SW Highland – mobility target of 0.99 with 3 hours of congestion (V/C ratio >1) acceptable; and,
- US 97/Evergreen Avenue – V/C ratio of 0.99.

In This Chapter

- What are the priority projects for roadways, intersections, and bicycle and pedestrian facilities?
- What specific needs do the South Redmond and South Redmond US 97 corridor areas have?

5 Transportation Priorities & Project Categories

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The TSP recommends transportation programs and infrastructure improvements to fulfill the plan's goals and policies. These are organized into the following categories that suggest timeframes for implementation based on complexity, likely available funding (including potential funding sources), and assessment of need:

- Strategic Street Capacity Investment Corridors
- New Planned Streets
- Intersection Capacity Improvements
- Grade-Separated Intersection Improvements
- Key Multiuse Pathways
- Key Bicycle Corridors
- Key Pedestrian Improvements

Some projects may be accelerated, and others postponed due to changing conditions, funding availability, public input, or more detailed study performed during programming and budgeting processes. Further, the projects included in the preferred TSP list represent the best estimation for appropriate design available at this time. Because the TSP is being drafted at a citywide scale, project design may change before construction

commences as public input, available funding, and unique site conditions are taken into consideration. Projects identified herein may be funded through a variety of sources including federal, state, or local transportation funds; system development charges (SDCs); partnerships with private developers; or a combination of these sources.

Project Costs

The estimated construction costs for each project are provided in the subsequent tables. These costs are order of magnitude (i.e., planning-level) estimates that account for right-of-way, design engineering, and construction and generally include a 30 percent contingency factor. The costs were calculated for each project using the methodology and procedures recommended by the American Association of Cost Engineers (Class 5 estimates). All costs are rounded to the nearest $100,000 and provided in 2020 dollars. Detailed cost estimate sheets are included in Volume 2, Appendix H. The detailed costs include all estimation assumptions as well as any deviations related to unique topographic, right-of-way, or other constraints.

Costs for individual transit corridors are not provided. The City and CET are working to refine the transit corridors and identify a list of capital improvements and strategic policies that can help implement more robust transit service within Redmond. These efforts are currently ongoing, and the results can be incorporated into future updates of the TSP.

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Strategic Street Capacity Investment Corridors

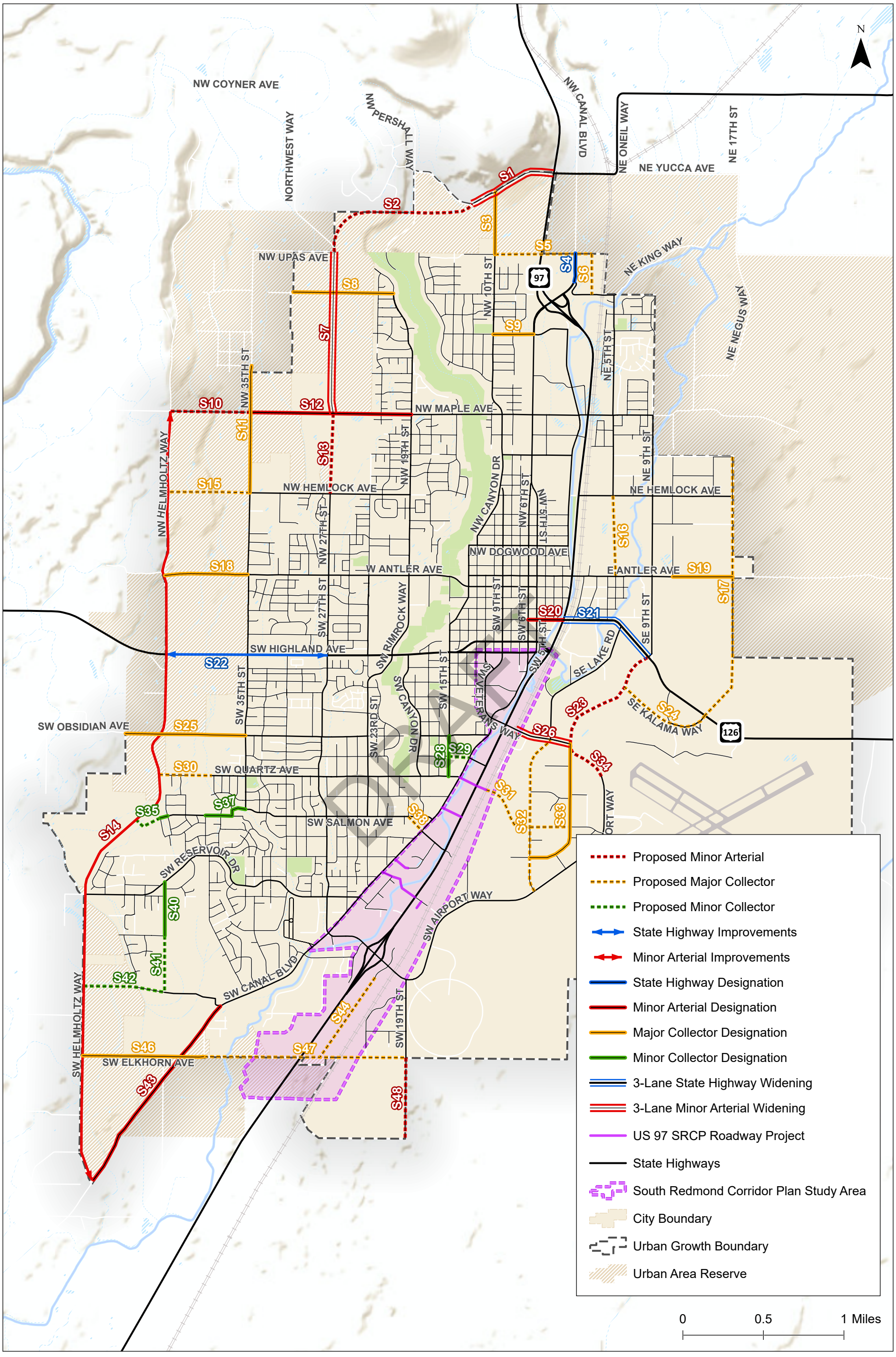
The projects shown in **Table 2** represent the City's current priorities for street capacity investments. Improvements to these key corridors help accommodate growth and economic development in the region and continue to shape the urban context for the City. Such improvements can strengthen mobility and connectivity as well as create opportunities to incorporate bicycle, pedestrian, and transit facilities where they do not exist. These projects are illustrated in **Figure 8.**

Table 2: Priority Street Capacity Investments

Map ID	Corridor	S-W Limit	E-N Limit	Improvement	Length (miles)	2020 Cost Estimates*
S1	Pershall Way	NW 19th Avenue	US 97	Widen to 3-lane arterial	0.6	$3.2M
S7	Northwest Way	Maple Ave	NW Upas Ave	Widen to 3 lanes	1.0	$5.8M
S14	SW/NW Helmholtz Way	SW Canal Blvd	NW Maple Ave	Widen roadway to add center turn lane	5.0	$29.0M
S21	OR 126	US 97	SE 9th St	Widen to 3 lanes	0.6	$5.4M
S22	OR 126	SW Helmholtz Way	SW 27th St	Provide a 3-lane cross section with sidewalks and bicycle lanes throughout entire corridor	1.0	$8.7M
S23	SE 9th St	Veterans Way	OR 126	Proposed arterial	0.8	$6.8M
S26	SW Veterans	Railroad	SE 1st St	Widen to 3 lanes (turn lanes where needed)	0.4	$2.0M
				Total		**$60.9M**

*As part of the TSP Amendment, the costs were not escalated from year 2020 to 2025 prices. Detailed cost estimates will be refined at the time of project development.

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Planned Roadway Projects
Redmond, Oregon

Figure **8**

Coordinate System: NAD 1983 Oregon Statewide Lambert Feet Intl

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New Planned Streets

The projects shown in **Table 3** represent the City's current priorities for planned new streets to improve connectivity between and within existing neighborhoods, employment, and commercial areas; to provide connections to newly developed or developing areas; and to provide alternative travel routes for all modes to existing streets. These projects are illustrated in **Figure 8**.

Table 3: Priority Planned New Streets

Map ID	Corridor	S-W Limit	E-N Limit	Improvement	Length (miles)	2020 Cost Estimates*
S2	NW Pershall Way	NW Upas Way	NW Pershall Way	Proposed 3-lane arterial	1.0	$8.9M
S5	NW Upas Ave	NW 10th St	East of NW Canal Blvd	Proposed collector & overcrossing	0.6	$11.0M
S6	NE 3rd	King Way	UGB	Proposed collector	0.3	$1.5M
S10	NW Maple Ave	SW Helmholtz Way	NW 35th St	Proposed 3-lane arterial	0.5	$4.3M
S13	NW 27th St	NW Hemlock Ave	NW Maple Ave	Proposed arterial	0.5	$4.3M
S15	NW Hemlock Ave	NW Helmholtz Way	NW 35th St	Proposed collector	0.5	$2.9M
S16	NE 5th St	E Antler Ave	NE Hemlock Ave	Proposed collector	0.5	$2.9M
S17	SE/NE 17th St	OR 126	NE Kingwood Ave	Proposed collector	1.7	$9.6M
S24	SE Veterans Way	SE 1st St	SE Veterans Way	Proposed collector	0.4	$2.1M
S29	SW Pumice Ave	SW 15th St	SW Canal Blvd	Proposed collector	0.1	$0.7M
S30	SW Quartz Ave	SW Helmholtz Way	SW 37th St	Proposed collector	0.3	$1.9M
S31	SW Salmon Dr	SW Quartz Ave	S 1st St	Proposed collector	0.4	$2.3M
S32	SW 6th St	SE Airport Way	SE Veterans Way	Proposed collector	1.0	$3.7M
S34	SE Airport Way	SE Airport Way	SW Veterans Way	Proposed arterial	0.3	$2.3M
S35	SW 45th St	SW Salmon Ave	SW Helmholtz Way	Proposed collector	0.1	$0.6M

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Map ID	Corridor	S-W Limit	E-N Limit	Improvement	Length (miles)	2020 Cost Estimates*
S38	SW Odem Medo Rd	SW Canal Blvd	SW 19th St	Proposed collector	0.1	$0.7M
S41	SW 43rd St	SW Badger Ave	SW Yew St	Proposed collector	0.4	$2.0M
S42	SW Badger Ave	SW Helmholtz Way	SW 43rd St	Proposed collector	0.5	$2.9M
S44	SW 21st St	SW Elkhorn Ave	South of SW Airport Ave	Proposed collector	0.6	$3.5M
S47	SW Elkhorn Ave	SW 39th St	SW 19th St	Proposed collector and overcrossing	1.3	$26.0M
S48	SW 19th St	UGB	SW Elkhorn Ave	Proposed arterial	0.5	$4.3M
US 97 SRCP	North Connection (Motel 6)	SW Canal Blvd	US 97	Proposed roadway connection with canal crossing	0.2	N/A
US 97 SRCP	SW 17th Pl	SW Canal Blvd	SW 17th Pl	Proposed roadway connection (extension)	0.1	N/A
US 97 SRCP	SE Airport Way	SW Canal Blvd	US 97	Proposed roadway connection with canal crossing	0.3	N/A
US 97 SRCP	Local Access Road	Possibilities Thrift Store	SE Airport Way	Proposed roadway connection	0.1	N/A
				Total:		**$98.4M**

*As part of the TSP Amendment, the costs were not escalated from year 2020 to 2025 prices. Detailed cost estimates will be refined at the time of project development.

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Intersection Capacity Improvements

The projects shown in **Table 4** and **Table 5** represent the City's current priorities for intersection capacity improvements. The TSP is not inclusive of all of the intersection projects that the City will pursue over the next twenty years. Rather, these are those that the City can pursue to strategically improve the operational efficiency of specific intersections and important roadways. These projects can enhance system operations and can be completed as opportunities arise. In all cases, the City will review the appropriate intersection control options at the time of project development and delivery. These projects are illustrated in **Figure 9**.

Table 4: Priority Intersection Capacity Improvements

Map ID	N-S Street	E-W Street	Improvement	Note[1]	2020 Cost Estimates*
I3	NW Canal Blvd	NE Upas Ave	Consider traffic signal or roundabout	-	$0.5M (signal) or $3.2M (roundabout)
I4	NW Helmholtz Way	NW Maple Ave	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)
I5	NW 35th St	NW Maple Ave	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)
I6	NW 27th St	NW Maple Ave	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)
I7	NW 19th St	NW Maple Ave	Consider traffic signal or roundabout	Signal preferred	$0.5M (signal) or $3.2M (roundabout)
I8	NW 9th St	NW Maple Ave	Consider traffic signal or roundabout	Signal preferred	$0.5M (signal) or $3.2M (roundabout)
I10	NE 5th St	NE Maple Ave	Consider traffic signal or roundabout	-	$0.5M (signal) or $3.2M (roundabout)
I11	NE 9th St	NE Maple Ave	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)
I13	NW 6th St	NW Kingwood Ave	Consider traffic signal or roundabout	Signal preferred	$0.5M (signal) or $3.2M (roundabout)
I14	NW 27th St	NW Hemlock Ave	Consider traffic signal or roundabout	Signal preferred	$0.5M (signal) or $3.2M (roundabout)
I15	NE 9th St	NE Hemlock Ave	Consider traffic signal or roundabout		$0.5M (signal) or $3.2M (roundabout)
I16	NW 27th St	W Antler Ave	Consider traffic signal or roundabout	Signal preferred	$0.5M (signal) or $3.2M (roundabout)
I17	NE 9th St	E Antler Ave	Roundabout		$3.2M
I22	SW Helmholtz Way	OR 126	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)
I23	SW 35th St	OR 126	Consider traffic signal or roundabout	Signal preferred	$0.5M (signal) or $3.2M (roundabout)

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Map ID	N-S Street	E-W Street	Improvement	Note[1]	2020 Cost Estimates*
I25	SW 15th St	OR 126	Consider traffic signal modification or roundabout	-	$0.5M (signal) or $3.2M (roundabout)
I29	SE 9th St	OR 126	Roundabout		6M
I30	SW Helmholtz Way	SW Obsidian Ave	Consider traffic signal or roundabout	-	$0.5M (signal) or $3.2M (roundabout)
I31	SW 27th St	SW Obsidian Ave	Consider traffic signal or roundabout	Signal preferred	$0.5M (signal) or $3.2M (roundabout)
I34	SE 9th St	SW Veterans Way/Airport Way/1st Street	Roundabout		$3.2M
I36	SE Kalama Way	OR 126	Roundabout	-	$3.2M
I37	SW Canal Blvd	SW Pumice	Consider traffic signal or roundabout	Disconnect SW Obsidian Ave	$0.5M (signal) or $3.2M (roundabout)
I38	SW Canal Blvd	SW Quartz Ave	Consider traffic signal or roundabout	Signal preferred	$0.5M (signal) or $3.2M (roundabout)
I39	SW Helmholtz Way	SW Salmon Ave	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)
I40	SW 27th St	SW Salmon Ave	Consider traffic signal or roundabout	Signal preferred	$0.5M (signal) or $3.2M (roundabout)
I41	SW Helmholtz Way	SW Wickiup Ave	Roundabout		$3.2M
I42	SW 27th St	SW Wickiup Ave	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)
I45	SW 19th St	SW Airport Way	Roundabout		$3M (single lane roundabout) $6M (multilane roundabout)
I46	SW Canal Blvd	SW Badger Ave	Roundabout	-	$3.2M
I47	SW Helmholtz Way	SW Elkhorn Ave	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)
I48	SW Canal Blvd	SW Elkhorn Ave	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)

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Map ID	N-S Street	E-W Street	Improvement	Note[1]	2020 Cost Estimates*
I49	SW Helmholtz Way	SW Canal Blvd	Consider traffic signal or roundabout	Roundabout preferred	$0.5M (signal) or $3.2M (roundabout)
I50	NW 6th St	NW Oak Ave	Traffic signal modification	-	$0.5M
I51	SE Airport Way	Jesse Butler Circle	Roundabout		$3.2 M
US 97 SRCP	SW Canal Blvd	SE Pumice Ave	Roundabout	-	Included in SRCP
US 97 SRCP	US 97	SE Pumice Ave	Traffic signal	-	Included in SRCP
US 97 SRCP	SW Canal Blvd	SW Quartz Ave	Roundabout	-	Included in SRCP
US 97 SRCP	US 97	SW Quartz Ave	Traffic signal	-	Included in SRCP
US 97 SRCP	SW Canal Blvd	New Northern Roadway Connection (Motel 6)	Roundabout	-	Included in SRCP
US 97 SRCP	US 97	New Northern Roadway Connection (Motel 6)	Traffic signal	-	Included in SRCP
US 97 SRCP	SW Canal Blvd	SE Airport Way	Roundabout	-	Included in SRCP
US 97 SRCP	US 97	SE Airport Way	Traffic signal	-	Included in SRCP
LLI	21st Street	Airport Way	Modify to right-in-right-out movements		$1M
			Total for intersection capacity improvements:		**$42.2M to $112.7M depending on control type selected**

*As part of the TSP Amendment, the costs were not escalated from year 2020 to 2025 prices. Detailed cost estimates will be refined at the time of project development.

[1] Intersection control preference noted where applicable. However, specific intersection control decisions will be made at the time of project development and project delivery.

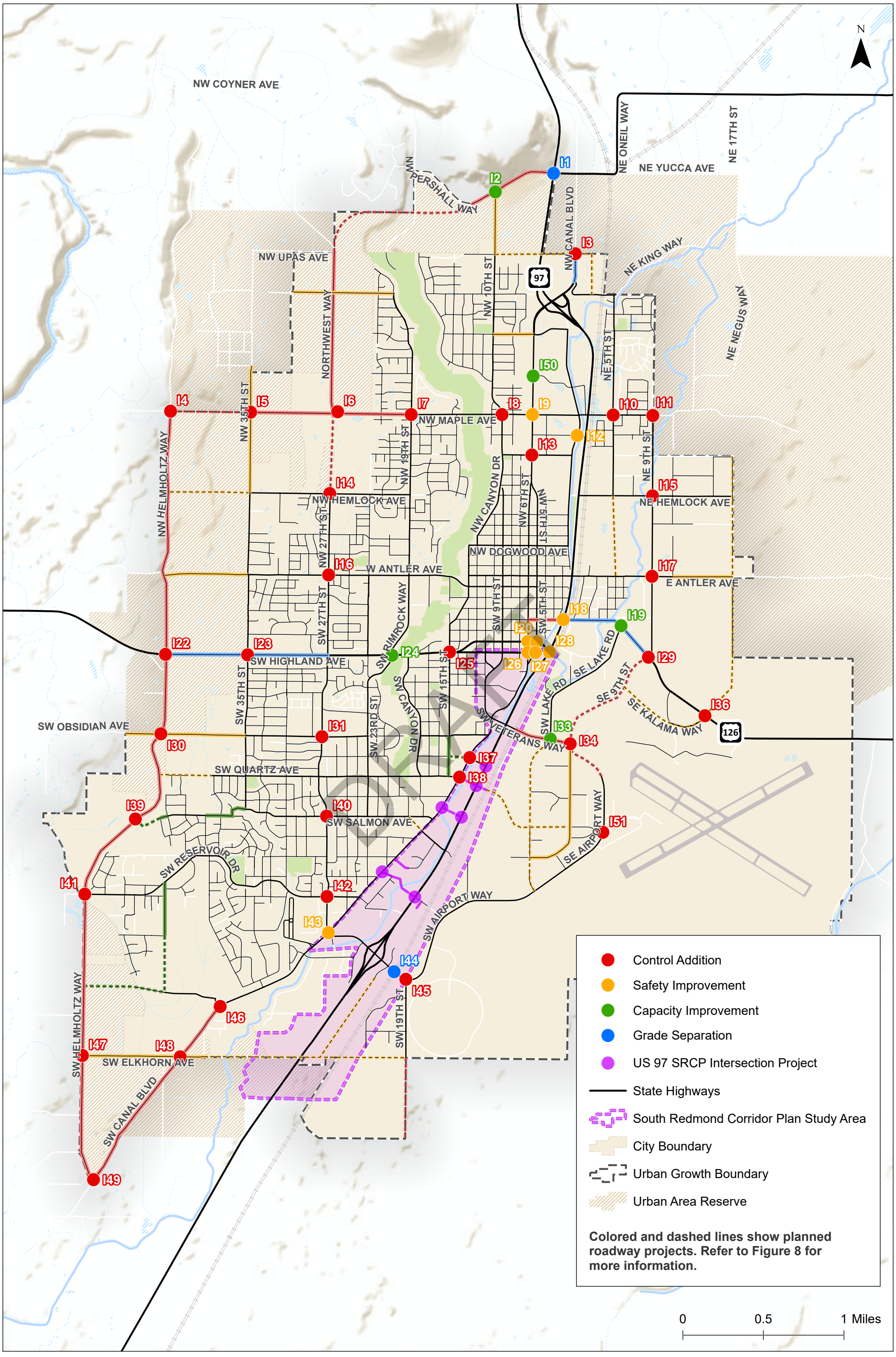
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Table 5: Other Priority Intersection Capacity Improvements

Map ID	N-S Street	E-W Street	Improvement	Note1	2020 Cost Estimates*
I2	NW 10th St	NW Pershall Way	Consider additional lanes	Add eastbound right turn	$0.3M
I19	SE Lake Rd	OR 126	Consider access management	Create right-in, right-out in conjunction with 9th St project	$0.1M
I24	SW Rimrock Way	OR 126	Consider capacity improvement	Intersection improvement should consider westbound lane drop	$0.7M
I33	SW Lake Road	SW Veteran's Way	Consider Access Management	Create right-in, right-out in conjunction with 9th St project	$0.1M
			Total for other intersection capacity improvements:		**$1.2M**

*As part of the TSP Amendment, the costs were not escalated from year 2020 to 2025 prices. Detailed cost estimates will be refined at the time of project development.

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Planned Intersection Projects
Redmond, Oregon

Figure **9**

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Coordinate System: NAD 1983 Oregon Statewide Lambert Feet Intl

Grade-Separated Intersection Improvements

Three intersections were identified for grade separation to eliminate conflict points and improve traffic flows. One intersection was identified for future evaluation. These are identified in **Table 6** and shown in **Figure 8** and **Figure 9**. A brief description of each is included below:

- **US 97/O'Neil Highway:** The Interchange Area Management Plan (IAMP) for this location identified the need to provide a grade-separated overcrossing of US 97 that would connect O'Neil Highway to Pershall Way. ODOT plans to convert this intersection to right-in-right-out movements as part of a STIP project in 2026.
- **Airport Way Rail Crossing:** Airport Way connects US 97 to the Redmond Airport. US 97 and the Redmond Airport are both critical statewide infrastructure as identified in the Oregon Resilience Plan. The planned grade-separation would eliminate the at-grade rail crossing between the highway and airport.
- US 97/Elkhorn Avenue: Construct an overcrossing of US 97 as part of the Elkhorn Avenue extension from Canal Boulevard to SW 19th Street unless alternative interchange locations are identified.
- **US 97/Hemlock Avenue:** Conduct a study to evaluate a possible grade-separated crossing of US 97.

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Table 6: Identified Grade-Separated Intersection Improvements

Map ID	N-S Street	E-W Street	Improvement	Description	2020 Cost Estimates*
I1	US 97	O'Neil Hwy	North Interchange IAMP Project	Interim STIP project would modify US 97/O'Neil Hwy intersection to right-in, right-out; eventual project would result in grade separation	STIP Project Estimate of $2.8 M
I44	Railroad	SW Airport Way	Grade separated crossing	Remove existing at-grade rail crossing	$16.8M
S47	US 97	Elkhorn Avenue	Grade separated crossing unless alternative connections or improvements are identified	Construct US 97 overcrossing at part of roadway extension	$26.0M
			Total for grade-separated intersection improvements:		**$45.6M**

*As part of the TSP Amendment, the costs were not escalated from year 2020 to 2025 prices. Detailed cost estimates will be refined at the time of project development.

Key Multiuse Pathways

The projects shown in **Table 7** represent the City's current priorities for multiuse pathways. The multiuse pathway system is intended to improve continuity for bicyclists and pedestrians to move freely throughout the transportation network and help to eliminate north-south barriers for east-west access, particularly through the Dry Canyon and across US 97. These projects are shown in **Figure 8. Table 7** identifies the associated costs.

Table 7: Priority Multiuse Pathways

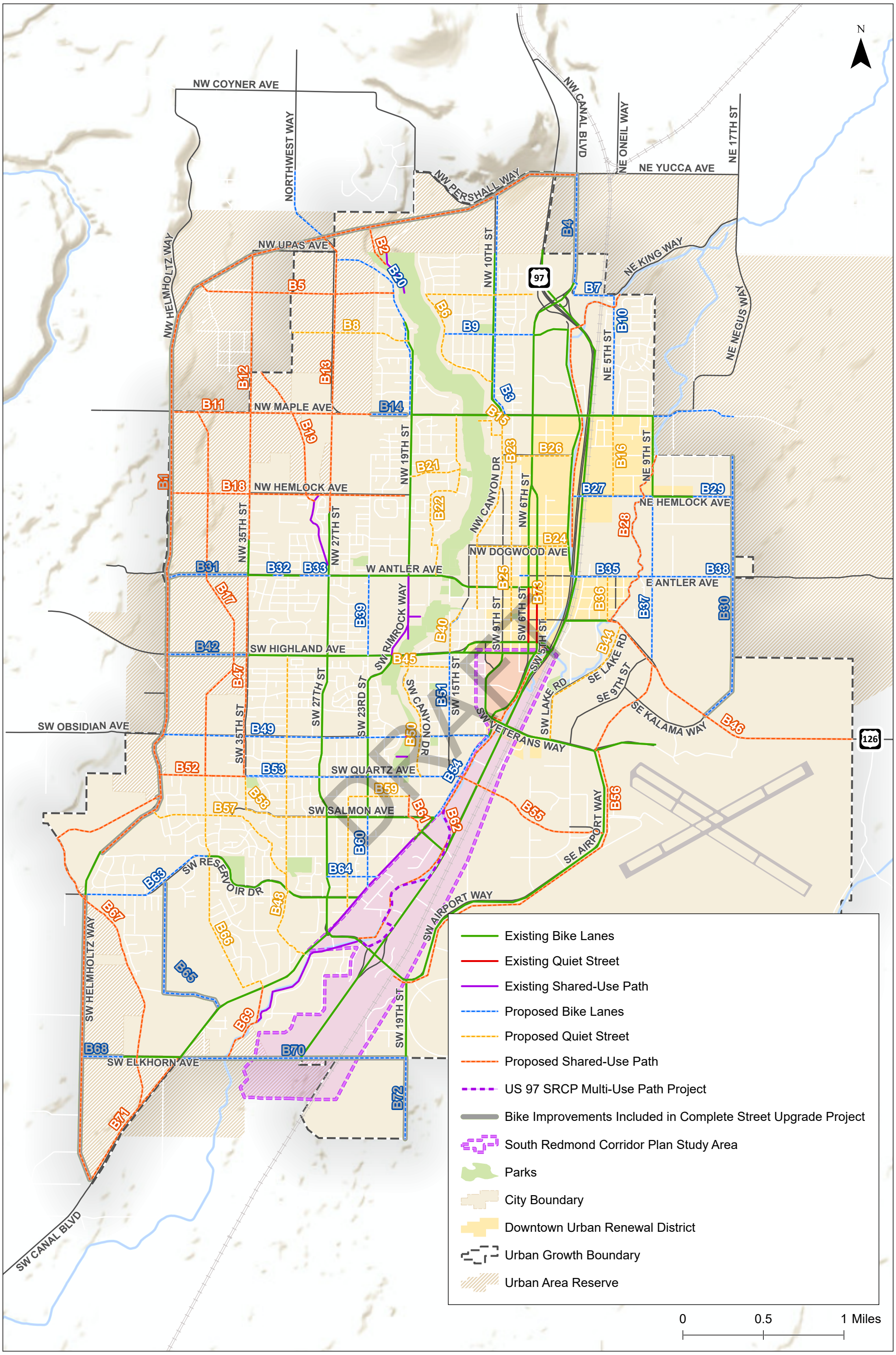
Map ID	Corridor	S-W Limit	E-N Limit	Length (miles)	2020 Cost Estimates*
B1	SW/NW Helmholtz Way	SW Canal Blvd	NW Canal Blvd	8.0	Costs included in S14
B2	NW Pershall Way	Dry Canyon Trail	B1	0.3	$1.0M
B5	NW Spruce Ave	NW Helmholtz Way	NW 19th St	1.2	$4.6M
B11	NW Maple Ave	NW Helmholtz Way	West of NW 22nd St	1.2	$4.7M
B12	NW 35th St	NW Dogwood Ave	NW Upas Way	1.8	$6.7M
B13	NW 27th St	NW Greenwood Ave	NW Upas Way	1.7	$6.6M
B17	SW 39th St	SW Quartz Ave	NW Maple Ave	2.4	$9.2M
B18	NW Hemlock Ave	NW Helmholtz Way	NW 19th St	1.4	$5.5M
B19	NW 29th St	NW Hemlock Ave	UGB	0.9	$3.5M
B28	Lateral E Pilot Butte Canal	OR 126	NE Kingwood Ave	1.2	$4.8M
B46	OR 126	SE Jackson St	UGB	1.8	$7.0M
B47	SW 35th St	SW Quartz Ave	W Antler Ave	1.2	$4.7M
B52	SW Quartz Ave	SW Helmholtz Way	SW 35th St	0.5	$2.1M
B55	SW Quartz Ave	SW Canal Blvd	SE Airport Way	1.0	$7.5M
B56	SE Airport Way/SE 9th St	Railroad	OR 126	3.0	$11.4M
B61	SW 19th St	SW Canal Blvd	SW Reindeer Ave	0.3	$1.0M
B62	SW Canal Blvd/Pilot Butte Canal	SW 27th St	NE King Way	2.4	$9.1M
B67	SW Helmholtz Way	SW Canal Blvd	SW Reservoir Dr	2.5	$9.8M
B69	Pilot Butte Canal	SW Elkhorn Ave	SW Canal Blvd	0.5	$2.0M

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Map ID	Corridor	S-W Limit	E-N Limit	Length (miles)	2020 Cost Estimates*
B71	SW Canal Blvd	SW Helmholtz Way	SW Elkhorn Ave	0.9	$3.5M
US 97 SRCP	SW Canal Blvd/US 97	SW Yew Ave	New Northern Roadway Connection (Motel 6)	1.3	Included in SRCP
			Total for multiuse pathways:		**$104.7M**

*As part of the TSP Amendment, the costs were not escalated from year 2020 to 2025 prices. Detailed cost estimates will be refined at the time of project development.

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Existing and Planned Bicycle Facilities
Redmond, Oregon

Figure **10**

Coordinate System: NAD 1983 Oregon Statewide Lambert Feet Intl

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Key Bicycle Corridors

More than 40 bicycle corridors were identified as the City's current priorities for inclusion into the TSP. Crossing improvements, though not specifically identified in the TSP, may be provided when bicycle facilities that cross major roads are constructed. The need for and type of crossing treatments will be evaluated at the time of project development and design. Further, the City of Redmond will consider upgrades to existing bicycle facilities (such as including a marked buffer) on a case-by-case basis. Such upgrades typically occur in conjunction with scheduled maintenance operations.

These projects are shown in **Figure 10**. **Table 8** identifies the associated costs.

Table 8: Current Bicycle Corridor Priorities

Map ID	Corridor	S-W Limit	E-N Limit	Improvement	Length (miles)	2020 Cost Estimates*
B3	NW 10th St	NW Maple Ave	NW Pershall Way	Bike lanes	1.0	$0.2M
B6	NW Canyon Dr/NW Spruce Ave	NW 10th St	US 97	Quiet street	1.4	$0.4M
B7	NE King Way	NW Canal Blvd	NE 5th St	Bike lanes	0.3	$0.5M
B8	NW Quince Ave	UGB	NW 19th St	Quiet street	0.7	$0.2M
B9	NW Quince Ave	NW Canyon Dr	NW 6th St	Bike lanes	0.3	$0.5M
B10	NE 5th St	NE Negus Way	NE King Way	Bike lanes	0.7	$1.1M
B15	NW 10th St/NW Larch/NW Rockcrest Ct	Dry Canyon Trail	NW 9th St	Quiet street	0.2	$0.1M
B16	NE 5th St	NE Hemlock Ave	NE Maple Ave	Quiet street	0.5	$0.1M
B20	NW 19th St	NW Maple Ave.	Northwest Way	Bike lanes	0.7	$0.5M
B21	NW Ivy Ave	NW 19th St	NW Rimrock Ct	Quiet street	0.3	$0.1M
B22	NW 17th St/NW Rimrock Ct	W Antler Ave	NW Maple Ave	Quiet street	1.2	$0.4M
B23	NW Canyon Dr	SW Deschutes Ave	NW Maple Ave	Quiet street	1.2	$0.4M
B24	NW Dogwood Ave	NW Canyon Dr	NW Canal Blvd	Quiet street	0.5	$0.2M
B25	SW 8th St	SW Evergreen Ave	NW Kingwood Ave	Quiet street	1.0	$0.3M

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Map ID	Corridor	S-W Limit	E-N Limit	Improvement	Length (miles)	2020 Cost Estimates*
B26	NW Kingwood Ave	NW Canyon Dr	NW Canal Blvd	Quiet street	0.4	$0.1M
B27	NE Hemlock Ave	NW Canal Blvd	NE 9th St	Bike lanes/ crossing	0.5	$0.7M
B29	NE Hemlock Ave	West of NE 15th St	NE 17th St	Bike lanes	0.2	$0.1M
B32	W Antler Ave	NW 32nd Ct	SW 31st St	Bike lanes	0.1	$0.1M
B33	W Antler Ave	NW 29th St	SW 27th St	Bike lanes	0.2	$0.3M
B35	E Antler Ave	SW 7th St	NE 17th St	Bike lanes/ crossing	0.8	$1.1M
B36	SE Jackson St	OR 126	E Antler Ave	Quiet street	0.3	$0.1M
B37	SE 9th St	OR 126	NE Hemlock Ave	Bike lanes	1.0	$1.4M
B38	E Antler Ave	SE 9th St	NE 17th St	Bike lanes	0.1	$0.2M
B39	SW 23rd St	SW Highland Ave	W Antler Ave	Bike lanes	0.5	$0.1M
B40	SW 15th St	SW Highland Ave	SW Deschutes Ave	Quiet street	0.3	$0.1M
B44	SW Lake Rd	SW Veterans Way	OR 126	Quiet street	0.9	$0.3M
B45	SW Juniper Ave	Dry Canyon Trail	SW 15th St	Quiet street	0.3	$0.1M
B48	SW 31st St	SW Canal Blvd	SW Highland Ave	Quiet street	2.0	$1.0M
B49	SW Obsidian Ave	SW Helmholtz Way	SW Canal Blvd	Bike lanes	1.4	$0.3M
B50	SW Canyon Dr	SW Quartz Ave	SW Highland Ave	Quiet street	0.8	$0.2M
B51	SW 15th St	SW Obsidian Ave	SW Highland Ave	Bike lanes	0.5	$0.7M
B53	SW Quartz Ave	SW 35th St	SW Canal Blvd	Bike lanes	1.3	$0.3M
B54	SW Canal Blvd	SW Salmon Ave	SW Obsidian Ave	Bike lanes	0.6	$0.9M
B57	SW Salmon Ave/SW Valleyview Dr/SW 32nd Ct	SW Helmholtz Way	SW 31st St	Quiet street	0.9	$0.3M
B58	SW 35th St/SW Salmon Ave	SW Quartz Ave	SW 27th St	Quiet street	0.7	$0.2M
B59	SW 25th St/SW Reindeer Ave	SW Canal Blvd	Dry Canyon Trail/SW 19th St	Quiet street	1.1	$0.3M

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Map ID	Corridor	S-W Limit	E-N Limit	Improvement	Length (miles)	2020 Cost Estimates*
B60	SW 23rd St	SW Canal Blvd	SW Salmon Ave	Bike lanes	0.4	$0.6M
B63	SW Reservoir Dr	SW Helmholtz Way	SW 39th St	Bike lanes	0.8	$1.2M
B64	Volcano Ave	27th Street	SW Canal Blvd	Bike lanes	0.3	$0.2M
B66	SW Cascade Vista Dr/SW Antelope Ave	SW Canal Blvd	SW Quartz Ave	Quiet street	1.5	$1.3M
B73	SW 4th St/SW Forest/SW 5th	SW Highland Ave	SW Dogwood Ave	Quiet street	0.6	$0.2M
			Total for bicycle corridors:			**$17.4M**

*As part of the TSP Amendment, the costs were not escalated from year 2020 to 2025 prices. Detailed cost estimates will be refined at the time of project development.

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Key Pedestrian Improvements

Key priority sidewalk investment areas are intended to prioritize new sidewalk facilities along ADA routes and provide key missing connections in the pedestrian system. Pedestrian crossing improvements at intersections, though not specifically identified, may be provided when pedestrian facilities are constructed that cross major roads. The need for and type of crossing treatments will be evaluated at the time of project development and design.

These projects are shown in Figure 11. Table 9 and Table 10 identify the associated costs.

Table 9: Priority New Sidewalk Facilities Along ADA Routes

Map ID	Corridor	S-W Limit	E-N Limit	Street Side	Note	Length (miles)	2020 Cost Estimates*
P4	NW 10th St	NW 9th St	NW Quince Ave	West	Add sidewalk or ramps	0.4	$0.4M
P8	NW 9th St	NW Hemlock Ave	NW Maple Ave	Both	Add sidewalk or ramps	0.9	$0.9M
P9	NW 6th St	North of NW Larch Ave	NW Maple Ave	Both	Add sidewalk or ramps	0.2	$0.2M
P11	NW 6th St	NW Jackpine Ave	NW Larch Ave	East	Add sidewalk or ramps	0.1	$0.1M

Map ID	Corridor	S-W Limit	E-N Limit	Street Side	Note	Length (miles)	2020 Cost Estimates*
P12	NW 6th St	South of NW Kingwood Ave	South of Larch Ave	West	Add sidewalk or ramps	0.1	$0.1M
P13	NW Larch Ave	NW 6th St	NW 4th St	Both	Add sidewalk or ramps	0.1	$0.1M
P14	NW Larch Ave	NW 4th St	West of NW Canal Blvd	South	Add sidewalk or ramps	0.1	$0.1M
P16	NW Kingwood Ave	NW 6th St	NW Canal Blvd	Both	Add sidewalk or ramps	0.4	$0.4M
P18	NW 6th St	North of NW Jackpine Ave	South of NW Kingwood Ave	West	Add sidewalk or ramps	0.04	<$0.1M
P19	NW 6th St	NW Jackpine Ave	NW Kingwood Ave	East	Add sidewalk or ramps	0.1	$0.1M
P20	NW Canal Blvd	NW Elm Ave	NW Larch Ave	West	Add sidewalk or ramps	0.4	$0.4M
P21	NW Hemlock Ave	NW Canyon Dr	NW 9th St	Both	Add sidewalk or ramps	0.03	<$0.1M
P23	NW 9th St	W Antler Ave	NW Greenwood Ave	Both	Add sidewalk or ramps	0.5	$0.5M
P24	NW Dogwood Ave	NW Canyon Dr	NW 10th St	South	Add sidewalk or ramps	0.1	$0.1M
P37	SW Highland Ave	SW Indian Cir	SW 27th St	South	Add sidewalk or ramps	0.1	$0.1M
P57	SW Canal Blvd	North of SW Salmon Ave	South of SW Obsidian Ave	West	Add sidewalk or ramps	0.4	$0.4M
P59	SW Salmon Ave	SW 31st St	SW 29th St	South	Add sidewalk or ramps	0.1	$0.1M
P66	SW Xero Ln	West of SW 34th St	SW 31st St	Both	Add sidewalk or ramps	0.3	$0.3M
P67	SW 31st St	SW 33rd St	SW Savannah Ct	West	Add sidewalk or ramps	0.03	<$0.1M
P69	SW 31st St	SW Timber Ct	SW 33rd St	East	Add sidewalk or ramps	0.1	$0.1M

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Map ID	Corridor	S-W Limit	E-N Limit	Street Side	Note	Length (miles)	2020 Cost Estimates*
P70	SW 31st St	SW Xero Ln	SW Volcano Way	Both	Add sidewalk or ramps	0.5	$0.5M
P71	SW Canal Blvd	SW 27th St	SW Timber Ave	East	Add sidewalk or ramps	0.8	$0.7M
					Total for new sidewalk facilities:		**$5.9M**

*As part of the TSP Amendment, the costs were not escalated from year 2020 to 2025 prices. Detailed cost estimates will be refined at the time of project development.

Table 10: Priority New Sidewalk Facilities Along ADA Routes

Map ID	Corridor	S-W Limit	E-N Limit	Street Side	Note	Length (miles)	2020 Cost Estimates*
P1	NW 10th St	NW Redwood Ave	NW Teak Ave	West	Upgrade sidewalk or ramps	0.1	$0.1M
P7	NE Negus Way	NE 5th St	NE 7th St	Both	Upgrade sidewalk or ramps	0.1	$0.1M
P10	NW 6th St	North of NW Kingwood Ave	North of NW Larch Ave	West	Upgrade sidewalk or ramps	0.1	$0.1M
P15	NE 5th St	NE Larch Ave	NE Negus Way	Both	Upgrade sidewalk or ramps	0.1	$0.1M
P17	NW 6th St	NW Jackpine Ave	NW Kingwood Ave	West	Upgrade sidewalk or ramps	0.03	<$0.1M
P22	NW 9th St	NW Fir Ave	NW Hemlock Ave	Both	Upgrade sidewalk or ramps	0.3	$0.3M
P25	NW Dogwood Ave	NW Canyon Dr	NW 10th St	North	Upgrade sidewalk or ramps	0.1	$0.1M
P26	NW Dogwood Ave	NW 10th St	NW 6th St	Both	Upgrade sidewalk or ramps	0.3	$0.3M
P27	NW Elm Ave	NW 27th St	NW 25th St	Both	Upgrade sidewalk or ramps	0.2	$0.2M
P28	NW 27th St	NW Cedar Ave	NW Elm Ave	Both	Upgrade sidewalk or ramps	0.2	$0.2M
P30	W Antler Ave	SW 27th St	SW Rimrock Way	Both	Upgrade sidewalk or ramps	0.8	$0.8M

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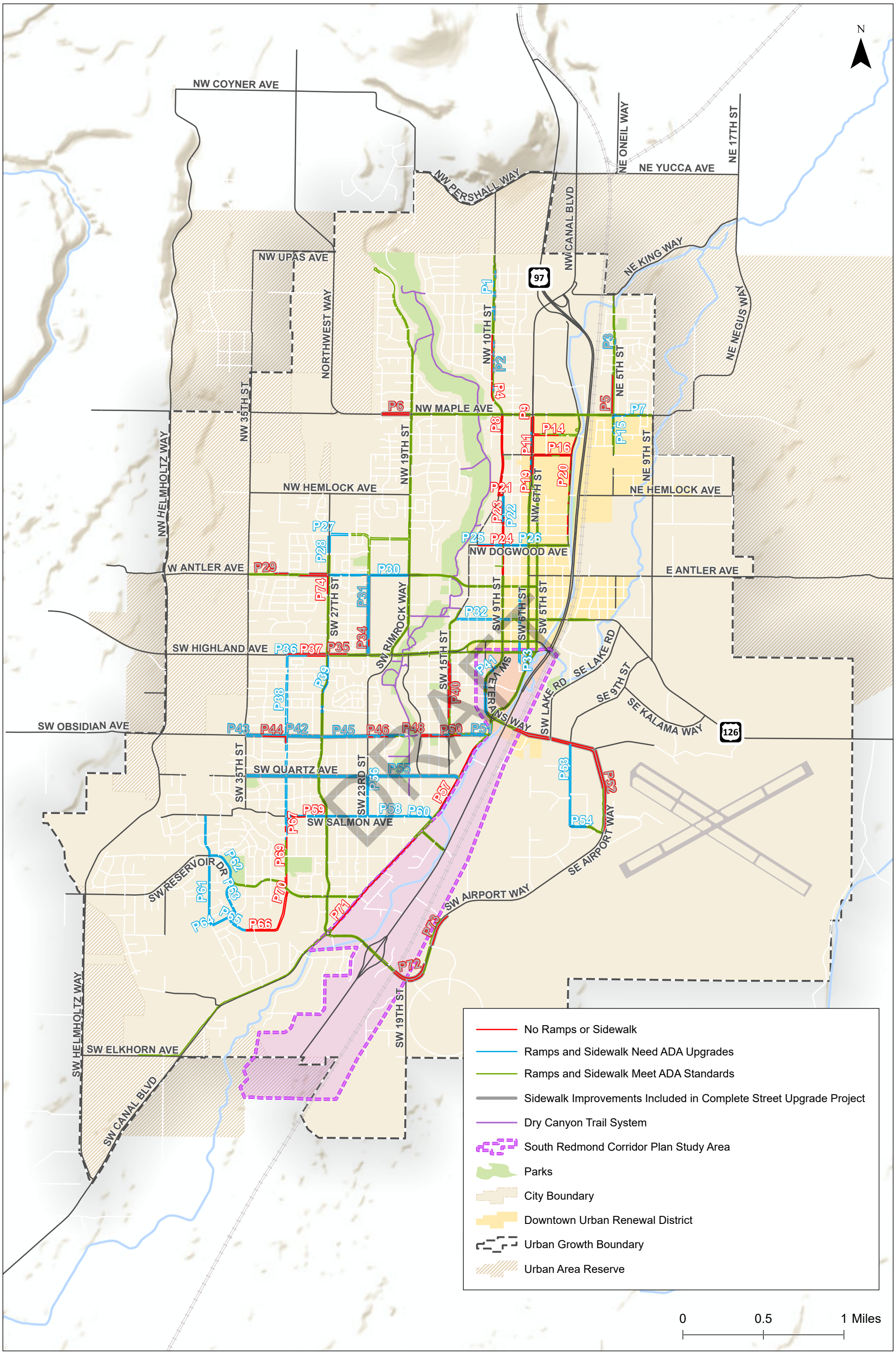
Map ID	Corridor	S-W Limit	E-N Limit	Street Side	Note	Length (miles)	2020 Cost Estimates*
P32	W Evergreen Ave	SW Canyon Dr	SW 8th St	Both	Upgrade sidewalk or ramps	0.6	$0.5M
P33	SW 7th St	SW Indian Ave	SW Black Butte Blvd	Both	Upgrade sidewalk or ramps	0.7	$0.7M
P36	SW Highland Ave	SW 31st St	SW Indian Cir	South	Upgrade sidewalk or ramps	0.1	$0.1M
P38	SW 31st St	SW Savanna Ct	SW Highland Ave	Both	Upgrade sidewalk or ramps	1.6	$1.6M
P39	SW 27th St	SW Metolius Ave	SW Highland Ave	East	Upgrade sidewalk or ramps	0.3	$0.3M
P41	SW Veterans Way	SW Canal Blvd	SW Indian Ave	Both	Upgrade sidewalk or ramps	0.4	$0.4M
P53	S 1st St	SE Salmon Dr	SW Veterans Way	Both	Upgrade sidewalk or ramps	0.9	$0.9M
P54	SE Salmon Dr	S 1st St	West of Timber Ave	Both	Upgrade sidewalk or ramps	0.2	$0.2M
P56	SW 23rd St	SW Salmon Ave	SW Quartz Ave	Both	Upgrade sidewalk or ramps	0.5	$0.4M
P58	SW Salmon Ave	SW 31st St	SW Canal Blvd	North	Upgrade sidewalk or ramps	0.8	$0.7M
P60	SW Salmon Ave	SW 29th St	SW Canal Blvd	South	Upgrade sidewalk or ramps	0.7	$0.6M
P61	SW 39th St	SW 35th St	SW Salmon Ave	Both	Upgrade sidewalk or ramps	1.2	$1.2M
P62	SW Reservoir Dr	SW 39th St	SW 36th St	Both	Upgrade sidewalk or ramps	0.5	$0.5M
P63	SW 36th St	SW 35th St	SW Reservoir Dr	Both	Upgrade sidewalk or ramps	0.4	$0.4M
P64	SW 35th St	SW Cascade Vista Dr	SW 36th St	Both	Upgrade sidewalk or ramps	0.2	$0.2M

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Map ID	Corridor	S-W Limit	E-N Limit	Street Side	Note	Length (miles)	2020 Cost Estimates*
P65	SW Xero Ln	SW 35th St	West of SW 34th St	Both	Upgrade sidewalk or ramps	0.2	$0.2M
				Total for sidewalk and ADA ramp upgrades:			**$11.3M**

*As part of the TSP Amendment, the costs were not escalated from year 2020 to 2025 prices. Detailed cost estimates will be refined at the time of project development.

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Priority (ADA) Pedestrian Routes and Projects
Redmond, Oregon

Figure **11**

Coordinate System: NAD 1983 Oregon Statewide Lambert Feet Intl

US 97 South Redmond Corridor Facility Plan

The City, ODOT, and Deschutes County adopted the US 97 South Redmond Corridor Facility Plan to address traffic congestion, safety, and local access needs—as well as noted pedestrian and bicycle needs—adjacent to US 97 between Yew Avenue and Highland Avenue. The City of Redmond adopted the plan in 2019. The adopted plan concept is included in Appendix I and includes the following improvements:

- New roadway connections that cross the COID canal and connect US 97 with neighborhoods to the west via Quartz Avenue, a new roadway south of Reindeer Avenue, and Volcano Avenue;
- New access roadways and alleys to provide alternative access to parcels adjacent to US 97;
- A center median with new signals along US 97 to facilitate protected left-turn movements and U-turns at existing signalized intersections to support the new connections;
- Pedestrian refuge islands on US 97;
- New sidewalks and cycle tracks along US 97 and the east-west streets connecting to the highway;
- A new multiuse path along Canal Boulevard and the COID canal;
- Roundabouts at Quartz Avenue/Canal Boulevard, the new roadway south of Reindeer Avenue/Canal Boulevard, and Volcano Avenue/Canal Boulevard; and
- Gateway and streetscape treatments to improve the aesthetics and the comfort and convenience of pedestrians and bicyclists along the corridor.

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The Facility Plan recommended concept is estimated to cost $55 million–$60 million. Current estimates are based on the adopted conceptual plan. The conceptual plan is a generalized look at possible improvement needs and will be refined before final design. The refinement of the plan, including additional citizen outreach on the details of the final plan, will occur before the right-of-way needs, easements, detailed design, and associated cost estimates are approved by the City Engineer and/or City Council.

The Oregon Transportation Commission (OTC) adopted the Facility Plan in 2021 as well as the alternative mobility targets at eight intersections along the corridor (as identified in Chapter 4 of the TSP). In 2025, when this TSP amendment was adopted ODOT had not identified funding for the transportation system changes needed to implement the $60 million plan.

Future Study of Alternative Southern Connections

To facilitate ongoing and anticipated levels of significant job growth on the east side of the City, additional transportation facilities will be needed over the next twenty years to maintain a system that is safe, reliable and that provides the needed access to the Redmond Municipal Airport and other critical service areas that are part of the State's Resiliency Plan. Many of these changes have been identified and incorporated into Chapter 5 of the TSP but there is still a need for further refinement of a future southern interchange. The updated TSP analyses have demonstrated that reliance solely on the Yew Avenue/US 97 interchange in the future will *not* allow the City, Regional, State, and Resiliency planning needs to be met overtime, even with an increase in the alternative mobility targets at this location. As a result, the City is and will continue to partner with Deschutes County and ODOT to evaluate how the transportation capacity needs can be met over the long-term.

Future interchange evaluations are anticipated to include consideration of a variety of topics, including but not limited to:

- Whether a slight increase to the alternative mobility target of 1.0 at the SW Yew Avenue/SW Airport Way/US 97 northbound ramp interchange is practical, given other system trade-offs such as impacts to system safety and economic viability considerations;
- Implementation of future Transportation Demand Management (TDM) and Transportation System Management (TSM) measures;
- Regional resiliency planning to ensure access to the Redmond Municipal Airport, Deschutes County Fairgrounds, and other emergency services providers;
- The potential economic, social, environmental, and energy (ESEE) impacts of providing a new overcrossing and/or new interchange with US 97 at SW Elkhorn Avenue or an alternative location within the UGB;
- A cost/benefit evaluation of potential new interchange locations within and outside the existing UGB;
- Applicable local, state and federal policies, such as ODOT's Major Investment Policy, City's Comprehensive Plan; and Council priorities on projects that enhance safety and the region's overall economic health and prosperity;
- ODOT and FHWA planning and design and safety policies for considering new interchange locations;
- Oregon's Statewide Planning Goals; and,
- The potential for a Goal Exception for a new interchange if a location in the existing UGB is not deemed feasible.

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The outcome of these future efforts will outline how changes to the existing system and expectations of system performance, in partnership with the construction of new facilities, can help the City, Region, and State to support economic development, the Oregon Resiliency Plan, provide for efficient movement of goods and freight, and address the mobility and safety needs of all users over the next twenty years. The future refinement planning will be a collaboration between the City, County and ODOT. Following this refinement planning, the three agencies may work together to secure funding for environmental review, design, and construction for the identified transportation projects.

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In This Chapter

- What resources are available to fund Redmond's transportation projects?

6 Transportation Funding & Implementation

The TSP includes projects under the jurisdiction and ownership of ODOT, Deschutes County, the City of Redmond, and CET as well as projects that will be implemented by private developers. Individual TSP projects will be funded through a different combination of federal, state, City, county, SDC revenue, and/or private sources. This chapter discusses current and possible new funding mechanisms that may be available to implement projects during the life of the TSP. A complete list of the multimodal projects and planning level cost estimates is provided in Chapter 5.

Today's fiscal environment is beset by uncertainty about future federal, state, and local funding for transportation projects. This uncertainty provides challenges to accurately forecast the amount of funding available for transportation investments and what projects or programs will receive funding. In this context, the TSP provides a prudent and conservative list of capital construction projects, an emphasis on lower cost methods of improving personal mobility within the City, and an increased reliance on technologies that can improve the efficiencies of our streets.

Further, City policies and priorities seek to include strategic investments that support mixed-use, pedestrian-friendly neighborhoods; increased use of active modes of transportation, and reduced reliance on travel by single-occupancy vehicle. These priorities include improved convenience and safety for walking and biking and continued support for the economic health and prosperity of the region.

The highest priority projects for strategic investments are those that (1) protect the existing system and (2) improve the efficiency and safety of existing multimodal facilities. These projects are to be implemented first unless a lower priority measure is demonstrated to be more cost-effective or is one that better supports safety, growth management, or other livability and economic considerations. Furthermore, the list of projects identified above are intended to make streets safer for all users as well as more efficient with use of emerging technologies.

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The timing of project implementation will depend on future policy direction and funding availability at the federal, state, and local level; changes in local development priorities; and the formation of public-private or public-public partnerships.

Transportation Revenue

Revenue forecasts from the City provided a basis for extrapolating an estimate of revenues that might be available for transportation projects over the next 20 years. Table 11 summarizes the potential revenue forecast and sources for the identified list of strategic priorities.

Table 11: Forecast Revenue Sources

Revenue Source	Average Annual Income	20-Year Revenue Forecast
SDC Improvement Sub-Fund	$1.02M	$20.35M
SDC Reimbursement Sub-Fund	$0.12M	$2.35M
Capital Projects Sub-Fund	$0.85M	$17.07M
Total Revenue	$1.99M	$39.77M

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Summary Of Transportation System Costs

Table 12 summarizes the total cost by category of recommended multimodal transportation projects.

Table 12: Project Costs

Revenue Source	Average Annual Income
Strategic Street Capacity Investment Corridors	$60.9M
New Planned Streets	$98.4M
Intersection Capacity Improvements	$42.2M to $112.7M depending on intersection control type selected
Other Priority Intersection Capacity Improvements	$1.2M
Grade-Separated Intersection Improvements	$45.6M
Key Multiuse Pathways	$104.7M
Key Bicycle Corridors	$17.4M
New Sidewalk Facilities along ADA Routes	$5.9M
Sidewalk and ADA Ramp Upgrades	$11.3M

Revenue Source	Average Annual Income
US 97 South Redmond Concept Facility Plan	$55–$60M
Total Cost	**$442.6M–$515.4M depending on intersection control type selected**

Funding Gap

Comparing Table 11 and Table 12 demonstrates that City funding alone is insufficient to address the TSP needs. As such, the City will need to partner with other agencies and the private development community and pursue alternative funding sources to address the 20-year list of prioritized projects.

Potential Funding Sources

Although highway user taxes and fees—including Oregon State fuel taxes, licensing, and registration fees as well as local fuel taxes—are available to fund transportation-related projects in the City, per local policy these sources have increasingly been devoted to operations, maintenance, and preservation. This practice diverts funds away from capacity development or expansion projects. The City will need to develop a strategy to fund the improvements identified in the TSP. Possible elements of this strategy are outlined below.

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Local Funding Mechanisms

Table 13 outlines potential funding sources at the local level that either can currently be used to fund future projects or that the City Council may want to consider adopting as a new funding source. The City has used some of these funding mechanisms in the past; others would be new. Inclusion of this table in the TSP does not create a new funding source but rather is intended to highlight the various funding sources that local governments throughout Oregon utilized. In general, local funding sources are more flexible than funding obtained from state or federal grant sources.

Table 13: Potential Local Funding Mechanisms

Funding Source	Description	Potential Application
Street Utility Fees (also called road maintenance fees)	A fee based on the number of automobile trips a particular land use generates, usually collected through a regular utility bill. Fees can also be tied to the annual registration of a vehicle to pay for improvements, expansion, and maintenance of the street system.	System-wide transportation facilities, including streets, sidewalks, bike lanes, and shared use paths.
Transportation Systems Development Charge (SDC)	SDCs are impact fees assessed to development for the capacity demand it creates on public infrastructure systems. SDCs may be an improvement fee, a reimbursement fee, or a combination thereof. Reimbursement fee revenues are dedicated to capital projects that increase capacity to meet the needs of growth. SDC credits are provided to developers for public improvements they construct that add capacity to the system beyond that required to serve their development. SDC credits may also be given for development provisions that reduce vehicular capacity demand on the transportation system, such as providing end-of-trip bike facilities within the new development.	The City currently has an SDC program. It may update the SDC to reflect the adoption of projects included in the updated TSP after adoption.
Stormwater SDCs, grants, and loans	SDCs, grants, loans, and stormwater improvement fees can be obtained for improving stormwater management facilities constructed as part of transportation system improvements.	SDCs may only be used for that portion of transportation improvements that generate additional stormwater management capacity related to growth.
Local gas tax	A local tax can be assessed on the purchase of gas within the city. This tax is added to the cost of gasoline at the pump, along with the state and federal gas taxes.	System-wide transportation facilities, including streets, sidewalks, and bike lanes.
Parking in-lieu fees	Parking in-lieu fees are developer fees paid if they cannot or do not want to provide on-site parking for the development. The idea behind these fees is to decrease the amount of off-street, private parking and consolidate parking supplies on-street or in parking garages as a way to decrease parking demand on the development site. In-lieu fees may benefit developers by reducing costs and allowing more intensive development on a site.	System-wide transportation facilities, including streets, sidewalks, bike lanes, shared use paths, and transit.

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Funding Source	Description	Potential Application
Incentives	The City provides enticements such as bonus densities and flexibility in design in exchange for a public benefit. Examples might include a commute trip reduction (CTR) program or transit facilities in exchange for bonus densities. Incentives may be used with SDC methods to reduce transportation impacts from new development.	System-wide transportation facilities, including streets, sidewalks, bike lanes, shared use paths, and transit.
Public/private partnerships	Public/private partnerships have been used around the country to provide public transportation amenities within the public right-of-way in exchange for operational revenue from the facilities. These partnerships could be used to provide services such as vehicle charging stations, public parking lots, bicycle lockers, or car-share facilities.	System-wide transportation facilities, including streets, sidewalks, bike lanes, shared use paths, and transit.
Tax Increment Financing (TIF)	TIF is a tool that cities may use to create special districts (tax increment areas) where public improvements are made to generate private-sector development. During a defined period, the City freezes the tax base at the pre-development level. Property taxes for that period can be waived or paid, but taxes derived from increases in assessed values (the tax increment) resulting from new development can go into a special fund created to retire bonds issued to originate the development or leverage future improvements. A number of small- to medium-sized communities in Oregon have implemented, or are considering implementing, urban renewal districts that will result in a TIF revenue stream.	System-wide transportation facilities, including streets, sidewalks, bike lanes, shared use paths, and transit.
Streets District	ORS 371 allows for the formation of special streets taxing districts for purposes of constructing and maintaining streets within the taxing district boundaries. A Streets District would be a separate entity from the City of Redmond, with its own property tax levy rate and an elected board of commissioners. Those within the potential district boundaries must vote on the creation of a Streets District.	Roadway improvement projects.
Revenue and general obligation bonds	Bonding allows municipal and county governments to finance construction projects by borrowing money and paying it back over time with interest. Financing requires smaller regular payments over time compared to paying the full cost at once, but financing increases the total cost of the project by adding interest. General obligation bonds are often used to pay for the construction of large capital improvements and must be approved by a public vote. These bonds add the cost of the improvement to property taxes over time.	Construction of major capital improvement projects within the city, street maintenance, and incidental improvements.

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Funding Source	Description	Potential Application
Reimbursement Districts	Also called Zones of Benefit or Advance Financed Districts, a city determines the boundary of the district. Property owners of new development or large redevelopment permits pay a fee for the installation of public improvements. They then recover some portion of the cost over a period of years (often 15).	Construction of major capital improvement projects within the city (possibly in Study Areas).

State and Federal Grants

In addition to local funding sources, the City can seek to leverage opportunities for funding from grants at the state and federal levels for specific projects. Table 14 outlines state and federal sources and their potential applications.

Potential state funding sources are extremely limited, with some having significant competition. Any future improvements that rely on state funding may require City and regional consensus that these improvements are more important than transportation needs elsewhere in the region and the state. It will likely be necessary to combine multiple funding sources to pay for a single improvement project (e.g., combining state, regional, or City bicycle and pedestrian funds to pay for new bike lanes and sidewalks).

Table 14: Potential State and Federal Grants

Funding Source	Description	Potential Application
Statewide Transportation Improvement Program (STIP)	STIP is the State of Oregon's four-year transportation capital improvement program. ODOT's system for distributing these funds has varied over recent years. Generally, local agencies apply in advance for projects to be funded in each four-year cycle.	Projects on any facility that meet the benefit categories of the STIP.
Statewide Transportation Improvement Program-Urban (STIP-U)	STIP-U is the State of Oregon's four-year transportation capital improvement program for urban areas. ODOT's system for distributing these funds has varied over recent years. Generally, local agencies apply in advance for projects to be funded in each four-year cycle.	Projects on any facility that meet the benefit categories of the STIP-U.

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Funding Source	Description	Potential Application
Transportation and Growth Management (TGM) Grants	TGM Grants are planning grants administered by ODOT and awarded on an annual basis. The TGM grants are generally awarded to projects that will lead to more livable, economically vital, transportation efficient, sustainable, and pedestrian-friendly communities. The grants are awarded in two categories: transportation system planning and integrated land use/transportation planning.	Refinement of any identified study projects.
Transportation Alternatives Program (TAP)	TAP is a federal program that provides funding for pedestrian and bicycle facilities, projects for improving public transit access, safe routes to schools, and recreational trails. Local governments, regional transportation authorities, transit agencies, school districts or schools, natural resource or public land agencies, and tribal governments are all eligible to receive TAP funds.	Bicycle and pedestrian facilities and shared use paths.
All Roads Transportation Safety Program (ARTS)	The federal Highway Safety Improvement Program is administered as ARTS in Oregon. ARTS provides funding to infrastructure and non-infrastructure projects that improve safety on all public roads. ARTS requires a data-driven approach and prioritizes projects in demonstrated problem areas.	Areas of safety concerns within the city, consistent with Oregon's Transportation Safety Action Plan.

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Funding Source	Description	Potential Application
Immediate Opportunity Fund (IOF)	This fund is discretionary and provides funding for transportation projects essential for supporting site-specific economic development projects. These funds are distributed on a case-by-case basis in cooperation with the Oregon Economic and Community Development Department. These funds can only be used when other sources of financial support are insufficient or unavailable. These funds are reserved for projects where a documented transportation problem exists or where private firm location decisions hinge on the immediate commitment of road construction. A minimum 50 percent match is required from project applications.	Any identified projects that would improve economic development in the city and where there are documented transportation problems.
Connect Oregon	Lottery-backed bonds distributed to air, marine, rail, transit, and pedestrian and bicycle projects statewide. No less than 10 percent of Connect Oregon IV funds must be distributed to each of the five regions of the state if there are qualified projects in the region. The objective is to improve the connections between the highway system and other modes of transportation.	System-wide transportation facilities.
Oregon Parks and Recreation Local Government Grants	Oregon Parks and Recreation Department administers this program using Oregon Lottery revenues. These grants can fund acquisition, development, and major rehabilitation of public outdoor parks and recreation facilities. A match of at least 20 percent is required.	Trails and other recreational facility development or rehabilitation.

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Funding Source	Description	Potential Application
Oregon Transportation Infrastructure Bank (OTIB)	A statewide revolving loan fund is available to local governments for many transportation infrastructure improvements, including highway, transit, and non-motorized projects. Most funds made available through this program are federal; streets must be functionally classified as a major collector or higher to be eligible for loan funding.	Infrastructure improvements to major collectors or higher classified roads for vehicle, transit, and non-motorized travel.
State highway gas tax increase or user fee	ODOT is currently researching a state user fee for drivers to address steady or declining state gas tax revenues. An increase in the state gas tax or a user fee would need to pass through state legislation and would increase the state's transportation funds.	System-wide transportation facilities including streets, sidewalks, bike lanes, and transit.
Oregon Statewide Transportation Improvement Fund (STIF)	HB 2017 established a new dedicated source of funding for improving or expanding public transportation service in Oregon. New revenue from this source is allocated across four programs, three of which apply to public transportation service in Redmond: the Formula program, the Discretionary program, and the Intercommunity Discretionary program.	Public transportation facilities and services.

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Appendix K

MEMORANDUM

March 13, 2024 Project# 27371

To: Jessica MacClanahan, John Roberts, Kyle Roberts, Morgan Snyder & Lindsey Cromsigt, City of Redmond
Tyler Deke, Bend MPO
Bob Townsend & David Amiton, ODOT
Chris Doty, Cody Smith, & Tarik Rawlings, Deschutes County

From: Matt Kittelson, Julia Kuhn, Cameron Thompson

RE: Redmond Large Lot Industrial (LLI) Lands Transportation System Plan (TSP) Amendment

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Redmond is amending its Transportation System Plan (TSP) to reflect an increase in future employment growth in the Large Lot Industrial (LLI) lands in the southeast part of the City. This TSP Amendment will enable the City to work with the County and ODOT to identify, evaluate and plan for the transportation infrastructure needed to support the development of these lands during the next twenty years.

To date, the City has coordinated with ODOT and the County on revised employment forecasts for the LLI lands as well as the transportation scenarios to be evaluated. This memo summarizes the transportation needs associated with the increased employment and compares those to the transportation projects in the adopted TSP as well as identifies additional changes in the transportation system needed to accommodate the LLI lands and the potential timing of these changes.

As described herein, the analyses of the employment and transportation scenarios revealed the following:

- Regardless of the employment density considered on the LLI lands, the following locations will not meet the applicable mobility targets by 2040:
  - Canal Boulevard/27th Street/Yew Avenue – this existing roundabout is a documented capacity deficiency and also a location where safety improvements will be needed to address identified crash histories. Right-of-way constraints at this location limit what changes can be made here.
  - 21st Street/Airport Way – due to previously identified capacity constraints, this intersection has been planned for conversion to a right-in-right-out and/or be grade separated, both of which have impacts to the surrounding properties and local streets as well as right-of-way constraints.
  - Yew Avenue/US 97 NB Ramp Terminals – ODOT adopted an alternative mobility target (v/c of 1.0) at this intersection, but this target will be exceeded upon development of the LLI lands unless other broader transportation system changes are made. ODOT currently has no plans to improve the Yew Avenue interchange.
- Depending on the employment density achieved within the LLI lands and in the absence of broader transportation system changes, the 19th Street/Airport Way may need to be expanded beyond the single lane roundabout currently planned.
- It does not appear to be feasible to widen Airport Way/Yew Avenue much beyond its current cross-section between 21st Street and the Canal Boulevard/27th Street/Yew Avenue intersection without

major capital expenditures, significant right-of-way impacts and significant rail impacts. This suggests broader transportation system changes and/or considerations are needed to continue to facilitate economic growth in Redmond and the region, particularly related to development of the LLI lands.

- A preliminary assessment of potential timing of when changes to the transportation may be needed revealed the following if no southern interchange were added.
  - The Canal Boulevard/27th Street/Yew Avenue roundabout is forecast to exceed mobility standards by 2027/2028;
  - The 21st Street/Airport Way intersection is forecast to exceed mobility standards by 2027/2028;
  - The 19th Street/Airport Way single lane roundabout is forecast to exceed mobility standards by 2035/2036;
  - The Yew Avenue/US 97 NB Ramp Terminal is forecast to operate acceptably when compared to the alternative mobility target until 2039/2040 with 6,500 jobs added.
- If a Southern Interchange is constructed:
  - The timing of the needs at the Canal Boulevard/27th Street/Yew Avenue roundabout and 21st Street/Airport Way intersection do not change.
  - The Yew Avenue/US 97 NB Ramp Terminal would not require changes to meet mobility targets, regardless of the employment scenario considered.
- We further note that broader transportation system changes beyond those currently identified in the TSP would provide a number of broader benefits to this area, such as:
  - Transportation network redundancy in the case of an emergency as well as providing for future economic development opportunities that benefit Central Oregon and Redmond. The LLI land could facilitate more than 9,800 people working in this area in the future (which is approximately one-third of the overall number of jobs anticipated in the Redmond UGB by 2040).
  - The Deschutes County Fairgrounds and Expo Center rely on 19th Street, Airport Way, and the Yew Avenue interchange for ingress and egress, especially during large events. Future expansion plans for the fairgrounds, including larger and more frequent events, would benefit from other transportation system changes for operational purposes and for emergency response scenarios.
  - Resiliency Planning: the Redmond Municipal Airport is a key location for resiliency planning for a Cascadia subduction event; adding a southern interchange can provide alternative access to the airport.
- There are a number of future considerations that the City can pursue as it continues to plan for growth in this area, such as:
  - Relevant transportation-related considerations identified during the upcoming Land Use Refinement Studies that the City is undertaking
  - Potential new funding opportunities to provide broader transportation system changes, such as by applying for funding via the Infrastructure Investment and Jobs Act (IIJA) program and/or other federal, state and public/private funding opportunities.

More details on the analysis methodology and findings are described herein.

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EMPLOYMENT SCENARIOS EVALUATED

As shown in Figure 1, the LLI lands are generally located to the south and southwest of the Deschutes County Fair and Expo Center. Today, these lands are accessed via the connection of SW 19th Street with SW Airport Way. The adopted TSP reflects future development of these lands with industrial-related uses that would be staffed by only approximately 1,000 employees, which equates to approximately 1.5 employees per acre. Since the TSP was adopted, the City has re-evaluated the potential employment growth expected during the next 15 – 20 years and is expecting a much higher density of employment growth in this area. As a result of these updated forecasts, the City is interested in understanding the transportation needs associated with the potential for up to 15 employees per acre on these lands. Accordingly, the following land use scenarios were evaluated using the Bend-Redmond Travel Demand Model (BRM):

- The existing TSP with 1.5 employees per acre = 1,000 employees
- A revised lower bound of 10 employees per acre = 6,550 employees
- An upper bound of 15 employees per acre = 9,820 employees

The following sections summarize the resultant year 2040 traffic volumes and the forecast transportation needs and possible solutions to address the deficiencies. A comparison of the needed solutions to those in the adopted Redmond TSP is also provided.

TRANSPORTATION NETWORK SCENARIOS EVALUATED

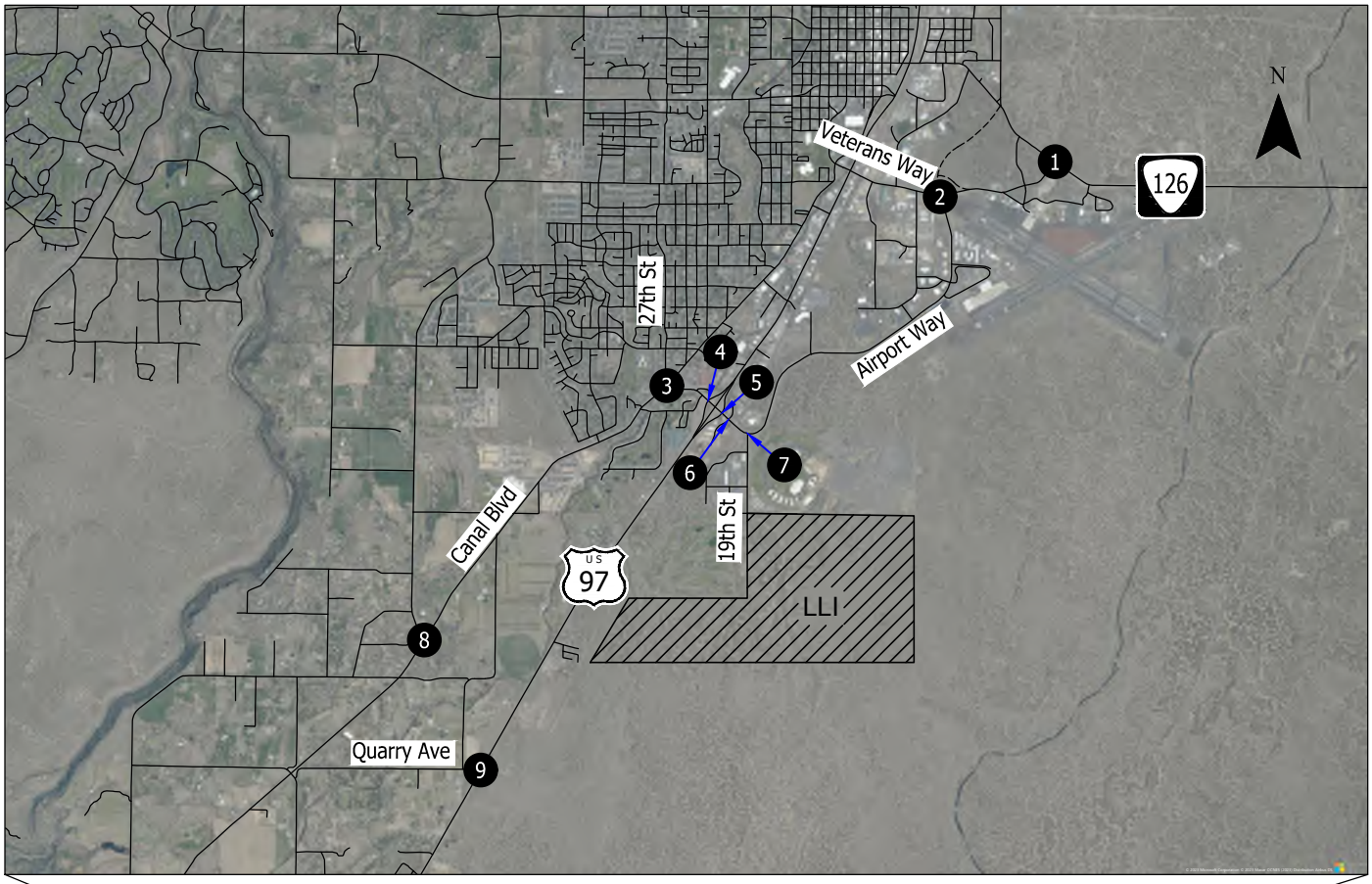
Two primary transportation network scenarios were tested as part of evaluating the increased employment densities. These scenarios were evaluated to understand whether there are any material differences in the transportation deficiencies associated with the adopted 1.5 employees per acre versus the potential for 10 – 15 employees per acre. The two primary transportation network scenarios are:

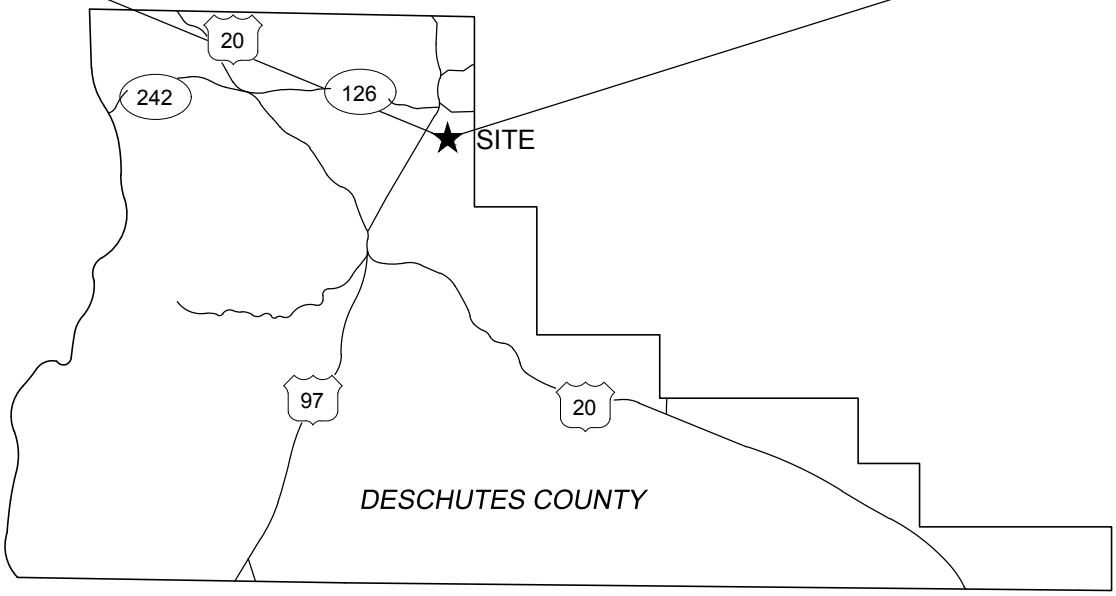
- The adopted list of projects contained within the 2020 TSP, including the US 97 South Redmond Corridor Facility Plan recommendations; and,
- The potential for the extension of SW 19th Street south of the City's Urban Growth Boundary (UGB) to a new interchange with US 97 at either McVey or at Quarry Road (recognizing that the State would need to review and approve a "Goal Exception" associated with the construction of a roadway outside of the UGB to serve the employment lands if this scenario were to materialize). This scenario is herein referred to as a "southern interchange."

For reference purposes, the adopted TSP includes the following transportation changes in the vicinity of the LLI lands:

- 9th Street Extension: This project would extend 9th Street south from OR 126 to connect with Airport Way. Intersection improvements would be implemented at the OR 126 / 9th Street intersection and new 9th Street / Veterans Way intersection, both of which are planned to be roundabouts.
- 19th Street / Airport Way: This intersection is planned to be a roundabout in the future. The geometry and lane configuration of this future roundabout is dependent on the demand along Airport Way and 19th Street, which varies based on the Land Use and Transportation scenarios evaluated. This is discussed further below.

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Site Vicinity Map
Redmond, OR

Figure
1

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures.dwg Mar 13, 2024 - 10:41am - cthompson Layout Tab: Site Vicinity Map

- Yew Avenue / US 97 NB Ramp Terminals: No modifications are planned at this location in the 20-year horizon, but an alternative mobility target (v/c of 1.0) was adopted as part of the South Redmond Corridor Plan.

The TSP notes that two locations within the vicinity of the LLI lands are not forecast to meet operational standards, including:

- Canal Boulevard / 27th Street / Yew Avenue: This is an existing single roundabout that is a known capacity deficiency and also a location where safety improvements will be needed to address identified crash histories. Right-of-way constraints at this location limit what changes can be made here.
- 21st Street / Airport Way: This intersection would need to be restricted to right-in-right-out and/or be grade separated to meet performance standards.

COMPARISON OF TRAVEL PATTERNS AND VOLUMES

Appendix A, Figures A-1 through A-4 compare the year 2040 travel demand estimates associated with the scenarios modeled versus the year 2040 travel demand associated with the adopted TSP transportation network and land use assumptions. These figures are direct output from the BRM model and reflect a comparison of the following scenarios:

- Figure A-1 = Scenario 1 (10 employees per acre with the adopted TSP projects) versus the adopted TSP land use and transportation network.
- Figure A-2 = Scenario 2 (15 employees per acre with the adopted TSP projects) versus the adopted TSP land use and transportation network.
- Figure A-3 = Scenario 3 (10 employees per acre with the adopted TSP projects and a southern interchange) versus the adopted TSP land use and transportation network.
- Figure A-4 = Scenario 4 (15 employees per acre with the adopted TSP projects and a southern interchange) versus the adopted TSP land use and transportation network.

In reviewing these figures, we note the following:

- When comparing Scenarios 1 and 2 to the adopted TSP scenario, either the 10 and 15 employee per acre density results in an increase of more than 100 PM peak hour vehicles being added along the Airport Way/Yew Avenue, US 97, and Canal Boulevard/Old Bend-Redmond Highway corridors. Similar volume increases along these corridors would also be expected in the AM peak hour.
- When comparing Scenarios 1 and 2 to the adopted TSP scenario, we note that both US 97 and the Old Bend-Redmond Highway corridor are expected to experience a significant increase in southbound traffic in the weekday PM peak hour. This is likely due to the fact that US 97 is shown to be capacity-constrained in the future, even under the adopted TSP scenario so the increase in volumes associated with higher employment densities would need to be facilitated on both corridors.
- As expected, the addition of a southern interchange (Scenarios 3 and 4) would reduce the demand on the Airport Way/Yew Avenue and Canal Boulevard corridors for those trips headed to/from Bend and areas to the south.
- Even with a new interchange, there is still a significant increase on the Old Bend-Redmond Highway corridor given the capacity constraints on US 97 between Bend and Redmond.

- Regardless of the scenario considered, all would require additional changes to intersections within the City's UGB beyond those included in the adopted TSP. Further details of the specific locations are provided in the sections below.

We also compared the change in travel demand with and without the southern interchange under each of the two increased land use scenarios rather than to the demand under the adopted TSP as described above. These comparisons are presented as follows:

- Figure A-5 = Scenario 1 (10 employees per acre with the adopted TSP projects) versus Scenario 3 (10 employees per acre with the southern interchange).
- Figure A-6 = Scenario 2 (15 employees per acre with the adopted TSP projects) versus Scenario 4 (15 employees per acre with the southern interchange).

In reviewing these two figures, we note that approximately 35% of the trips associated with the LLI employment is forecast to travel to and from the south via the southern interchange and/or the connection of a southerly extension of 19th Street and the Old Bend-Redmond Highway. With the potential up to nearly 10,000 new employees that could work in this area, the travel forecasts confirm that these employees would likely live in the broader Central Oregon region in addition to the City of Redmond, including Bend, Sisters, Tumalo, La Pine, and Prineville.

In reviewing all six figures, it is important to note that capacity constraints on specific roadways both within the city as well as on US 97 result in some variability in travel demands between scenarios within the BRM model but that the overall trends and patterns are reasonable.

DEVELOPMENT OF INTERSECTION VOLUMES

Using the travel demand forecasts, we developed year 2040 traffic volumes at key intersections near the LLI lands for each of the four land use/transportation network scenarios evaluated. For comparison purposes, we also evaluated year 2023 intersection operations to establish a baseline as well as year 2030 intersection operations to understand the potential for phasing.

The existing intersection operations were based on turning movement count data collected in April 2023 that was seasonally adjusted to reflect 30th highest hour conditions per the ODOT Analysis and Procedures Manual (APM). All year 2040 travel demand estimates were post-processed in accordance with the ODOT APM.

The study intersections are listed below and shown in Figure 1.

1. Veterans Way / OR 126
2. Airport Way / Veterans Way
3. Canal Boulevard / 27th Street / Yew Avenue
4. US 97 Southbound Ramps / Yew Avenue
5. US 97 Northbound Ramps / Yew Avenue
6. 21st Street / Airport Way
7. 19th Street / Airport Way
8. Canal Boulevard / Helmholtz Way
9. US 97 / Quarry Avenue (modeled to reflect a "southern interchange")

Appendix B shows the traffic volumes and operations figures for each scenario. Figures B-1 – B-7 present the volumes and resultant operations. Appendix C shows the traffic operations worksheets for each scenario.

The following section highlights the key findings and outcomes of the operational analysis.

EXISTING (2023) CONDITIONS

All intersections operate within applicable City and ODOT performance standards today, with the exception of the SW 21st Street/SW Airport Way intersection. This intersection is closely spaced to the Yew Avenue interchange and drivers attempting to make southbound or northbound left turns at this location often experience high delays during peak periods. The City has plans to eventually limit this intersection to right-in-right-out conditions only. Long-term, the City may pursue a grade separation of the railroad, which would change this intersection configuration.

If the City were to limit this intersection to right-in-right-out movements only via a median on SW Airport Way, implementation would need to be associated with a more detailed review of local access needs as well as how other transportation system changes, including a roundabout at the SW 19th Street/SW Airport Way intersection could facilitate this change.

2040 INTERSECTION OPERATIONS FOR SCENARIO 1 AND SCENARIO 2

Based on the year 2040 traffic volumes, we analyzed intersection operations assuming increased employment density and implementation of the TSP projects. As shown in Appendix B, the intersection operations for the two employment scenarios would suggest the following:

- The need for changes to key intersections does not materially change regardless of whether 10 or 15 employees per acre are realized.
- The previously noted Canal Boulevard/27th Street/Yew Avenue and SW 21st Street/SW Airport Way deficiencies would be exacerbated.
- The SW 19th Street/SW Airport Way roundabout would need to be constructed with additional turn lanes (northbound left and left/right turn lanes and an additional westbound through lane) beyond those planned to meet operational requirements.
- The Yew Avenue / US 97 NB Ramp Terminal would exceed its alternative mobility target, indicating that the facility would operate in excess of capacity during an average day. Additional changes to this ramp terminal would be challenging due to the existing US 97 bridge and constrained right-of-way in the vicinity.

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2040 INTERSECTION OPERATIONS FOR SCENARIO 3 AND SCENARIO 4

Based on the year 2040 traffic volumes, we also analyzed intersection operations assuming increased employment density and construction of a southern interchange. As shown in Appendix B, the intersection operations would suggest the following:

- The SW 19th Street/SW Airport Way roundabout would require a smaller overall cross-section due to reduced demand at the intersection compared to the non-interchange scenarios.
- Traffic volumes would be reduced at the US 97/Yew Avenue interchange, including allowing for the US 97 northbound ramp terminal to operate within the adopted mobility targets.
- The potential construction of the SW 19th Street extension and a new interchange is forecast to serve approximately 300 to 400 vehicles during the PM peak by 2040 on a typical weekday.

In addition to the intersection operations, we note that a southern interchange would have other regional benefits, such as:

- Network redundancy and access to a large employment area: The LLI area would facilitate up to 9,820 future employees. For context, the Redmond UGB is forecast to have 28,550 employees by 2040 according to the Redmond TSP. This level of employee concentration would benefit from multiple access points to and from US 97.
- Event traffic management: The Deschutes County Fairgrounds and Expo Center relies on 19th Street, Airport Way, and the Yew Avenue interchange for ingress and egress, especially during large events. Future expansion plans for the fairgrounds, including larger and more frequent events, would benefit from an additional connection to US 97 for operational purposes and for emergency response scenarios.
- Grade separated connection of the BNSF railroad: The existing BNSF crossing on Airport Way has several challenges that make it difficult to provide a grade separated crossing for vehicles, emergency services, and freight. A connection to US 97 via a southern interchange would be built to provide a grade separated crossing of the rail line, providing a reliable route for these important purposes.
- Resiliency Planning: the Redmond Municipal Airport is a key location for resiliency planning for a Cascadia subduction event; adding a southern interchange can provide alternative access to the airport.

MAJOR INVESTMENT POLICY CONSIDERATIONS

As noted in the TSP, City policies, the Comprehensive Plan, and Council priorities focus on strategic investments that support mixed-use neighborhoods, providing options for increased use of walking and cycling, enhancing safety, and continued support for the economic health and prosperity of the region. Further, the highest priority projects for strategic investments are those that (1) protect the existing system and (2) improve the efficiency and safety of existing multimodal facilities. We also note that ODOT policies focus on protecting the existing transportation system prior to consideration of new major capital investments.

With these considerations in-mind, we note the following related to the adopted TSP projects:

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- SW Airport Way Grade Separated Crossing – this project was estimated to cost more than $16 million, not including right-of-purchases. Construction of this overcrossing would require major capital expenditures, significant right-of-way impacts, significant changes to the US 97/Yew Avenue interchange, and significant rail impacts. Further, widening from Airport Way/Yew Avenue would not address the existing deficiencies at the Canal Boulevard/Yew Avenue/27th Street intersection and therefore not address broader system needs.
- Construction of an Elkhorn extension to 19th Street, including an overcrossing with US 97. This project was estimated to cost more than $26 million, not including right-of-way acquisition and was not shown to provide material changes to the broader system needs nor does it align with Council priorities and the Comprehensive Plan policies. This extension would not enable a new connection to US 97 via an interchange and/or at-grade intersection as it would not meet either ODOT or federal policy and spacing considerations. Without material benefits, this very costly grade-separation is not supported by City, State or Federal priorities and policies.

We also note that future consideration of a southern interchange will need to be considered relative to feasibility of the existing transportation system to accommodate planned growth in the region, the state's Transportation Planning Rule and other Statewide Goal considerations, the judicious use of future funding opportunities, consistency with major investment policies, and other broader resiliency and economic benefits.

INTERIM YEAR INTERSECTION OPERATIONS AND POSSIBLE FUNDING NEEDS

In addition to the year 2040 analyses, we also evaluated year 2030 intersection operations to help inform how changes to the transportation system may be able to be phased over time. This evaluation was performed only for Scenarios 1 and 2 (i.e., no southern interchange). Traffic volumes for these scenarios were developed by assuming linear growth between existing (2023) and future (2040) conditions. In all cases, the transportation network assumed that the adopted TSP projects were in-place but the southern interchange was not. Figures B-7 – B-8 summarize the 2030 volumes and operations.

The key findings of this evaluation include:

- The Canal Boulevard/27th Street/Yew Avenue is forecast to exceed mobility standards by 2030 regardless of the employment scenario evaluated (including the adopted TSP employment density).
- The 21st Street/Airport Way exceeds performance metrics today and will continue to do so in 2030.
- The US 97 Northbound Ramps at the Yew Avenue Interchange would meet the alternative mobility targets regardless of the employment density achieved.
- The 19th Street/Airport Way intersection could operate as a single lane roundabout regardless of the employment density achieved.

These findings indicate that the transportation network could be improved in the near-term to serve the LLI lands without implementation of a southern interchange from an operational perspective. However, the other benefits of a southern interchange discussed previously, including redundancy with US 97 and event traffic, would still be applicable in 2030.

Based on the year 2030 results, we also evaluated a phased development scenario to help the City plan for when specific improvements may be needed. For this analysis, we used Employment Scenario 1 (i.e., 10 jobs per acre for a total of 6,550 people working on the LLI lands) and evaluated the following scenarios

based on a possible linear growth in job development. The interim employment numbers correlate to an approximate year that the employment would occur. For analysis purposes background traffic was assumed to be consistent with 2040 projections.

- Approximately 2,400 jobs added by 2027/2028
- Approximately 3,800 jobs added by 2031/2032
- Approximately 5,200 jobs added by 2035/2036
- Approximately 6,500 jobs added by 2039/2040 (buildout)

Each of these scenarios was evaluated with and without a Southern Interchange. Key findings of these evaluations are discussed below.

If a Southern Interchange is not added:

- The Canal Boulevard/27th Street/Yew Avenue roundabout is forecast to exceed mobility targets by 2027/2028;
- The 21st Street/Airport Way intersection is forecast to exceed mobility standards is forecast to exceed mobility targets by 2027/2028;
- The 19th Street/Airport Way single lane roundabout is forecast to exceed mobility standards by 2035/2036; and,
- The Yew Avenue/US 97 NB Ramp Terminal is forecast to operate acceptably when compared to the alternative mobility target until 2039/2040 with 6,500 jobs added.

If a Southern Interchange is constructed:

- The timing of the needs at the Canal Boulevard/27th Street/Yew Avenue roundabout and 21st Street/Airport Way intersection do not change.
- The Yew Avenue/US 97 NB Ramp Terminal would not require changes to meet mobility targets, regardless of the employment scenario considered.

FUTURE CONSIDERATIONS

As part of further planning and based on the above analyses that demonstrates changes will be needed to the transportation system in the next 3 – 4 years to support early development of the LLI lands, it appears that the City may want to consider applying for new funding opportunities available at the federal, state, and/or regional level as well as to pursue possible public/private partnerships. One possible funding source for further exploration is the Infrastructure Investment and Jobs Act (IIJA) program.

In addition, we understand that the City is undertaking a land use refinement study in the next few months to further identify considerations related to LLI development opportunities. This effort and our analyses can help inform an amendment to the existing TSP.

KEY FINDINGS & NEXT STEPS

As described herein, whether the LLI lands were to facilitate a density of 10 or 15 employees per acre, the transportation needs are essentially the same. The key locations that would require changes to the intersection configuration in the future include:

- The Canal Boulevard/27th Street/Yew Avenue is forecast to exceed mobility standards by 2027/2028 regardless of the employment or transportation scenario evaluated. This deficiency is highlighted in the TSP so no changes would be required as part of the TSP Amendment.
- The 21st Street/Airport Way exceeds performance metrics today and will continue to do so. This deficiency is highlighted in the TSP so no changes would be required as part of the TSP Amendment.
- The US 97 Northbound Ramps at the Yew Avenue Interchange would not meet the alternative mobility targets regardless of the employment density achieved by 2039/2040 if no southern interchange is constructed. This deficiency would need to be addressed as part of the TSP Amendment.
- The 19th Street/Airport Way intersection would not operate as a single lane roundabout regardless of the employment density or transportation network scenario evaluated and is anticipated to exceed applicable performance targets by 2034/2035. This deficiency would need to be addressed as part of the TSP Amendment. The addition of a southern interchange would help reduce the overall footprint of the intersection changes.
- The southern interchange could facilitate 300 – 400 vehicles per hour during peak periods but also has other regional benefits, including providing for alternative access to the Redmond Municipal Airport during a Cascadia subduction event, peak events at the Deschutes County Fairgrounds and Expo Center, as well as serving up to 9,820 employees in the LLI lands. Any further evaluation of the potential for a southern interchange would need to be explored through a Goal Exception Process as well as to consider such factors as the state's Transportation Planning Rule and other Statewide Goal considerations, the judicious use of future funding opportunities, consistency with major investment policies, and other broader resiliency and economic benefits.

We look forward to discussing our findings with you and identifying the next steps as part of the TSP Amendment.

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Appendix A Year 2040 Travel Demand

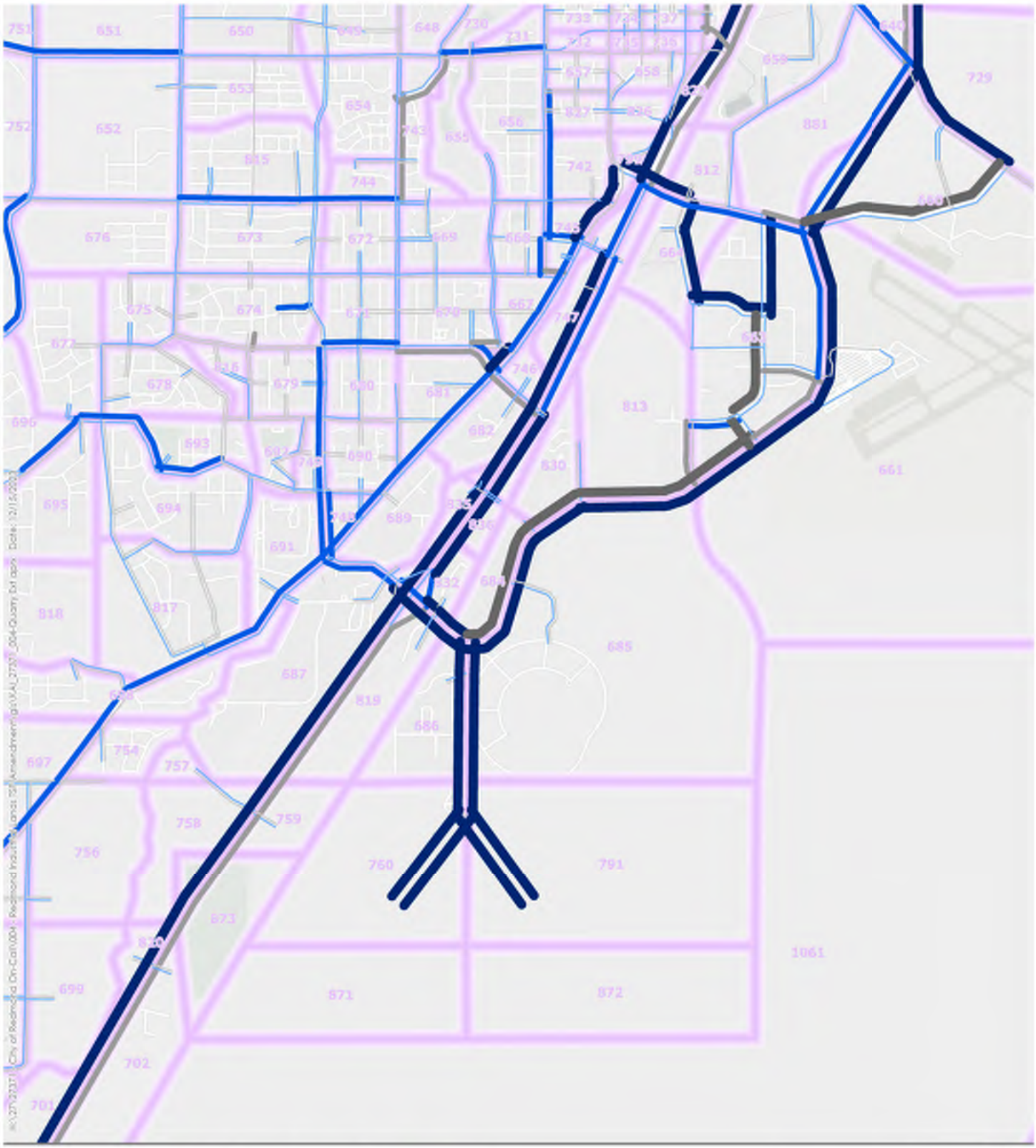


Figure A-1

2040 PM Peak Hour Travel Demand Comparison between Scenario 1 and the Adopted TSP

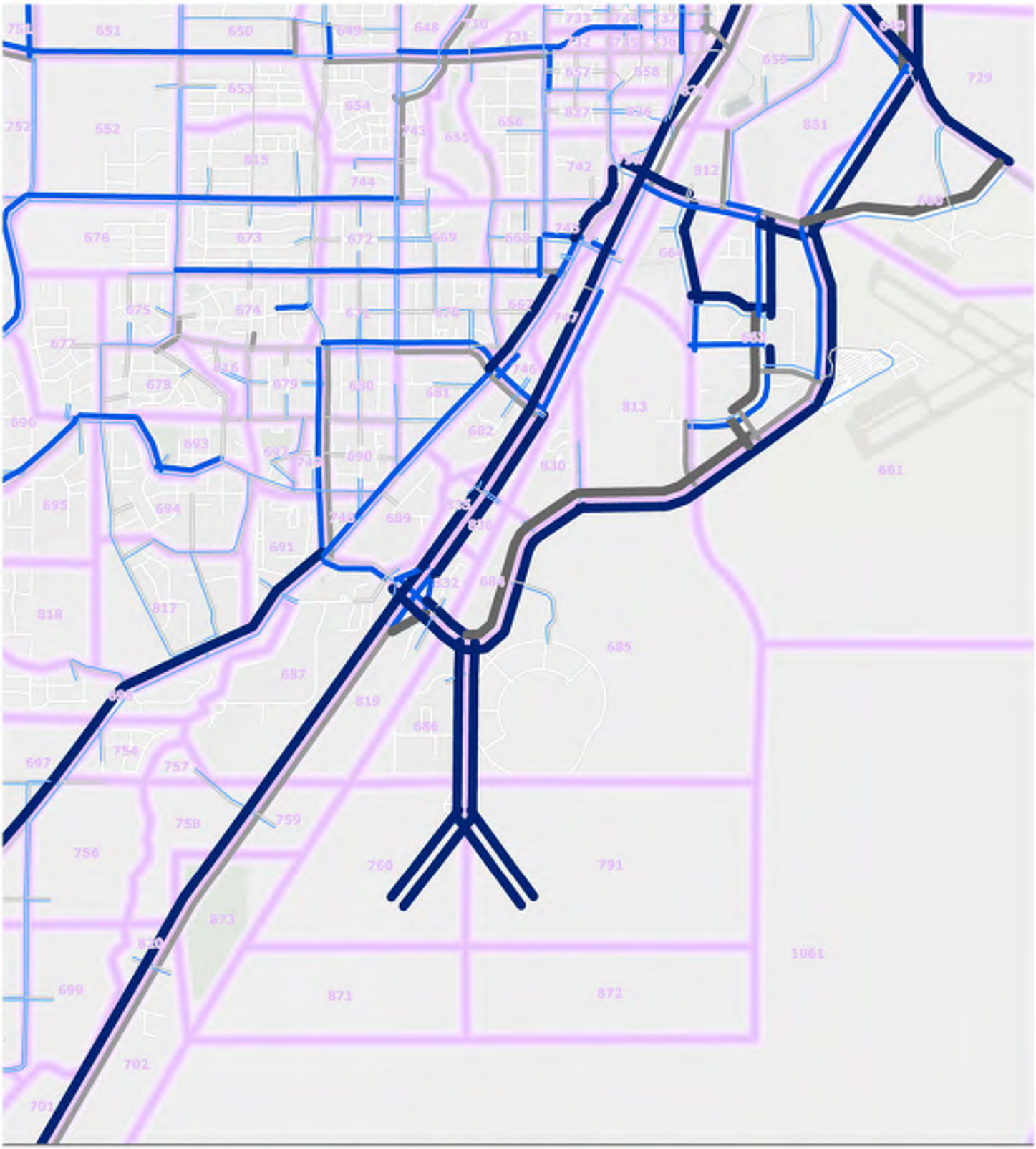


Figure A-2

2040 PM Peak Hour Travel Demand Comparison between Scenario 2 and the Adopted TSP

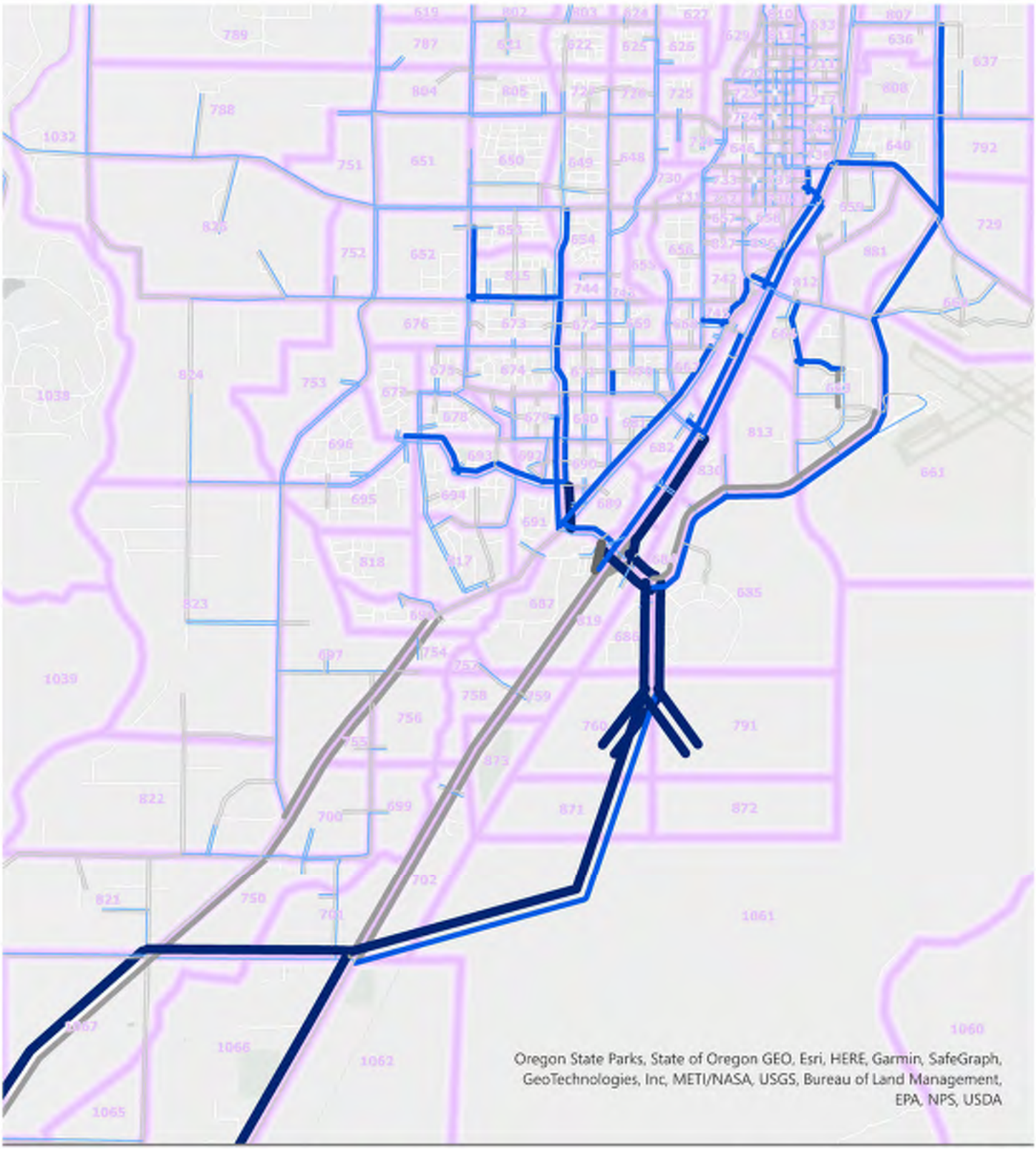


Figure A-3

2040 PM Peak Hour Travel Demand Comparison between Scenario 3 and the Adopted TSP

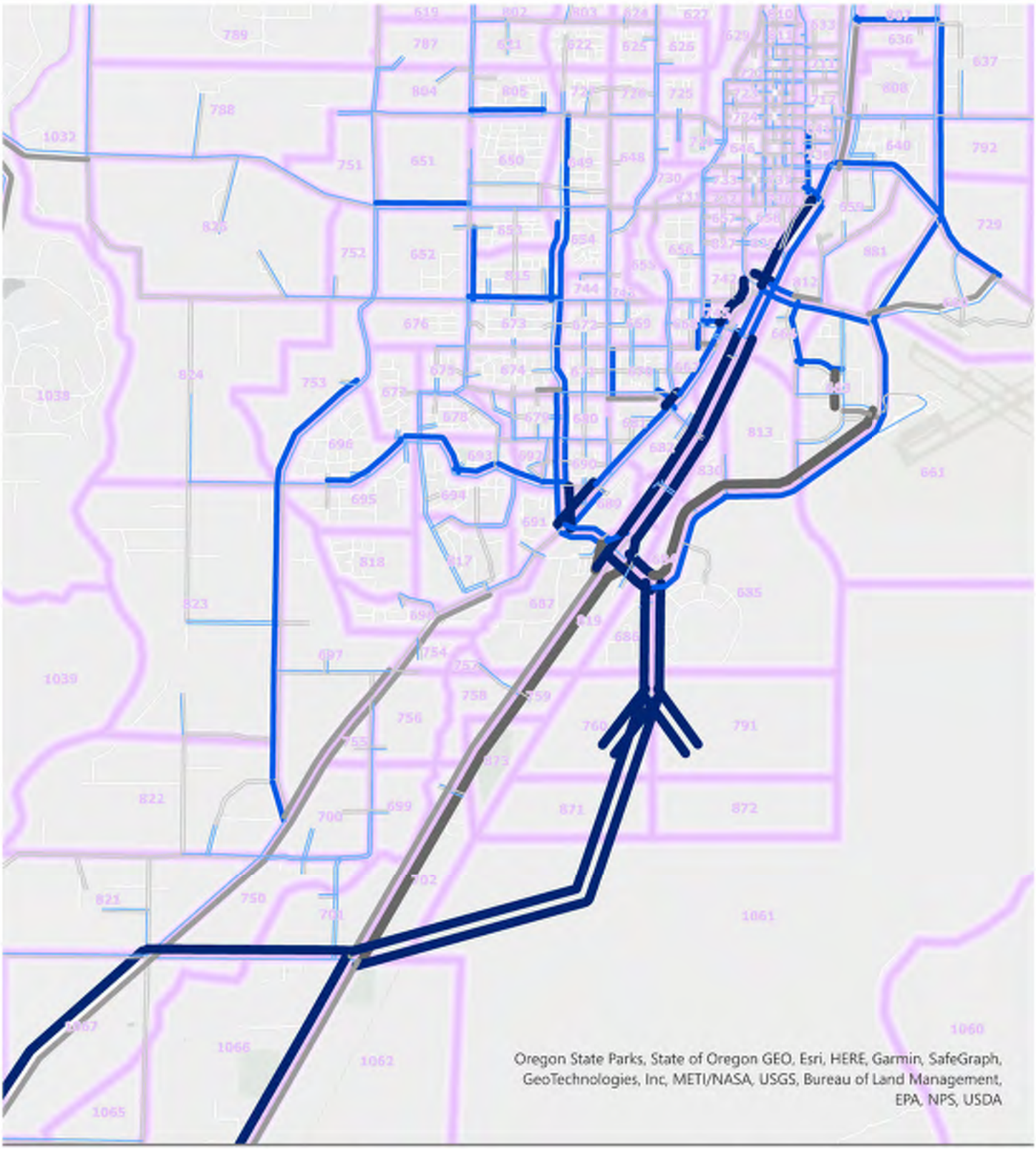


Figure A-4

2040 PM Peak Hour Travel Demand Comparison between Scenario 4 and the Adopted TSP

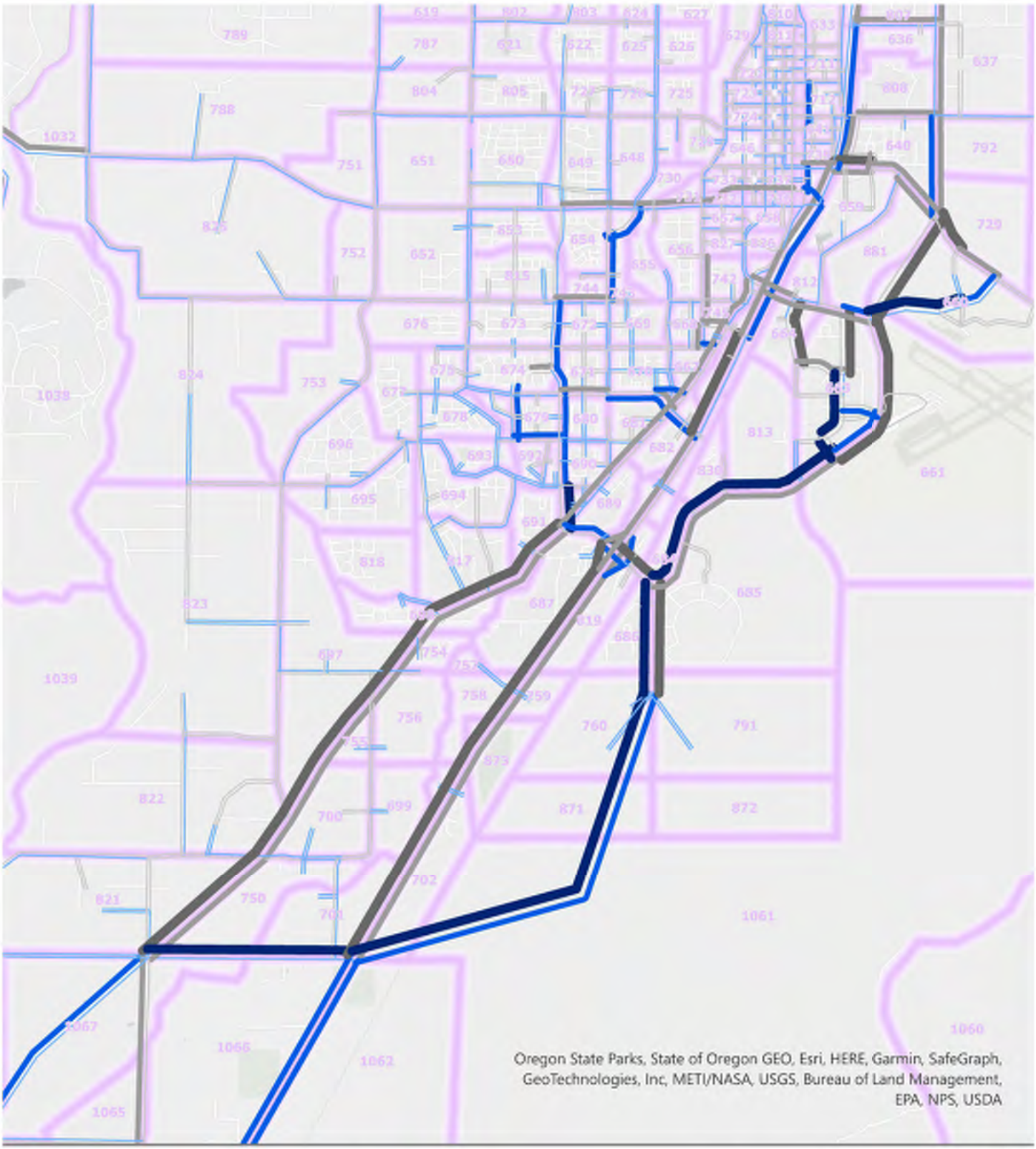


Figure A-5

2040 PM Peak Hour
Travel Demand Comparison of Scenario 1
With and Without the Southern Interchange

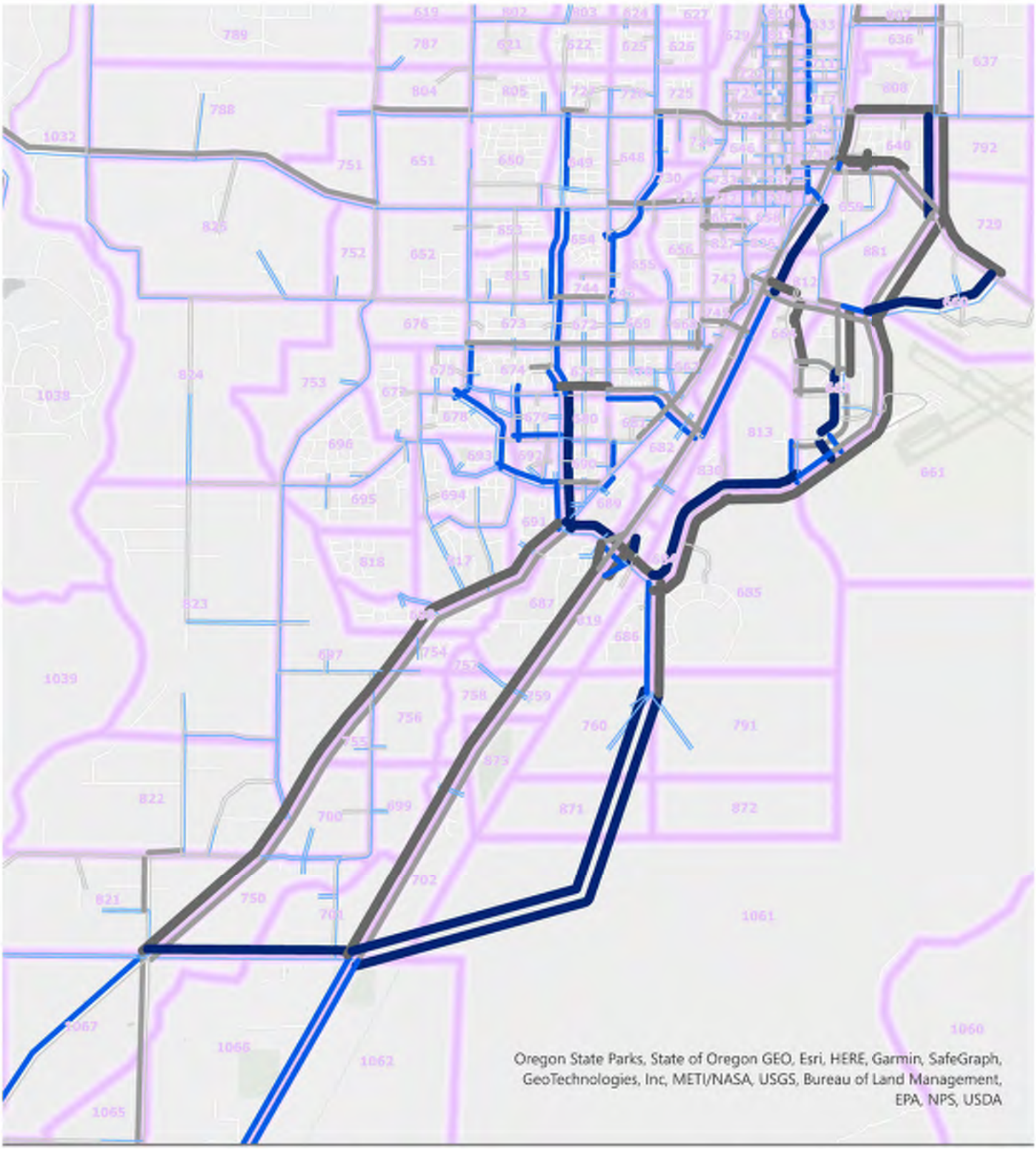
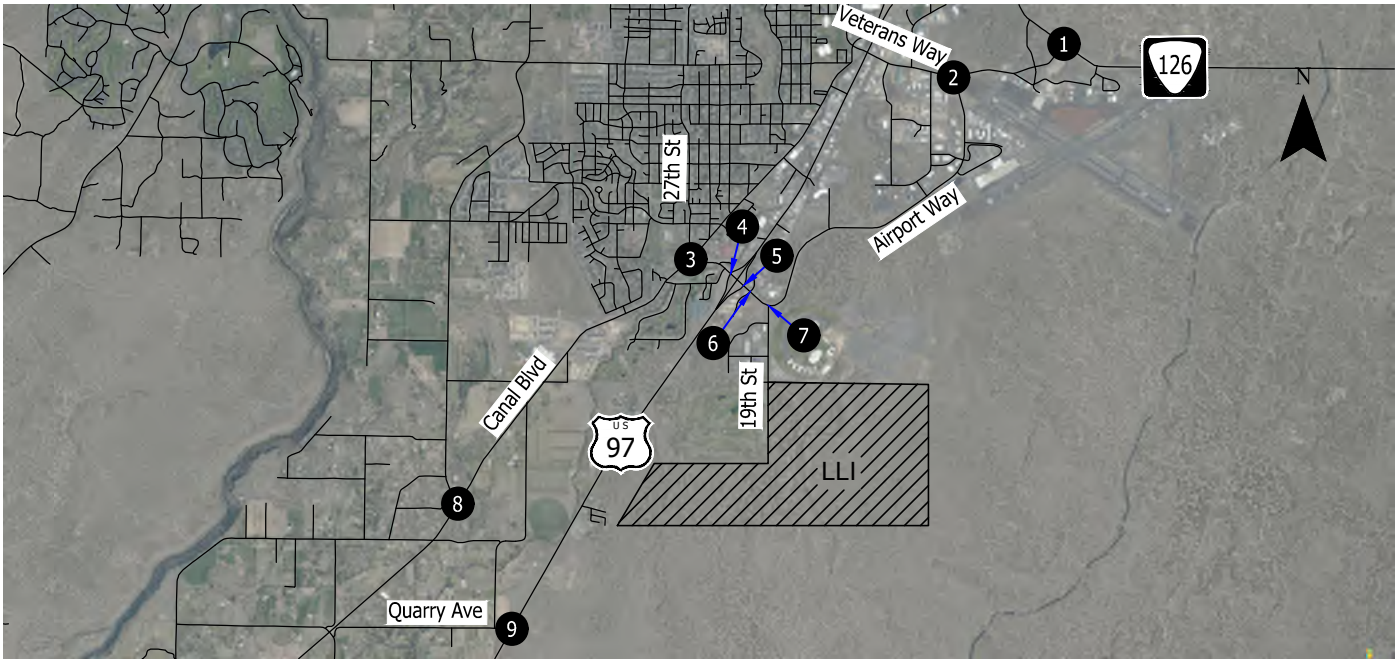


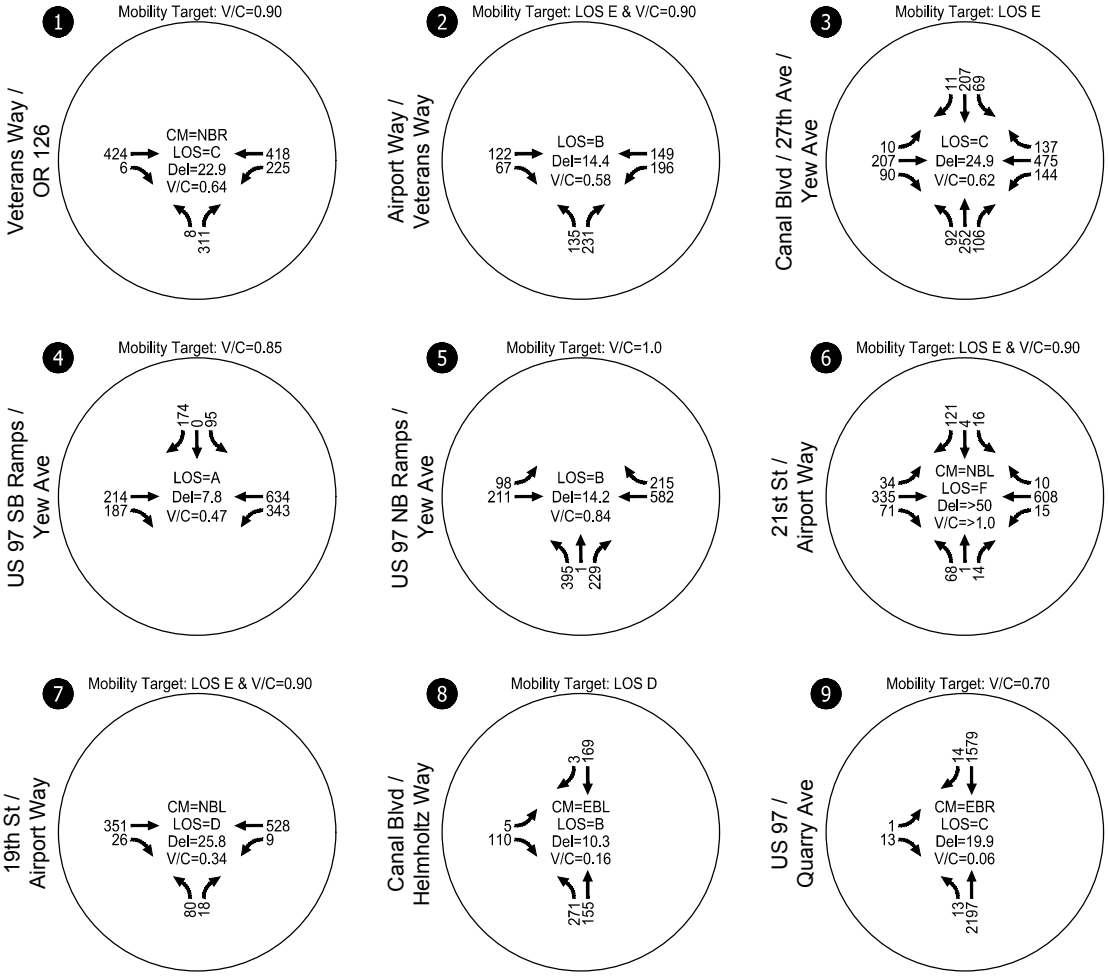
Figure A-6

2040 PM Peak Hour
Travel Demand Comparison of Scenario 2
With and Without the Southern Interchange

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Appendix B Traffic Volumes and Operations



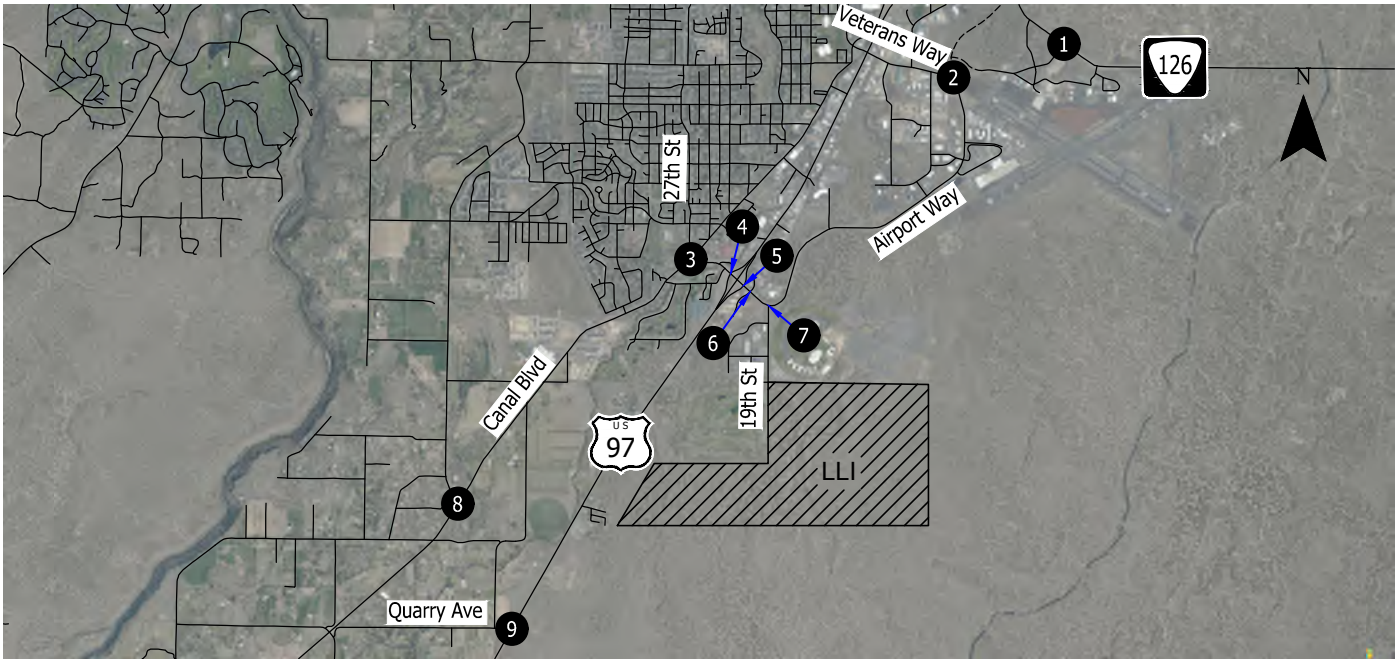


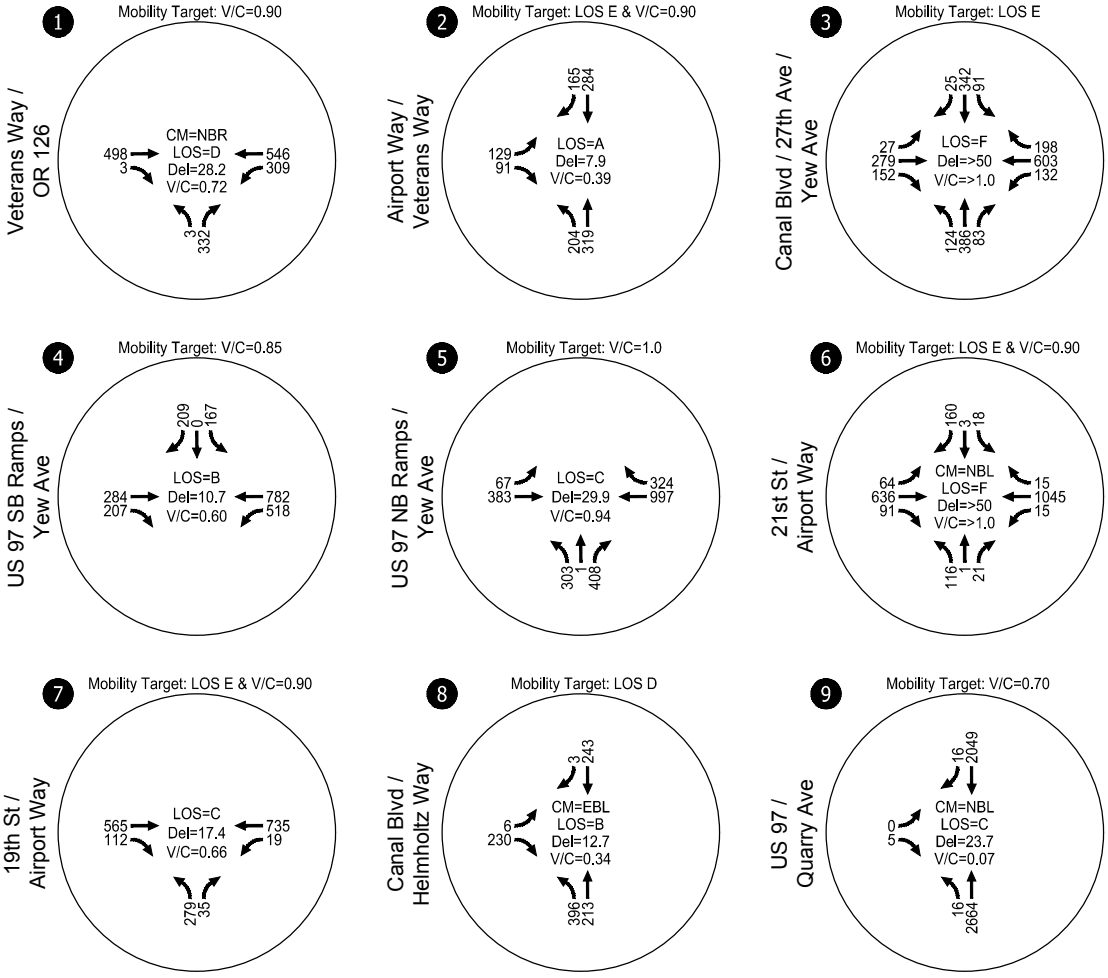
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V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO (SIGNALIZED, ROUNDABOUT, AWSC)/ CRITICAL MOVEMENT VOLUME-TO-CAPACITY RATIO (TWSC)

Existing Traffic Conditions
2023 PM Peak Hour
Redmond, OR

Figure
B-1

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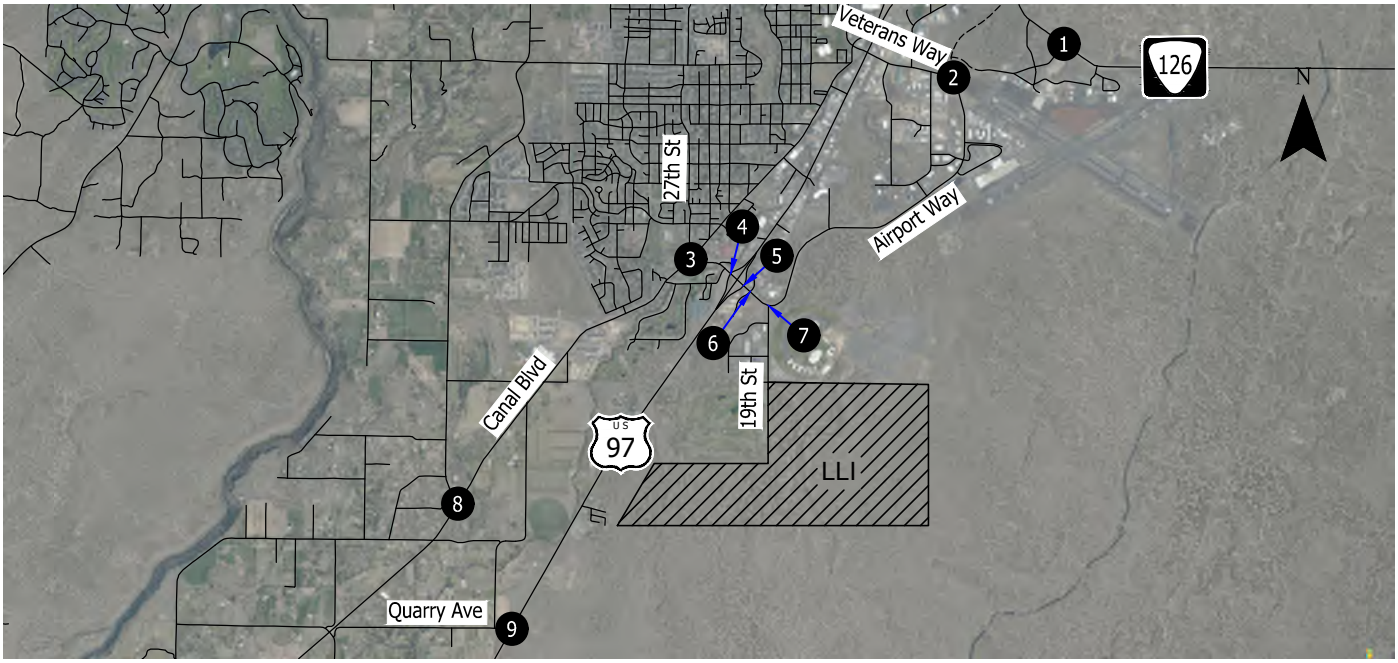


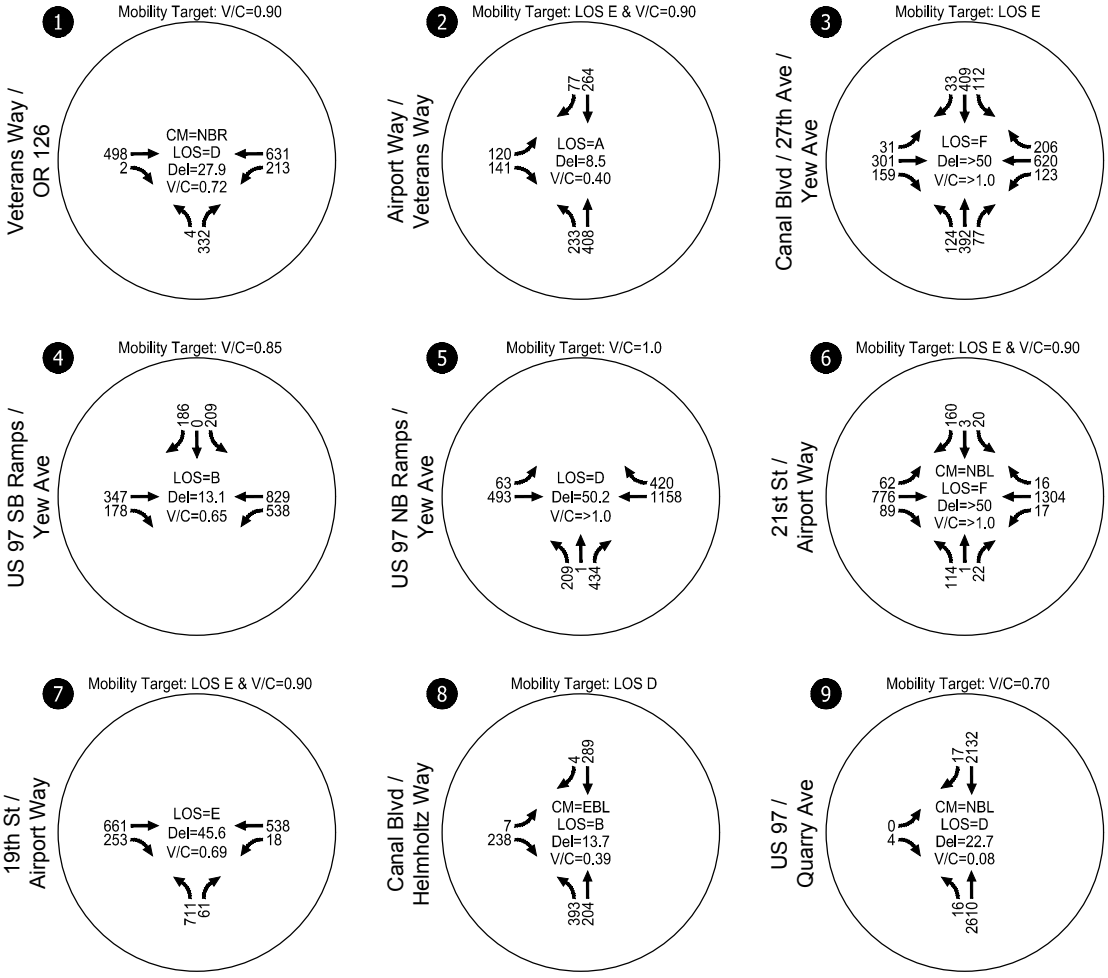
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V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO (SIGNALIZED, ROUNDABOUT, AWSC)/ CRITICAL MOVEMENT VOLUME-TO-CAPACITY RATIO (TWSC)

Base TSP Growth Scenario
2040 PM Peak Hour
Redmond, OR

Figure
B-2

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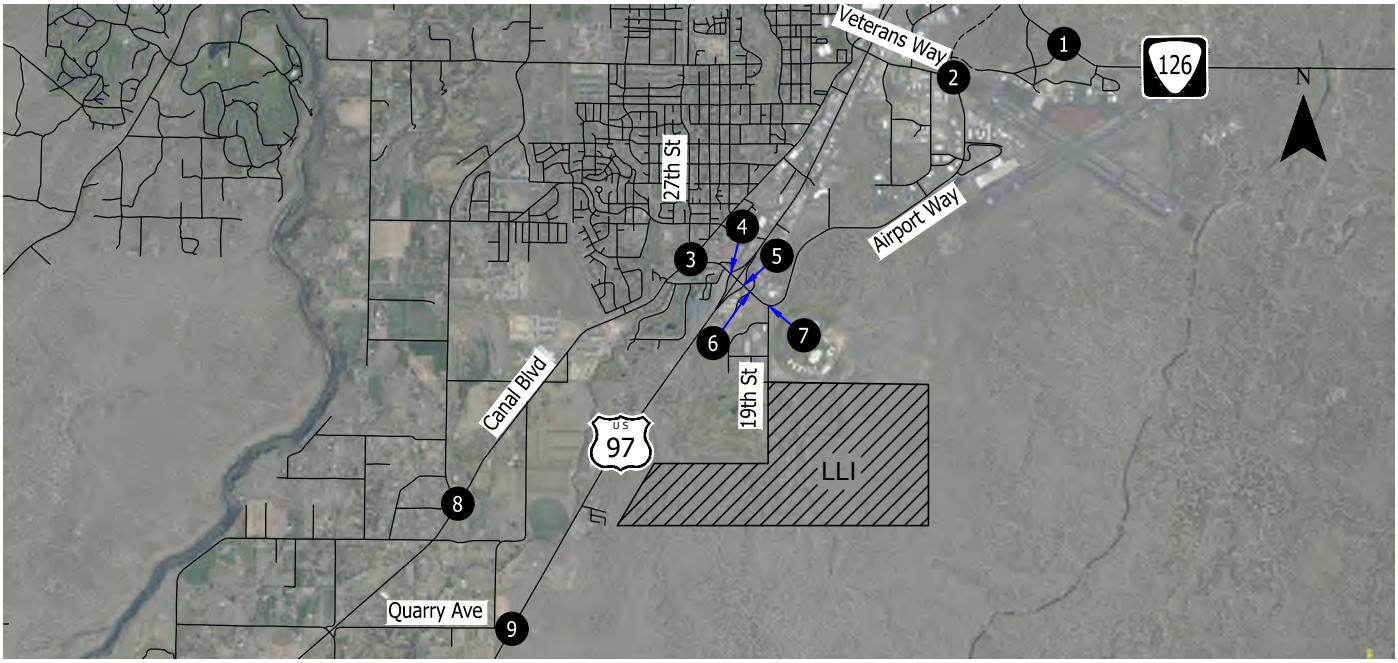


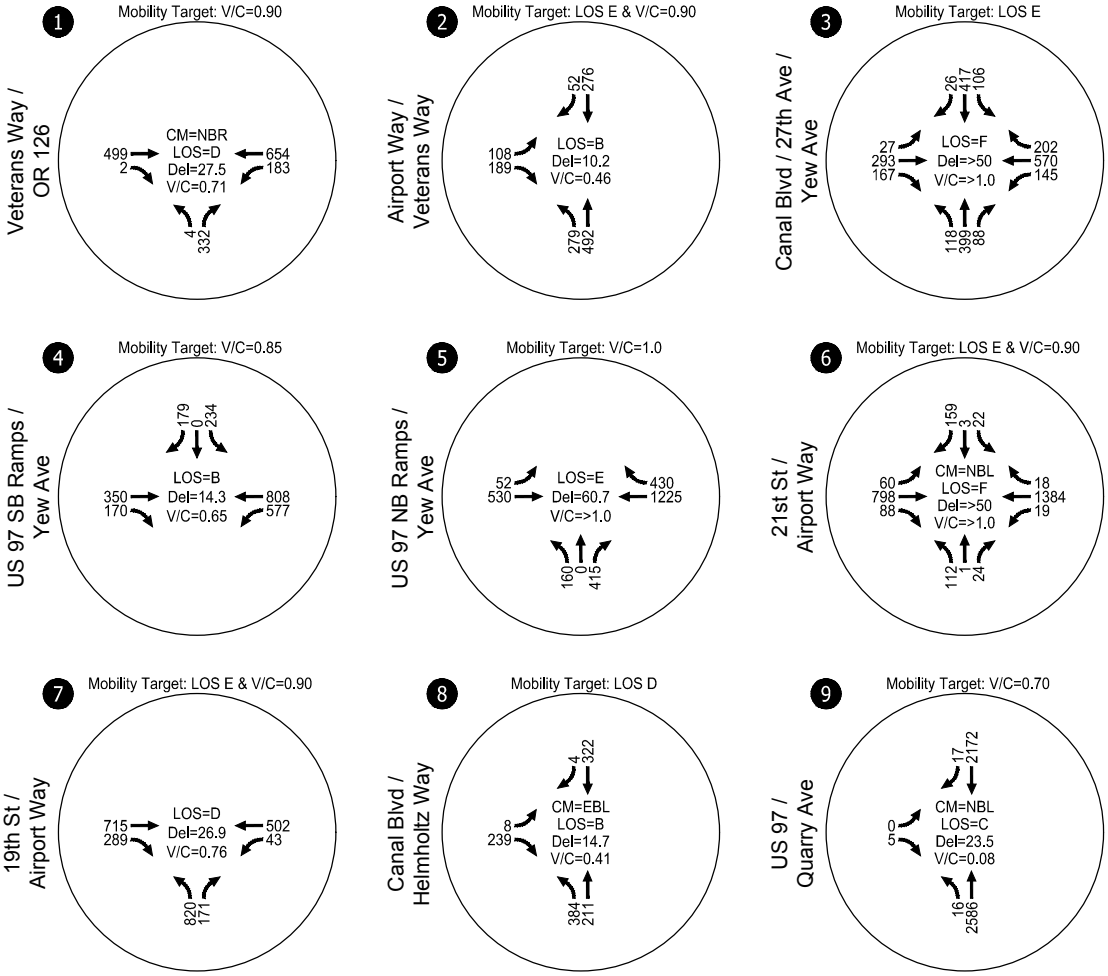
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Land Use Scenario 1
No Southern Interchange
2040 PM Peak Hour
Redmond, OR

Figure
B-3

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures.dwg Mar 13, 2024 - 10:39am - cthompson Layout Tab: 2040_Scen 1_PM



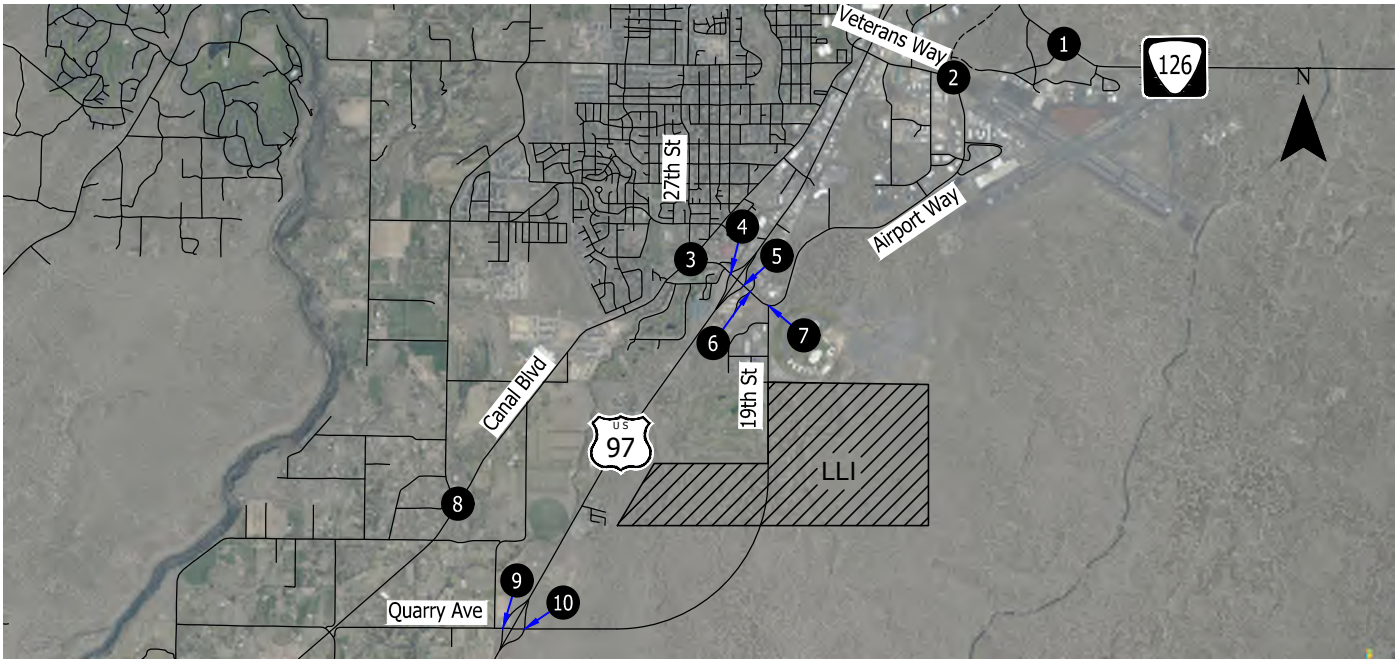


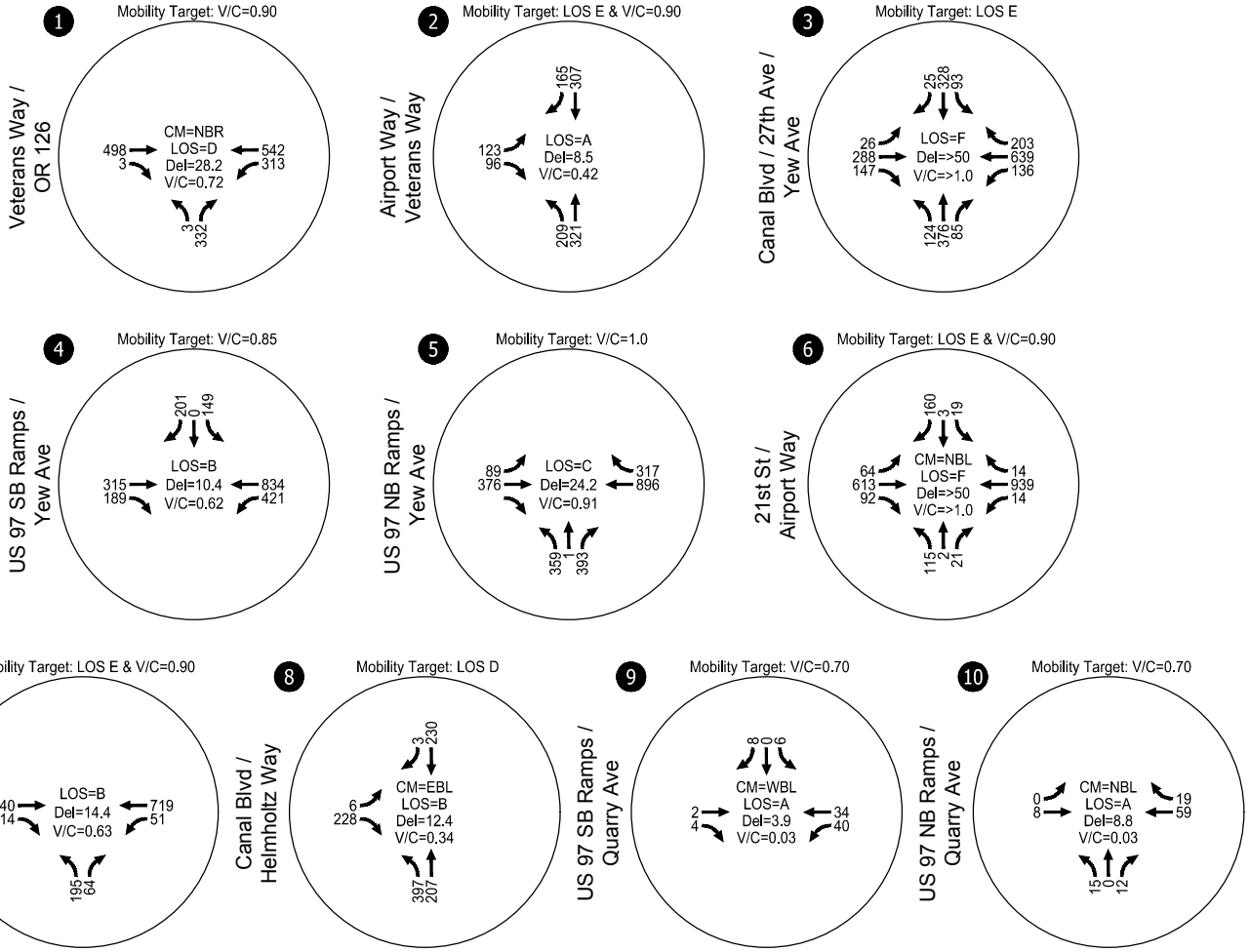
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Land Use Scenario 2
No Southern Interchange
2040 PM Peak Hour
Redmond, OR

Figure
B-4

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures.dwg Mar 13, 2024 - 10:39am - cthompson Layout Tab: 2040_Scen 2_PM



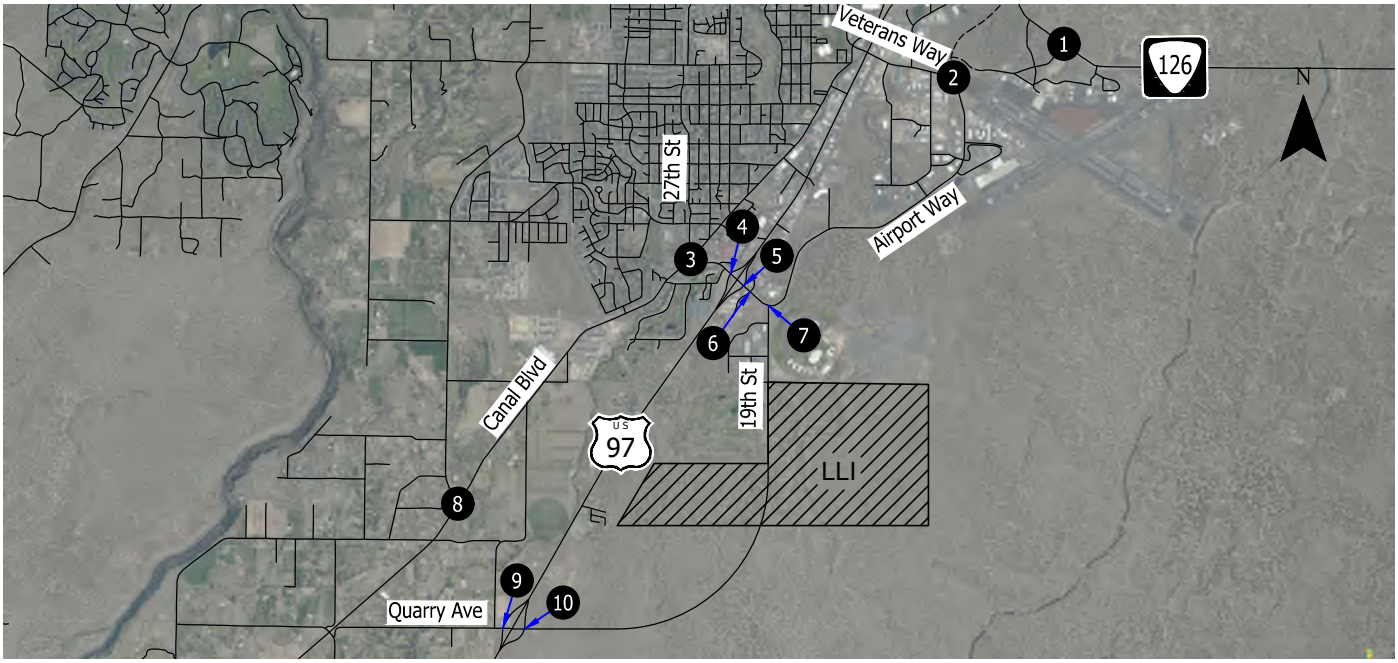


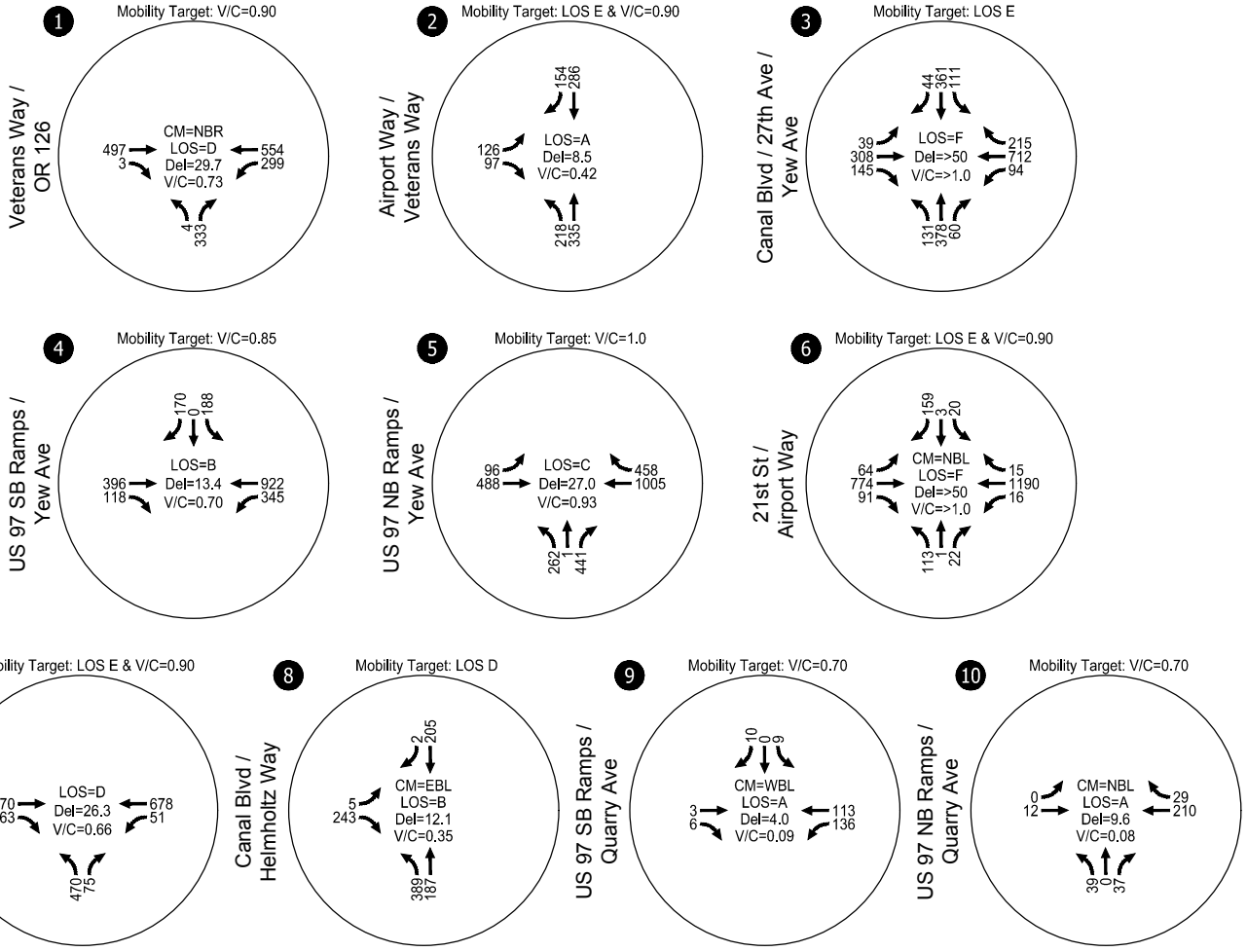
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Base TSP Growth Scenario With Southern Interchange 2040 PM Peak Hour Redmond, OR

Figure B-5

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures.dwg Mar 13, 2024 - 10:39am - cthompson Layout Tab: Q_2040_Base_PM



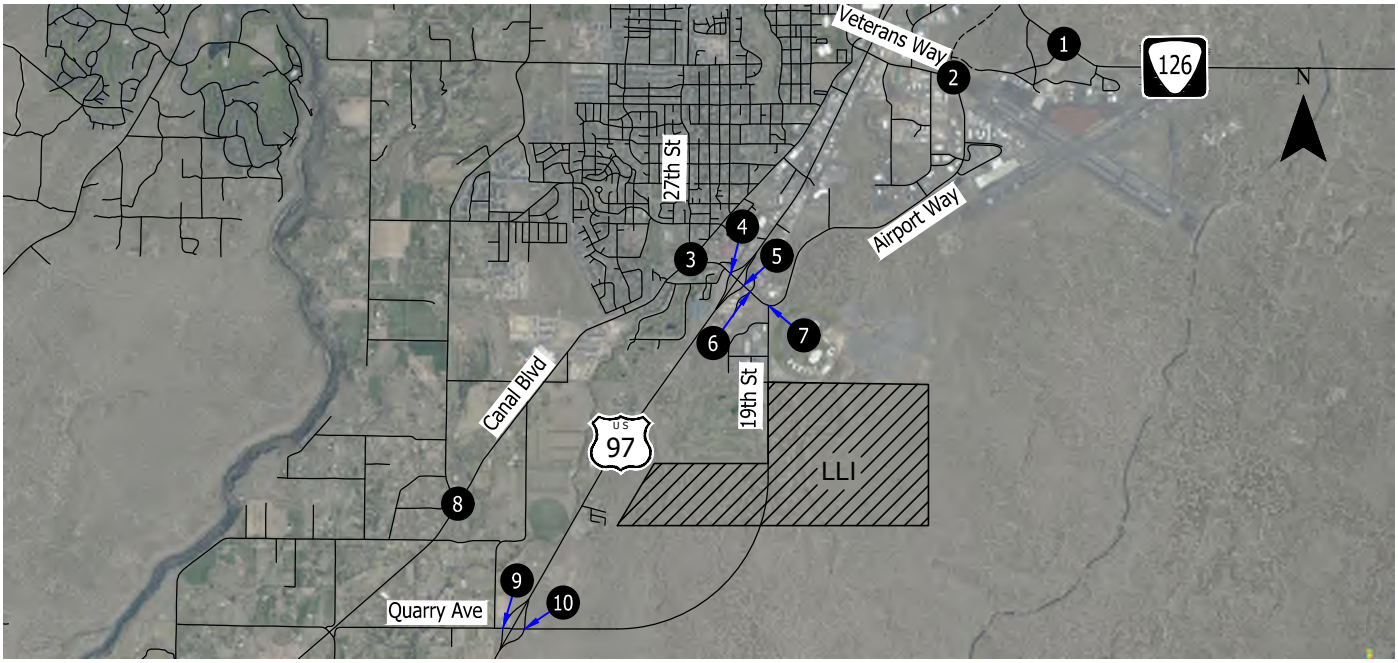


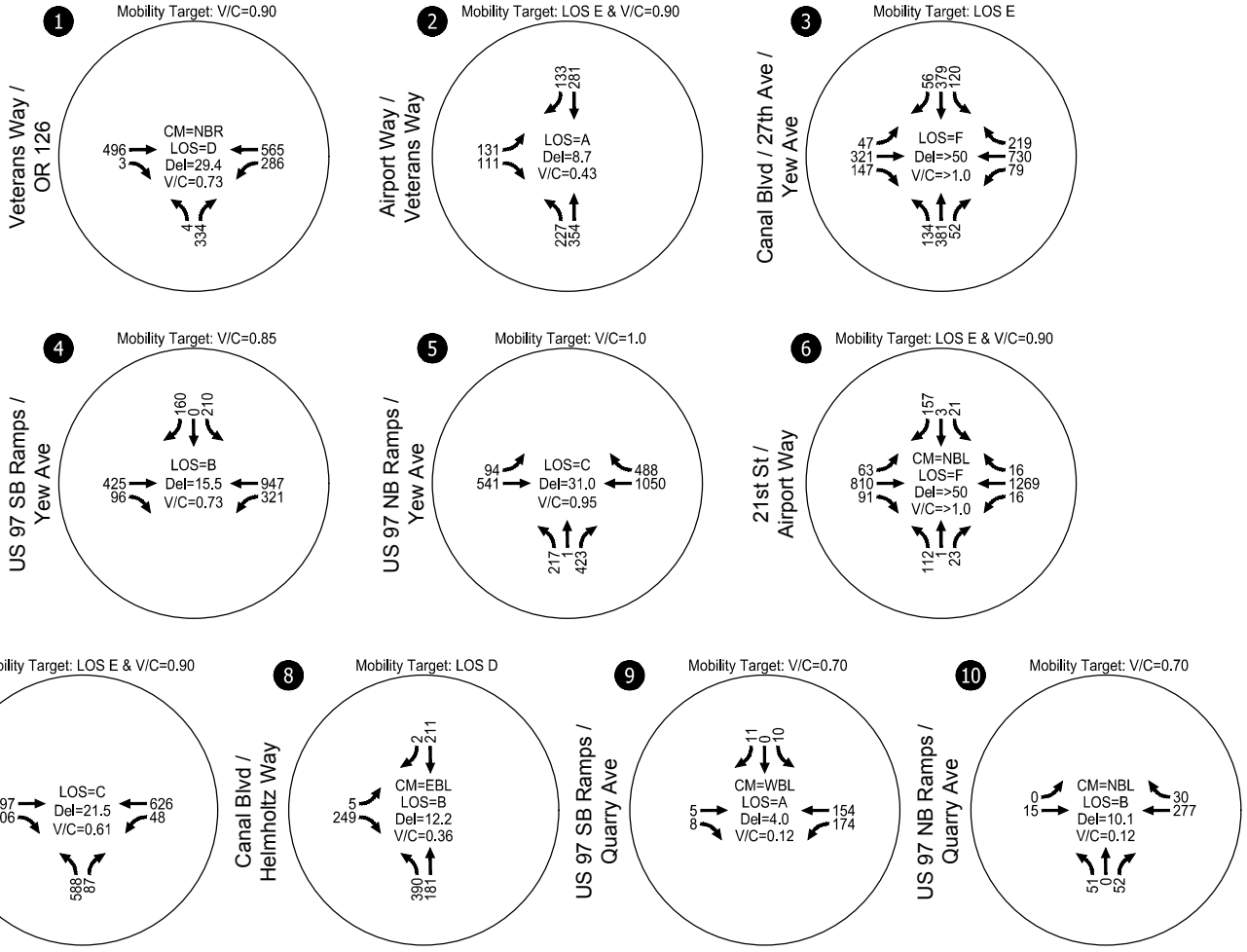
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Land Use Scenario 1 With Southern Interchange 2040 PM Peak Hour Redmond, OR

Figure B-6

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures.dwg Mar 13, 2024 - 10:39am - cthompson Layout Tab: Q_2040_Scen 1_PM



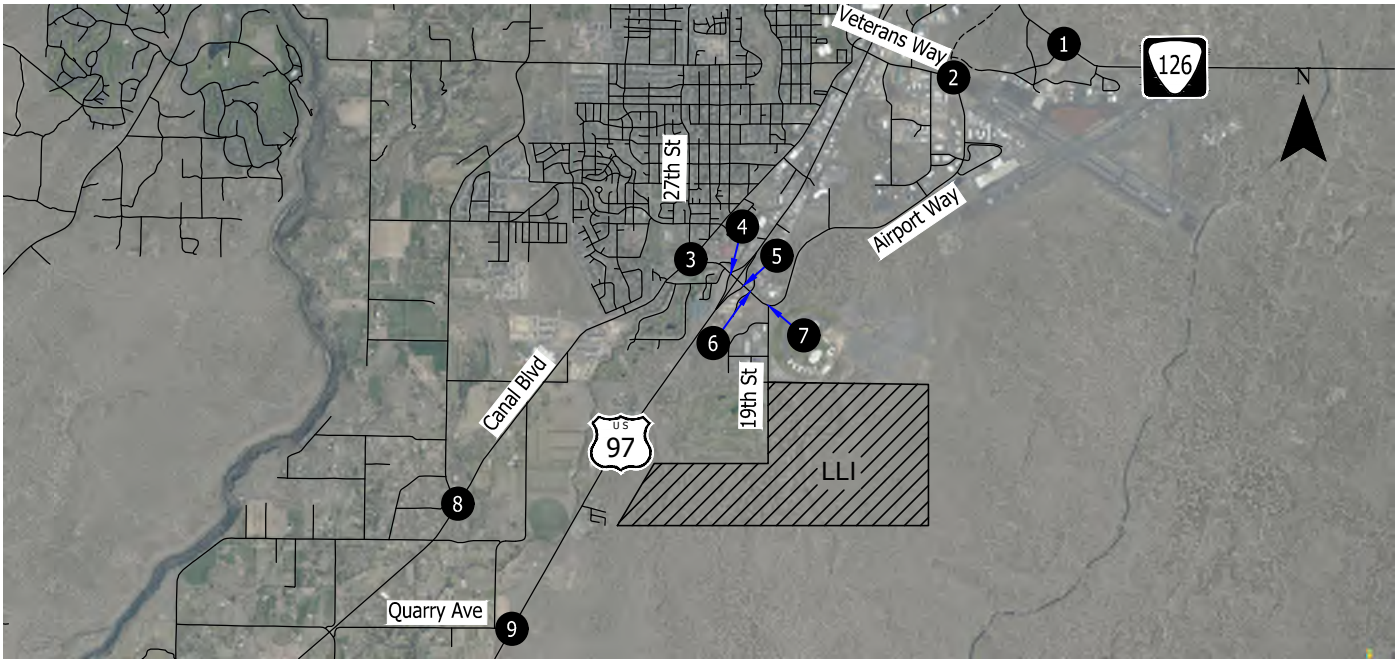


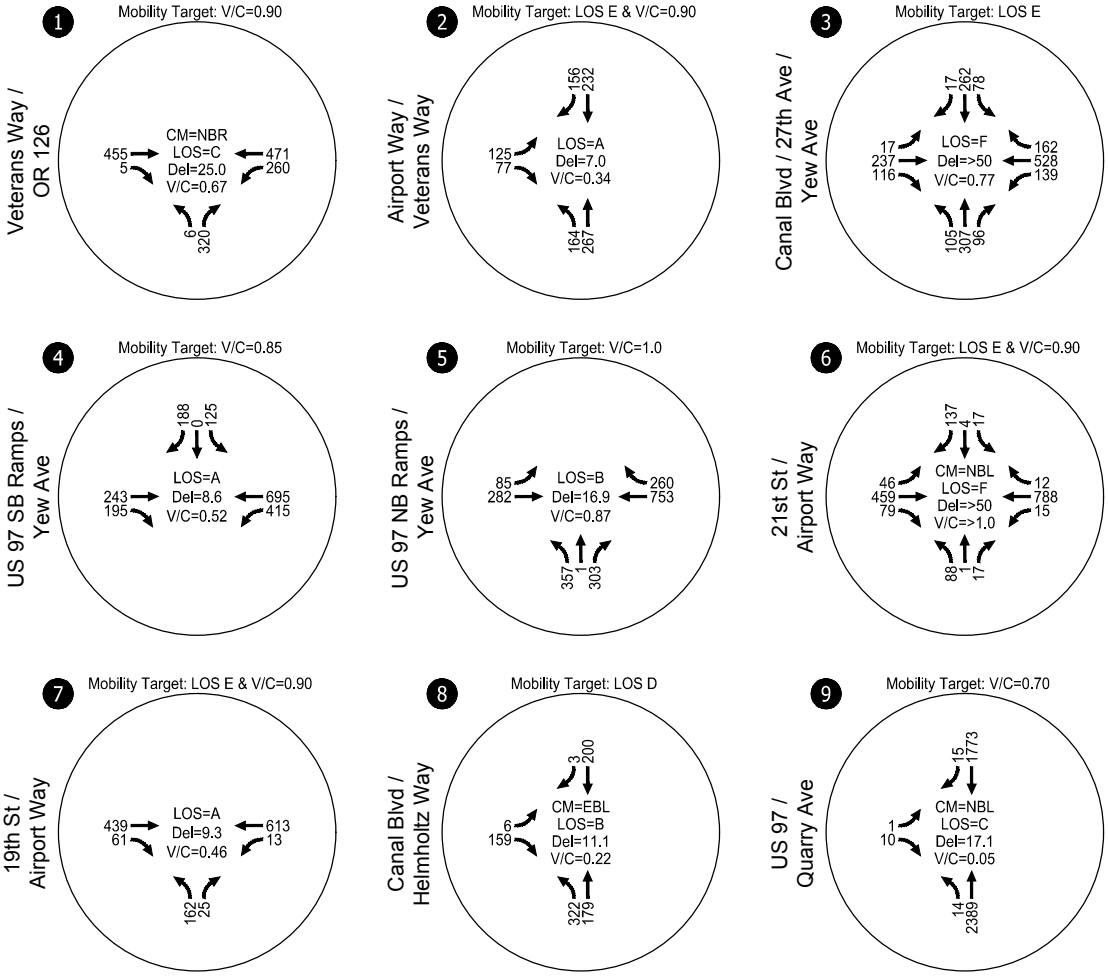
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Land Use Scenario 2 With Southern Interchange 2040 PM Peak Hour Redmond, OR

Figure B-7

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures.dwg Mar 13, 2024 - 10:39am - cthompson Layout Tab: Q_2040_Scen 2_PM



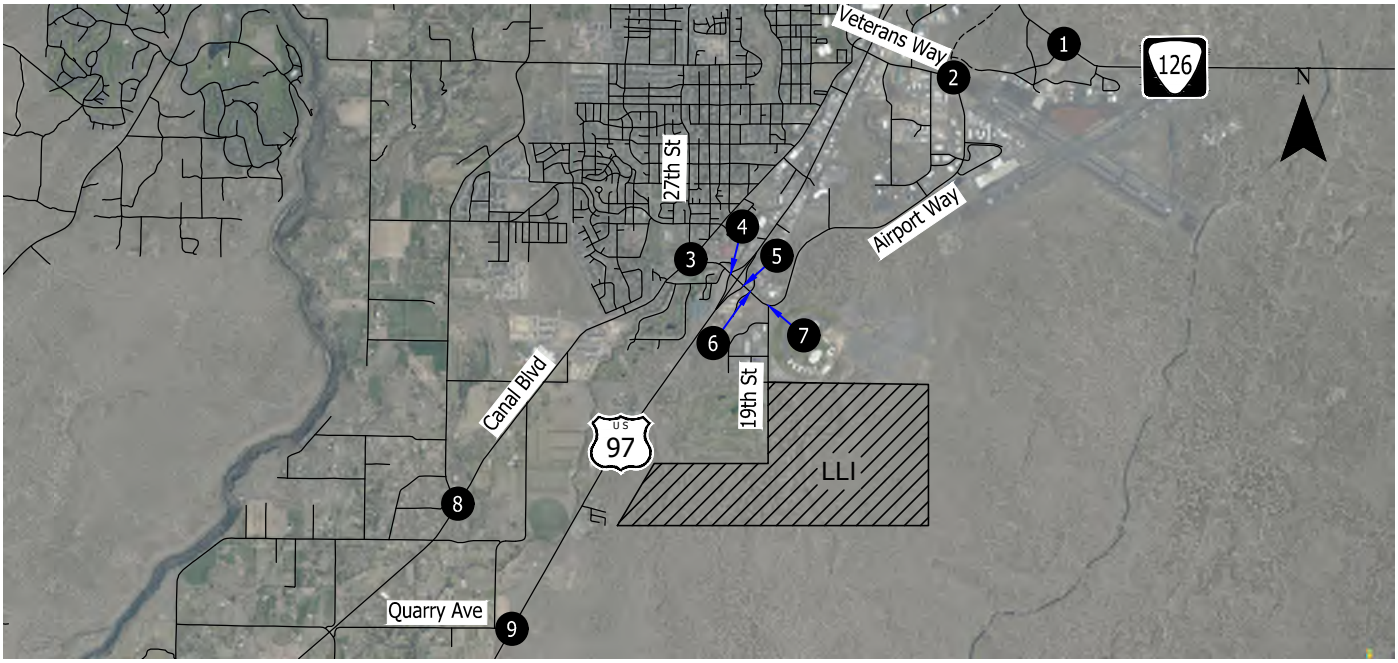


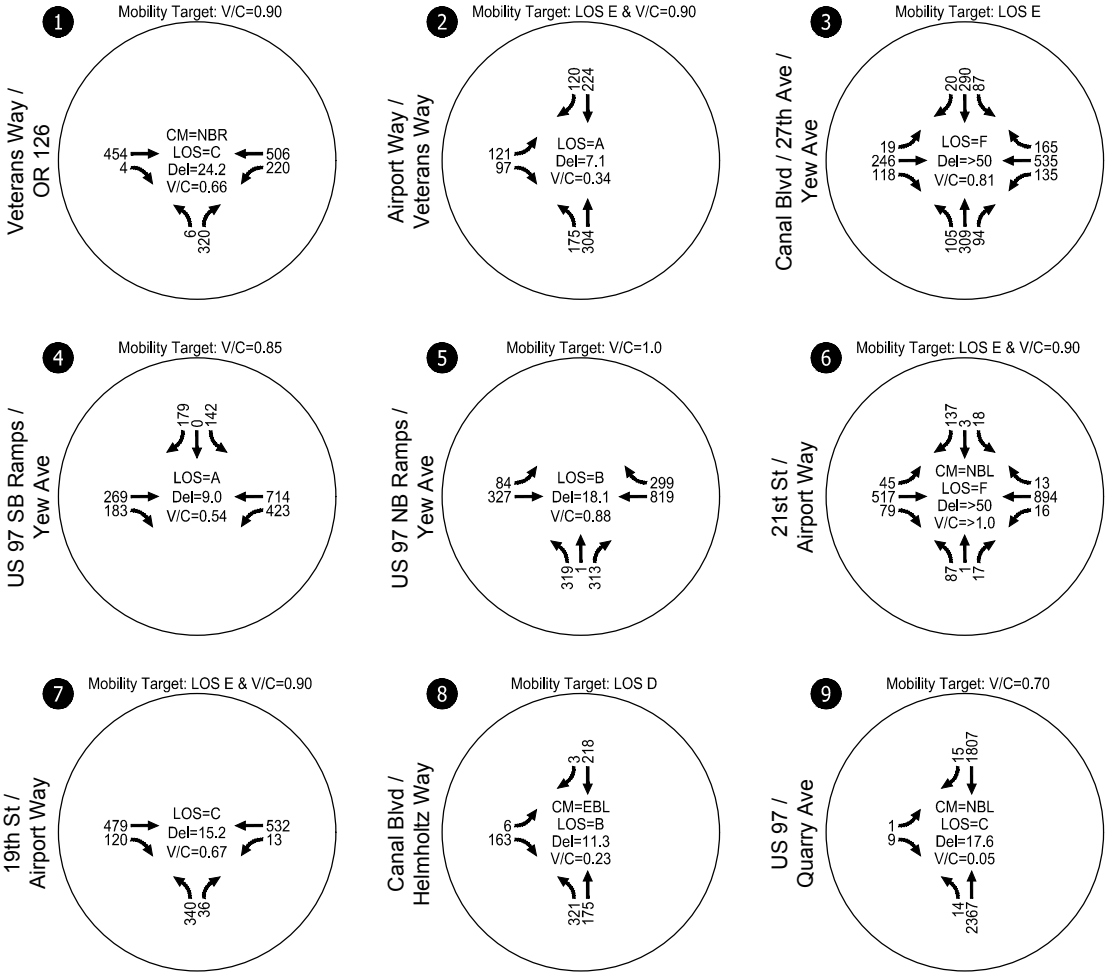
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Base TSP Growth Scenario
2030 PM Peak Hour
Redmond, OR

Figure
B-8

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures.dwg Mar 13, 2024 - 10:40am - cthompson Layout Tab: 2030_Base_PM



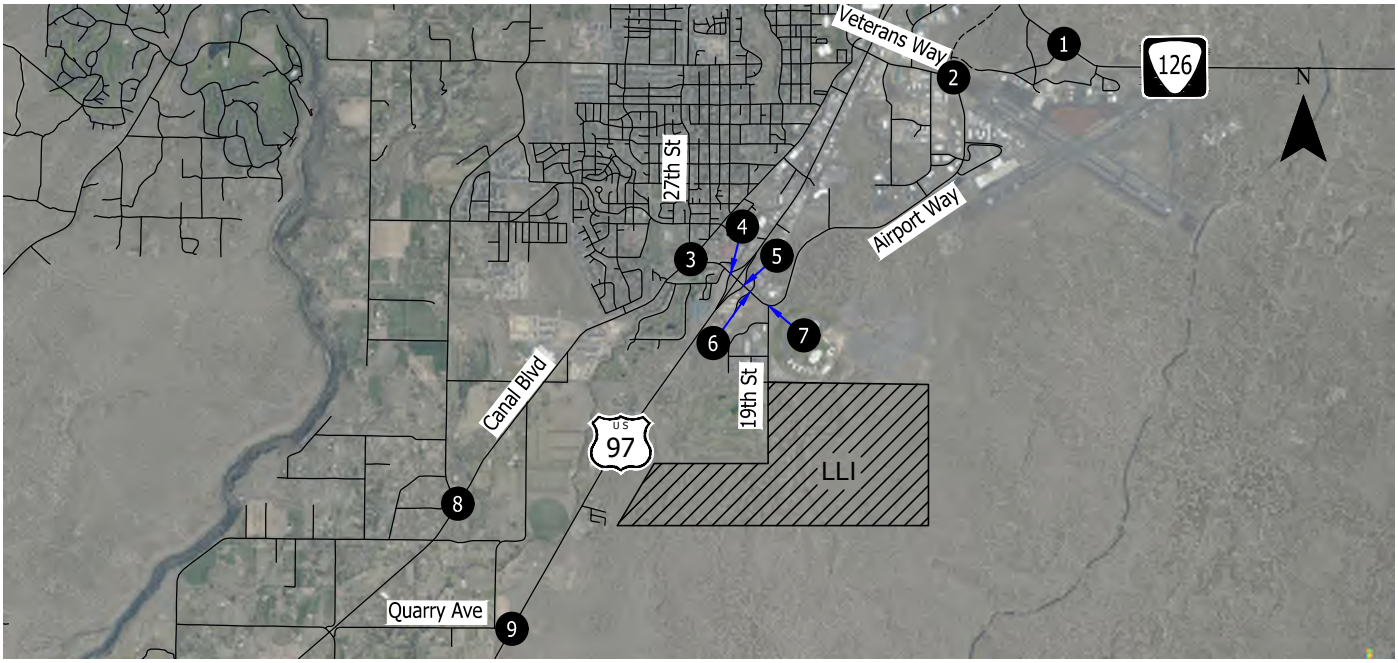


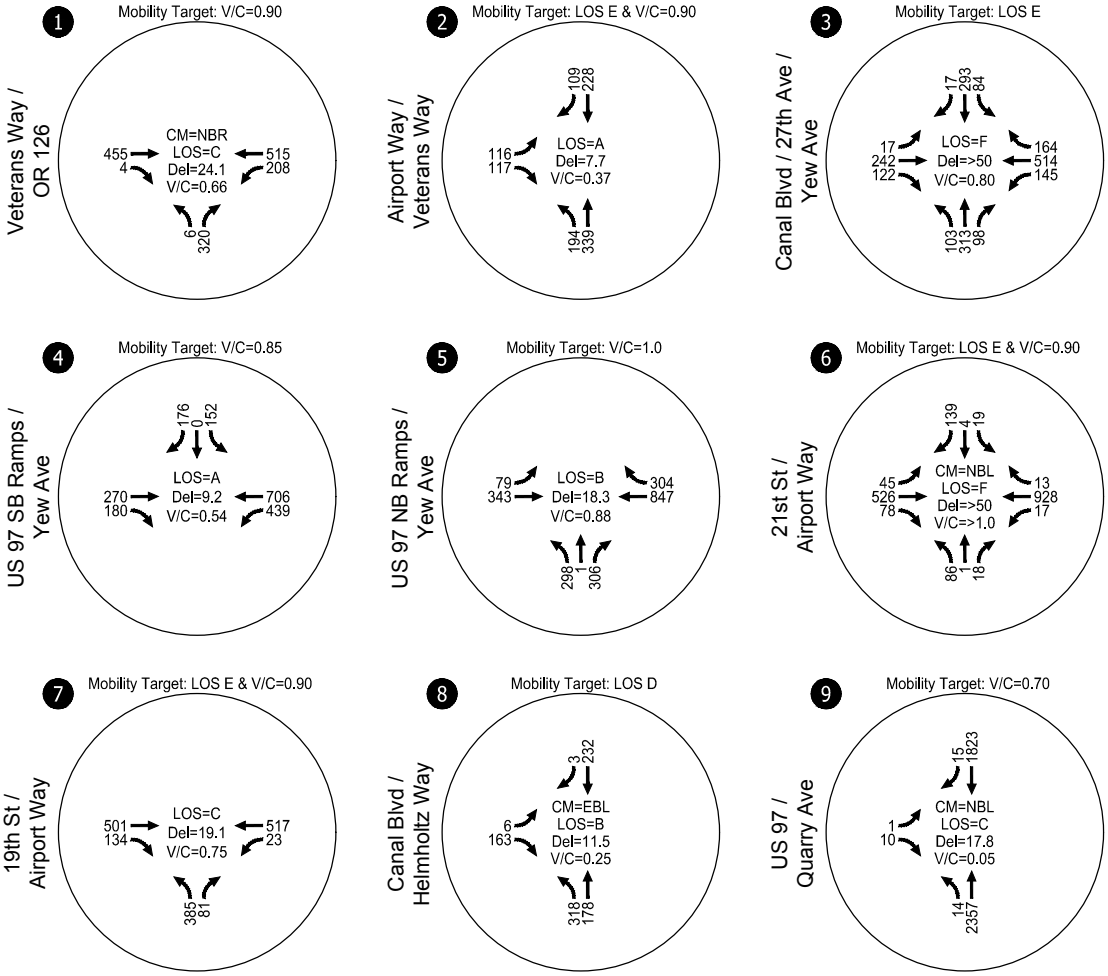
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Land Use Scenario 1
No Southern Interchange
2030 PM Peak Hour
Redmond, OR

Figure
B-9

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures.dwg Mar 13, 2024 - 10:40am - cthompson Layout Tab: 2030_Scenario 1_PM



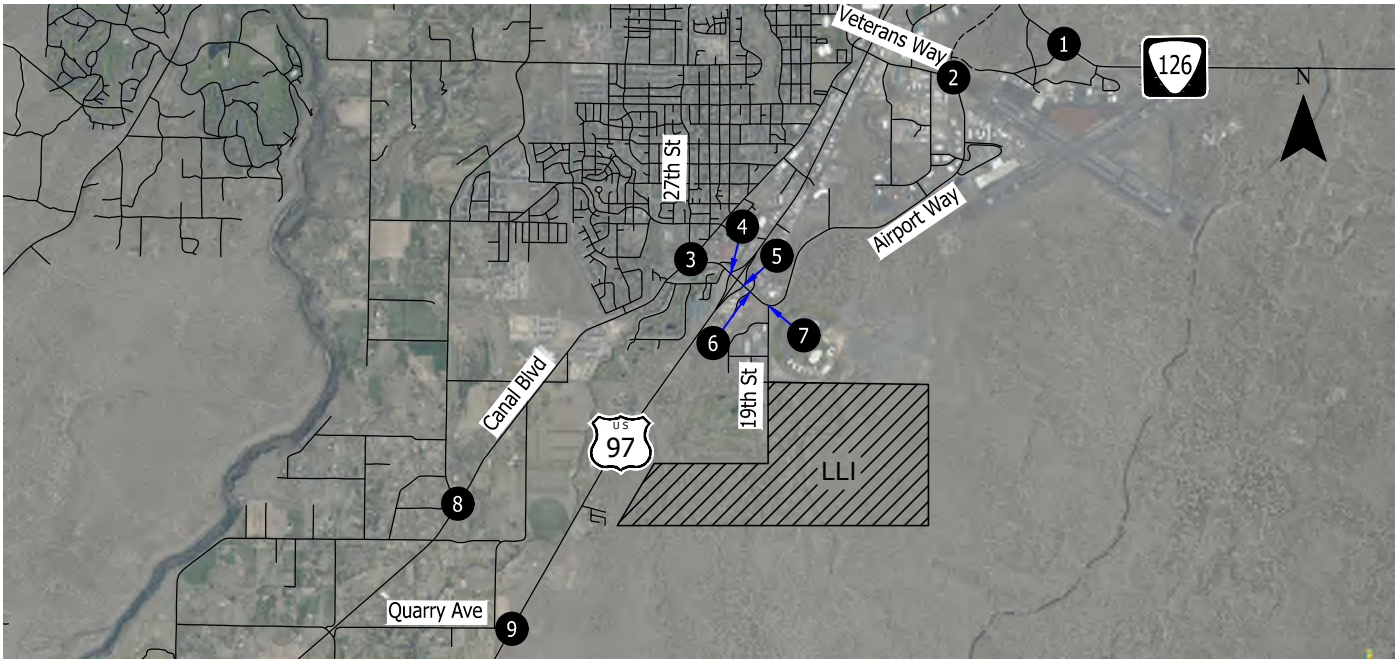


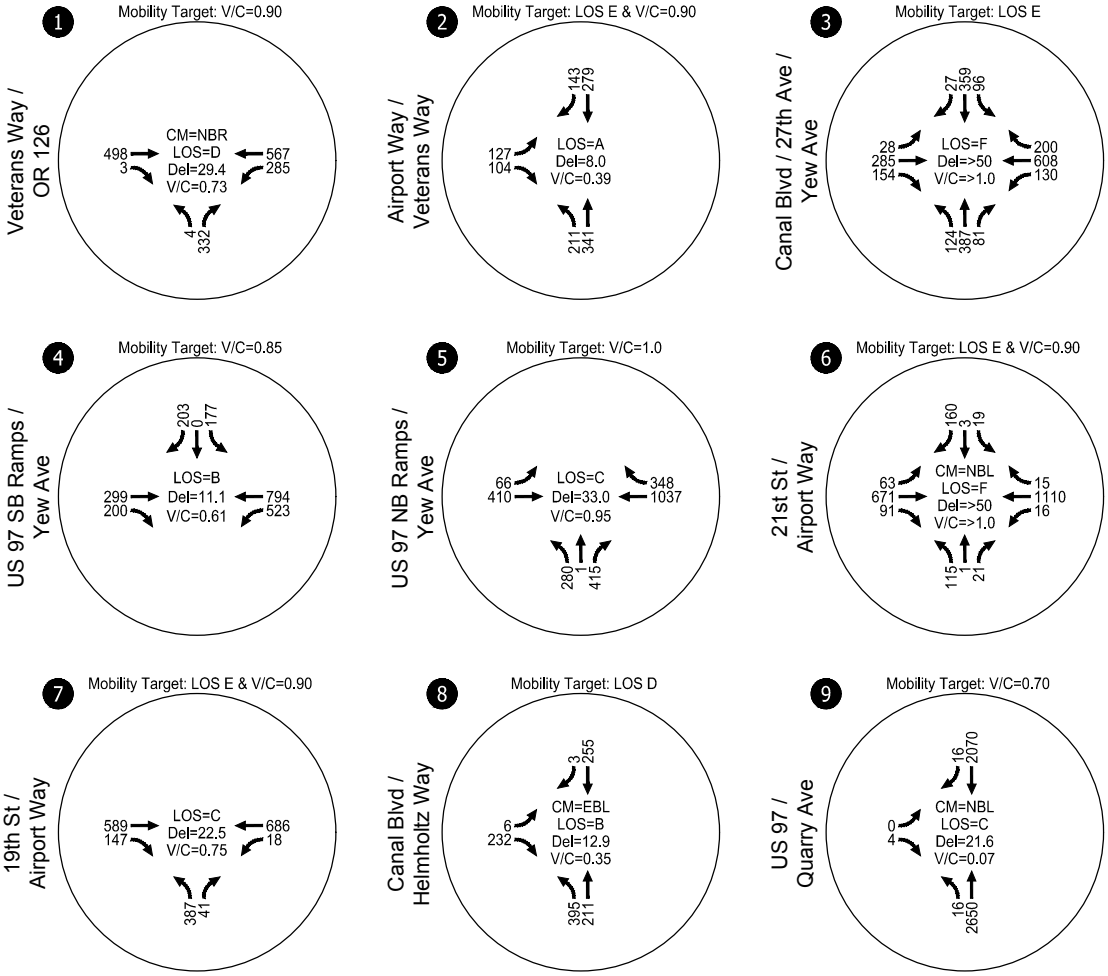
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Land Use Scenario 2
No Southern Interchange
2030 PM Peak Hour
Redmond, OR

Figure
B-10

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures.dwg Mar 13, 2024 - 10:40am - cthompson Layout Tab: 2030_Scenario 2_PM



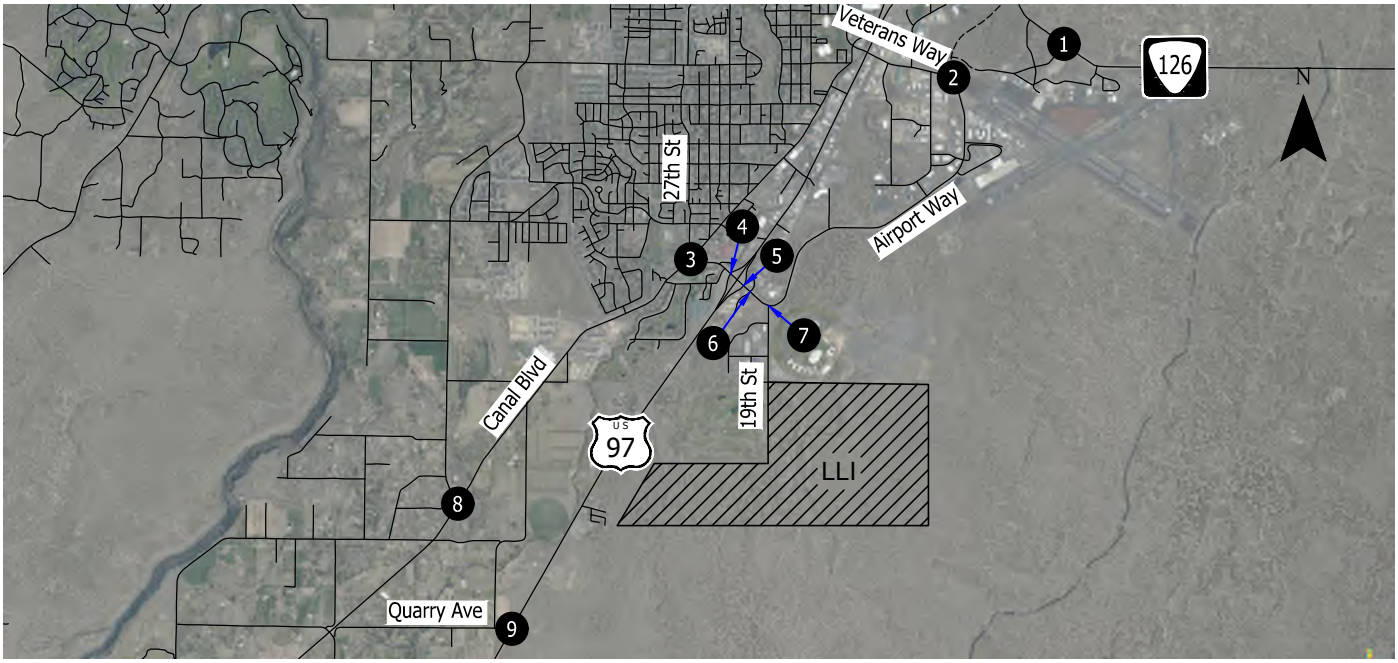


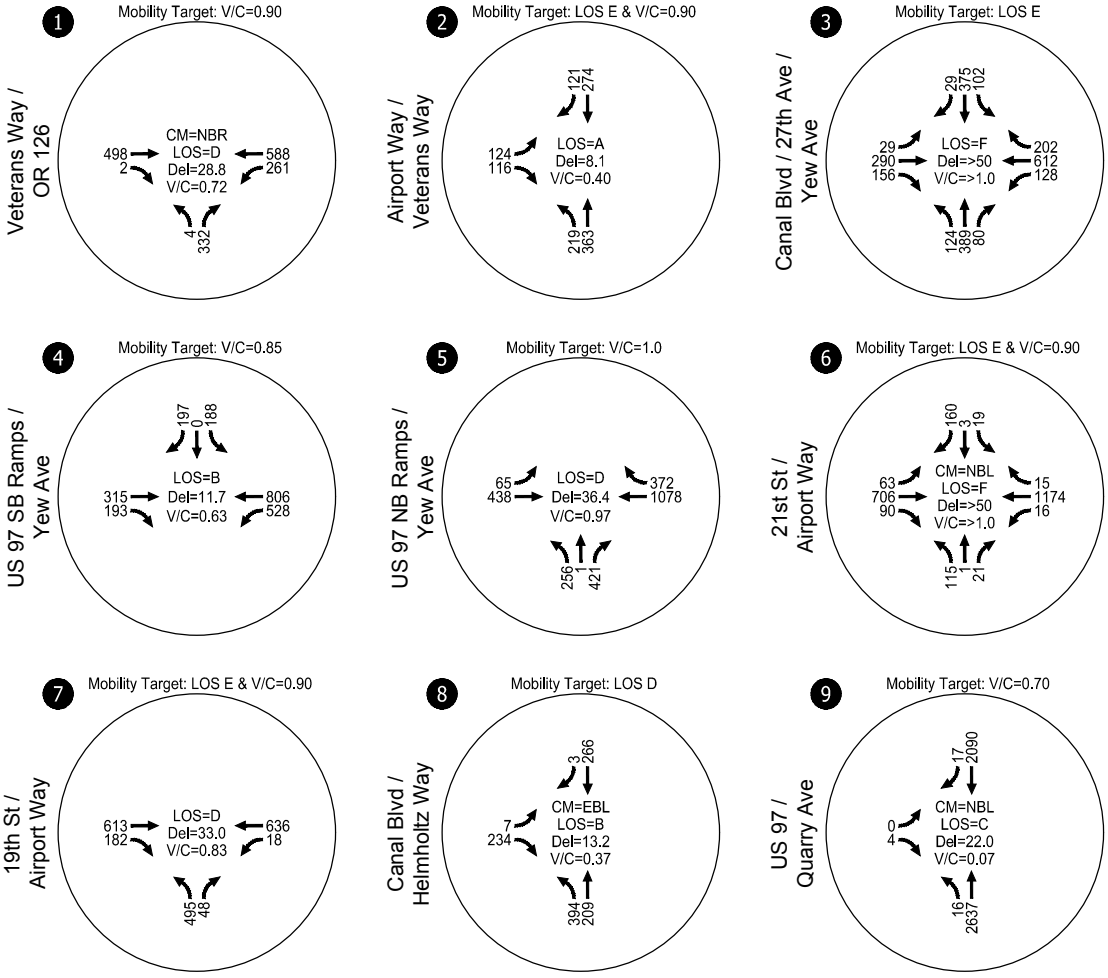
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2,400 Jobs Scenario
No Southern Interchange
2027/2028 PM Peak Hour
Redmond, OR

Figure
B-11

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures-Trigger Points.dwg Mar 13, 2024 - 10:40am - cthompson Layout Tab: 2040_25%



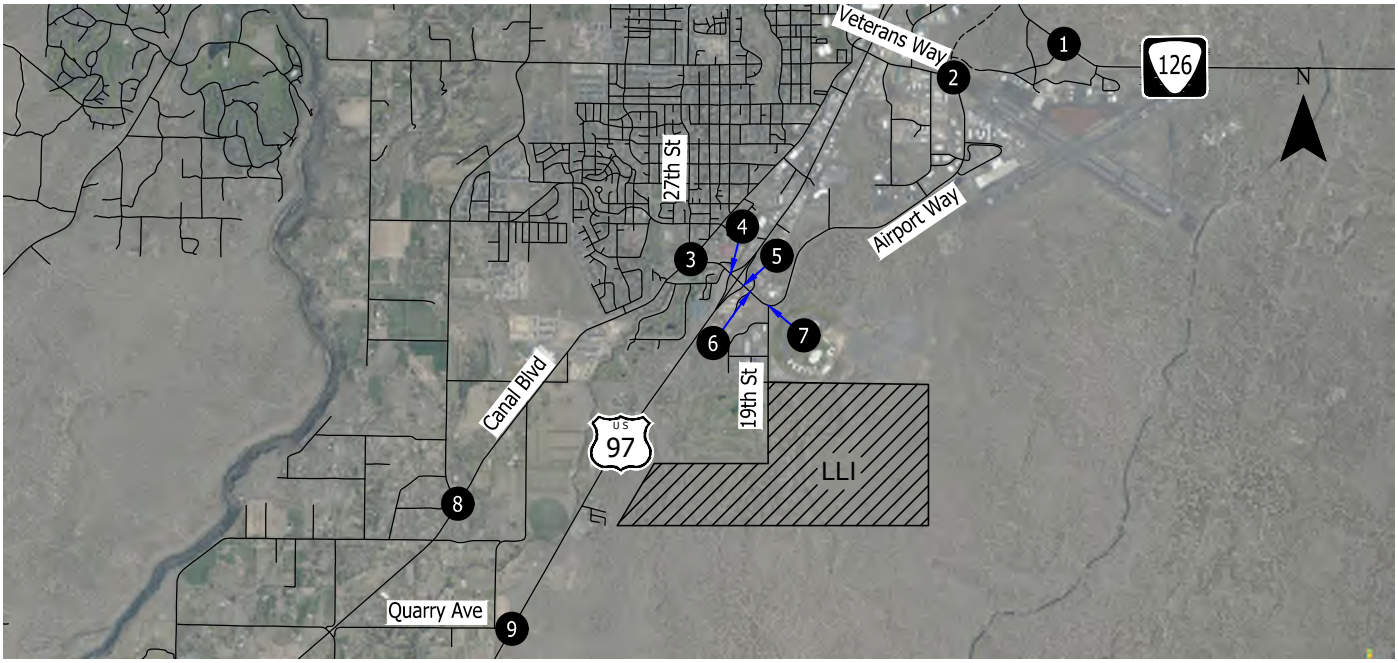


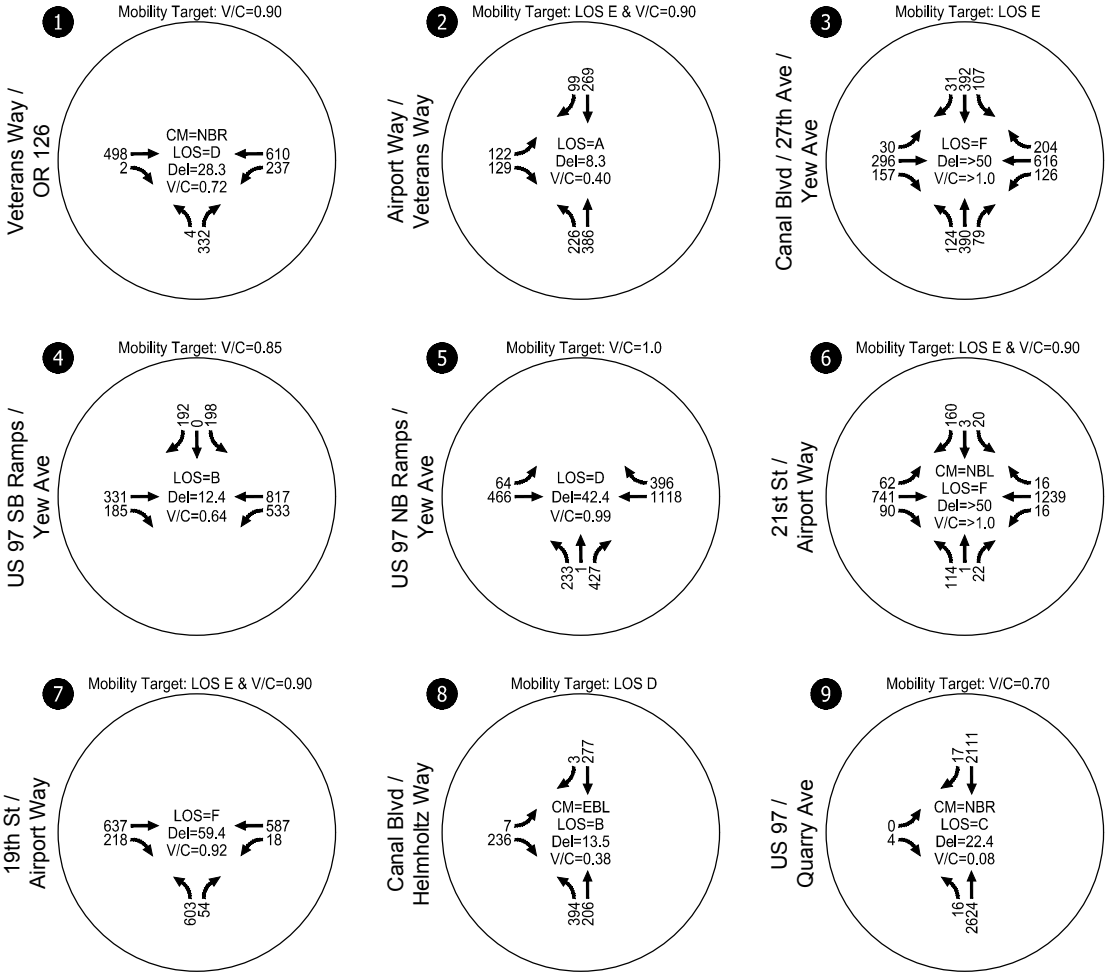
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3,800 Jobs Scenario
No Southern Interchange
2031/2032 PM Peak Hour
Redmond, OR

Figure
B-12

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures-Trigger Points.dwg Mar 13, 2024 - 10:40am - cthompson Layout Tab: 2040_50%



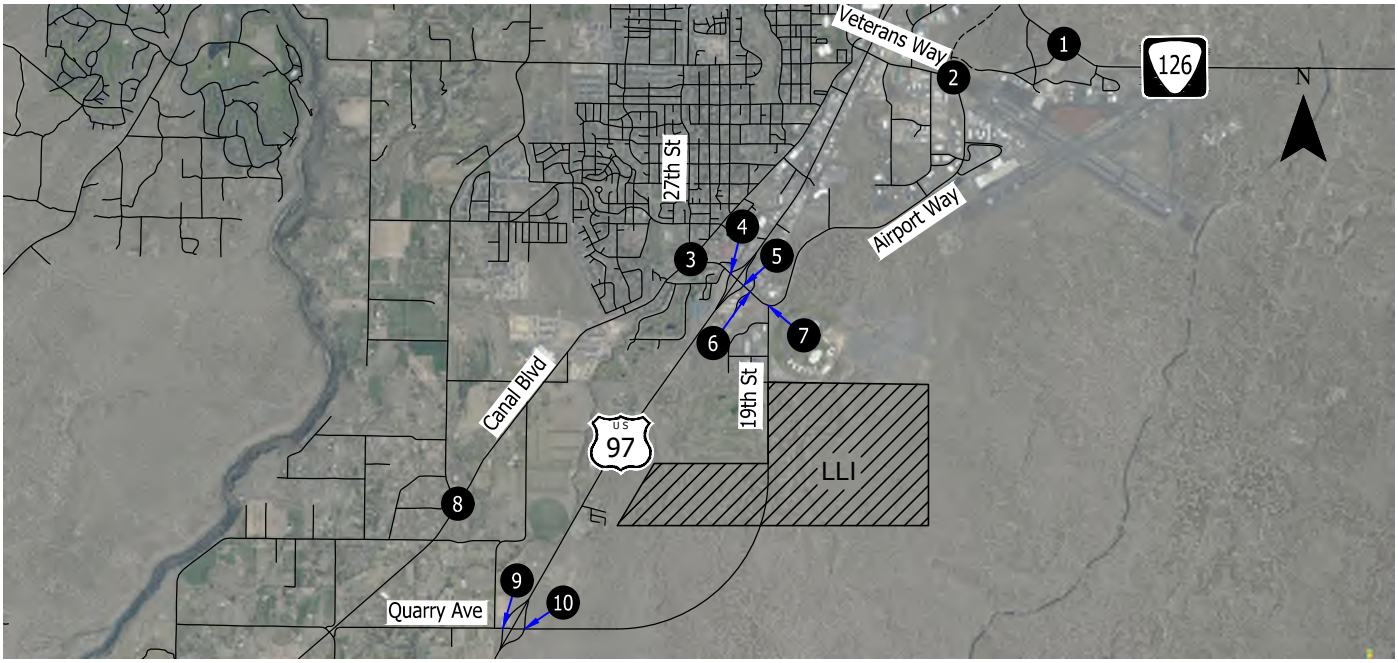


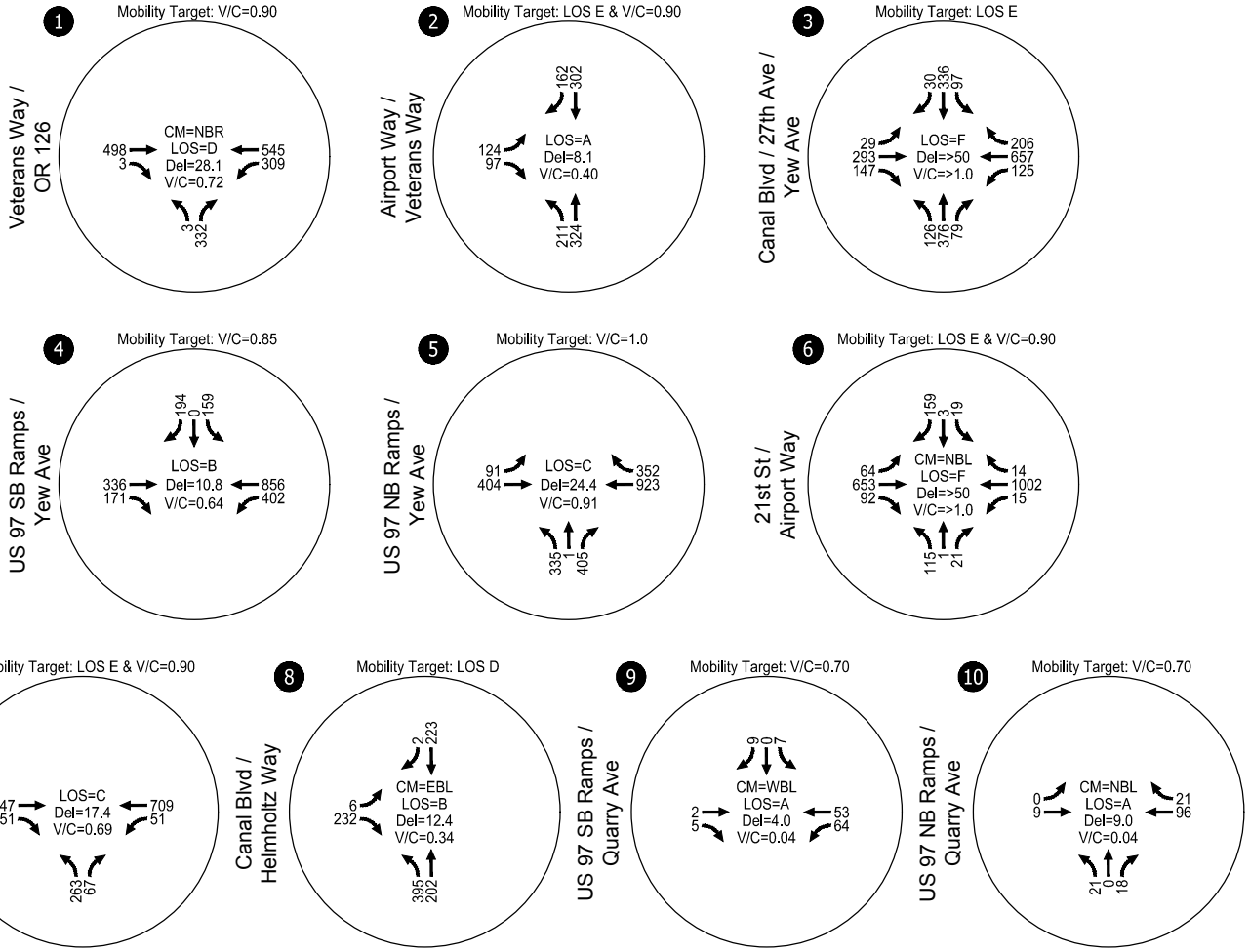
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5,200 Jobs Scenario
No Southern Interchange
2035/2036 PM Peak Hour
Redmond, OR

Figure
B-13

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures-Trigger Points.dwg Mar 13, 2024 - 10:40am - cthompson Layout Tab: 2040_75%



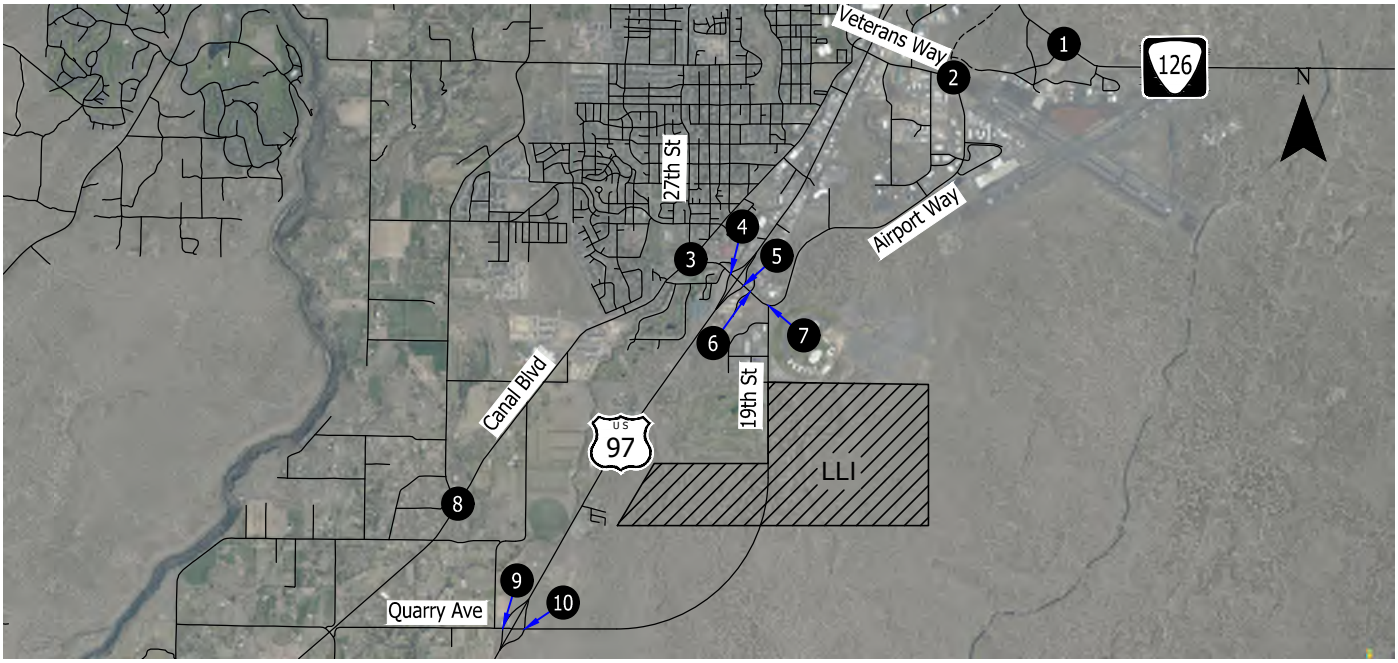


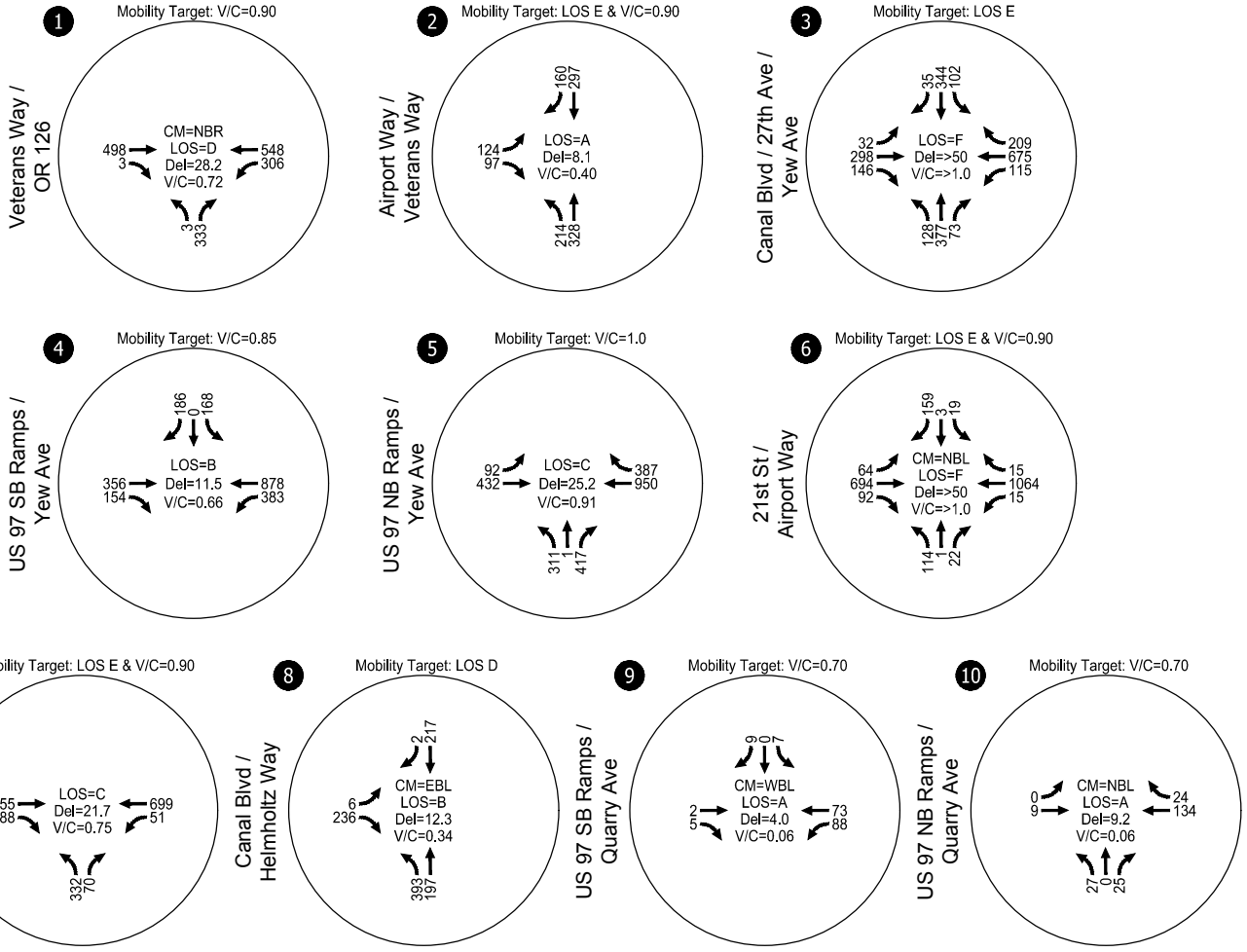
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2,400 Jobs Scenario With Southern Interchange 2027/2028 PM Peak Hour Redmond, OR

Figure B-14

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures-Trigger Points.dwg Mar 13, 2024 - 10:40am - cthompson Layout Tab: Q_2040_25%



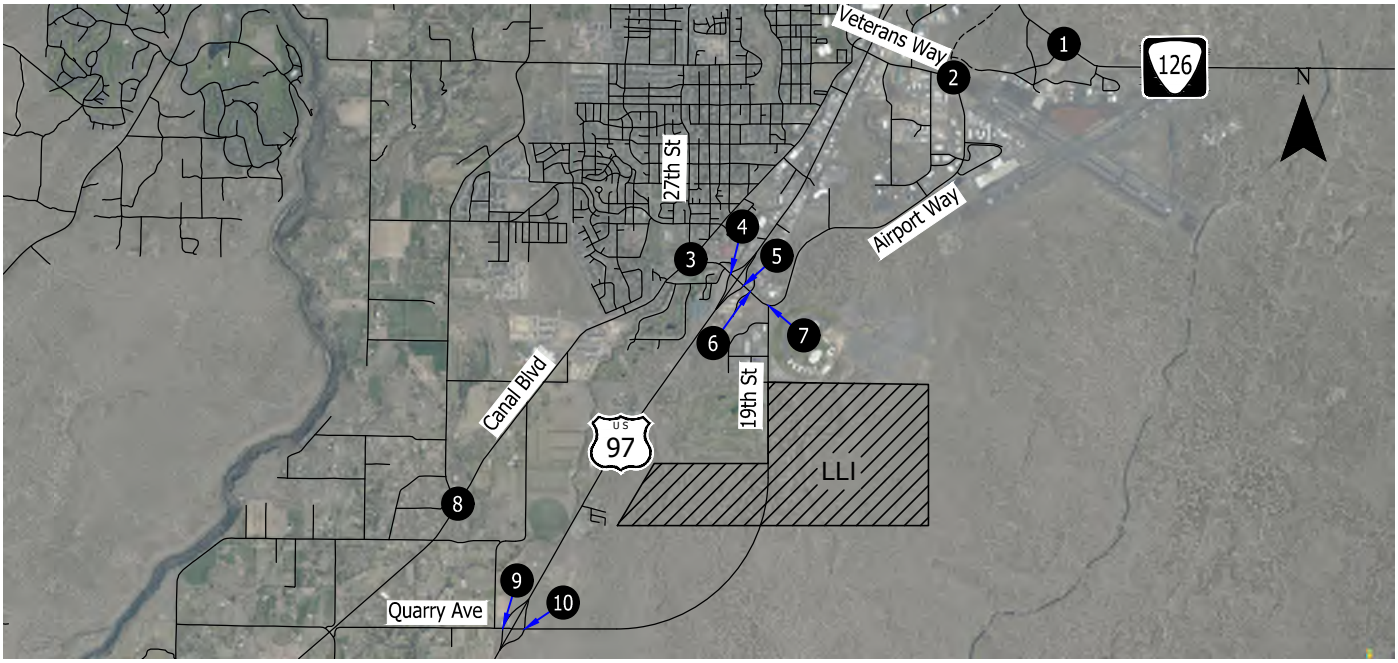


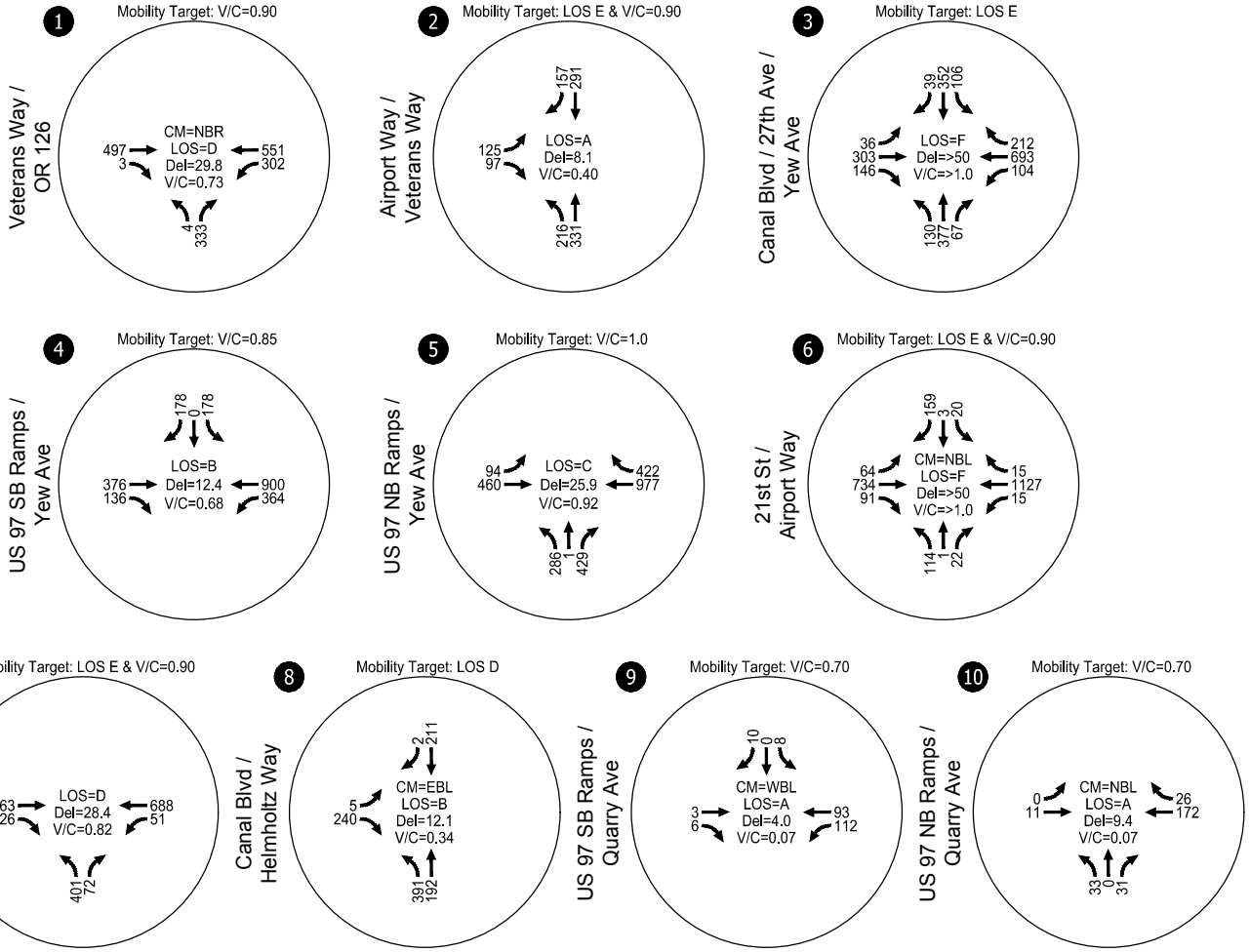
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3,800 Jobs Scenario
With Southern Interchange
2031/2032 PM Peak Hour
Redmond, OR

Figure
B-15

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures-Trigger Points.dwg Mar 13, 2024 - 10:40am - cthompson Layout Tab: Q_2040_50%





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5,200 Jobs Scenario With Southern Interchange 2035/2036 PM Peak Hour Redmond, OR

Figure B-16

H:\27\27371 - City of Redmond On-Call\004 - Redmond Industrial Lands TSP Amendment\report\figs\dwg\27371-Redmond LLI Figures-Trigger Points.dwg Mar 13, 2024 - 10:40am - cthompson Layout Tab: Q_2040_75%

DRAFT

Appendix C Traffic Operations Worksheets

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	49.3
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.083

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	8	311	424	6	225	418
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	8	311	424	6	225	418
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	83	113	2	60	111
Total Analysis Volume [veh/h]	9	331	451	6	239	445
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	0.56	0.00	0.00	0.22	0.00
d_M, Delay for Movement [s/veh]	49.33	22.22	0.00	0.00	9.31	0.00
Movement LOS	E	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	4.47	4.47	0.00	0.00	0.85	0.00
95th-Percentile Queue Length [ft/ln]	111.74	111.74	0.00	0.00	21.32	0.00
d_A, Approach Delay [s/veh]	22.94		0.00		3.25	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	6.77					
Intersection LOS	E					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	All-way stop	Delay (sec / veh):	14.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.580

Intersection Setup

Name	SE Airport Way		SE Veterans Way		SE Veterans Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	14.00	12.00	13.00	13.00
No. of Lanes in Entry Pocket	0	0	1	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]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way		SE Veterans Way		SE Veterans Way	
Base Volume Input [veh/h]	135	231	122	67	196	149
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	5.00	11.00	11.00	7.00	5.00
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]	135	231	122	67	196	149
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	36	61	32	18	52	40
Total Analysis Volume [veh/h]	144	246	130	71	209	159
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	691	567	639	634
Degree of Utilization, x	0.56	0.23	0.11	0.58

Movement, Approach, & Intersection Results

95th-Percentile Queue Length [veh]	3.55	0.88	0.37	3.73
95th-Percentile Queue Length [ft]	88.83	21.95	9.33	93.18
Approach Delay [s/veh]	14.75	10.26		16.21
Approach LOS	B	B		C
Intersection Delay [s/veh]	14.37			
Intersection LOS	B			

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	24.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	92	252	106	69	207	11	10	207	90	144	475	137
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	92	252	106	69	207	11	10	207	90	144	475	137
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	26	72	30	20	59	3	3	59	26	41	135	39
Total Analysis Volume [veh/h]	105	286	120	78	235	13	11	235	102	164	540	156
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	329			827			480			409		
Exiting Flow Rate [veh/h]	506			457			673			441		
Demand Flow Rate [veh/h]	92	252	106	69	207	11	10	207	90	144	475	137
Adjusted Demand Flow Rate [veh/h]	105	286	120	78	235	13	11	235	102	164	540	156

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	522	326	355	876
Capacity of Entry and Bypass Lanes [veh/h]	987	594	846	910
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	967	594	830	894
X, volume / capacity	0.53	0.55	0.42	0.96

Movement, Approach, & Intersection Results

Lane LOS	B	C	A	E
95th-Percentile Queue Length [veh]	3.18	3.33	2.10	16.01
95th-Percentile Queue Length [ft]	79.62	83.14	52.38	400.34
Approach Delay [s/veh]	10.46	15.95	9.54	43.15
Approach LOS	B	C	A	E
Intersection Delay [s/veh]	24.93			
Intersection LOS	C			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	7.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.465

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	95	0	174	0	214	187	343	634	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	85	0	0	24	0	0	0
Total Hourly Volume [veh/h]	0	0	0	95	0	89	0	214	163	343	634	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	26	0	24	0	58	44	92	170	0
Total Analysis Volume [veh/h]	0	0	0	102	0	96	0	230	175	369	682	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		35	35	35	35	35	35
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		4	4	10	10	21	21
g / C, Green / Cycle		0.12	0.12	0.28	0.28	0.60	0.60
(v / s)_i Volume / Saturation Flow Rate		0.05	0.06	0.12	0.11	0.29	0.41
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1251	1673
c, Capacity [veh/h]		230	204	519	441	951	998
d1, Uniform Delay [s]		14.48	14.53	10.57	10.42	4.01	4.89
k, delay calibration		0.04	0.04	0.11	0.11	0.04	0.11
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		0.50	0.63	0.60	0.58	0.10	0.84
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		0.44	0.47	0.44	0.40	0.39	0.68
d, Delay for Lane Group [s/veh]		14.97	15.16	11.17	11.00	4.10	5.72
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		No	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		0.65	0.62	1.13	0.86	0.44	1.23
50th-Percentile Queue Length [ft/ln]		16.32	15.56	28.36	21.43	10.89	30.73
95th-Percentile Queue Length [veh/ln]		1.18	1.12	2.04	1.54	0.78	2.21
95th-Percentile Queue Length [ft/ln]		29.38	28.00	51.05	38.57	19.60	55.31

Movement, Approach, & Intersection Results

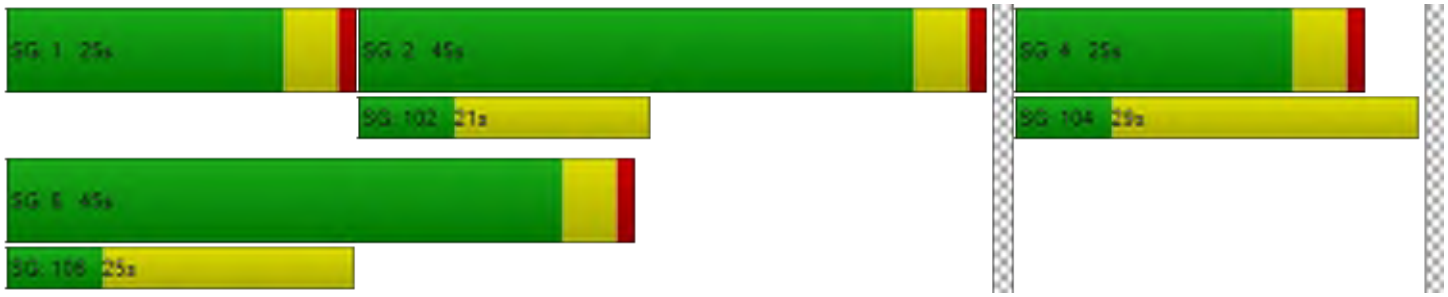
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	14.97	14.97	15.16	0.00	11.17	11.00	4.10	5.72	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			15.06			11.09			5.15		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	7.79											
Intersection LOS	A											
Intersection V/C	0.465											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	8.42	8.42	8.42	8.42
l_p,int, Pedestrian LOS Score for Intersection	2.095	2.096	2.407	2.407
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1129	2258	2258
d_b, Bicycle Delay [s]	17.72	3.36	0.29	0.29
l_b,int, Bicycle LOS Score for Intersection	4.132	2.577	2.113	3.140
Bicycle LOS	D	B	B	C

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	14.2
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.844

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	395	1	229	0	0	0	98	211	0	0	582	215
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	108	0	0	0	0	0	0	0	0	105
Total Hourly Volume [veh/h]	395	1	121	0	0	0	98	211	0	0	582	110
Peak Hour 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
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]	99	0	30	0	0	0	25	53	0	0	146	28
Total Analysis Volume [veh/h]	395	1	121	0	0	0	98	211	0	0	582	110
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	47	47		47	47	47	47
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	12	12		25	25	17	17
g / C, Green / Cycle	0.26	0.26		0.53	0.53	0.35	0.35
(v / s)_i Volume / Saturation Flow Rate	0.21	0.07		0.10	0.13	0.31	0.07
s, saturation flow rate [veh/h]	1852	1681		943	1643	1884	1543
c, Capacity [veh/h]	476	432		522	875	659	540
d1, Uniform Delay [s]	16.65	14.13		7.85	5.96	14.51	10.78
k, delay calibration	0.04	0.04		0.04	0.04	0.04	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.45	0.13		0.06	0.05	1.60	0.07
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	0.83	0.28		0.19	0.24	0.88	0.20
d, Delay for Lane Group [s/veh]	18.10	14.26		7.91	6.01	16.11	10.85
Lane Group LOS	B	B		A	A	B	B
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.65	0.92		0.33	0.75	4.88	0.65
50th-Percentile Queue Length [ft/ln]	91.25	23.05		8.16	18.73	121.91	16.34
95th-Percentile Queue Length [veh/ln]	6.57	1.66		0.59	1.35	8.50	1.18
95th-Percentile Queue Length [ft/ln]	164.24	41.49		14.68	33.71	212.44	29.42

Movement, Approach, & Intersection Results

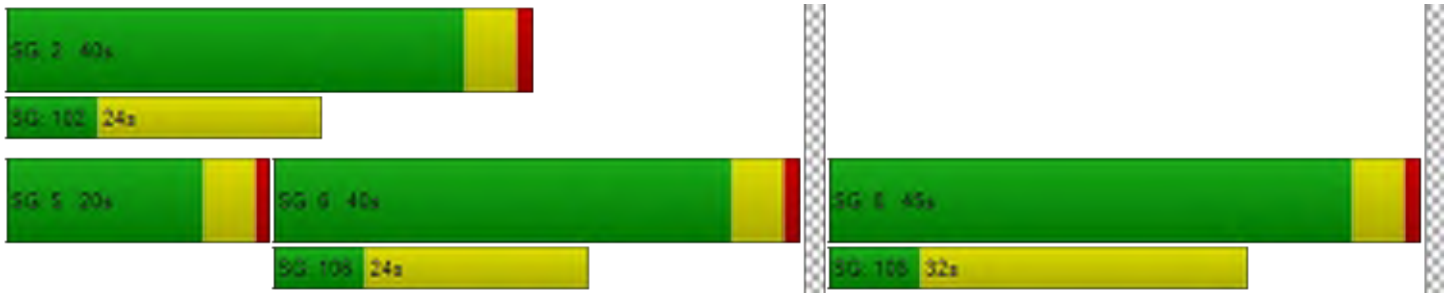
d_M, Delay for Movement [s/veh]	18.10	14.26	14.26	0.00	0.00	0.00	7.91	6.01	0.00	0.00	16.11	10.85
Movement LOS	B	B	B				A	A			B	B
d_A, Approach Delay [s/veh]	17.19			0.00			6.61			15.28		
Approach LOS	B			A			A			B		
d_I, Intersection Delay [s/veh]	14.17											
Intersection LOS	B											
Intersection V/C	0.844											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	13.94	13.94	13.94	13.94
l_p,int, Pedestrian LOS Score for Intersection	2.260	1.747	2.391	2.522
Crosswalk LOS	B	A	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1690	0	1479	1479
d_b, Bicycle Delay [s]	0.57	23.67	1.61	1.61
l_b,int, Bicycle LOS Score for Intersection	3.126	4.132	1.915	2.721
Bicycle LOS	C	D	A	B

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	220.1
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.072

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	68	1	14	16	4	121	34	335	71	15	608	10
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	68	1	14	16	4	121	34	335	71	15	608	10
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	20	0	4	5	1	36	10	100	21	4	181	3
Total Analysis Volume [veh/h]	81	1	17	19	5	144	40	399	85	18	724	12
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	1.07	0.01	0.03	0.15	0.04	0.34	0.05	0.00	0.00	0.02	0.01	0.00
d_M, Delay for Movement [s/veh]	220.11	195.85	178.45	39.31	38.62	17.69	9.29	0.00	0.00	8.36	0.00	0.00
Movement LOS	F	F	F	E	E	C	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	6.72	6.72	6.72	0.65	0.65	1.47	0.14	0.00	0.00	0.05	0.00	0.00
95th-Percentile Queue Length [ft/ln]	167.93	167.93	167.93	16.32	16.32	36.72	3.57	0.00	0.00	1.26	0.00	0.00
d_A, Approach Delay [s/veh]	212.71			20.76			0.71			0.20		
Approach LOS	F			C			A			A		
d_I, Intersection Delay [s/veh]	16.23											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	25.8
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.344

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
No. of Lanes in Entry Pocket	1	0	0	0	1	0
Entry Pocket Length [ft]	170.00	100.00	100.00	100.00	60.00	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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	80	18	351	26	9	528
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	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]	80	18	351	26	9	528
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	22	5	99	7	3	148
Total Analysis Volume [veh/h]	90	20	394	29	10	593
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	0.03	0.00	0.00	0.01	0.01
d_M, Delay for Movement [s/veh]	25.81	10.74	0.00	0.00	8.17	0.00
Movement LOS	D	B	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.47	0.10	0.00	0.00	0.03	0.00
95th-Percentile Queue Length [ft/ln]	36.80	2.39	0.00	0.00	0.66	0.00
d_A, Approach Delay [s/veh]	23.07		0.00		0.14	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	2.31					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	17.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.017

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	271	155	169	3	5	110
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	271	155	169	3	5	110
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	72	41	45	1	1	29
Total Analysis Volume [veh/h]	288	165	180	3	5	117
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.21	0.00	0.00	0.00	0.02	0.14
d_M, Delay for Movement [s/veh]	8.28	0.00	0.00	0.00	17.91	9.99
Movement LOS	A	A	A	A	C	A
95th-Percentile Queue Length [veh/ln]	0.78	0.00	0.00	0.00	0.54	0.54
95th-Percentile Queue Length [ft/ln]	19.56	0.00	0.00	0.00	13.43	13.43
d_A, Approach Delay [s/veh]	5.26		0.00		10.32	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	4.81					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	48.2
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.012

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	13	2197	1579	14	1	13
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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	2197	1579	14	1	13
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	3	591	424	4	0	3
Total Analysis Volume [veh/h]	14	2362	1698	15	1	14
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.02	0.02	0.00	0.01	0.05
d_M, Delay for Movement [s/veh]	14.97	0.00	0.00	0.00	48.19	17.90
Movement LOS	B	A	A	A	E	C
95th-Percentile Queue Length [veh/ln]	0.12	0.00	0.00	0.00	0.15	0.15
95th-Percentile Queue Length [ft/ln]	2.90	0.00	0.00	0.00	3.78	3.78
d_A, Approach Delay [s/veh]	0.09		0.00		19.92	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.12					
Intersection LOS	E					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	89.3
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.057

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	3	332	498	3	309	546
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	3	332	498	3	309	546
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	88	132	1	82	145
Total Analysis Volume [veh/h]	3	353	530	3	329	581
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	0.66	0.01	0.00	0.33	0.01
d_M, Delay for Movement [s/veh]	89.33	27.63	0.00	0.00	10.32	0.00
Movement LOS	F	D	A	A	B	A
95th-Percentile Queue Length [veh/ln]	5.66	5.66	0.00	0.00	1.44	0.00
95th-Percentile Queue Length [ft/ln]	141.54	141.54	0.00	0.00	35.90	0.00
d_A, Approach Delay [s/veh]	28.15		0.00		3.73	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.46					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	7.9
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	204	319	284	165	129	91
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	204	319	284	165	129	91
Peak Hour Factor	0.9400	1.0000	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	54	80	71	41	32	24
Total Analysis Volume [veh/h]	217	319	284	165	129	97
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	143		224		304	
Exiting Flow Rate [veh/h]	403		478		397	
Demand Flow Rate [veh/h]	204	319	284	165	129	91
Adjusted Demand Flow Rate [veh/h]	217	319	284	165	129	97

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	0.96	0.94	0.93
Entry Flow Rate [veh/h]	559	478	243
Capacity of Entry and Bypass Lanes [veh/h]	1193	1099	1013
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1145	1034	946
X, volume / capacity	0.47	0.43	0.24

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	2.56	2.23	0.93
95th-Percentile Queue Length [ft]	63.94	55.86	23.33
Approach Delay [s/veh]	8.23	8.30	6.20
Approach LOS	A	A	A
Intersection Delay [s/veh]	7.88		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	115.5
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	124	386	83	91	342	25	27	279	152	132	603	198
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	124	386	83	91	342	25	27	279	152	132	603	198
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	35	110	24	26	97	7	8	79	43	38	171	56
Total Analysis Volume [veh/h]	141	439	94	103	389	28	31	317	173	150	685	225
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	457			998			645			621		
Exiting Flow Rate [veh/h]	718			702			873			523		
Demand Flow Rate [veh/h]	124	386	83	91	342	25	27	279	152	132	603	198
Adjusted Demand Flow Rate [veh/h]	141	439	94	103	389	28	31	317	173	150	685	225

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	687	520	531	1079
Capacity of Entry and Bypass Lanes [veh/h]	866	499	715	733
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	850	499	702	720
X, volume / capacity	0.79	1.04	0.74	1.47

Movement, Approach, & Intersection Results

Lane LOS	C	F	C	F
95th-Percentile Queue Length [veh]	8.35	15.37	6.68	50.43
95th-Percentile Queue Length [ft]	208.67	384.37	166.99	1260.82
Approach Delay [s/veh]	22.34	80.98	22.13	237.46
Approach LOS	C	F	C	F
Intersection Delay [s/veh]	115.46			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	10.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.598

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	167	0	209	0	284	207	518	782	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	102	0	0	27	0	0	0
Total Hourly Volume [veh/h]	0	0	0	167	0	107	0	284	180	518	782	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	45	0	29	0	76	48	139	210	0
Total Analysis Volume [veh/h]	0	0	0	180	0	115	0	305	194	557	841	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		41	41	41	41	41	41
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		6	6	10	10	25	25
g / C, Green / Cycle		0.14	0.14	0.24	0.24	0.62	0.62
(v / s)_i Volume / Saturation Flow Rate		0.10	0.07	0.16	0.12	0.43	0.50
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1283	1673
c, Capacity [veh/h]		264	234	452	384	923	1034
d1, Uniform Delay [s]		16.89	16.41	14.20	13.53	5.64	6.07
k, delay calibration		0.04	0.04	0.11	0.11	0.30	0.11
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.16	0.59	1.76	1.03	1.75	1.61
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		0.68	0.49	0.67	0.50	0.60	0.81
d, Delay for Lane Group [s/veh]		18.05	17.00	15.96	14.56	7.39	7.69
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.47	0.90	2.25	1.34	1.51	2.61
50th-Percentile Queue Length [ft/ln]		36.76	22.46	56.21	33.47	37.70	65.13
95th-Percentile Queue Length [veh/ln]		2.65	1.62	4.05	2.41	2.71	4.69
95th-Percentile Queue Length [ft/ln]		66.17	40.43	101.17	60.24	67.86	117.23

Movement, Approach, & Intersection Results

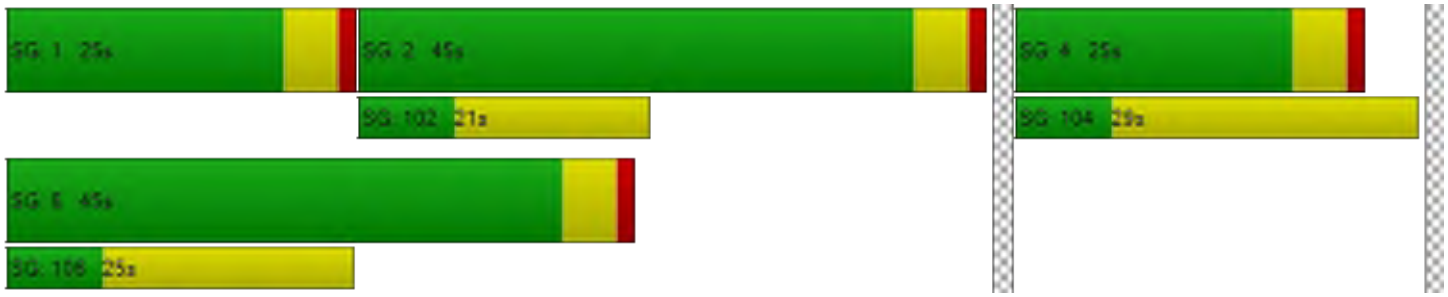
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	18.05	18.05	17.00	0.00	15.96	14.56	7.39	7.69	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			17.64			15.41			7.57		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	10.71											
Intersection LOS	B											
Intersection V/C	0.598											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	11.07	11.07	11.07	11.07
l_p,int, Pedestrian LOS Score for Intersection	2.366	2.168	2.533	2.608
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	971	1941	1941
d_b, Bicycle Delay [s]	20.60	5.46	0.02	0.02
l_b,int, Bicycle LOS Score for Intersection	4.132	2.765	2.274	3.712
Bicycle LOS	D	C	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	29.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.935

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	303	1	408	0	0	0	67	383	0	0	997	324
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	192	0	0	0	0	0	0	0	0	159
Total Hourly Volume [veh/h]	303	1	216	0	0	0	67	383	0	0	997	165
Peak Hour 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
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]	76	0	54	0	0	0	17	96	0	0	249	41
Total Analysis Volume [veh/h]	303	1	216	0	0	0	67	383	0	0	997	165
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	67	67		67	67	67	67
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	13	13		44	44	35	35
g / C, Green / Cycle	0.20	0.20		0.65	0.65	0.52	0.52
(v / s)_i Volume / Saturation Flow Rate	0.16	0.13		0.11	0.23	0.53	0.11
s, saturation flow rate [veh/h]	1852	1681		628	1643	1884	1543
c, Capacity [veh/h]	367	333		333	1072	986	808
d1, Uniform Delay [s]	25.72	24.70		14.25	5.26	15.94	8.48
k, delay calibration	0.04	0.04		0.04	0.04	0.44	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.83	0.81		0.11	0.07	29.60	0.05
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	0.83	0.65		0.20	0.36	1.01	0.20
d, Delay for Lane Group [s/veh]	27.55	25.51		14.36	5.34	45.54	8.53
Lane Group LOS	C	C		B	A	F	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	4.54	3.07		0.24	1.68	19.91	1.06
50th-Percentile Queue Length [ft/ln]	113.38	76.65		6.05	41.99	497.81	26.55
95th-Percentile Queue Length [veh/ln]	8.03	5.52		0.44	3.02	27.47	1.91
95th-Percentile Queue Length [ft/ln]	200.70	137.97		10.89	75.59	686.83	47.80

Movement, Approach, & Intersection Results

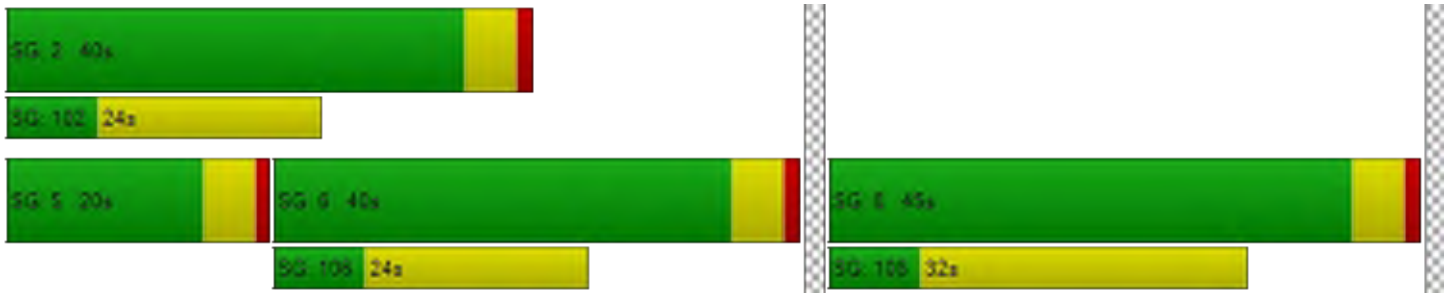
d_M, Delay for Movement [s/veh]	27.55	25.51	25.51	0.00	0.00	0.00	14.36	5.34	0.00	0.00	45.54	8.53
Movement LOS	C	C	C				B	A			F	A
d_A, Approach Delay [s/veh]	26.70			0.00			6.68			40.29		
Approach LOS	C			A			A			D		
d_I, Intersection Delay [s/veh]	29.88											
Intersection LOS	C											
Intersection V/C	0.935											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	23.28	23.28	23.28	23.28
l_p,int, Pedestrian LOS Score for Intersection	2.428	1.842	2.587	2.951
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1199	0	1049	1049
d_b, Bicycle Delay [s]	5.36	33.37	7.55	7.55
l_b,int, Bicycle LOS Score for Intersection	3.270	4.132	2.148	3.585
Bicycle LOS	C	D	B	D

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	68.312

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	116	1	21	18	3	160	64	636	91	15	1045	15
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	116	1	21	18	3	160	64	636	91	15	1045	15
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	35	0	6	5	1	48	19	189	27	4	311	4
Total Analysis Volume [veh/h]	138	1	25	21	4	190	76	757	108	18	1244	18
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	68.31	0.03	0.07	0.93	0.14	0.89	0.14	0.01	0.00	0.02	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	453.31	423.64	83.39	12.47	0.00	0.00	9.68	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	22.89	22.89	22.89	3.17	3.17	7.12	0.47	0.00	0.00	0.07	0.00	0.00
95th-Percentile Queue Length [ft/ln]	572.18	572.18	572.18	79.19	79.19	178.02	11.74	0.00	0.00	1.76	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			125.85			1.01			0.14		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	641.61											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	17.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	279	35	565	112	19	735
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	279	35	565	112	19	735
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	78	10	159	31	5	206
Total Analysis Volume [veh/h]	313	39	635	126	21	826
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	679		21		313	
Exiting Flow Rate [veh/h]	162		1156		718	
Demand Flow Rate [veh/h]	279	35	565	112	19	735
Adjusted Demand Flow Rate [veh/h]	313	39	635	126	21	826

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	0.93	0.98
Entry Flow Rate [veh/h]	352	821	864
Capacity of Entry and Bypass Lanes [veh/h]	691	1351	1003
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	691	1254	984
X, volume / capacity	0.51	0.61	0.86

Movement, Approach, & Intersection Results

Lane LOS	B	B	D
95th-Percentile Queue Length [veh]	2.92	4.33	11.22
95th-Percentile Queue Length [ft]	73.04	108.36	280.55
Approach Delay [s/veh]	13.07	10.25	25.65
Approach LOS	B	B	D
Intersection Delay [s/veh]	17.41		
Intersection LOS	C		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	28.2
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.034

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	396	213	243	3	6	230
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	396	213	243	3	6	230
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	105	57	65	1	2	61
Total Analysis Volume [veh/h]	421	227	259	3	6	245
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.32	0.00	0.00	0.00	0.03	0.31
d_M, Delay for Movement [s/veh]	9.11	0.00	0.00	0.00	28.17	12.29
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.42	0.00	0.00	0.00	1.57	1.57
95th-Percentile Queue Length [ft/ln]	35.60	0.00	0.00	0.00	39.17	39.17
d_A, Approach Delay [s/veh]	5.92		0.00		12.67	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.04					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	23.7
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.025

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	16	2664	2049	16	0	5
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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]	16	2664	2049	16	0	5
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	4	716	551	4	0	1
Total Analysis Volume [veh/h]	17	2865	2203	17	0	5
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.07	0.03	0.02	0.00	0.00	0.03
d_M, Delay for Movement [s/veh]	21.24	0.00	0.00	0.00	81.65	23.74
Movement LOS	C	A	A	A	F	C
95th-Percentile Queue Length [veh/ln]	0.23	0.00	0.00	0.00	0.08	0.08
95th-Percentile Queue Length [ft/ln]	5.71	0.00	0.00	0.00	1.95	1.95
d_A, Approach Delay [s/veh]	0.13		0.00		23.74	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.09					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	70.9
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.056

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	4	332	498	2	213	631
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	4	332	498	2	213	631
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	88	132	1	57	168
Total Analysis Volume [veh/h]	4	353	530	2	227	671
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	0.66	0.01	0.00	0.23	0.01
d_M, Delay for Movement [s/veh]	70.88	27.44	0.00	0.00	9.62	0.00
Movement LOS	F	D	A	A	A	A
95th-Percentile Queue Length [veh/ln]	5.64	5.64	0.00	0.00	0.87	0.00
95th-Percentile Queue Length [ft/ln]	140.88	140.88	0.00	0.00	21.67	0.00
d_A, Approach Delay [s/veh]	27.92		0.00		2.43	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	6.80					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	8.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	233	408	264	77	120	141
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	233	408	264	77	120	141
Peak Hour Factor	0.9400	1.0000	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	62	102	66	19	30	38
Total Analysis Volume [veh/h]	248	408	264	77	120	150
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	133		255		282	
Exiting Flow Rate [veh/h]	435		562		336	
Demand Flow Rate [veh/h]	233	408	264	77	120	141
Adjusted Demand Flow Rate [veh/h]	248	408	264	77	120	150

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	0.96	0.94	0.94
Entry Flow Rate [veh/h]	684	364	287
Capacity of Entry and Bypass Lanes [veh/h]	1205	1064	1035
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1156	999	977
X, volume / capacity	0.57	0.34	0.28

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	3.72	1.53	1.13
95th-Percentile Queue Length [ft]	92.98	38.21	28.30
Approach Delay [s/veh]	9.96	7.17	6.47
Approach LOS	A	A	A
Intersection Delay [s/veh]	8.47		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	142.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	124	392	77	112	409	33	31	301	159	123	620	206
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	124	392	77	112	409	33	31	301	159	123	620	206
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	35	111	22	32	116	9	9	86	45	35	176	59
Total Analysis Volume [veh/h]	141	445	88	127	465	38	35	342	181	140	705	234
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	511			1009			735			631		
Exiting Flow Rate [veh/h]	792			721			904			566		
Demand Flow Rate [veh/h]	124	392	77	112	409	33	31	301	159	123	620	206
Adjusted Demand Flow Rate [veh/h]	141	445	88	127	465	38	35	342	181	140	705	234

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	687	630	569	1099
Capacity of Entry and Bypass Lanes [veh/h]	820	494	653	725
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	805	494	641	713
X, volume / capacity	0.84	1.28	0.87	1.51

Movement, Approach, & Intersection Results

Lane LOS	D	F	E	F
95th-Percentile Queue Length [veh]	9.71	26.13	10.21	53.42
95th-Percentile Queue Length [ft]	242.79	653.22	255.32	1335.38
Approach Delay [s/veh]	27.11	164.54	36.23	255.76
Approach LOS	D	F	E	F
Intersection Delay [s/veh]	142.17			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	13.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.652

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	209	0	186	0	347	178	538	829	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	91	0	0	23	0	0	0
Total Hourly Volume [veh/h]	0	0	0	209	0	95	0	347	155	538	829	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	56	0	26	0	93	42	145	223	0
Total Analysis Volume [veh/h]	0	0	0	225	0	102	0	373	167	578	891	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		46	46	46	46	46	46
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		7	7	12	12	29	29
g / C, Green / Cycle		0.16	0.16	0.26	0.26	0.62	0.62
(v / s)_i Volume / Saturation Flow Rate		0.12	0.06	0.20	0.11	0.46	0.53
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1255	1673
c, Capacity [veh/h]		301	266	483	410	861	1042
d1, Uniform Delay [s]		18.42	17.27	15.79	14.13	6.65	7.01
k, delay calibration		0.04	0.04	0.11	0.11	0.43	0.16
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.40	0.33	2.67	0.65	3.55	3.16
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	0.38	0.77	0.41	0.67	0.86
d, Delay for Lane Group [s/veh]		19.82	17.61	18.47	14.78	10.21	10.17
Lane Group LOS		B	B	B	B	B	B
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		2.12	0.87	3.31	1.26	2.35	4.16
50th-Percentile Queue Length [ft/ln]		52.88	21.86	82.83	31.43	58.82	103.93
95th-Percentile Queue Length [veh/ln]		3.81	1.57	5.96	2.26	4.24	7.48
95th-Percentile Queue Length [ft/ln]		95.19	39.34	149.09	56.58	105.88	187.07

Movement, Approach, & Intersection Results

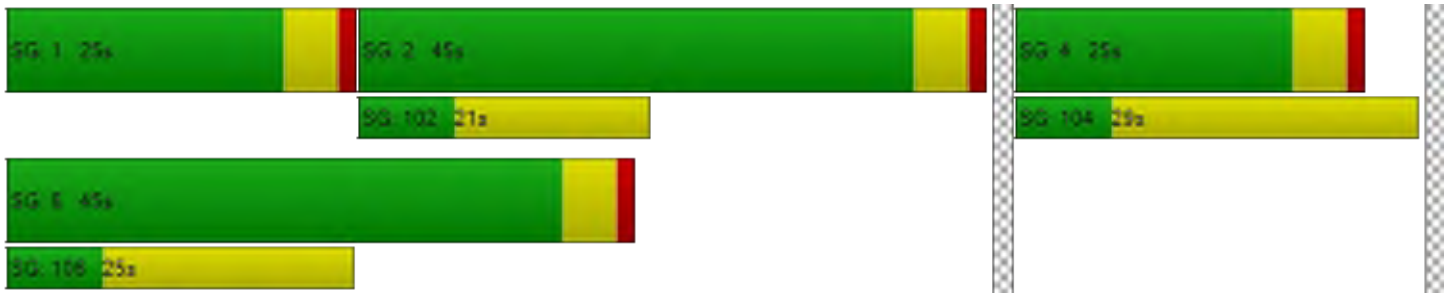
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	19.82	19.82	17.61	0.00	18.47	14.78	10.21	10.17	0.00
Movement LOS				B	B	B		B	B	B	B	
d_A, Approach Delay [s/veh]	0.00			19.13			17.33			10.18		
Approach LOS	A			B			B			B		
d_I, Intersection Delay [s/veh]	13.09											
Intersection LOS	B											
Intersection V/C	0.652											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	13.25	13.25	13.25	13.25
I_p,int, Pedestrian LOS Score for Intersection	2.381	2.166	2.558	2.685
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	872	1745	1745
d_b, Bicycle Delay [s]	22.93	7.29	0.37	0.37
I_b,int, Bicycle LOS Score for Intersection	4.132	2.800	2.335	3.829
Bicycle LOS	D	C	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	50.2
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.022

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	209	1	434	0	0	0	63	493	0	0	1158	420
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	204	0	0	0	0	0	0	0	0	206
Total Hourly Volume [veh/h]	209	1	230	0	0	0	63	493	0	0	1158	214
Peak Hour 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
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]	52	0	58	0	0	0	16	123	0	0	290	54
Total Analysis Volume [veh/h]	209	1	230	0	0	0	63	493	0	0	1158	214
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	65	65		65	65	65	65
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	11	11		43	43	35	35
g / C, Green / Cycle	0.17	0.17		0.67	0.67	0.54	0.54
(v / s)_i Volume / Saturation Flow Rate	0.11	0.14		0.11	0.30	0.61	0.14
s, saturation flow rate [veh/h]	1852	1680		555	1643	1884	1543
c, Capacity [veh/h]	320	291		338	1105	1020	836
d1, Uniform Delay [s]	24.92	25.63		14.02	4.96	14.82	7.87
k, delay calibration	0.04	0.04		0.04	0.05	0.50	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.84	1.89		0.10	0.13	73.29	0.06
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	0.65	0.79		0.19	0.45	1.14	0.26
d, Delay for Lane Group [s/veh]	25.76	27.52		14.12	5.09	88.11	7.93
Lane Group LOS	C	C		B	A	F	A
Critical Lane Group	No	Yes		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	2.89	3.35		0.19	1.98	32.08	1.27
50th-Percentile Queue Length [ft/ln]	72.29	83.86		4.73	49.39	801.93	31.85
95th-Percentile Queue Length [veh/ln]	5.21	6.04		0.34	3.56	45.57	2.29
95th-Percentile Queue Length [ft/ln]	130.13	150.95		8.52	88.90	1139.26	57.33

Movement, Approach, & Intersection Results

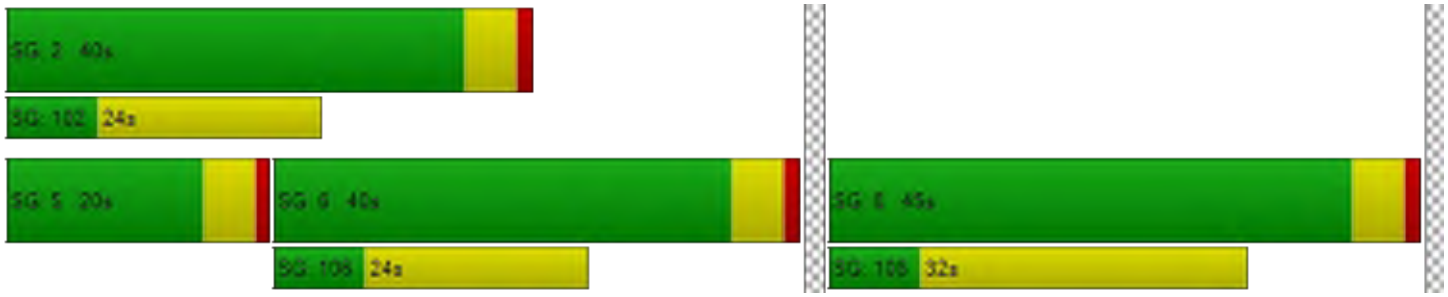
d_M, Delay for Movement [s/veh]	25.76	27.52	27.52	0.00	0.00	0.00	14.12	5.09	0.00	0.00	88.11	7.93
Movement LOS	C	C	C				B	A			F	A
d_A, Approach Delay [s/veh]	26.69			0.00			6.11			75.60		
Approach LOS	C			A			A			E		
d_I, Intersection Delay [s/veh]	50.20											
Intersection LOS	D											
Intersection V/C	1.022											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	22.20	22.20	22.20	22.20
l_p,int, Pedestrian LOS Score for Intersection	2.421	1.928	2.651	3.165
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1240	0	1085	1085
d_b, Bicycle Delay [s]	4.66	32.26	6.75	6.76
l_b,int, Bicycle LOS Score for Intersection	3.158	4.132	2.323	4.009
Bicycle LOS	C	D	B	D

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.088

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	114	1	22	20	3	160	62	776	89	17	1304	16
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	114	1	22	20	3	160	62	776	89	17	1304	16
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	34	0	7	6	1	48	18	231	26	5	388	5
Total Analysis Volume [veh/h]	136	1	26	24	4	190	74	924	106	20	1552	19
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.06	0.09	2.63	0.32	1.36	0.17	0.01	0.00	0.03	0.02	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	1672.6	1566.1	259.49	15.24	0.00	0.00	10.44	0.00	0.00
Movement LOS	F	F	F	F	F	F	C	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	23.03	23.03	23.03	4.60	4.60	12.12	0.62	0.00	0.00	0.09	0.00	0.00
95th-Percentile Queue Length [ft/ln]	575.73	575.73	575.73	114.94	114.94	302.93	15.57	0.00	0.00	2.26	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			439.04			1.02			0.13		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	561.46											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	16.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
No. of Lanes in Entry Pocket	0	1	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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	711	61	661	253	18	538
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	711	61	661	253	18	538
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	200	17	186	71	5	151
Total Analysis Volume [veh/h]	799	69	743	284	20	604
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	795		20		799	
Exiting Flow Rate [veh/h]	338		1415		864	
Demand Flow Rate [veh/h]	711	61	661	253	18	538
Adjusted Demand Flow Rate [veh/h]	799	69	743	284	20	604

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00
A (intercept)	1420.00	1420.00	1380.00	1420.00	1420.00
B (coefficient)	0.00091	0.00091	0.00102	0.00091	0.00091
HV Adjustment Factor	1.00	1.00	0.92	0.98	0.98
Entry Flow Rate [veh/h]	461	408	1113	299	338
Capacity of Entry and Bypass Lanes [veh/h]	689	689	1353	687	687
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	689	689	1249	674	673
X, volume / capacity	0.67	0.59	0.82	0.44	0.49

Movement, Approach, & Intersection Results

Lane LOS	C	C	C	B	B
95th-Percentile Queue Length [veh]	5.12	3.92	10.18	2.21	2.73
95th-Percentile Queue Length [ft]	127.93	98.00	254.60	55.31	68.15
Approach Delay [s/veh]	17.05		18.69	12.27	
Approach LOS	C		C	B	
Intersection Delay [s/veh]	16.53				
Intersection LOS	C				

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	29.1
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.040

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	393	204	289	4	7	238
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	393	204	289	4	7	238
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	105	54	77	1	2	63
Total Analysis Volume [veh/h]	418	217	307	4	7	253
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.34	0.00	0.00	0.00	0.04	0.35
d_M, Delay for Movement [s/veh]	9.35	0.00	0.00	0.00	29.08	13.25
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.50	0.00	0.00	0.00	1.82	1.82
95th-Percentile Queue Length [ft/ln]	37.42	0.00	0.00	0.00	45.62	45.62
d_A, Approach Delay [s/veh]	6.16		0.00		13.68	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.19					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	25.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.022

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	16	2610	2132	17	0	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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]	16	2610	2132	17	0	4
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	4	702	573	5	0	1
Total Analysis Volume [veh/h]	17	2806	2292	18	0	4
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.03	0.02	0.00	0.00	0.02
d_M, Delay for Movement [s/veh]	22.73	0.00	0.00	0.00	87.64	25.03
Movement LOS	C	A	A	A	F	D
95th-Percentile Queue Length [veh/ln]	0.25	0.00	0.00	0.00	0.07	0.07
95th-Percentile Queue Length [ft/ln]	6.22	0.00	0.00	0.00	1.66	1.66
d_A, Approach Delay [s/veh]	0.14		0.00		25.03	
Approach LOS	A		A		D	
d_I, Intersection Delay [s/veh]	0.09					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	65.9
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.051

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	4	332	499	2	183	654
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	4	332	499	2	183	654
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	88	133	1	49	174
Total Analysis Volume [veh/h]	4	353	531	2	195	696
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	0.66	0.01	0.00	0.19	0.01
d_M, Delay for Movement [s/veh]	65.93	27.09	0.00	0.00	9.44	0.00
Movement LOS	F	D	A	A	A	A
95th-Percentile Queue Length [veh/ln]	5.56	5.56	0.00	0.00	0.72	0.00
95th-Percentile Queue Length [ft/ln]	139.10	139.10	0.00	0.00	17.93	0.00
d_A, Approach Delay [s/veh]	27.53		0.00		2.07	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	6.55					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	10.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	279	492	276	52	108	189
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	5.00	7.00	11.00	2.00
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
Total Hourly Volume [veh/h]	279	492	276	52	108	189
Peak Hour Factor	0.9400	1.0000	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	74	123	69	13	27	50
Total Analysis Volume [veh/h]	297	492	276	52	108	201
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	120		306		290	
Exiting Flow Rate [veh/h]	495		636		362	
Demand Flow Rate [veh/h]	279	492	276	52	108	189
Adjusted Demand Flow Rate [veh/h]	297	492	276	52	108	201

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	0.96	0.95	0.95
Entry Flow Rate [veh/h]	823	346	325
Capacity of Entry and Bypass Lanes [veh/h]	1222	1011	1027
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1172	960	978
X, volume / capacity	0.67	0.34	0.32

Movement, Approach, & Intersection Results

Lane LOS	B	A	A
95th-Percentile Queue Length [veh]	5.55	1.53	1.37
95th-Percentile Queue Length [ft]	138.72	38.23	34.13
Approach Delay [s/veh]	12.54	7.40	6.96
Approach LOS	B	A	A
Intersection Delay [s/veh]	10.15		
Intersection LOS	B		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	126.7
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	118	399	88	106	417	26	27	293	167	145	570	202
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	118	399	88	106	417	26	27	293	167	145	570	202
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	34	113	25	30	118	7	8	83	47	41	162	57
Total Analysis Volume [veh/h]	134	453	100	120	474	30	31	333	190	165	648	230
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	491			969			762			628		
Exiting Flow Rate [veh/h]	836			721			830			563		
Demand Flow Rate [veh/h]	118	399	88	106	417	26	27	293	167	145	570	202
Adjusted Demand Flow Rate [veh/h]	134	453	100	120	474	30	31	333	190	165	648	230

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	700	624	565	1062
Capacity of Entry and Bypass Lanes [veh/h]	837	514	635	728
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	822	514	623	715
X, volume / capacity	0.84	1.21	0.89	1.46

Movement, Approach, & Intersection Results

Lane LOS	D	F	E	F
95th-Percentile Queue Length [veh]	9.72	23.66	10.76	49.02
95th-Percentile Queue Length [ft]	242.95	591.58	268.97	1225.61
Approach Delay [s/veh]	26.57	138.73	39.62	231.73
Approach LOS	D	F	E	F
Intersection Delay [s/veh]	126.71			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	14.3
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.653

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	234	0	179	0	350	170	577	808	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	88	0	0	22	0	0	0
Total Hourly Volume [veh/h]	0	0	0	234	0	91	0	350	148	577	808	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	63	0	24	0	94	40	155	217	0
Total Analysis Volume [veh/h]	0	0	0	252	0	98	0	376	159	620	869	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		50	50	50	50	50	50
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		9	9	13	13	31	31
g / C, Green / Cycle		0.17	0.17	0.25	0.25	0.63	0.63
(v / s)_i Volume / Saturation Flow Rate		0.13	0.06	0.20	0.10	0.49	0.52
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1269	1673
c, Capacity [veh/h]		323	286	477	405	855	1050
d1, Uniform Delay [s]		19.71	18.14	17.28	15.34	7.28	7.19
k, delay calibration		0.04	0.04	0.11	0.11	0.50	0.19
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.56	0.26	2.95	0.62	5.32	2.97
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	0.34	0.79	0.39	0.72	0.83
d, Delay for Lane Group [s/veh]		21.27	18.40	20.23	15.96	12.60	10.16
Lane Group LOS		C	B	C	B	B	B
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		2.63	0.91	3.76	1.34	3.26	4.54
50th-Percentile Queue Length [ft/ln]		65.63	22.75	94.07	33.38	81.61	113.47
95th-Percentile Queue Length [veh/ln]		4.73	1.64	6.77	2.40	5.88	8.03
95th-Percentile Queue Length [ft/ln]		118.13	40.96	169.33	60.09	146.91	200.82

Movement, Approach, & Intersection Results

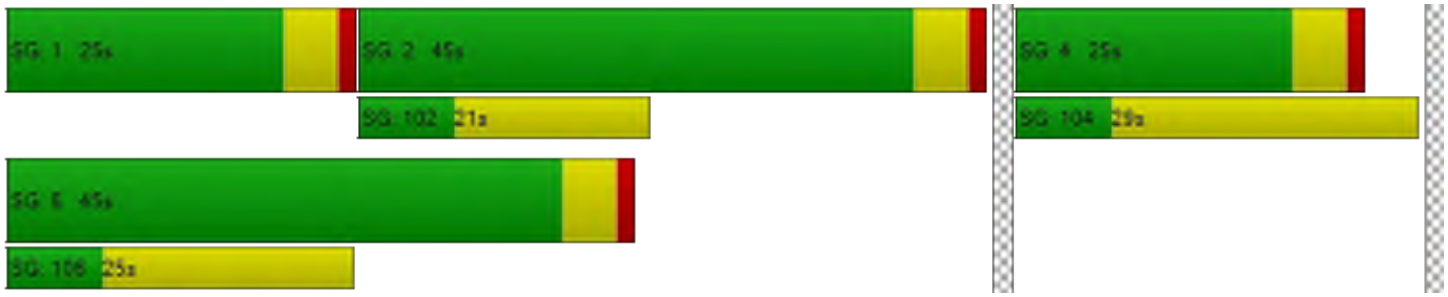
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	21.27	21.27	18.40	0.00	20.23	15.96	12.60	10.16	0.00
Movement LOS				C	C	B		C	B	B	B	
d_A, Approach Delay [s/veh]	0.00			20.46			18.96			11.17		
Approach LOS	A			C			B			B		
d_I, Intersection Delay [s/veh]	14.30											
Intersection LOS	B											
Intersection V/C	0.653											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.04	15.04	15.04	15.04
l_p,int, Pedestrian LOS Score for Intersection	2.431	2.174	2.549	2.709
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	806	1612	1612
d_b, Bicycle Delay [s]	24.82	8.85	0.94	0.94
l_b,int, Bicycle LOS Score for Intersection	4.132	2.833	2.325	3.862
Bicycle LOS	D	C	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	60.7
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.062

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	160	0	415	0	0	0	52	530	0	0	1225	430
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	195	0	0	0	0	0	0	0	0	211
Total Hourly Volume [veh/h]	160	0	220	0	0	0	52	530	0	0	1225	219
Peak Hour 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
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]	40	0	55	0	0	0	13	133	0	0	306	55
Total Analysis Volume [veh/h]	160	0	220	0	0	0	52	530	0	0	1225	219
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	64	64		64	64	64	64
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	11	11		43	43	35	35
g / C, Green / Cycle	0.17	0.17		0.68	0.68	0.55	0.55
(v / s)_i Volume / Saturation Flow Rate	0.09	0.13		0.10	0.32	0.65	0.14
s, saturation flow rate [veh/h]	1852	1679		525	1643	1884	1543
c, Capacity [veh/h]	308	279		332	1112	1035	848
d1, Uniform Delay [s]	24.22	25.47		13.98	4.91	14.34	7.50
k, delay calibration	0.04	0.04		0.04	0.08	0.50	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.51	1.88		0.08	0.23	92.49	0.06
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	0.52	0.79		0.16	0.48	1.18	0.26
d, Delay for Lane Group [s/veh]	24.73	27.34		14.06	5.14	106.84	7.56
Lane Group LOS	C	C		B	A	F	A
Critical Lane Group	No	Yes		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	2.12	3.15		0.15	2.09	37.68	1.24
50th-Percentile Queue Length [ft/ln]	52.97	78.66		3.66	52.31	941.95	31.00
95th-Percentile Queue Length [veh/ln]	3.81	5.66		0.26	3.77	54.16	2.23
95th-Percentile Queue Length [ft/ln]	95.35	141.58		6.58	94.17	1354.03	55.80

Movement, Approach, & Intersection Results

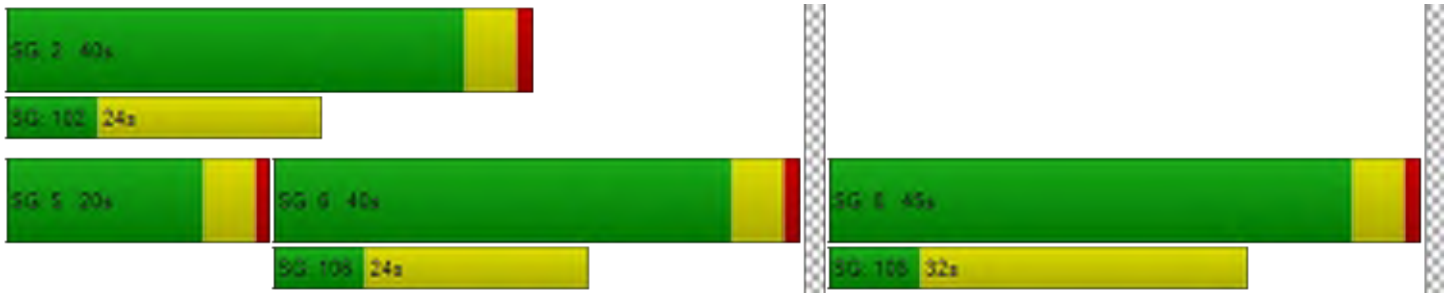
d_M, Delay for Movement [s/veh]	24.73	27.34	27.34	0.00	0.00	0.00	14.06	5.14	0.00	0.00	106.84	7.56
Movement LOS	C	C	C				B	A			F	A
d_A, Approach Delay [s/veh]	26.24			0.00			5.94			91.78		
Approach LOS	C			A			A			F		
d_I, Intersection Delay [s/veh]	60.66											
Intersection LOS	E											
Intersection V/C	1.062											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	21.73	21.73	21.73	21.73
I_p,int, Pedestrian LOS Score for Intersection	2.385	1.917	2.667	3.207
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1259	0	1101	1101
d_b, Bicycle Delay [s]	4.36	31.78	6.41	6.42
I_b,int, Bicycle LOS Score for Intersection	3.044	4.132	2.366	4.136
Bicycle LOS	C	D	B	D

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.101

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	112	1	24	22	3	159	60	798	88	19	1384	18
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	112	1	24	22	3	159	60	798	88	19	1384	18
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	33	0	7	7	1	47	18	238	26	6	412	5
Total Analysis Volume [veh/h]	133	1	29	26	4	189	71	950	105	23	1648	21
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.08	0.10	3.71	0.40	1.54	0.18	0.01	0.00	0.03	0.02	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	2401.4	2246.8	342.80	16.27	0.00	0.00	10.58	0.00	0.00
Movement LOS	F	F	F	F	F	F	C	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	23.03	23.03	23.03	5.06	5.06	13.52	0.66	0.00	0.00	0.11	0.00	0.00
95th-Percentile Queue Length [ft/ln]	575.73	575.73	575.73	126.51	126.51	337.98	16.42	0.00	0.00	2.67	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			621.99			1.03			0.14		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	552.38											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	26.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
No. of Lanes in Entry Pocket	0	1	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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	820	171	715	289	43	502
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	820	171	715	289	43	502
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	230	48	201	81	12	141
Total Analysis Volume [veh/h]	921	192	803	325	48	564
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		2		2	
Circulating Flow Rate [veh/h]	859		48		921	
Exiting Flow Rate [veh/h]	412		1496		1051	
Demand Flow Rate [veh/h]	820	171	715	289	43	502
Adjusted Demand Flow Rate [veh/h]	921	192	803	325	48	564

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00
A (intercept)	1420.00	1420.00	1420.00	1350.00	1420.00
B (coefficient)	0.00091	0.00091	0.00085	0.00092	0.00085
HV Adjustment Factor	1.00	1.00	0.92	0.98	0.98
Entry Flow Rate [veh/h]	590	524	1223	293	331
Capacity of Entry and Bypass Lanes [veh/h]	650	650	1364	579	650
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	650	650	1258	569	637
X, volume / capacity	0.91	0.81	0.90	0.51	0.51

Movement, Approach, & Intersection Results

Lane LOS	E	D	D	C	B
95th-Percentile Queue Length [veh]	11.60	8.17	14.00	2.85	2.90
95th-Percentile Queue Length [ft]	289.92	204.35	350.04	71.14	72.57
Approach Delay [s/veh]	35.22		25.30	14.53	
Approach LOS	E		D	B	
Intersection Delay [s/veh]	26.86				
Intersection LOS	D				

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	29.8
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.052

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	384	211	322	4	8	239
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	384	211	322	4	8	239
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	102	56	86	1	2	64
Total Analysis Volume [veh/h]	409	224	343	4	9	254
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.34	0.00	0.00	0.00	0.05	0.36
d_M, Delay for Movement [s/veh]	9.51	0.00	0.00	0.00	29.80	14.15
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.52	0.00	0.00	0.00	2.05	2.05
95th-Percentile Queue Length [ft/ln]	37.89	0.00	0.00	0.00	51.15	51.15
d_A, Approach Delay [s/veh]	6.14		0.00		14.69	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.24					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	25.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.028

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	16	2586	2172	17	0	5
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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]	16	2586	2172	17	0	5
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	4	695	584	5	0	1
Total Analysis Volume [veh/h]	17	2781	2335	18	0	5
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.03	0.02	0.00	0.00	0.03
d_M, Delay for Movement [s/veh]	23.49	0.00	0.00	0.00	91.07	25.85
Movement LOS	C	A	A	A	F	D
95th-Percentile Queue Length [veh/ln]	0.26	0.00	0.00	0.00	0.09	0.09
95th-Percentile Queue Length [ft/ln]	6.48	0.00	0.00	0.00	2.16	2.16
d_A, Approach Delay [s/veh]	0.14		0.00		25.85	
Approach LOS	A		A		D	
d_I, Intersection Delay [s/veh]	0.10					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	88.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.073

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	4	333	497	3	299	554
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	4	333	497	3	299	554
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	89	132	1	80	147
Total Analysis Volume [veh/h]	4	354	529	3	318	589
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	0.66	0.01	0.00	0.32	0.01
d_M, Delay for Movement [s/veh]	88.16	29.05	0.00	0.00	10.23	0.00
Movement LOS	F	D	A	A	B	A
95th-Percentile Queue Length [veh/ln]	5.96	5.96	0.00	0.00	1.37	0.00
95th-Percentile Queue Length [ft/ln]	149.08	149.08	0.00	0.00	34.14	0.00
d_A, Approach Delay [s/veh]	29.71		0.00		3.59	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.73					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	8.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way		SE Airport Way		SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way		SE Airport Way		SE Veterans Way	
Base Volume Input [veh/h]	218	335	286	154	126	97
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	5.00	7.00	11.00	2.00
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
Total Hourly Volume [veh/h]	218	335	286	154	126	97
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	58	89	76	41	34	26
Total Analysis Volume [veh/h]	232	356	304	164	134	103
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	149		239		319	
Exiting Flow Rate [veh/h]	424		523		414	
Demand Flow Rate [veh/h]	218	335	286	154	126	97
Adjusted Demand Flow Rate [veh/h]	232	356	304	164	134	103

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	0.96	0.95	0.94
Entry Flow Rate [veh/h]	613	495	254
Capacity of Entry and Bypass Lanes [veh/h]	1186	1082	997
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1138	1024	933
X, volume / capacity	0.52	0.46	0.25

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	3.07	2.44	1.01
95th-Percentile Queue Length [ft]	76.76	61.06	25.27
Approach Delay [s/veh]	9.08	8.74	6.44
Approach LOS	A	A	A
Intersection Delay [s/veh]	8.47		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	165.4
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	131	378	60	111	361	44	39	308	145	94	712	215
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	131	378	60	111	361	44	39	308	145	94	712	215
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	37	107	17	32	103	13	11	88	41	27	202	61
Total Analysis Volume [veh/h]	149	430	68	126	410	50	44	350	165	107	809	244
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	527			1089			645			633		
Exiting Flow Rate [veh/h]	687			725			1030			553		
Demand Flow Rate [veh/h]	131	378	60	111	361	44	39	308	145	94	712	215
Adjusted Demand Flow Rate [veh/h]	149	430	68	126	410	50	44	350	165	107	809	244

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	660	586	570	1181
Capacity of Entry and Bypass Lanes [veh/h]	807	455	715	724
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	792	455	702	711
X, volume / capacity	0.82	1.29	0.80	1.63

Movement, Approach, & Intersection Results

Lane LOS	D	F	D	F
95th-Percentile Queue Length [veh]	8.98	25.19	8.08	63.07
95th-Percentile Queue Length [ft]	224.54	629.66	202.12	1576.63
Approach Delay [s/veh]	25.56	172.24	26.06	307.12
Approach LOS	D	F	D	F
Intersection Delay [s/veh]	165.41			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew 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):	0.700

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	188	0	170	0	396	118	345	922	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	83	0	0	15	0	0	0
Total Hourly Volume [veh/h]	0	0	0	188	0	87	0	396	103	345	922	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	51	0	23	0	106	28	93	248	0
Total Analysis Volume [veh/h]	0	0	0	202	0	94	0	426	111	371	991	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		46	46	46	46	46	46
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		7	7	18	18	30	30
g / C, Green / Cycle		0.15	0.15	0.38	0.38	0.64	0.64
(v / s)_i Volume / Saturation Flow Rate		0.11	0.06	0.23	0.07	0.34	0.59
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1106	1673
c, Capacity [veh/h]		276	244	707	601	785	1068
d1, Uniform Delay [s]		18.99	17.97	11.65	9.67	5.32	7.46
k, delay calibration		0.04	0.04	0.11	0.11	0.20	0.22
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.41	0.37	0.83	0.15	0.84	7.64
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		0.73	0.38	0.60	0.18	0.47	0.93
d, Delay for Lane Group [s/veh]		20.40	18.33	12.48	9.82	6.16	15.10
Lane Group LOS		C	B	B	A	A	B
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.95	0.83	2.88	0.61	0.93	6.05
50th-Percentile Queue Length [ft/ln]		48.68	20.87	71.88	15.28	23.13	151.33
95th-Percentile Queue Length [veh/ln]		3.51	1.50	5.18	1.10	1.67	10.09
95th-Percentile Queue Length [ft/ln]		87.63	37.56	129.38	27.50	41.64	252.20

Movement, Approach, & Intersection Results

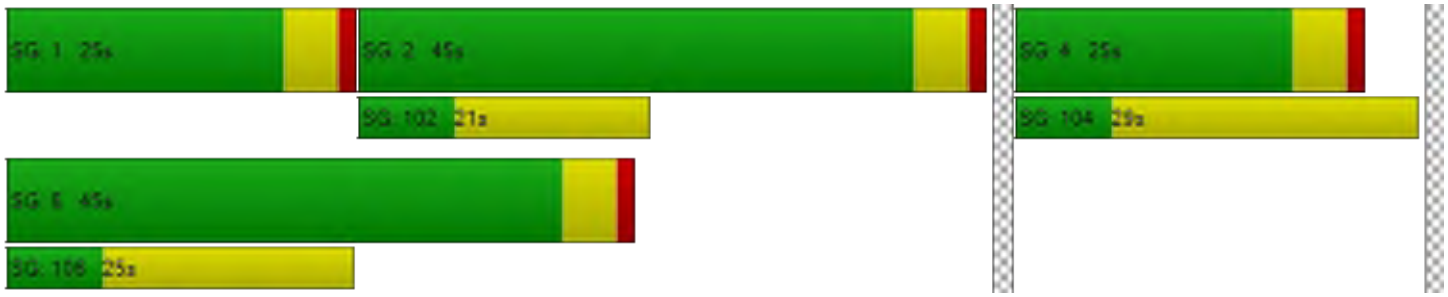
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	20.40	20.40	18.33	0.00	12.48	9.82	6.16	15.10	0.00
Movement LOS				C	C	B		B	A	A	B	
d_A, Approach Delay [s/veh]	0.00			19.74			11.93			12.67		
Approach LOS	A			B			B			B		
d_I, Intersection Delay [s/veh]	13.44											
Intersection LOS	B											
Intersection V/C	0.700											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	13.53	13.53	13.53	13.53
l_p,int, Pedestrian LOS Score for Intersection	2.092	2.143	2.575	2.657
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	861	1722	1722
d_b, Bicycle Delay [s]	23.23	7.53	0.45	0.45
l_b,int, Bicycle LOS Score for Intersection	4.132	2.736	2.316	3.653
Bicycle LOS	D	B	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	27.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.926

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	262	1	441	0	0	0	96	488	0	0	1005	458
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	207	0	0	0	0	0	0	0	0	224
Total Hourly Volume [veh/h]	262	1	234	0	0	0	96	488	0	0	1005	234
Peak Hour 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
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]	66	0	59	0	0	0	24	122	0	0	251	59
Total Analysis Volume [veh/h]	262	1	234	0	0	0	96	488	0	0	1005	234
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	66	66		66	66	66	66
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	12	12		44	44	35	35
g / C, Green / Cycle	0.18	0.18		0.67	0.67	0.53	0.53
(v / s)_i Volume / Saturation Flow Rate	0.14	0.14		0.16	0.30	0.53	0.15
s, saturation flow rate [veh/h]	1852	1680		615	1643	1884	1543
c, Capacity [veh/h]	328	297		352	1103	1001	820
d1, Uniform Delay [s]	25.99	25.94		14.04	5.06	15.43	8.49
k, delay calibration	0.04	0.04		0.04	0.05	0.43	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.72	1.80		0.15	0.14	27.37	0.07
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	0.80	0.79		0.27	0.44	1.00	0.29
d, Delay for Lane Group [s/veh]	27.71	27.73		14.20	5.20	42.81	8.56
Lane Group LOS	C	C		B	A	F	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.87	3.47		0.31	2.04	19.21	1.51
50th-Percentile Queue Length [ft/ln]	96.72	86.79		7.72	51.03	480.16	37.69
95th-Percentile Queue Length [veh/ln]	6.96	6.25		0.56	3.67	26.48	2.71
95th-Percentile Queue Length [ft/ln]	174.10	156.23		13.89	91.86	661.94	67.84

Movement, Approach, & Intersection Results

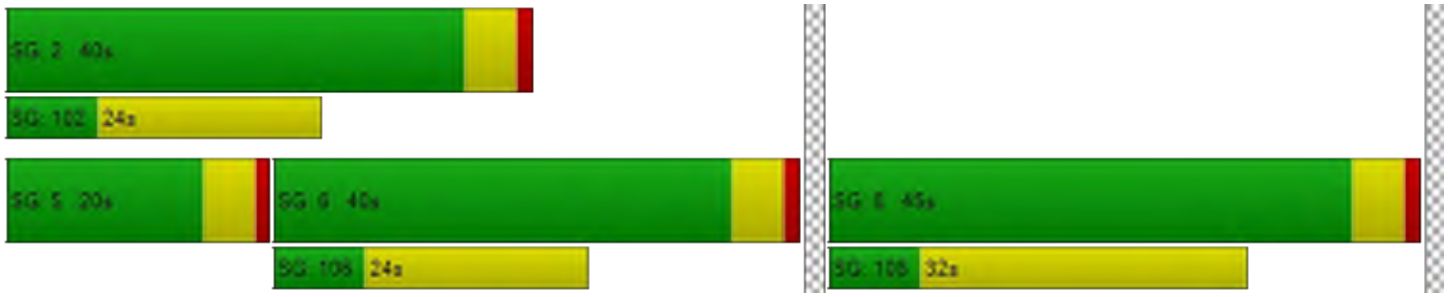
d_M, Delay for Movement [s/veh]	27.71	27.73	27.73	0.00	0.00	0.00	14.20	5.20	0.00	0.00	42.81	8.56
Movement LOS	C	C	C				B	A			F	A
d_A, Approach Delay [s/veh]	27.72			0.00			6.68			36.34		
Approach LOS	C			A			A			D		
d_I, Intersection Delay [s/veh]	27.03											
Intersection LOS	C											
Intersection V/C	0.926											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	22.79	22.79	22.79	22.79
l_p,int, Pedestrian LOS Score for Intersection	2.446	2.024	2.625	3.148
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1217	0	1065	1065
d_b, Bicycle Delay [s]	5.04	32.87	7.19	7.19
l_b,int, Bicycle LOS Score for Intersection	3.257	4.132	2.369	3.820
Bicycle LOS	C	D	B	D

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.087

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	113	1	22	20	3	159	64	774	91	16	1190	15
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	113	1	22	20	3	159	64	774	91	16	1190	15
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	34	0	7	6	1	47	19	230	27	5	354	4
Total Analysis Volume [veh/h]	135	1	26	24	4	189	76	921	108	19	1417	18
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.05	0.09	2.02	0.25	1.12	0.16	0.01	0.00	0.03	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	1210.1	1134.6	161.14	13.92	0.00	0.00	10.42	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	22.90	22.90	22.90	4.36	4.36	9.80	0.56	0.00	0.00	0.09	0.00	0.00
95th-Percentile Queue Length [ft/ln]	572.56	572.56	572.56	109.11	109.11	244.93	13.97	0.00	0.00	2.14	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			295.11			0.96			0.14		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	573.62											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	26.3
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
No. of Lanes in Entry Pocket	0	0	0	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]	30.00		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	470	75	570	263	51	678
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	470	75	570	263	51	678
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	132	21	160	74	14	190
Total Analysis Volume [veh/h]	528	84	640	296	57	762
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	685		57		528	
Exiting Flow Rate [veh/h]	389		1305		769	
Demand Flow Rate [veh/h]	470	75	570	263	51	678
Adjusted Demand Flow Rate [veh/h]	528	84	640	296	57	762

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1420.00	1420.00
B (coefficient)	0.00102	0.00102	0.00091	0.00091
HV Adjustment Factor	1.00	0.92	1.00	0.98
Entry Flow Rate [veh/h]	612	1016	57	778
Capacity of Entry and Bypass Lanes [veh/h]	687	1303	879	879
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	687	1200	879	862
X, volume / capacity	0.89	0.78	0.06	0.88

Movement, Approach, & Intersection Results

Lane LOS	E	C	A	D
95th-Percentile Queue Length [veh]	11.20	8.47	0.21	11.81
95th-Percentile Queue Length [ft]	280.01	211.77	5.19	295.31
Approach Delay [s/veh]	37.29	16.60	29.21	
Approach LOS	E	C	D	
Intersection Delay [s/veh]	26.31			
Intersection LOS	D			

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	26.4
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.026

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	389	187	205	2	5	243
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	389	187	205	2	5	243
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	103	50	55	1	1	65
Total Analysis Volume [veh/h]	414	199	218	2	5	259
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.31	0.00	0.00	0.00	0.03	0.32
d_M, Delay for Movement [s/veh]	8.87	0.00	0.00	0.00	26.35	11.79
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.32	0.00	0.00	0.00	1.52	1.52
95th-Percentile Queue Length [ft/ln]	33.03	0.00	0.00	0.00	38.05	38.05
d_A, Approach Delay [s/veh]	5.99		0.00		12.06	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.25					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: SW Quarry Ave/US 97 SB Ramps

Control Type:	Two-way stop	Delay (sec / veh):	12.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.020

Intersection Setup

Name				US 97 SB Ramps			SW Quarry Ave			SW Quarry Ave		
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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name				US 97 SB Ramps			SW Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	0	0	0	9	0	10	0	3	6	136	113	0
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 [%]	2.00	2.00	2.00	0.00	7.00	0.00	2.00	0.00	8.00	0.00	0.00	2.00
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	0	0	9	0	10	0	3	6	136	113	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	2	0	3	0	1	2	37	30	0
Total Analysis Volume [veh/h]	0	0	0	10	0	11	0	3	6	146	122	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop			Stop			Free			Free		
Flared Lane				No								
Storage Area [veh]	0			0			0			0		
Two-Stage Gap Acceptance				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	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.09	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	12.46	12.92	9.03	0.00	0.00	0.00	7.39	0.00	0.00
Movement LOS				B	B	A		A	A	A	A	
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.10	0.10	0.10	0.00	0.00	0.00	0.26	0.26	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	2.48	2.48	2.48	0.00	0.00	0.00	6.61	6.61	0.00
d_A, Approach Delay [s/veh]	0.00			10.67			0.00			4.03		
Approach LOS	A			B			A			A		
d_I, Intersection Delay [s/veh]	4.37											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 10: SW Quarry Ave/US 97 NB Ramps

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):	0.054

Intersection Setup

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	39	0	37	0	0	0	0	12	0	0	210	29
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 [%]	2.00	2.00	2.00	2.00	2.00	2.00	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	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]	39	0	37	0	0	0	0	12	0	0	210	29
Peak Hour 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
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	0	9	0	0	0	0	3	0	0	53	7
Total Analysis Volume [veh/h]	39	0	37	0	0	0	0	12	0	0	210	29
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.43	10.93	8.78	0.00	0.00	0.00	7.71	0.00	0.00	0.00	0.00	0.00
Movement LOS	B	B	A				A	A			A	A
95th-Percentile Queue Length [veh/ln]	0.29	0.29	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	7.30	7.30	7.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.62			0.00			0.00			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.24											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	85.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.070

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	4	334	496	3	286	565
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	4	334	496	3	286	565
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	89	132	1	76	150
Total Analysis Volume [veh/h]	4	355	528	3	304	601
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	0.66	0.01	0.00	0.30	0.01
d_M, Delay for Movement [s/veh]	84.96	28.79	0.00	0.00	10.12	0.00
Movement LOS	F	D	A	A	B	A
95th-Percentile Queue Length [veh/ln]	5.93	5.93	0.00	0.00	1.28	0.00
95th-Percentile Queue Length [ft/ln]	148.17	148.17	0.00	0.00	31.98	0.00
d_A, Approach Delay [s/veh]	29.41		0.00		3.40	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.60					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	8.7
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way		SE Airport Way		SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way		SE Airport Way		SE Veterans Way	
Base Volume Input [veh/h]	227	354	281	133	131	111
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	5.00	7.00	11.00	2.00
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
Total Hourly Volume [veh/h]	227	354	281	133	131	111
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	60	94	75	35	35	30
Total Analysis Volume [veh/h]	241	377	299	141	139	118
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	154		248		314	
Exiting Flow Rate [veh/h]	434		550		399	
Demand Flow Rate [veh/h]	227	354	281	133	131	111
Adjusted Demand Flow Rate [veh/h]	241	377	299	141	139	118

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	0.96	0.95	0.94
Entry Flow Rate [veh/h]	645	465	275
Capacity of Entry and Bypass Lanes [veh/h]	1180	1072	1002
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1132	1015	940
X, volume / capacity	0.55	0.43	0.27

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	3.43	2.23	1.12
95th-Percentile Queue Length [ft]	85.70	55.74	27.89
Approach Delay [s/veh]	9.67	8.41	6.64
Approach LOS	A	A	A
Intersection Delay [s/veh]	8.66		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	182.5
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	134	381	52	120	379	56	47	321	147	79	730	219
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	134	381	52	120	379	56	47	321	147	79	730	219
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	38	108	15	34	108	16	13	91	42	22	207	62
Total Analysis Volume [veh/h]	152	433	59	136	431	64	53	365	167	90	830	249
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	561			1096			659			648		
Exiting Flow Rate [veh/h]	693			742			1069			569		
Demand Flow Rate [veh/h]	134	381	52	120	379	56	47	321	147	79	730	219
Adjusted Demand Flow Rate [veh/h]	152	433	59	136	431	64	53	365	167	90	830	249

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	657	631	596	1190
Capacity of Entry and Bypass Lanes [veh/h]	779	451	705	713
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	765	451	693	700
X, volume / capacity	0.84	1.40	0.85	1.67

Movement, Approach, & Intersection Results

Lane LOS	D	F	D	F
95th-Percentile Queue Length [veh]	9.75	30.31	9.56	65.36
95th-Percentile Queue Length [ft]	243.78	757.73	238.90	1633.99
Approach Delay [s/veh]	28.67	217.22	31.08	324.20
Approach LOS	D	F	D	F
Intersection Delay [s/veh]	182.47			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	15.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.728

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	210	0	160	0	425	96	321	947	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	78	0	0	12	0	0	0
Total Hourly Volume [veh/h]	0	0	0	210	0	82	0	425	84	321	947	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	56	0	22	0	114	23	86	255	0
Total Analysis Volume [veh/h]	0	0	0	226	0	88	0	457	90	345	1018	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		51	51	51	51	51	51
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		8	8	21	21	33	33
g / C, Green / Cycle		0.16	0.16	0.41	0.41	0.65	0.65
(v / s)_i Volume / Saturation Flow Rate		0.12	0.05	0.24	0.06	0.32	0.61
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1069	1673
c, Capacity [veh/h]		295	261	771	655	746	1083
d1, Uniform Delay [s]		20.60	19.13	11.64	9.32	5.58	8.10
k, delay calibration		0.04	0.04	0.11	0.11	0.24	0.28
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.58	0.28	0.73	0.09	0.99	10.55
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		0.77	0.34	0.59	0.14	0.46	0.94
d, Delay for Lane Group [s/veh]		22.18	19.41	12.38	9.42	6.57	18.65
Lane Group LOS		C	B	B	A	A	B
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		2.45	0.86	3.30	0.51	1.02	8.05
50th-Percentile Queue Length [ft/ln]		61.23	21.48	82.47	12.82	25.50	201.32
95th-Percentile Queue Length [veh/ln]		4.41	1.55	5.94	0.92	1.84	12.71
95th-Percentile Queue Length [ft/ln]		110.22	38.67	148.45	23.07	45.90	317.66

Movement, Approach, & Intersection Results

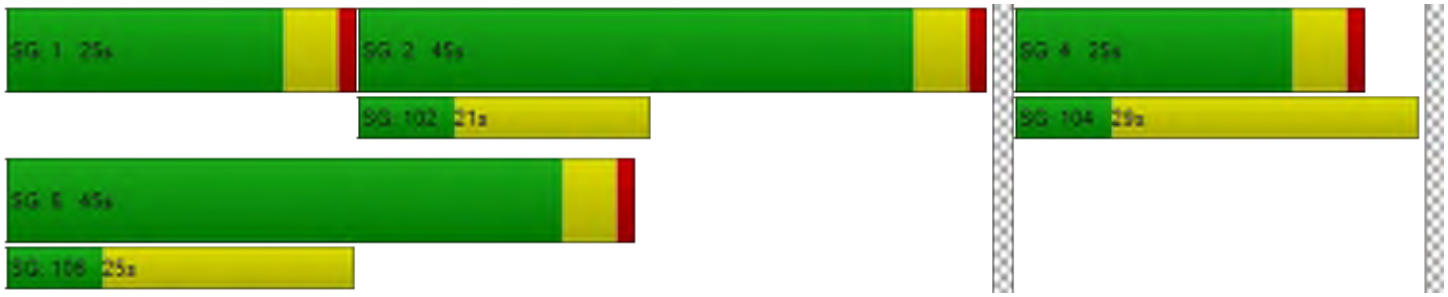
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	22.18	22.18	19.41	0.00	12.38	9.42	6.57	18.65	0.00
Movement LOS				C	C	B		B	A	A	B	
d_A, Approach Delay [s/veh]	0.00			21.41			11.89			15.59		
Approach LOS	A			C			B			B		
d_I, Intersection Delay [s/veh]	15.50											
Intersection LOS	B											
Intersection V/C	0.728											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	15.62	15.62	15.62	15.62
I_p,int, Pedestrian LOS Score for Intersection	2.048	2.146	2.586	2.683
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	787	1573	1573
d_b, Bicycle Delay [s]	25.43	9.36	1.16	1.16
I_b,int, Bicycle LOS Score for Intersection	4.132	2.757	2.328	3.655
Bicycle LOS	D	C	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	31.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.949

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	217	1	423	0	0	0	94	541	0	0	1050	488
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	199	0	0	0	0	0	0	0	0	239
Total Hourly Volume [veh/h]	217	1	224	0	0	0	94	541	0	0	1050	249
Peak Hour 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
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]	54	0	56	0	0	0	24	135	0	0	263	62
Total Analysis Volume [veh/h]	217	1	224	0	0	0	94	541	0	0	1050	249
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	65	65		65	65	65	65
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	11	11		44	44	35	35
g / C, Green / Cycle	0.17	0.17		0.68	0.68	0.54	0.54
(v / s)_i Volume / Saturation Flow Rate	0.12	0.13		0.16	0.33	0.56	0.16
s, saturation flow rate [veh/h]	1852	1681		594	1643	1884	1543
c, Capacity [veh/h]	313	284		353	1113	1011	829
d1, Uniform Delay [s]	25.49	25.98		13.97	5.06	15.10	8.31
k, delay calibration	0.04	0.04		0.04	0.10	0.46	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.03	1.89		0.15	0.30	37.59	0.07
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	0.69	0.79		0.27	0.49	1.04	0.30
d, Delay for Lane Group [s/veh]	26.51	27.87		14.12	5.36	52.69	8.38
Lane Group LOS	C	C		B	A	F	A
Critical Lane Group	No	Yes		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.08	3.31		0.28	2.28	22.01	1.57
50th-Percentile Queue Length [ft/ln]	76.91	82.64		7.11	56.94	550.13	39.19
95th-Percentile Queue Length [veh/ln]	5.54	5.95		0.51	4.10	30.59	2.82
95th-Percentile Queue Length [ft/ln]	138.43	148.76		12.80	102.49	764.81	70.54

Movement, Approach, & Intersection Results

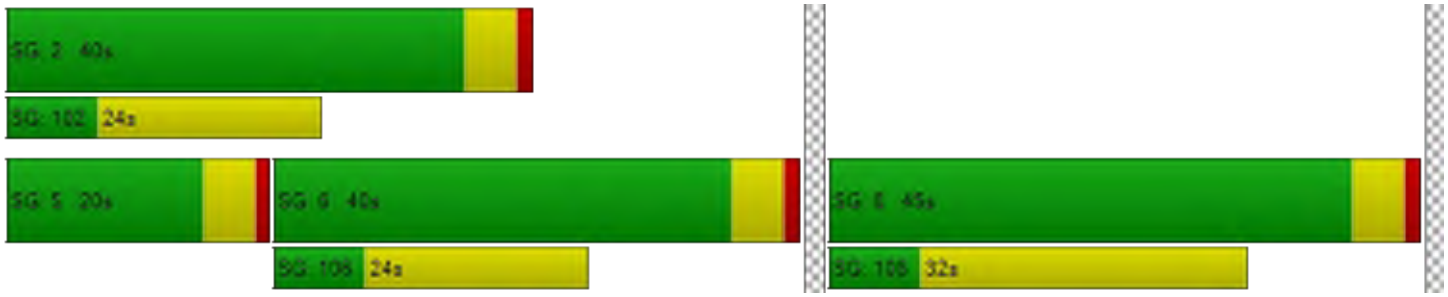
d_M, Delay for Movement [s/veh]	26.51	27.87	27.87	0.00	0.00	0.00	14.12	5.36	0.00	0.00	52.69	8.38
Movement LOS	C	C	C				B	A			F	A
d_A, Approach Delay [s/veh]	27.20			0.00			6.66			44.20		
Approach LOS	C			A			A			D		
d_I, Intersection Delay [s/veh]	31.00											
Intersection LOS	C											
Intersection V/C	0.949											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	22.47	22.47	22.47	22.47
l_p,int, Pedestrian LOS Score for Intersection	2.414	2.050	2.643	3.211
Crosswalk LOS	B	B	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1229	0	1076	1076
d_b, Bicycle Delay [s]	4.83	32.54	6.95	6.95
l_b,int, Bicycle LOS Score for Intersection	3.153	4.132	2.453	3.943
Bicycle LOS	C	D	B	D

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.096

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	112	1	23	21	3	157	63	810	91	16	1269	16
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	112	1	23	21	3	157	63	810	91	16	1269	16
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	33	0	7	6	1	47	19	241	27	5	378	5
Total Analysis Volume [veh/h]	133	1	27	25	4	187	75	964	108	19	1511	19
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.06	0.10	2.75	0.32	1.26	0.17	0.01	0.00	0.03	0.02	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	1728.4	1618.9	219.59	14.83	0.00	0.00	10.63	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	22.78	22.78	22.78	4.74	4.74	11.14	0.61	0.00	0.00	0.09	0.00	0.00
95th-Percentile Queue Length [ft/ln]	569.40	569.40	569.40	118.47	118.47	278.58	15.17	0.00	0.00	2.23	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			420.13			0.97			0.13		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	553.88											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	21.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
No. of Lanes in Entry Pocket	0	1	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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	588	87	597	306	48	626
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	588	87	597	306	48	626
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	165	24	168	86	13	176
Total Analysis Volume [veh/h]	661	98	671	344	54	703
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	718		54		661	
Exiting Flow Rate [veh/h]	439		1378		816	
Demand Flow Rate [veh/h]	588	87	597	306	48	626
Adjusted Demand Flow Rate [veh/h]	661	98	671	344	54	703

Lanes

Overwrite Calculated Critical Headway	No	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00	4.00
Overwrite Calculated Follow-Up Time	No	No	No	No	No
User-Defined Follow-Up Time [s]	3.00	3.00	3.00	3.00	3.00
A (intercept)	1420.00	1420.00	1380.00	1420.00	1420.00
B (coefficient)	0.00091	0.00091	0.00102	0.00091	0.00091
HV Adjustment Factor	1.00	1.00	0.92	0.98	0.98
Entry Flow Rate [veh/h]	661	98	1103	363	410
Capacity of Entry and Bypass Lanes [veh/h]	739	739	1307	779	779
Pedestrian Impedance	1.00	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	739	739	1203	764	763
X, volume / capacity	0.89	0.13	0.84	0.47	0.53

Movement, Approach, & Intersection Results

Lane LOS	E	A	C	B	B
95th-Percentile Queue Length [veh]	11.61	0.46	11.05	2.49	3.11
95th-Percentile Queue Length [ft]	290.36	11.40	276.27	62.33	77.84
Approach Delay [s/veh]	32.06		20.82	11.81	
Approach LOS	D		C	B	
Intersection Delay [s/veh]	21.49				
Intersection LOS	C				

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	26.5
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.026

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	390	181	211	2	5	249
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	390	181	211	2	5	249
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	104	48	56	1	1	66
Total Analysis Volume [veh/h]	415	193	224	2	5	265
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.31	0.00	0.00	0.00	0.03	0.33
d_M, Delay for Movement [s/veh]	8.90	0.00	0.00	0.00	26.48	11.94
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.34	0.00	0.00	0.00	1.59	1.59
95th-Percentile Queue Length [ft/ln]	33.39	0.00	0.00	0.00	39.68	39.68
d_A, Approach Delay [s/veh]	6.08		0.00		12.21	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.33					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: SW Quarry Ave/US 97 SB Ramps

Control Type:	Two-way stop	Delay (sec / veh):	14.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.028

Intersection Setup

Name				US 97 SB Ramps			SW Quarry Ave			SW Quarry Ave		
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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name				US 97 SB Ramps			SW Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	0	0	0	10	0	11	0	5	8	174	154	0
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 [%]	2.00	2.00	2.00	0.00	7.00	0.00	2.00	0.00	8.00	0.00	0.00	2.00
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	0	0	10	0	11	0	5	8	174	154	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	3	0	3	0	1	2	47	41	0
Total Analysis Volume [veh/h]	0	0	0	11	0	12	0	5	9	187	166	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop			Stop			Free			Free		
Flared Lane				No								
Storage Area [veh]	0			0			0			0		
Two-Stage Gap Acceptance				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	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.12	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	14.47	14.80	9.36	0.00	0.00	0.00	7.46	0.00	0.00
Movement LOS				B	B	A		A	A	A	A	
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.13	0.13	0.13	0.00	0.00	0.00	0.35	0.35	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	3.25	3.25	3.25	0.00	0.00	0.00	8.68	8.68	0.00
d_A, Approach Delay [s/veh]	0.00			11.80			0.00			3.95		
Approach LOS	A			B			A			A		
d_I, Intersection Delay [s/veh]	4.27											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 10: SW Quarry Ave/US 97 NB Ramps

Control Type:	Two-way stop	Delay (sec / veh):	11.2
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.079

Intersection Setup

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	51	0	52	0	0	0	0	15	0	0	277	30
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 [%]	2.00	2.00	2.00	2.00	2.00	2.00	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	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]	51	0	52	0	0	0	0	15	0	0	277	30
Peak Hour 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
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]	13	0	13	0	0	0	0	4	0	0	69	8
Total Analysis Volume [veh/h]	51	0	52	0	0	0	0	15	0	0	277	30
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	11.23	11.70	9.04	0.00	0.00	0.00	7.87	0.00	0.00	0.00	0.00	0.00
Movement LOS	B	B	A				A	A			A	A
95th-Percentile Queue Length [veh/ln]	0.44	0.44	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	10.94	10.94	10.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	10.12			0.00			0.00			0.00		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	2.45											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	56.5
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.065

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	6	320	454	4	220	506
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	6	320	454	4	220	506
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	85	121	1	59	135
Total Analysis Volume [veh/h]	6	340	483	4	234	538
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	0.59	0.00	0.00	0.22	0.01
d_M, Delay for Movement [s/veh]	56.54	23.61	0.00	0.00	9.43	0.00
Movement LOS	F	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	4.79	4.79	0.00	0.00	0.86	0.00
95th-Percentile Queue Length [ft/ln]	119.73	119.73	0.00	0.00	21.44	0.00
d_A, Approach Delay [s/veh]	24.18		0.00		2.86	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	6.59					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	7.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	175	304	224	120	121	97
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	175	304	224	120	121	97
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	47	81	60	32	32	26
Total Analysis Volume [veh/h]	186	323	238	128	129	103
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	143		192		255	
Exiting Flow Rate [veh/h]	360		482		326	
Demand Flow Rate [veh/h]	175	304	224	120	121	97
Adjusted Demand Flow Rate [veh/h]	186	323	238	128	129	103

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	0.96	0.94	0.94
Entry Flow Rate [veh/h]	531	390	248
Capacity of Entry and Bypass Lanes [veh/h]	1193	1136	1065
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1144	1068	997
X, volume / capacity	0.45	0.34	0.23

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	2.34	1.54	0.90
95th-Percentile Queue Length [ft]	58.42	38.44	22.55
Approach Delay [s/veh]	7.87	6.83	5.87
Approach LOS	A	A	A
Intersection Delay [s/veh]	7.11		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	54.7
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	105	309	94	87	290	20	19	246	118	135	535	165
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	105	309	94	87	290	20	19	246	118	135	535	165
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	30	88	27	25	82	6	5	70	34	38	152	47
Total Analysis Volume [veh/h]	119	351	107	99	330	23	22	280	134	153	608	188
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	407			900			585			500		
Exiting Flow Rate [veh/h]	623			566			767			495		
Demand Flow Rate [veh/h]	105	309	94	87	290	20	19	246	118	135	535	165
Adjusted Demand Flow Rate [veh/h]	119	351	107	99	330	23	22	280	134	153	608	188

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	589	452	445	967
Capacity of Entry and Bypass Lanes [veh/h]	912	552	760	829
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	894	552	746	814
X, volume / capacity	0.65	0.82	0.58	1.17

Movement, Approach, & Intersection Results

Lane LOS	B	D	B	F
95th-Percentile Queue Length [veh]	4.87	8.22	3.84	29.12
95th-Percentile Queue Length [ft]	121.63	205.62	96.06	728.02
Approach Delay [s/veh]	14.28	33.80	14.32	107.78
Approach LOS	B	D	B	F
Intersection Delay [s/veh]	54.70			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	9.0
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.540

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	142	0	179	0	269	183	423	714	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	88	0	0	24	0	0	0
Total Hourly Volume [veh/h]	0	0	0	142	0	91	0	269	159	423	714	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	38	0	24	0	72	43	114	192	0
Total Analysis Volume [veh/h]	0	0	0	153	0	98	0	289	171	455	768	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		38	38	38	38	38	38
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		5	5	10	10	23	23
g / C, Green / Cycle		0.13	0.13	0.26	0.26	0.61	0.61
(v / s)_i Volume / Saturation Flow Rate		0.08	0.06	0.15	0.11	0.36	0.46
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1257	1673
c, Capacity [veh/h]		237	210	493	419	926	1018
d1, Uniform Delay [s]		15.66	15.28	12.07	11.43	4.68	5.34
k, delay calibration		0.04	0.04	0.11	0.11	0.13	0.11
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.09	0.60	1.11	0.64	0.47	1.16
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		0.64	0.47	0.59	0.41	0.49	0.75
d, Delay for Lane Group [s/veh]		16.75	15.88	13.18	12.07	5.15	6.50
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.11	0.68	1.71	0.95	0.73	1.72
50th-Percentile Queue Length [ft/ln]		27.79	17.12	42.81	23.72	18.29	42.88
95th-Percentile Queue Length [veh/ln]		2.00	1.23	3.08	1.71	1.32	3.09
95th-Percentile Queue Length [ft/ln]		50.02	30.81	77.06	42.70	32.93	77.18

Movement, Approach, & Intersection Results

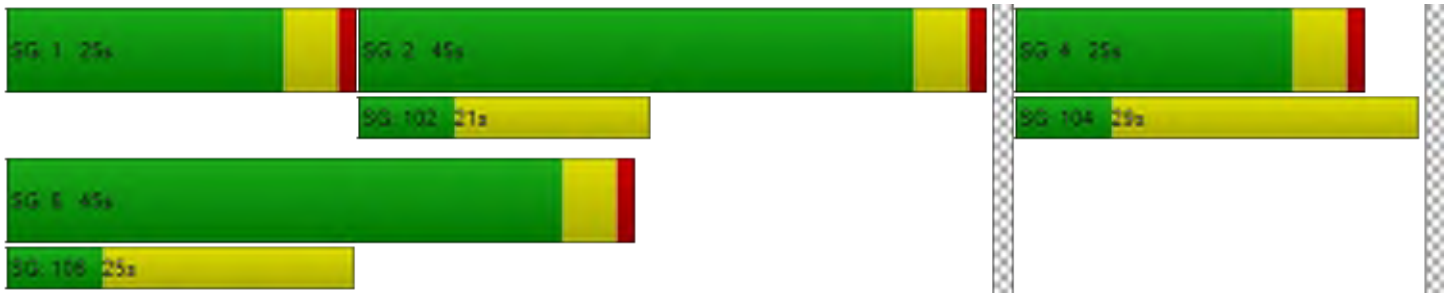
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	16.75	16.75	15.88	0.00	13.18	12.07	5.15	6.50	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			16.41			12.76			6.00		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	8.96											
Intersection LOS	A											
Intersection V/C	0.540											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.39	9.39	9.39	9.39
l_p,int, Pedestrian LOS Score for Intersection	2.210	2.123	2.467	2.519
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1065	2130	2130
d_b, Bicycle Delay [s]	18.78	4.11	0.08	0.08
l_b,int, Bicycle LOS Score for Intersection	4.132	2.670	2.204	3.424
Bicycle LOS	D	B	B	C

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	18.0
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.877

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	319	1	313	0	0	0	84	327	0	0	819	299
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	147	0	0	0	0	0	0	0	0	147
Total Hourly Volume [veh/h]	319	1	166	0	0	0	84	327	0	0	819	152
Peak Hour 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
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]	80	0	42	0	0	0	21	82	0	0	205	38
Total Analysis Volume [veh/h]	319	1	166	0	0	0	84	327	0	0	819	152
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	57	57		57	57	57	57
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	12	12		35	35	27	27
g / C, Green / Cycle	0.21	0.21		0.62	0.62	0.46	0.46
(v / s)_i Volume / Saturation Flow Rate	0.17	0.10		0.11	0.20	0.43	0.10
s, saturation flow rate [veh/h]	1852	1681		744	1643	1884	1543
c, Capacity [veh/h]	388	352		421	1013	876	717
d1, Uniform Delay [s]	21.68	19.93		10.22	5.27	14.55	9.10
k, delay calibration	0.04	0.04		0.04	0.04	0.18	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.69	0.37		0.09	0.07	8.48	0.05
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	0.82	0.47		0.20	0.32	0.94	0.21
d, Delay for Lane Group [s/veh]	23.37	20.30		10.31	5.34	23.03	9.15
Lane Group LOS	C	C		B	A	C	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.92	1.84		0.28	1.24	9.91	0.92
50th-Percentile Queue Length [ft/ln]	98.09	45.91		6.89	31.09	247.77	23.04
95th-Percentile Queue Length [veh/ln]	7.06	3.31		0.50	2.24	15.07	1.66
95th-Percentile Queue Length [ft/ln]	176.56	82.64		12.40	55.96	376.85	41.48

Movement, Approach, & Intersection Results

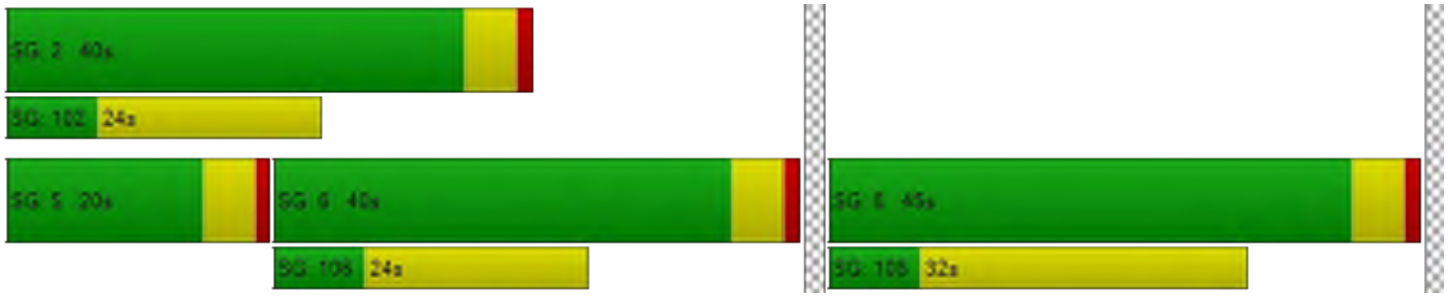
d_M, Delay for Movement [s/veh]	23.37	20.30	20.30	0.00	0.00	0.00	10.31	5.34	0.00	0.00	23.03	9.15
Movement LOS	C	C	C				B	A			C	A
d_A, Approach Delay [s/veh]	22.32			0.00			6.36			20.86		
Approach LOS	C			A			A			C		
d_I, Intersection Delay [s/veh]	18.05											
Intersection LOS	B											
Intersection V/C	0.877											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	18.72	18.72	18.72	18.72
l_p,int, Pedestrian LOS Score for Intersection	2.330	1.832	2.502	2.791
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1395	0	1221	1221
d_b, Bicycle Delay [s]	2.62	28.67	4.35	4.35
l_b,int, Bicycle LOS Score for Intersection	3.140	4.132	2.084	3.250
Bicycle LOS	C	D	B	C

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	2,946.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	6.516

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	87	1	17	18	3	137	45	517	79	16	894	13
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	87	1	17	18	3	137	45	517	79	16	894	13
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	26	0	5	5	1	41	13	154	24	5	266	4
Total Analysis Volume [veh/h]	104	1	20	21	4	163	54	615	94	19	1064	15
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	6.52	0.02	0.04	0.45	0.08	0.60	0.08	0.01	0.00	0.02	0.01	0.00
d_M, Delay for Movement [s/veh]	2946.2	2777.0	2728.6	148.76	139.30	36.37	11.00	0.00	0.00	9.09	0.00	0.00
Movement LOS	F	F	F	F	F	E	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	16.15	16.15	16.15	1.98	1.98	3.57	0.27	0.00	0.00	0.06	0.00	0.00
95th-Percentile Queue Length [ft/ln]	403.78	403.78	403.78	49.43	49.43	89.23	6.73	0.00	0.00	1.62	0.00	0.00
d_A, Approach Delay [s/veh]	2910.03			51.11			0.78			0.16		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	172.09											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	15.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	340	36	566	120	13	619
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	340	36	566	120	13	619
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	96	10	159	34	4	174
Total Analysis Volume [veh/h]	382	40	636	135	15	696
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	681		15		382	
Exiting Flow Rate [veh/h]	166		1092		721	
Demand Flow Rate [veh/h]	340	36	566	120	13	619
Adjusted Demand Flow Rate [veh/h]	382	40	636	135	15	696

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	0.93	0.98
Entry Flow Rate [veh/h]	422	832	725
Capacity of Entry and Bypass Lanes [veh/h]	690	1360	935
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	690	1261	917
X, volume / capacity	0.61	0.61	0.78

Movement, Approach, & Intersection Results

Lane LOS	C	B	C
95th-Percentile Queue Length [veh]	4.21	4.41	7.93
95th-Percentile Queue Length [ft]	105.16	110.25	198.14
Approach Delay [s/veh]	16.17	10.31	19.92
Approach LOS	C	B	C
Intersection Delay [s/veh]	15.20		
Intersection LOS	C		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	21.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.025

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	321	175	218	3	6	163
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	321	175	218	3	6	163
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	85	47	58	1	2	43
Total Analysis Volume [veh/h]	341	186	232	3	6	173
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.26	0.00	0.00	0.00	0.02	0.21
d_M, Delay for Movement [s/veh]	8.65	0.00	0.00	0.00	21.50	10.98
Movement LOS	A	A	A	A	C	B
95th-Percentile Queue Length [veh/ln]	1.03	0.00	0.00	0.00	0.93	0.93
95th-Percentile Queue Length [ft/ln]	25.74	0.00	0.00	0.00	23.34	23.34
d_A, Approach Delay [s/veh]	5.60		0.00		11.33	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	5.29					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	61.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.015

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	14	2367	1807	15	1	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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]	14	2367	1807	15	1	9
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	4	636	486	4	0	2
Total Analysis Volume [veh/h]	15	2545	1943	16	1	10
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.03	0.02	0.00	0.02	0.04
d_M, Delay for Movement [s/veh]	17.57	0.00	0.00	0.00	61.20	20.51
Movement LOS	C	A	A	A	F	C
95th-Percentile Queue Length [veh/ln]	0.16	0.00	0.00	0.00	0.13	0.13
95th-Percentile Queue Length [ft/ln]	3.91	0.00	0.00	0.00	3.28	3.28
d_A, Approach Delay [s/veh]	0.10		0.00		24.21	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.12					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	55.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.063

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	6	320	455	4	208	515
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	6	320	455	4	208	515
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	85	121	1	55	137
Total Analysis Volume [veh/h]	6	340	484	4	221	548
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	0.60	0.00	0.00	0.21	0.01
d_M, Delay for Movement [s/veh]	54.98	23.51	0.00	0.00	9.37	0.00
Movement LOS	F	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	4.76	4.76	0.00	0.00	0.80	0.00
95th-Percentile Queue Length [ft/ln]	119.12	119.12	0.00	0.00	19.97	0.00
d_A, Approach Delay [s/veh]	24.06		0.00		2.69	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	6.48					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	7.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	194	339	228	109	116	117
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	194	339	228	109	116	117
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	52	90	61	29	31	31
Total Analysis Volume [veh/h]	206	361	243	116	123	124
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	137		212		260	
Exiting Flow Rate [veh/h]	386		516		334	
Demand Flow Rate [veh/h]	194	339	228	109	116	117
Adjusted Demand Flow Rate [veh/h]	206	361	243	116	123	124

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	0.96	0.94	0.94
Entry Flow Rate [veh/h]	592	382	263
Capacity of Entry and Bypass Lanes [veh/h]	1201	1112	1059
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1152	1046	996
X, volume / capacity	0.49	0.34	0.25

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	2.80	1.54	0.98
95th-Percentile Queue Length [ft]	70.07	38.55	24.48
Approach Delay [s/veh]	8.58	6.95	6.04
Approach LOS	A	A	A
Intersection Delay [s/veh]	7.55		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	51.4
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	103	313	98	84	293	17	17	242	122	145	514	164
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	103	313	98	84	293	17	17	242	122	145	514	164
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	29	89	28	24	83	5	5	69	35	41	146	47
Total Analysis Volume [veh/h]	117	356	111	95	333	19	19	275	139	165	584	186
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	395			886			596			500		
Exiting Flow Rate [veh/h]	643			566			736			490		
Demand Flow Rate [veh/h]	103	313	98	84	293	17	17	242	122	145	514	164
Adjusted Demand Flow Rate [veh/h]	117	356	111	95	333	19	19	275	139	165	584	186

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	596	447	442	952
Capacity of Entry and Bypass Lanes [veh/h]	923	560	752	829
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	906	560	738	814
X, volume / capacity	0.65	0.80	0.59	1.15

Movement, Approach, & Intersection Results

Lane LOS	B	D	B	F
95th-Percentile Queue Length [veh]	4.87	7.71	3.88	27.77
95th-Percentile Queue Length [ft]	121.68	192.81	96.91	694.27
Approach Delay [s/veh]	14.14	31.28	14.53	101.31
Approach LOS	B	D	B	F
Intersection Delay [s/veh]	51.38			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	9.2
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.540

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	152	0	176	0	270	180	439	706	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	86	0	0	23	0	0	0
Total Hourly Volume [veh/h]	0	0	0	152	0	90	0	270	157	439	706	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	41	0	24	0	73	42	118	190	0
Total Analysis Volume [veh/h]	0	0	0	163	0	97	0	290	169	472	759	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		38	38	38	38	38	38
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		5	5	10	10	23	23
g / C, Green / Cycle		0.13	0.13	0.26	0.26	0.61	0.61
(v / s)_i Volume / Saturation Flow Rate		0.09	0.06	0.16	0.11	0.37	0.45
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1265	1673
c, Capacity [veh/h]		247	219	484	412	924	1018
d1, Uniform Delay [s]		15.87	15.39	12.48	11.80	4.88	5.39
k, delay calibration		0.04	0.04	0.11	0.11	0.15	0.11
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.12	0.52	1.19	0.66	0.62	1.11
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		0.66	0.44	0.60	0.41	0.51	0.75
d, Delay for Lane Group [s/veh]		16.99	15.91	13.67	12.45	5.50	6.50
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.21	0.69	1.80	0.98	0.86	1.78
50th-Percentile Queue Length [ft/ln]		30.32	17.18	44.91	24.41	21.38	44.57
95th-Percentile Queue Length [veh/ln]		2.18	1.24	3.23	1.76	1.54	3.21
95th-Percentile Queue Length [ft/ln]		54.57	30.92	80.84	43.95	38.49	80.23

Movement, Approach, & Intersection Results

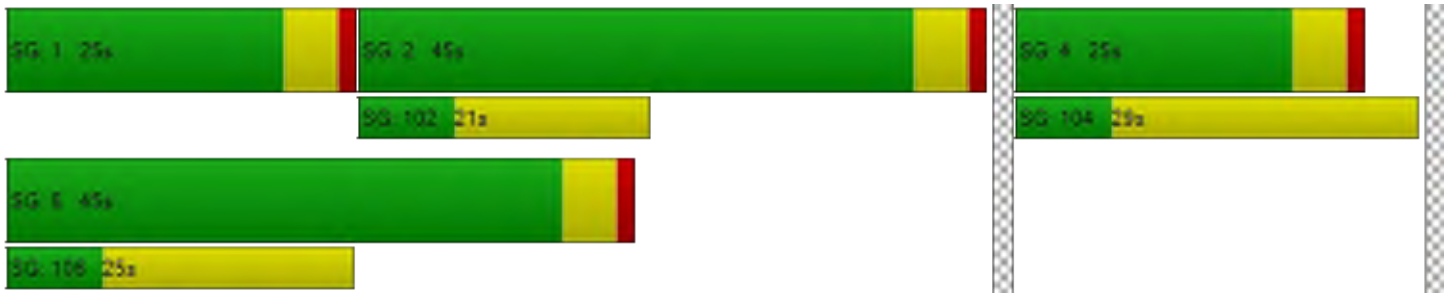
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	16.99	16.99	15.91	0.00	13.67	12.45	5.50	6.50	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			16.58			13.22			6.12		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	9.19											
Intersection LOS	A											
Intersection V/C	0.540											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.73	9.73	9.73	9.73
l_p,int, Pedestrian LOS Score for Intersection	2.229	2.124	2.461	2.527
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1044	2089	2089
d_b, Bicycle Delay [s]	19.15	4.37	0.04	0.04
l_b,int, Bicycle LOS Score for Intersection	4.132	2.681	2.201	3.437
Bicycle LOS	D	B	B	C

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	18.3
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.878

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	298	1	306	0	0	0	79	343	0	0	847	304
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	144	0	0	0	0	0	0	0	0	149
Total Hourly Volume [veh/h]	298	1	162	0	0	0	79	343	0	0	847	155
Peak Hour 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
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]	75	0	41	0	0	0	20	86	0	0	212	39
Total Analysis Volume [veh/h]	298	1	162	0	0	0	79	343	0	0	847	155
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	58	58		58	58	58	58
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	11	11		36	36	28	28
g / C, Green / Cycle	0.20	0.20		0.63	0.63	0.48	0.48
(v / s)_i Volume / Saturation Flow Rate	0.16	0.10		0.11	0.21	0.45	0.10
s, saturation flow rate [veh/h]	1852	1681		723	1643	1884	1543
c, Capacity [veh/h]	367	333		416	1033	903	740
d1, Uniform Delay [s]	22.11	20.55		10.34	5.03	14.21	8.68
k, delay calibration	0.04	0.04		0.04	0.04	0.21	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.66	0.41		0.08	0.07	9.40	0.05
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	0.81	0.49		0.19	0.33	0.94	0.21
d, Delay for Lane Group [s/veh]	23.77	20.96		10.42	5.10	23.61	8.73
Lane Group LOS	C	C		B	A	C	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.70	1.83		0.24	1.25	10.40	0.91
50th-Percentile Queue Length [ft/ln]	92.53	45.83		6.11	31.20	259.88	22.71
95th-Percentile Queue Length [veh/ln]	6.66	3.30		0.44	2.25	15.68	1.64
95th-Percentile Queue Length [ft/ln]	166.55	82.50		11.01	56.17	392.07	40.88

Movement, Approach, & Intersection Results

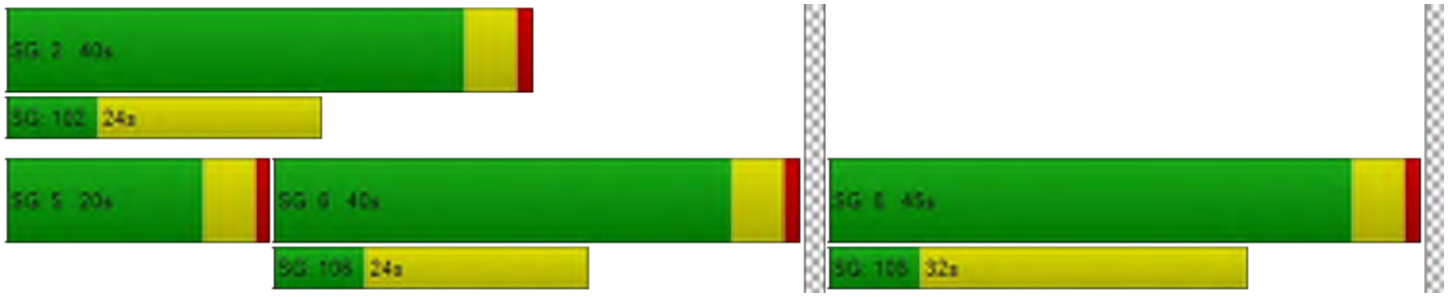
d_M, Delay for Movement [s/veh]	23.77	20.96	20.96	0.00	0.00	0.00	10.42	5.10	0.00	0.00	23.61	8.73
Movement LOS	C	C	C				B	A			C	A
d_A, Approach Delay [s/veh]	22.78			0.00			6.10			21.31		
Approach LOS	C			A			A			C		
d_I, Intersection Delay [s/veh]	18.26											
Intersection LOS	B											
Intersection V/C	0.878											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	18.84	18.84	18.84	18.84
l_p,int, Pedestrian LOS Score for Intersection	2.317	1.831	2.509	2.810
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1389	0	1216	1216
d_b, Bicycle Delay [s]	2.68	28.79	4.43	4.43
l_b,int, Bicycle LOS Score for Intersection	3.093	4.132	2.102	3.305
Bicycle LOS	C	D	B	C

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	3,604.6
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	7.786

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	86	1	18	19	4	136	45	526	78	17	928	13
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	86	1	18	19	4	136	45	526	78	17	928	13
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	26	0	5	6	1	40	13	157	23	5	276	4
Total Analysis Volume [veh/h]	102	1	21	23	5	162	54	626	93	20	1105	15
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	7.79	0.02	0.05	0.55	0.10	0.63	0.09	0.01	0.00	0.02	0.01	0.00
d_M, Delay for Movement [s/veh]	3604.5	3390.9	3337.8	187.91	176.51	40.21	11.24	0.00	0.00	9.13	0.00	0.00
Movement LOS	F	F	F	F	F	E	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	16.37	16.37	16.37	2.44	2.44	3.86	0.28	0.00	0.00	0.07	0.00	0.00
95th-Percentile Queue Length [ft/ln]	409.17	409.17	409.17	60.97	60.97	96.55	6.99	0.00	0.00	1.72	0.00	0.00
d_A, Approach Delay [s/veh]	3557.67			61.68			0.79			0.16		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	203.71											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	19.1
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	385	81	587	134	23	603
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	385	81	587	134	23	603
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	108	23	165	38	6	169
Total Analysis Volume [veh/h]	433	91	660	151	26	678
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	706		26		433	
Exiting Flow Rate [veh/h]	195		1125		797	
Demand Flow Rate [veh/h]	385	81	587	134	23	603
Adjusted Demand Flow Rate [veh/h]	433	91	660	151	26	678

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	0.93	0.98
Entry Flow Rate [veh/h]	524	876	718
Capacity of Entry and Bypass Lanes [veh/h]	672	1344	888
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	672	1246	871
X, volume / capacity	0.78	0.65	0.81

Movement, Approach, & Intersection Results

Lane LOS	D	B	C
95th-Percentile Queue Length [veh]	7.56	5.12	8.89
95th-Percentile Queue Length [ft]	188.97	127.92	222.19
Approach Delay [s/veh]	25.61	11.37	23.08
Approach LOS	D	B	C
Intersection Delay [s/veh]	19.07		
Intersection LOS	C		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	21.6
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.025

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	318	178	232	3	6	163
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	318	178	232	3	6	163
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	85	47	62	1	2	43
Total Analysis Volume [veh/h]	338	189	247	3	6	173
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.26	0.00	0.00	0.00	0.03	0.22
d_M, Delay for Movement [s/veh]	8.70	0.00	0.00	0.00	21.61	11.13
Movement LOS	A	A	A	A	C	B
95th-Percentile Queue Length [veh/ln]	1.03	0.00	0.00	0.00	0.95	0.95
95th-Percentile Queue Length [ft/ln]	25.87	0.00	0.00	0.00	23.87	23.87
d_A, Approach Delay [s/veh]	5.58		0.00		11.48	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	5.23					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	62.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.016

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	14	2357	1823	15	1	10
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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]	14	2357	1823	15	1	10
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	4	634	490	4	0	3
Total Analysis Volume [veh/h]	15	2534	1960	16	1	11
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.03	0.02	0.00	0.02	0.05
d_M, Delay for Movement [s/veh]	17.77	0.00	0.00	0.00	62.04	20.79
Movement LOS	C	A	A	A	F	C
95th-Percentile Queue Length [veh/ln]	0.16	0.00	0.00	0.00	0.15	0.15
95th-Percentile Queue Length [ft/ln]	3.97	0.00	0.00	0.00	3.66	3.66
d_A, Approach Delay [s/veh]	0.10		0.00		24.22	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.12					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	90.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.058

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	3	332	498	3	313	542
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	3	332	498	3	313	542
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	88	132	1	83	144
Total Analysis Volume [veh/h]	3	353	530	3	333	577
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	0.66	0.01	0.00	0.33	0.01
d_M, Delay for Movement [s/veh]	90.21	27.69	0.00	0.00	10.35	0.00
Movement LOS	F	D	A	A	B	A
95th-Percentile Queue Length [veh/ln]	5.67	5.67	0.00	0.00	1.46	0.00
95th-Percentile Queue Length [ft/ln]	141.83	141.83	0.00	0.00	36.54	0.00
d_A, Approach Delay [s/veh]	28.21		0.00		3.79	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.50					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	8.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way		SE Airport Way		SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way		SE Airport Way		SE Veterans Way	
Base Volume Input [veh/h]	209	321	307	165	123	96
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	5.00	7.00	11.00	2.00
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
Total Hourly Volume [veh/h]	209	321	307	165	123	96
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	56	85	82	44	33	26
Total Analysis Volume [veh/h]	222	341	327	176	131	102
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	145		229		343	
Exiting Flow Rate [veh/h]	447		503		417	
Demand Flow Rate [veh/h]	209	321	307	165	123	96
Adjusted Demand Flow Rate [veh/h]	222	341	327	176	131	102

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	0.96	0.95	0.94
Entry Flow Rate [veh/h]	587	532	249
Capacity of Entry and Bypass Lanes [veh/h]	1190	1093	973
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1142	1035	910
X, volume / capacity	0.49	0.49	0.26

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	2.81	2.73	1.02
95th-Percentile Queue Length [ft]	70.23	68.23	25.51
Approach Delay [s/veh]	8.65	9.17	6.59
Approach LOS	A	A	A
Intersection Delay [s/veh]	8.48		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	128.5
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	124	376	85	93	328	25	26	288	147	136	639	203
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	124	376	85	93	328	25	26	288	147	136	639	203
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	35	107	24	26	93	7	7	82	42	39	182	58
Total Analysis Volume [veh/h]	141	427	97	106	373	28	30	327	167	155	726	231
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	470			1045			637			608		
Exiting Flow Rate [veh/h]	701			695			915			539		
Demand Flow Rate [veh/h]	124	376	85	93	328	25	26	288	147	136	639	203
Adjusted Demand Flow Rate [veh/h]	141	427	97	106	373	28	30	327	167	155	726	231

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	678	507	534	1132
Capacity of Entry and Bypass Lanes [veh/h]	855	476	721	743
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	839	476	708	730
X, volume / capacity	0.79	1.07	0.74	1.52

Movement, Approach, & Intersection Results

Lane LOS	C	F	C	F
95th-Percentile Queue Length [veh]	8.30	15.92	6.65	55.37
95th-Percentile Queue Length [ft]	207.60	398.02	166.24	1384.35
Approach Delay [s/veh]	22.50	89.82	21.88	259.68
Approach LOS	C	F	C	F
Intersection Delay [s/veh]	128.47			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	10.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.621

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	149	0	201	0	315	189	421	834	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	98	0	0	25	0	0	0
Total Hourly Volume [veh/h]	0	0	0	149	0	103	0	315	164	421	834	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	40	0	28	0	85	44	113	224	0
Total Analysis Volume [veh/h]	0	0	0	160	0	111	0	339	176	453	897	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		38	38	38	38	38	38
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		5	5	10	10	23	23
g / C, Green / Cycle		0.13	0.13	0.26	0.26	0.61	0.61
(v / s)_i Volume / Saturation Flow Rate		0.09	0.07	0.18	0.11	0.37	0.54
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1234	1673
c, Capacity [veh/h]		247	218	492	418	890	1013
d1, Uniform Delay [s]		15.67	15.36	12.59	11.59	5.12	6.37
k, delay calibration		0.04	0.04	0.11	0.11	0.14	0.11
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.07	0.68	1.73	0.67	0.58	2.81
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		0.65	0.51	0.69	0.42	0.51	0.89
d, Delay for Lane Group [s/veh]		16.74	16.04	14.32	12.26	5.70	9.17
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.17	0.79	2.16	1.00	0.79	2.80
50th-Percentile Queue Length [ft/ln]		29.22	19.65	53.94	24.91	19.73	70.04
95th-Percentile Queue Length [veh/ln]		2.10	1.42	3.88	1.79	1.42	5.04
95th-Percentile Queue Length [ft/ln]		52.60	35.38	97.10	44.85	35.52	126.08

Movement, Approach, & Intersection Results

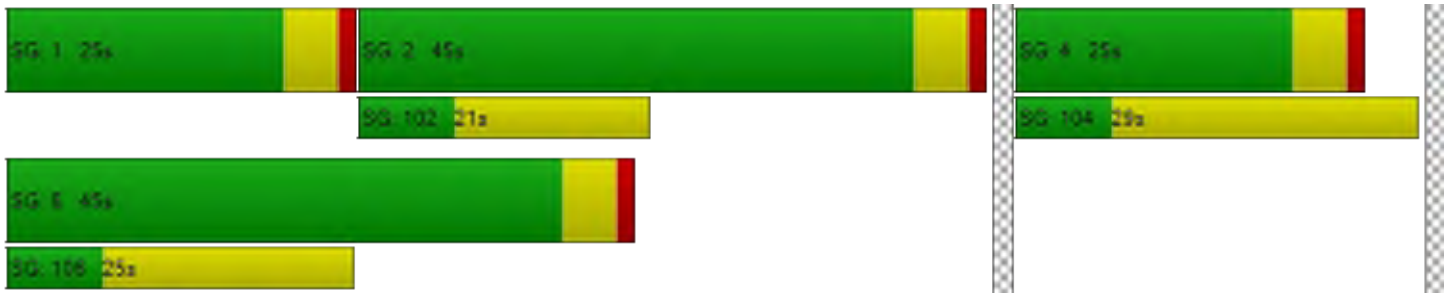
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	16.74	16.74	16.04	0.00	14.32	12.26	5.70	9.17	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			16.45			13.62			8.01		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	10.43											
Intersection LOS	B											
Intersection V/C	0.621											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.54	9.54	9.54	9.54
I_p,int, Pedestrian LOS Score for Intersection	2.213	2.147	2.548	2.589
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1056	2112	2112
d_b, Bicycle Delay [s]	18.94	4.22	0.06	0.06
I_b,int, Bicycle LOS Score for Intersection	4.132	2.719	2.297	3.633
Bicycle LOS	D	B	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	24.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.908

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	359	1	393	0	0	0	89	376	0	0	896	317
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	185	0	0	0	0	0	0	0	0	155
Total Hourly Volume [veh/h]	359	1	208	0	0	0	89	376	0	0	896	162
Peak Hour 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
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]	90	0	52	0	0	0	22	94	0	0	224	41
Total Analysis Volume [veh/h]	359	1	208	0	0	0	89	376	0	0	896	162
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	68	68		68	68	68	68
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	15	15		43	43	34	34
g / C, Green / Cycle	0.23	0.23		0.63	0.63	0.49	0.49
(v / s)_i Volume / Saturation Flow Rate	0.19	0.12		0.13	0.23	0.48	0.10
s, saturation flow rate [veh/h]	1852	1681		682	1643	1884	1543
c, Capacity [veh/h]	418	379		356	1032	933	764
d1, Uniform Delay [s]	25.43	23.41		13.59	6.13	16.62	9.71
k, delay calibration	0.04	0.04		0.04	0.04	0.37	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.04	0.47		0.14	0.08	17.44	0.05
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	0.86	0.55		0.25	0.36	0.96	0.21
d, Delay for Lane Group [s/veh]	27.47	23.88		13.73	6.21	34.06	9.76
Lane Group LOS	C	C		B	A	C	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	5.49	2.87		0.38	1.94	15.57	1.18
50th-Percentile Queue Length [ft/ln]	137.29	71.64		9.61	48.61	389.15	29.45
95th-Percentile Queue Length [veh/ln]	9.33	5.16		0.69	3.50	22.04	2.12
95th-Percentile Queue Length [ft/ln]	233.37	128.96		17.29	87.50	550.91	53.01

Movement, Approach, & Intersection Results

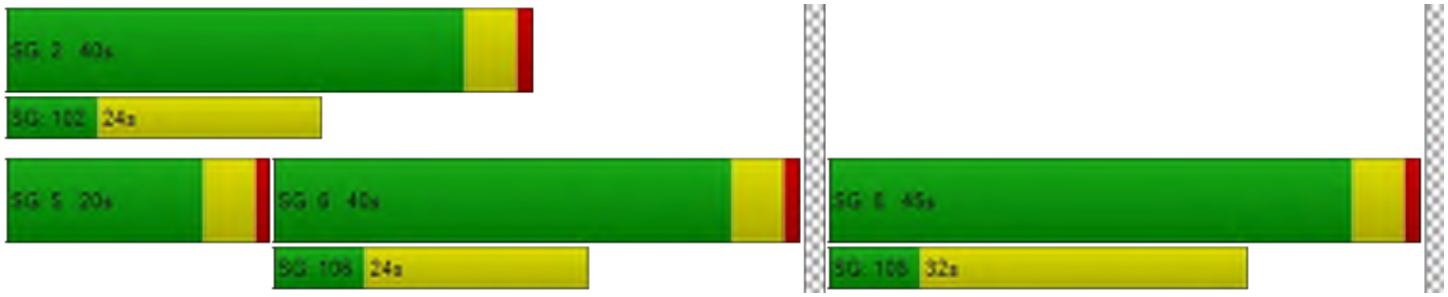
d_M, Delay for Movement [s/veh]	27.47	23.88	23.88	0.00	0.00	0.00	13.73	6.21	0.00	0.00	34.06	9.76
Movement LOS	C	C	C				B	A			C	A
d_A, Approach Delay [s/veh]	26.15			0.00			7.65			30.34		
Approach LOS	C			A			A			C		
d_I, Intersection Delay [s/veh]	24.16											
Intersection LOS	C											
Intersection V/C	0.908											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	24.01	24.01	24.01	24.01
l_p,int, Pedestrian LOS Score for Intersection	2.433	1.871	2.577	2.897
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1172	0	1026	1026
d_b, Bicycle Delay [s]	5.85	34.13	8.10	8.10
l_b,int, Bicycle LOS Score for Intersection	3.338	4.132	2.173	3.407
Bicycle LOS	C	D	B	C

Sequence

Ring 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	21.866

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	115	2	21	19	3	160	64	613	92	14	939	14
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	115	2	21	19	3	160	64	613	92	14	939	14
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	34	1	6	6	1	48	19	182	27	4	279	4
Total Analysis Volume [veh/h]	137	2	25	23	4	190	76	730	110	17	1118	17
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	21.87	0.04	0.07	0.78	0.11	0.75	0.12	0.01	0.00	0.02	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	9934.7	324.12	302.05	52.61	11.58	0.00	0.00	9.58	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	22.32	22.32	22.32	2.99	2.99	5.39	0.41	0.00	0.00	0.06	0.00	0.00
95th-Percentile Queue Length [ft/ln]	558.06	558.06	558.06	74.72	74.72	134.87	10.36	0.00	0.00	1.62	0.00	0.00
d_A, Approach Delay [s/veh]	9990.05			85.99			0.96			0.14		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	677.04											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	14.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	195	64	540	114	51	719
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	195	64	540	114	51	719
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	55	18	152	32	14	202
Total Analysis Volume [veh/h]	219	72	607	128	57	808
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	649		57		219	
Exiting Flow Rate [veh/h]	200		1043		721	
Demand Flow Rate [veh/h]	195	64	540	114	51	719
Adjusted Demand Flow Rate [veh/h]	219	72	607	128	57	808

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	0.93	0.98
Entry Flow Rate [veh/h]	291	793	882
Capacity of Entry and Bypass Lanes [veh/h]	712	1303	1104
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	712	1208	1084
X, volume / capacity	0.41	0.61	0.80

Movement, Approach, & Intersection Results

Lane LOS	B	B	C
95th-Percentile Queue Length [veh]	2.00	4.35	8.95
95th-Percentile Queue Length [ft]	50.00	108.69	223.63
Approach Delay [s/veh]	10.56	10.55	18.97
Approach LOS	B	B	C
Intersection Delay [s/veh]	14.40		
Intersection LOS	B		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	27.8
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.034

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	397	207	230	3	6	228
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	397	207	230	3	6	228
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	106	55	61	1	2	61
Total Analysis Volume [veh/h]	422	220	245	3	6	243
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.32	0.00	0.00	0.00	0.03	0.31
d_M, Delay for Movement [s/veh]	9.04	0.00	0.00	0.00	27.76	12.06
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.40	0.00	0.00	0.00	1.51	1.51
95th-Percentile Queue Length [ft/ln]	35.12	0.00	0.00	0.00	37.77	37.77
d_A, Approach Delay [s/veh]	5.94		0.00		12.44	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.07					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: SW Quarry Ave/US 97 SB Ramps

Control Type:	Two-way stop	Delay (sec / veh):	9.4
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.007

Intersection Setup

Name				US 97 SB Ramps			SW Quarry Ave			SW Quarry Ave		
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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name				US 97 SB Ramps			SW Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	0	0	0	6	0	8	0	2	4	40	34	0
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 [%]	2.00	2.00	2.00	0.00	7.00	0.00	2.00	0.00	8.00	0.00	0.00	2.00
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	0	0	6	0	8	0	2	4	40	34	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	2	0	2	0	1	1	11	9	0
Total Analysis Volume [veh/h]	0	0	0	6	0	9	0	2	4	43	37	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane		No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance		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	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	9.41	9.98	8.52	0.00	0.00	0.00	7.26	0.00	0.00
Movement LOS				A	A	A		A	A	A	A	
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.07	0.07	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	1.21	1.21	1.21	0.00	0.00	0.00	1.83	1.83	0.00
d_A, Approach Delay [s/veh]	0.00			8.88			0.00			3.90		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	4.41											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 10: SW Quarry Ave/US 97 NB Ramps

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):	0.018

Intersection Setup

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	15	0	12	0	0	0	0	8	0	0	59	19
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 [%]	2.00	2.00	2.00	2.00	2.00	2.00	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	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]	15	0	12	0	0	0	0	8	0	0	59	19
Peak Hour Factor	0.9300	0.9300	0.9300	1.0000	1.0000	1.0000	0.9300	0.9300	1.0000	1.0000	0.9300	0.9300
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	0	3	0	0	0	0	2	0	0	16	5
Total Analysis Volume [veh/h]	16	0	13	0	0	0	0	9	0	0	63	20
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.09	9.62	8.47	0.00	0.00	0.00	7.38	0.00	0.00	0.00	0.00	0.00
Movement LOS	A	A	A				A	A			A	A
95th-Percentile Queue Length [veh/ln]	0.09	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	2.30	2.30	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	8.81			0.00			0.00			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.11											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	62.6
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.074

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	6	320	455	5	260	471
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	6	320	455	5	260	471
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	85	121	1	69	125
Total Analysis Volume [veh/h]	6	340	484	5	277	501
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	0.60	0.00	0.00	0.27	0.01
d_M, Delay for Movement [s/veh]	62.64	24.32	0.00	0.00	9.69	0.00
Movement LOS	F	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	4.94	4.94	0.00	0.00	1.07	0.00
95th-Percentile Queue Length [ft/ln]	123.57	123.57	0.00	0.00	26.79	0.00
d_A, Approach Delay [s/veh]	24.98		0.00		3.45	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	7.02					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	7.0
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	164	267	232	156	125	77
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	5.00	7.00	11.00	2.00
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
Total Hourly Volume [veh/h]	164	267	232	156	125	77
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	44	71	62	41	33	20
Total Analysis Volume [veh/h]	174	284	247	166	133	82
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	148		179		259	
Exiting Flow Rate [veh/h]	343		446		357	
Demand Flow Rate [veh/h]	164	267	232	156	125	77
Adjusted Demand Flow Rate [veh/h]	174	284	247	166	133	82

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	0.96	0.95	0.93
Entry Flow Rate [veh/h]	478	437	231
Capacity of Entry and Bypass Lanes [veh/h]	1188	1150	1060
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1139	1087	987
X, volume / capacity	0.40	0.38	0.22

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	1.97	1.80	0.83
95th-Percentile Queue Length [ft]	49.30	45.03	20.73
Approach Delay [s/veh]	7.28	7.23	5.75
Approach LOS	A	A	A
Intersection Delay [s/veh]	6.96		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	51.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	105	307	96	78	262	17	17	237	116	139	528	162
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	105	307	96	78	262	17	17	237	116	139	528	162
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	30	87	27	22	74	5	5	67	33	39	150	46
Total Analysis Volume [veh/h]	119	349	109	89	298	19	19	269	132	158	600	184
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	382			897			548			495		
Exiting Flow Rate [veh/h]	594			557			755			476		
Demand Flow Rate [veh/h]	105	307	96	78	262	17	17	237	116	139	528	162
Adjusted Demand Flow Rate [veh/h]	119	349	109	89	298	19	19	269	132	158	600	184

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	589	406	429	959
Capacity of Entry and Bypass Lanes [veh/h]	935	553	789	833
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	917	553	775	818
X, volume / capacity	0.63	0.73	0.54	1.15

Movement, Approach, & Intersection Results

Lane LOS	B	D	B	F
95th-Percentile Queue Length [veh]	4.60	6.20	3.31	28.08
95th-Percentile Queue Length [ft]	115.10	155.04	82.75	702.09
Approach Delay [s/veh]	13.52	26.08	12.74	102.22
Approach LOS	B	D	B	F
Intersection Delay [s/veh]	51.18			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	8.6
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.518

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	125	0	188	0	243	195	415	695	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	92	0	0	25	0	0	0
Total Hourly Volume [veh/h]	0	0	0	125	0	96	0	243	170	415	695	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	34	0	26	0	65	46	112	187	0
Total Analysis Volume [veh/h]	0	0	0	134	0	103	0	261	183	446	747	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		37	37	37	37	37	37
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		5	5	10	10	23	23
g / C, Green / Cycle		0.12	0.12	0.27	0.27	0.61	0.61
(v / s)_i Volume / Saturation Flow Rate		0.07	0.06	0.14	0.12	0.35	0.45
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1260	1673
c, Capacity [veh/h]		233	206	498	423	944	1018
d1, Uniform Delay [s]		15.43	15.28	11.68	11.36	4.43	5.17
k, delay calibration		0.04	0.04	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		0.83	0.69	0.86	0.70	0.37	1.04
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		0.58	0.50	0.52	0.43	0.47	0.73
d, Delay for Lane Group [s/veh]		16.27	15.97	12.54	12.06	4.80	6.22
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		0.95	0.72	1.48	1.01	0.67	1.57
50th-Percentile Queue Length [ft/ln]		23.64	17.96	36.92	25.20	16.80	39.24
95th-Percentile Queue Length [veh/ln]		1.70	1.29	2.66	1.81	1.21	2.83
95th-Percentile Queue Length [ft/ln]		42.56	32.33	66.45	45.36	30.24	70.64

Movement, Approach, & Intersection Results

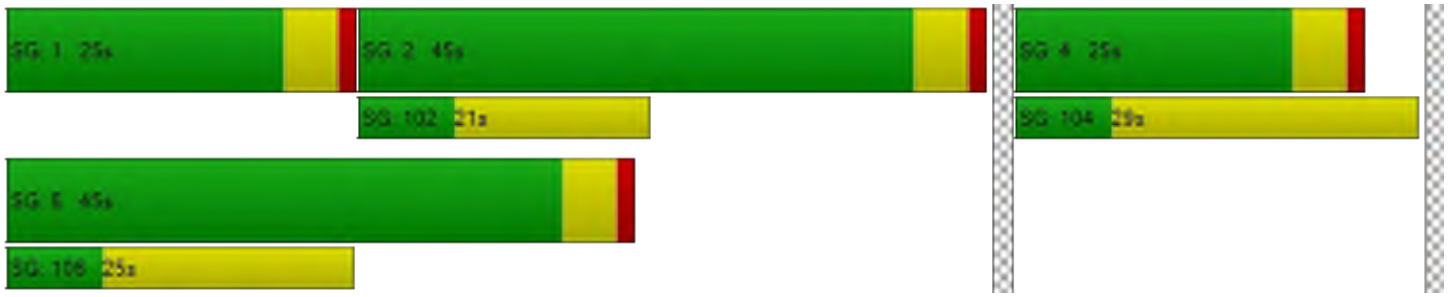
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	16.27	16.27	15.97	0.00	12.54	12.06	4.80	6.22	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			16.14			12.34			5.69		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	8.59											
Intersection LOS	A											
Intersection V/C	0.518											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	9.24	9.24	9.24	9.24
I_p,int, Pedestrian LOS Score for Intersection	2.211	2.124	2.457	2.489
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1074	2148	2148
d_b, Bicycle Delay [s]	18.62	3.99	0.10	0.10
I_b,int, Bicycle LOS Score for Intersection	4.132	2.653	2.179	3.374
Bicycle LOS	D	B	B	C

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	16.9
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.872

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	357	1	303	0	0	0	85	282	0	0	753	260
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	142	0	0	0	0	0	0	0	0	127
Total Hourly Volume [veh/h]	357	1	161	0	0	0	85	282	0	0	753	133
Peak Hour 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
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]	89	0	40	0	0	0	21	71	0	0	188	33
Total Analysis Volume [veh/h]	357	1	161	0	0	0	85	282	0	0	753	133
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	55	55		55	55	55	55
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	13	13		33	33	24	24
g / C, Green / Cycle	0.23	0.23		0.59	0.59	0.43	0.43
(v / s)_i Volume / Saturation Flow Rate	0.19	0.10		0.11	0.17	0.40	0.09
s, saturation flow rate [veh/h]	1852	1681		796	1643	1884	1543
c, Capacity [veh/h]	428	388		439	967	814	667
d1, Uniform Delay [s]	20.31	18.14		9.59	5.66	14.89	9.76
k, delay calibration	0.04	0.04		0.04	0.04	0.12	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.66	0.27		0.08	0.06	5.46	0.05
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	0.83	0.42		0.19	0.29	0.92	0.20
d, Delay for Lane Group [s/veh]	21.97	18.41		9.67	5.73	20.34	9.81
Lane Group LOS	C	B		A	A	C	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	4.15	1.63		0.30	1.11	8.28	0.83
50th-Percentile Queue Length [ft/ln]	103.76	40.78		7.45	27.77	207.11	20.66
95th-Percentile Queue Length [veh/ln]	7.47	2.94		0.54	2.00	13.00	1.49
95th-Percentile Queue Length [ft/ln]	186.77	73.41		13.40	49.99	325.12	37.19

Movement, Approach, & Intersection Results

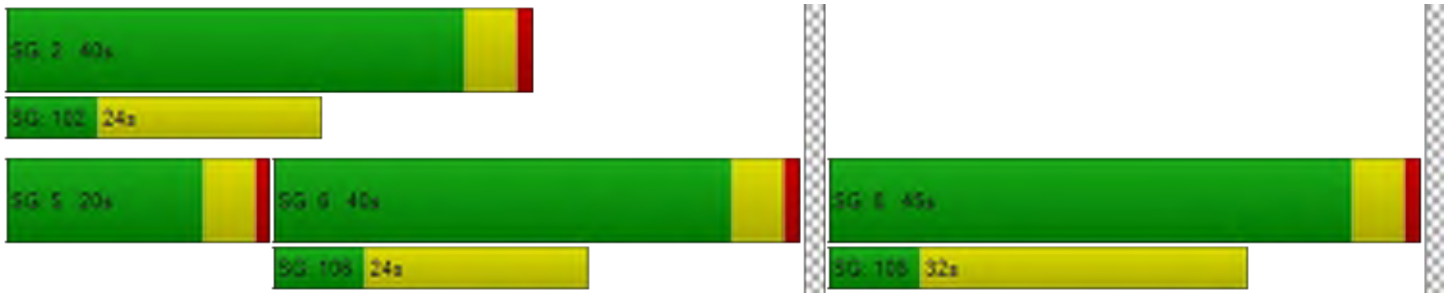
d_M, Delay for Movement [s/veh]	21.97	18.41	18.41	0.00	0.00	0.00	9.67	5.73	0.00	0.00	20.34	9.81
Movement LOS	C	B	B				A	A			C	A
d_A, Approach Delay [s/veh]	20.86			0.00			6.64			18.76		
Approach LOS	C			A			A			B		
d_I, Intersection Delay [s/veh]	16.86											
Intersection LOS	B											
Intersection V/C	0.872											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	17.76	17.76	17.76	17.76
I_p,int, Pedestrian LOS Score for Intersection	2.330	1.790	2.473	2.699
Crosswalk LOS	B	A	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1446	0	1265	1265
d_b, Bicycle Delay [s]	2.13	27.67	3.74	3.74
I_b,int, Bicycle LOS Score for Intersection	3.186	4.132	2.011	3.077
Bicycle LOS	C	D	B	C

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	1,566.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	3.825

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	88	1	17	17	4	137	46	459	79	15	788	12
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	88	1	17	17	4	137	46	459	79	15	788	12
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	26	0	5	5	1	41	14	137	24	4	235	4
Total Analysis Volume [veh/h]	105	1	20	20	5	163	55	546	94	18	938	14
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	3.82	0.01	0.04	0.31	0.07	0.51	0.08	0.01	0.00	0.02	0.01	0.00
d_M, Delay for Movement [s/veh]	1566.0	1477.0	1442.1	91.04	85.97	27.21	10.33	0.00	0.00	8.85	0.00	0.00
Movement LOS	F	F	F	F	F	D	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	14.87	14.87	14.87	1.44	1.44	2.72	0.24	0.00	0.00	0.06	0.00	0.00
95th-Percentile Queue Length [ft/ln]	371.65	371.65	371.65	35.89	35.89	67.94	6.09	0.00	0.00	1.44	0.00	0.00
d_A, Approach Delay [s/veh]	1545.63			35.56			0.82			0.16		
Approach LOS	F			E			A			A		
d_I, Intersection Delay [s/veh]	102.15											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	9.3
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	162	25	439	61	13	613
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	162	25	439	61	13	613
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	46	7	123	17	4	172
Total Analysis Volume [veh/h]	182	28	493	69	15	689
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	528		15		182	
Exiting Flow Rate [veh/h]	92		885		556	
Demand Flow Rate [veh/h]	162	25	439	61	13	613
Adjusted Demand Flow Rate [veh/h]	182	28	493	69	15	689

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	0.93	0.98
Entry Flow Rate [veh/h]	210	605	718
Capacity of Entry and Bypass Lanes [veh/h]	806	1360	1147
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	806	1264	1125
X, volume / capacity	0.26	0.44	0.63

Movement, Approach, & Intersection Results

Lane LOS	A	A	B
95th-Percentile Queue Length [veh]	1.04	2.34	4.62
95th-Percentile Queue Length [ft]	26.07	58.55	115.50
Approach Delay [s/veh]	7.34	7.34	11.54
Approach LOS	A	A	B
Intersection Delay [s/veh]	9.34		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

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):	0.025

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	322	179	200	3	6	159
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	322	179	200	3	6	159
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	86	48	53	1	2	42
Total Analysis Volume [veh/h]	343	190	213	3	6	169
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.25	0.00	0.00	0.00	0.02	0.20
d_M, Delay for Movement [s/veh]	8.58	0.00	0.00	0.00	21.38	10.76
Movement LOS	A	A	A	A	C	B
95th-Percentile Queue Length [veh/ln]	1.02	0.00	0.00	0.00	0.88	0.88
95th-Percentile Queue Length [ft/ln]	25.39	0.00	0.00	0.00	22.10	22.10
d_A, Approach Delay [s/veh]	5.52		0.00		11.13	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	5.29					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	59.6
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.015

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	14	2389	1773	15	1	10
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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]	14	2389	1773	15	1	10
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	4	642	477	4	0	3
Total Analysis Volume [veh/h]	15	2569	1906	16	1	11
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.03	0.02	0.00	0.02	0.04
d_M, Delay for Movement [s/veh]	17.14	0.00	0.00	0.00	59.65	20.11
Movement LOS	C	A	A	A	F	C
95th-Percentile Queue Length [veh/ln]	0.15	0.00	0.00	0.00	0.14	0.14
95th-Percentile Queue Length [ft/ln]	3.78	0.00	0.00	0.00	3.50	3.50
d_A, Approach Delay [s/veh]	0.10		0.00		23.40	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.12					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	85.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.070

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	4	332	498	3	285	567
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	4	332	498	3	285	567
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	88	132	1	76	151
Total Analysis Volume [veh/h]	4	353	530	3	303	603
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	0.66	0.01	0.00	0.30	0.01
d_M, Delay for Movement [s/veh]	85.02	28.72	0.00	0.00	10.12	0.00
Movement LOS	F	D	A	A	B	A
95th-Percentile Queue Length [veh/ln]	5.89	5.89	0.00	0.00	1.28	0.00
95th-Percentile Queue Length [ft/ln]	147.20	147.20	0.00	0.00	31.91	0.00
d_A, Approach Delay [s/veh]	29.36		0.00		3.38	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.54					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	7.9
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	211	341	279	143	127	104
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	211	341	279	143	127	104
Peak Hour Factor	0.9400	1.0000	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	56	85	70	36	32	28
Total Analysis Volume [veh/h]	224	341	279	143	127	111
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	141		231		299	
Exiting Flow Rate [veh/h]	412		499		381	
Demand Flow Rate [veh/h]	211	341	279	143	127	104
Adjusted Demand Flow Rate [veh/h]	224	341	279	143	127	111

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	0.96	0.94	0.94
Entry Flow Rate [veh/h]	589	449	255
Capacity of Entry and Bypass Lanes [veh/h]	1196	1091	1018
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1147	1026	954
X, volume / capacity	0.49	0.41	0.25

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	2.81	2.04	0.99
95th-Percentile Queue Length [ft]	70.14	51.03	24.68
Approach Delay [s/veh]	8.61	8.00	6.28
Approach LOS	A	A	A
Intersection Delay [s/veh]	7.95		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	121.4
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	124	387	81	96	359	27	28	285	154	130	608	200
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	124	387	81	96	359	27	28	285	154	130	608	200
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	35	110	23	27	102	8	8	81	44	37	173	57
Total Analysis Volume [veh/h]	141	440	92	109	408	31	32	324	175	148	691	227
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	471			1002			668			623		
Exiting Flow Rate [veh/h]	737			706			882			534		
Demand Flow Rate [veh/h]	124	387	81	96	359	27	28	285	154	130	608	200
Adjusted Demand Flow Rate [veh/h]	141	440	92	109	408	31	32	324	175	148	691	227

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	686	548	541	1086
Capacity of Entry and Bypass Lanes [veh/h]	854	497	699	731
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	838	497	686	719
X, volume / capacity	0.80	1.10	0.77	1.48

Movement, Approach, & Intersection Results

Lane LOS	C	F	C	F
95th-Percentile Queue Length [veh]	8.65	17.92	7.45	51.28
95th-Percentile Queue Length [ft]	216.15	447.97	186.17	1281.99
Approach Delay [s/veh]	23.36	100.06	24.78	242.41
Approach LOS	C	F	C	F
Intersection Delay [s/veh]	121.41			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	11.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.611

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	177	0	203	0	299	200	523	794	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	99	0	0	26	0	0	0
Total Hourly Volume [veh/h]	0	0	0	177	0	104	0	299	174	523	794	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	48	0	28	0	80	47	141	213	0
Total Analysis Volume [veh/h]	0	0	0	190	0	112	0	322	187	562	854	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		42	42	42	42	42	42
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		6	6	10	10	26	26
g / C, Green / Cycle		0.14	0.14	0.24	0.24	0.62	0.62
(v / s)_i Volume / Saturation Flow Rate		0.10	0.07	0.17	0.12	0.44	0.51
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1282	1673
c, Capacity [veh/h]		273	242	448	381	910	1031
d1, Uniform Delay [s]		17.01	16.39	14.61	13.71	5.85	6.30
k, delay calibration		0.04	0.04	0.11	0.11	0.31	0.11
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.20	0.51	2.19	0.98	1.98	1.78
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		0.70	0.46	0.72	0.49	0.62	0.83
d, Delay for Lane Group [s/veh]		18.21	16.90	16.80	14.69	7.83	8.09
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.58	0.88	2.49	1.31	1.64	2.85
50th-Percentile Queue Length [ft/ln]		39.40	21.96	62.22	32.79	40.91	71.27
95th-Percentile Queue Length [veh/ln]		2.84	1.58	4.48	2.36	2.95	5.13
95th-Percentile Queue Length [ft/ln]		70.93	39.52	112.00	59.03	73.64	128.28

Movement, Approach, & Intersection Results

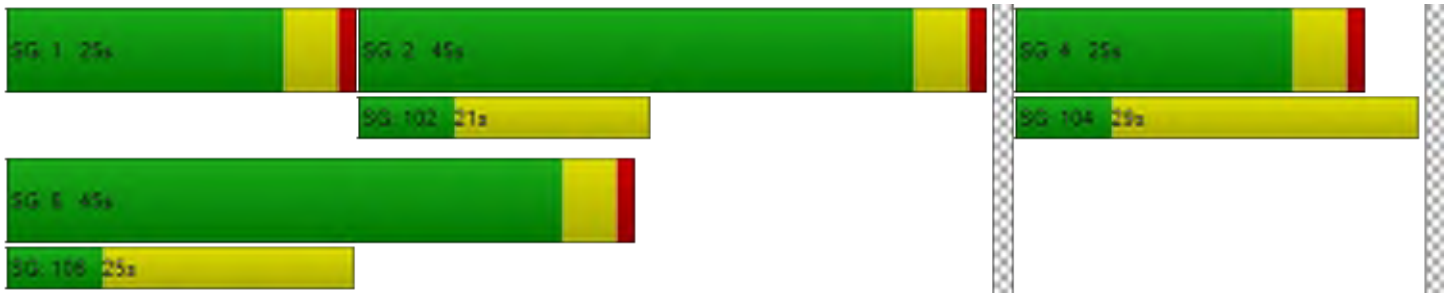
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	18.21	18.21	16.90	0.00	16.80	14.69	7.83	8.09	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			17.72			16.02			7.98		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	11.14											
Intersection LOS	B											
Intersection V/C	0.611											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	11.31	11.31	11.31	11.31
I_p,int, Pedestrian LOS Score for Intersection	2.364	2.166	2.538	2.626
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	959	1918	1918
d_b, Bicycle Delay [s]	20.86	5.65	0.04	0.04
I_b,int, Bicycle LOS Score for Intersection	4.132	2.772	2.288	3.742
Bicycle LOS	D	C	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	33.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.951

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	280	1	415	0	0	0	66	410	0	0	1037	348
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	195	0	0	0	0	0	0	0	0	171
Total Hourly Volume [veh/h]	280	1	220	0	0	0	66	410	0	0	1037	177
Peak Hour 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
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]	70	0	55	0	0	0	17	103	0	0	259	44
Total Analysis Volume [veh/h]	280	1	220	0	0	0	66	410	0	0	1037	177
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	66	66		66	66	66	66
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	12	12		44	44	35	35
g / C, Green / Cycle	0.19	0.19		0.66	0.66	0.53	0.53
(v / s)_i Volume / Saturation Flow Rate	0.15	0.13		0.11	0.25	0.55	0.11
s, saturation flow rate [veh/h]	1852	1681		608	1643	1884	1543
c, Capacity [veh/h]	345	313		336	1088	1001	820
d1, Uniform Delay [s]	25.68	25.10		14.12	5.02	15.43	8.14
k, delay calibration	0.04	0.04		0.04	0.04	0.46	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.76	1.10		0.10	0.08	36.89	0.05
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	0.81	0.71		0.20	0.38	1.04	0.22
d, Delay for Lane Group [s/veh]	27.45	26.20		14.23	5.10	52.32	8.19
Lane Group LOS	C	C		B	A	F	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	4.12	3.15		0.22	1.69	21.85	1.09
50th-Percentile Queue Length [ft/ln]	103.10	78.66		5.49	42.26	546.23	27.31
95th-Percentile Queue Length [veh/ln]	7.42	5.66		0.40	3.04	30.34	1.97
95th-Percentile Queue Length [ft/ln]	185.57	141.58		9.88	76.07	758.57	49.16

Movement, Approach, & Intersection Results

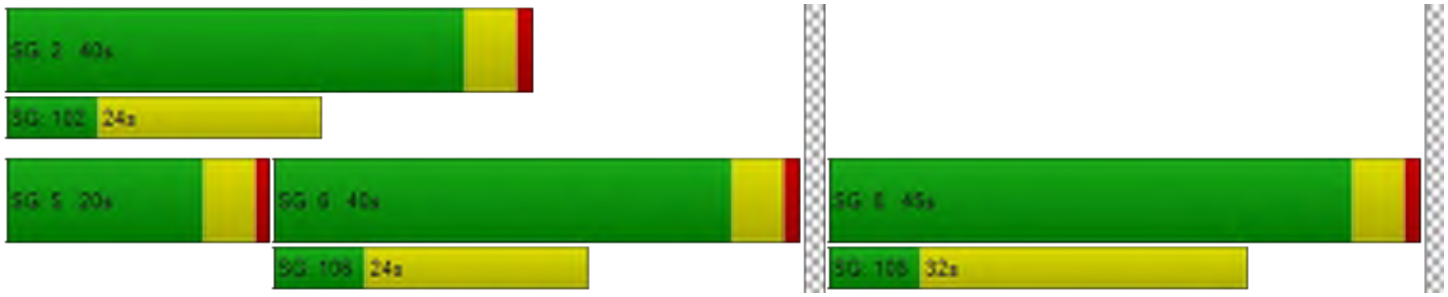
d_M, Delay for Movement [s/veh]	27.45	26.20	26.20	0.00	0.00	0.00	14.23	5.10	0.00	0.00	52.32	8.19
Movement LOS	C	C	C				B	A			F	A
d_A, Approach Delay [s/veh]	26.90			0.00			6.36			45.88		
Approach LOS	C			A			A			D		
d_I, Intersection Delay [s/veh]	32.96											
Intersection LOS	C											
Intersection V/C	0.951											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	22.78	22.78	22.78	22.78
l_p,int, Pedestrian LOS Score for Intersection	2.426	1.864	2.603	3.004
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1217	0	1065	1065
d_b, Bicycle Delay [s]	5.03	32.86	7.18	7.18
l_b,int, Bicycle LOS Score for Intersection	3.244	4.132	2.191	3.691
Bicycle LOS	C	D	B	D

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	903.552

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	115	1	21	19	3	160	63	671	91	16	1110	15
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	115	1	21	19	3	160	63	671	91	16	1110	15
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	34	0	6	6	1	48	19	200	27	5	330	4
Total Analysis Volume [veh/h]	137	1	25	23	4	190	75	799	108	19	1321	18
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	903.55	0.03	0.07	1.27	0.17	0.99	0.14	0.01	0.00	0.03	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	668.81	628.05	112.84	13.06	0.00	0.00	9.87	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	23.01	23.01	23.01	3.74	3.74	8.32	0.50	0.00	0.00	0.08	0.00	0.00
95th-Percentile Queue Length [ft/ln]	575.23	575.23	575.23	93.49	93.49	207.94	12.49	0.00	0.00	1.92	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			181.26			1.00			0.14		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	614.15											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	22.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	387	41	589	147	18	686
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	387	41	589	147	18	686
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	109	12	165	41	5	193
Total Analysis Volume [veh/h]	435	46	662	165	20	771
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	708		20		435	
Exiting Flow Rate [veh/h]	205		1221		754	
Demand Flow Rate [veh/h]	387	41	589	147	18	686
Adjusted Demand Flow Rate [veh/h]	435	46	662	165	20	771

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	0.93	0.98
Entry Flow Rate [veh/h]	481	893	807
Capacity of Entry and Bypass Lanes [veh/h]	671	1353	886
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	671	1253	869
X, volume / capacity	0.72	0.66	0.91

Movement, Approach, & Intersection Results

Lane LOS	C	B	D
95th-Percentile Queue Length [veh]	6.07	5.30	13.04
95th-Percentile Queue Length [ft]	151.82	132.58	326.10
Approach Delay [s/veh]	21.41	11.57	34.46
Approach LOS	C	B	D
Intersection Delay [s/veh]	22.45		
Intersection LOS	C		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	28.3
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.034

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	395	211	255	3	6	232
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	395	211	255	3	6	232
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	105	56	68	1	2	62
Total Analysis Volume [veh/h]	420	224	271	3	6	247
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.33	0.00	0.00	0.00	0.03	0.32
d_M, Delay for Movement [s/veh]	9.16	0.00	0.00	0.00	28.32	12.48
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.44	0.00	0.00	0.00	1.62	1.62
95th-Percentile Queue Length [ft/ln]	36.00	0.00	0.00	0.00	40.42	40.42
d_A, Approach Delay [s/veh]	5.98		0.00		12.86	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.07					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	24.0
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.021

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	16	2650	2070	16	0	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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]	16	2650	2070	16	0	4
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	4	712	556	4	0	1
Total Analysis Volume [veh/h]	17	2849	2226	17	0	4
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.07	0.03	0.02	0.00	0.00	0.02
d_M, Delay for Movement [s/veh]	21.61	0.00	0.00	0.00	83.03	23.99
Movement LOS	C	A	A	A	F	C
95th-Percentile Queue Length [veh/ln]	0.23	0.00	0.00	0.00	0.06	0.06
95th-Percentile Queue Length [ft/ln]	5.83	0.00	0.00	0.00	1.58	1.58
d_A, Approach Delay [s/veh]	0.13		0.00		23.99	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.09					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	79.9
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.065

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	4	332	498	2	261	588
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	4	332	498	2	261	588
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	88	132	1	69	156
Total Analysis Volume [veh/h]	4	353	530	2	278	626
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	0.66	0.01	0.00	0.28	0.01
d_M, Delay for Movement [s/veh]	79.91	28.22	0.00	0.00	9.94	0.00
Movement LOS	F	D	A	A	A	A
95th-Percentile Queue Length [veh/ln]	5.79	5.79	0.00	0.00	1.13	0.00
95th-Percentile Queue Length [ft/ln]	144.79	144.79	0.00	0.00	28.30	0.00
d_A, Approach Delay [s/veh]	28.80		0.00		3.06	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.28					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	8.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	219	363	274	121	124	116
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	219	363	274	121	124	116
Peak Hour Factor	0.9400	1.0000	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	58	91	69	30	31	31
Total Analysis Volume [veh/h]	233	363	274	121	124	123
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	138		240		293	
Exiting Flow Rate [veh/h]	419		519		367	
Demand Flow Rate [veh/h]	219	363	274	121	124	116
Adjusted Demand Flow Rate [veh/h]	233	363	274	121	124	123

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	0.96	0.94	0.94
Entry Flow Rate [veh/h]	622	421	263
Capacity of Entry and Bypass Lanes [veh/h]	1200	1081	1024
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1151	1016	962
X, volume / capacity	0.52	0.39	0.26

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	3.09	1.86	1.03
95th-Percentile Queue Length [ft]	77.18	46.62	25.64
Approach Delay [s/veh]	9.03	7.73	6.32
Approach LOS	A	A	A
Intersection Delay [s/veh]	8.07		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	127.5
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	124	389	80	102	375	29	29	290	156	128	612	202
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	124	389	80	102	375	29	29	290	156	128	612	202
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	35	111	23	29	107	8	8	82	44	36	174	57
Total Analysis Volume [veh/h]	141	442	91	116	426	33	33	330	177	145	695	230
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	486			1003			690			626		
Exiting Flow Rate [veh/h]	754			712			889			546		
Demand Flow Rate [veh/h]	124	389	80	102	375	29	29	290	156	128	612	202
Adjusted Demand Flow Rate [veh/h]	141	442	91	116	426	33	33	330	177	145	695	230

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	687	575	551	1090
Capacity of Entry and Bypass Lanes [veh/h]	841	496	683	729
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	826	496	671	716
X, volume / capacity	0.82	1.16	0.81	1.49

Movement, Approach, & Intersection Results

Lane LOS	C	F	D	F
95th-Percentile Queue Length [veh]	9.04	20.44	8.26	51.98
95th-Percentile Queue Length [ft]	225.95	510.99	206.39	1299.47
Approach Delay [s/veh]	24.67	119.41	27.81	246.86
Approach LOS	C	F	D	F
Intersection Delay [s/veh]	127.47			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	11.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.625

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	188	0	197	0	315	193	528	806	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	97	0	0	25	0	0	0
Total Hourly Volume [veh/h]	0	0	0	188	0	100	0	315	168	528	806	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	51	0	27	0	85	45	142	217	0
Total Analysis Volume [veh/h]	0	0	0	202	0	108	0	339	181	568	867	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		43	43	43	43	43	43
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		6	6	10	10	26	26
g / C, Green / Cycle		0.15	0.15	0.24	0.24	0.62	0.62
(v / s)_i Volume / Saturation Flow Rate		0.11	0.06	0.18	0.11	0.45	0.52
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1274	1673
c, Capacity [veh/h]		282	250	457	389	894	1033
d1, Uniform Delay [s]		17.42	16.62	15.00	13.86	6.10	6.53
k, delay calibration		0.04	0.04	0.11	0.11	0.35	0.12
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.27	0.44	2.39	0.87	2.40	2.16
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		0.72	0.43	0.74	0.47	0.64	0.84
d, Delay for Lane Group [s/veh]		18.68	17.06	17.39	14.73	8.51	8.70
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.74	0.87	2.75	1.30	1.85	3.24
50th-Percentile Queue Length [ft/ln]		43.52	21.70	68.68	32.48	46.18	80.90
95th-Percentile Queue Length [veh/ln]		3.13	1.56	4.95	2.34	3.33	5.82
95th-Percentile Queue Length [ft/ln]		78.34	39.06	123.63	58.47	83.13	145.62

Movement, Approach, & Intersection Results

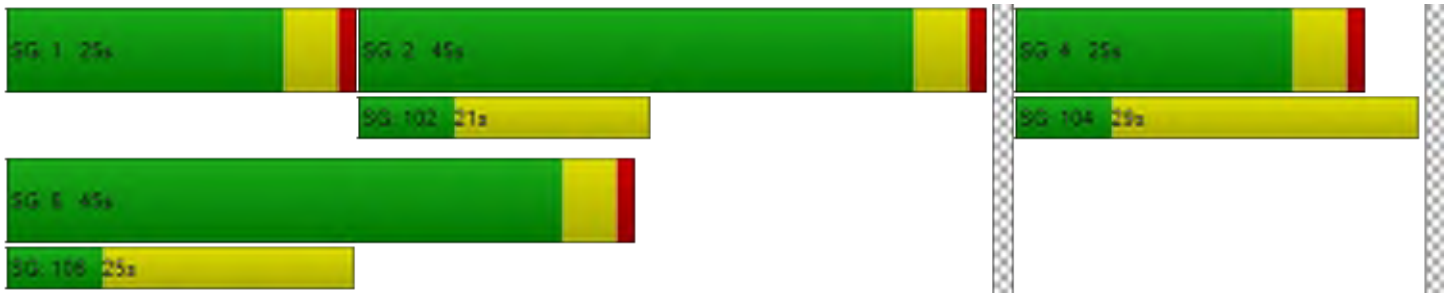
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	18.68	18.68	17.06	0.00	17.39	14.73	8.51	8.70	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			18.12			16.47			8.62		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	11.72											
Intersection LOS	B											
Intersection V/C	0.625											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	11.87	11.87	11.87	11.87
I_p,int, Pedestrian LOS Score for Intersection	2.370	2.167	2.545	2.646
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	932	1864	1864
d_b, Bicycle Delay [s]	21.46	6.12	0.10	0.10
I_b,int, Bicycle LOS Score for Intersection	4.132	2.782	2.305	3.773
Bicycle LOS	D	C	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	36.4
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.966

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	256	1	421	0	0	0	65	438	0	0	1078	372
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	198	0	0	0	0	0	0	0	0	182
Total Hourly Volume [veh/h]	256	1	223	0	0	0	65	438	0	0	1078	190
Peak Hour 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
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]	64	0	56	0	0	0	16	110	0	0	270	48
Total Analysis Volume [veh/h]	256	1	223	0	0	0	65	438	0	0	1078	190
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	65	65		65	65	65	65
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	11	11		43	43	35	35
g / C, Green / Cycle	0.17	0.17		0.67	0.67	0.54	0.54
(v / s)_i Volume / Saturation Flow Rate	0.14	0.13		0.11	0.27	0.57	0.12
s, saturation flow rate [veh/h]	1852	1681		589	1643	1884	1543
c, Capacity [veh/h]	323	293		340	1104	1017	833
d1, Uniform Delay [s]	25.65	25.50		14.01	4.77	14.91	7.80
k, delay calibration	0.04	0.04		0.04	0.04	0.48	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.69	1.59		0.10	0.09	44.87	0.05
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	0.77		0.19	0.40	1.06	0.23
d, Delay for Lane Group [s/veh]	27.34	27.09		14.11	4.85	59.78	7.85
Lane Group LOS	C	C		B	A	F	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.71	3.22		0.20	1.68	24.04	1.12
50th-Percentile Queue Length [ft/ln]	92.71	80.59		4.94	42.12	600.88	28.03
95th-Percentile Queue Length [veh/ln]	6.68	5.80		0.36	3.03	33.57	2.02
95th-Percentile Queue Length [ft/ln]	166.88	145.06		8.89	75.82	839.23	50.46

Movement, Approach, & Intersection Results

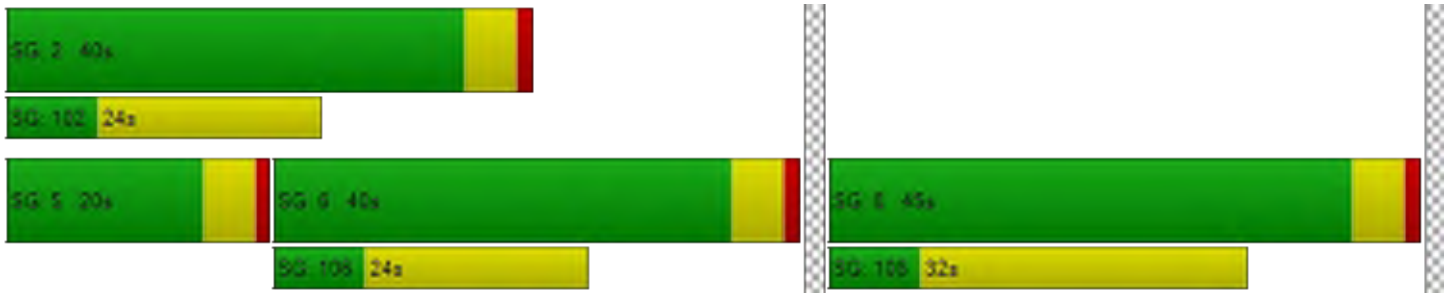
d_M, Delay for Movement [s/veh]	27.34	27.09	27.09	0.00	0.00	0.00	14.11	4.85	0.00	0.00	59.78	7.85
Movement LOS	C	C	C				B	A			F	A
d_A, Approach Delay [s/veh]	27.22			0.00			6.05			52.00		
Approach LOS	C			A			A			D		
d_I, Intersection Delay [s/veh]	36.45											
Intersection LOS	D											
Intersection V/C	0.966											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	22.28	22.28	22.28	22.28
l_p,int, Pedestrian LOS Score for Intersection	2.424	1.885	2.618	3.056
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1237	0	1082	1082
d_b, Bicycle Delay [s]	4.71	32.34	6.81	6.82
l_b,int, Bicycle LOS Score for Intersection	3.214	4.132	2.236	3.798
Bicycle LOS	C	D	B	D

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.075

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	115	1	21	19	3	160	63	706	90	16	1174	15
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	115	1	21	19	3	160	63	706	90	16	1174	15
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	34	0	6	6	1	48	19	210	27	5	349	4
Total Analysis Volume [veh/h]	137	1	25	23	4	190	75	840	107	19	1398	18
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.08	1.58	0.21	1.10	0.15	0.01	0.00	0.03	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	904.44	848.68	151.92	13.72	0.00	0.00	10.04	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	23.03	23.03	23.03	4.01	4.01	9.58	0.54	0.00	0.00	0.08	0.00	0.00
95th-Percentile Queue Length [ft/ln]	575.73	575.73	575.73	100.36	100.36	239.40	13.50	0.00	0.00	1.99	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			244.52			1.01			0.13		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	593.68											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	33.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	495	48	613	182	18	636
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	495	48	613	182	18	636
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	139	13	172	51	5	179
Total Analysis Volume [veh/h]	556	54	689	204	20	715
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	737		20		556	
Exiting Flow Rate [veh/h]	248		1285		791	
Demand Flow Rate [veh/h]	495	48	613	182	18	636
Adjusted Demand Flow Rate [veh/h]	556	54	689	204	20	715

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	0.93	0.98
Entry Flow Rate [veh/h]	610	966	750
Capacity of Entry and Bypass Lanes [veh/h]	651	1353	783
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	651	1251	768
X, volume / capacity	0.94	0.71	0.96

Movement, Approach, & Intersection Results

Lane LOS	E	B	E
95th-Percentile Queue Length [veh]	12.80	6.53	14.68
95th-Percentile Queue Length [ft]	319.99	163.34	367.02
Approach Delay [s/veh]	46.50	13.27	45.84
Approach LOS	E	B	E
Intersection Delay [s/veh]	33.02		
Intersection LOS	D		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	28.6
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.040

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	394	209	266	3	7	234
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	394	209	266	3	7	234
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	105	56	71	1	2	62
Total Analysis Volume [veh/h]	419	222	283	3	7	249
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.33	0.00	0.00	0.00	0.04	0.33
d_M, Delay for Movement [s/veh]	9.22	0.00	0.00	0.00	28.61	12.80
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.46	0.00	0.00	0.00	1.71	1.71
95th-Percentile Queue Length [ft/ln]	36.41	0.00	0.00	0.00	42.72	42.72
d_A, Approach Delay [s/veh]	6.03		0.00		13.23	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.13					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	24.3
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.021

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	16	2637	2090	17	0	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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]	16	2637	2090	17	0	4
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	4	709	562	5	0	1
Total Analysis Volume [veh/h]	17	2835	2247	18	0	4
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.07	0.03	0.02	0.00	0.00	0.02
d_M, Delay for Movement [s/veh]	21.97	0.00	0.00	0.00	84.45	24.32
Movement LOS	C	A	A	A	F	C
95th-Percentile Queue Length [veh/ln]	0.24	0.00	0.00	0.00	0.06	0.06
95th-Percentile Queue Length [ft/ln]	5.96	0.00	0.00	0.00	1.61	1.61
d_A, Approach Delay [s/veh]	0.13		0.00		24.32	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.09					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	75.1
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.060

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	4	332	498	2	237	610
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	4	332	498	2	237	610
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	88	132	1	63	162
Total Analysis Volume [veh/h]	4	353	530	2	252	649
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	0.66	0.01	0.00	0.25	0.01
d_M, Delay for Movement [s/veh]	75.10	27.80	0.00	0.00	9.77	0.00
Movement LOS	F	D	A	A	A	A
95th-Percentile Queue Length [veh/ln]	5.71	5.71	0.00	0.00	0.99	0.00
95th-Percentile Queue Length [ft/ln]	142.70	142.70	0.00	0.00	24.81	0.00
d_A, Approach Delay [s/veh]	28.33		0.00		2.73	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.03					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	8.2
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	226	386	269	99	122	129
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	226	386	269	99	122	129
Peak Hour Factor	0.9400	1.0000	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	60	97	67	25	31	34
Total Analysis Volume [veh/h]	240	386	269	99	122	137
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	135		247		288	
Exiting Flow Rate [veh/h]	428		541		351	
Demand Flow Rate [veh/h]	226	386	269	99	122	129
Adjusted Demand Flow Rate [veh/h]	240	386	269	99	122	137

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	0.96	0.94	0.94
Entry Flow Rate [veh/h]	653	392	276
Capacity of Entry and Bypass Lanes [veh/h]	1202	1073	1029
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1153	1008	969
X, volume / capacity	0.54	0.37	0.27

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	3.39	1.69	1.08
95th-Percentile Queue Length [ft]	84.74	42.27	27.03
Approach Delay [s/veh]	9.48	7.44	6.40
Approach LOS	A	A	A
Intersection Delay [s/veh]	8.25		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	134.5
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	124	390	79	107	392	31	30	296	157	126	616	204
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	124	390	79	107	392	31	30	296	157	126	616	204
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	35	111	22	30	111	9	9	84	45	36	175	58
Total Analysis Volume [veh/h]	141	443	90	122	445	35	34	336	178	143	700	232
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	499			1007			713			628		
Exiting Flow Rate [veh/h]	772			716			896			557		
Demand Flow Rate [veh/h]	124	390	79	107	392	31	30	296	157	126	616	204
Adjusted Demand Flow Rate [veh/h]	141	443	90	122	445	35	34	336	178	143	700	232

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	687	602	559	1095
Capacity of Entry and Bypass Lanes [veh/h]	830	495	667	728
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	815	495	655	715
X, volume / capacity	0.83	1.22	0.84	1.50

Movement, Approach, & Intersection Results

Lane LOS	D	F	D	F
95th-Percentile Queue Length [veh]	9.38	23.19	9.14	52.71
95th-Percentile Queue Length [ft]	234.54	579.81	228.55	1317.85
Approach Delay [s/veh]	25.89	141.24	31.46	251.26
Approach LOS	D	F	D	F
Intersection Delay [s/veh]	134.47			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	12.3
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.638

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	198	0	192	0	331	185	533	817	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	94	0	0	24	0	0	0
Total Hourly Volume [veh/h]	0	0	0	198	0	98	0	331	161	533	817	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	53	0	26	0	89	43	143	220	0
Total Analysis Volume [veh/h]	0	0	0	213	0	105	0	356	173	573	878	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		44	44	44	44	44	44
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		7	7	11	11	28	28
g / C, Green / Cycle		0.15	0.15	0.25	0.25	0.62	0.62
(v / s)_i Volume / Saturation Flow Rate		0.11	0.06	0.19	0.11	0.45	0.52
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1265	1673
c, Capacity [veh/h]		292	258	470	400	878	1038
d1, Uniform Delay [s]		17.91	16.95	15.39	13.98	6.37	6.75
k, delay calibration		0.04	0.04	0.11	0.11	0.39	0.14
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.32	0.38	2.52	0.74	2.92	2.60
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		0.73	0.41	0.76	0.43	0.65	0.85
d, Delay for Lane Group [s/veh]		19.24	17.33	17.91	14.72	9.29	9.35
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.92	0.87	3.02	1.27	2.08	3.66
50th-Percentile Queue Length [ft/ln]		47.91	21.79	75.47	31.74	52.09	91.38
95th-Percentile Queue Length [veh/ln]		3.45	1.57	5.43	2.29	3.75	6.58
95th-Percentile Queue Length [ft/ln]		86.24	39.22	135.85	57.13	93.76	164.49

Movement, Approach, & Intersection Results

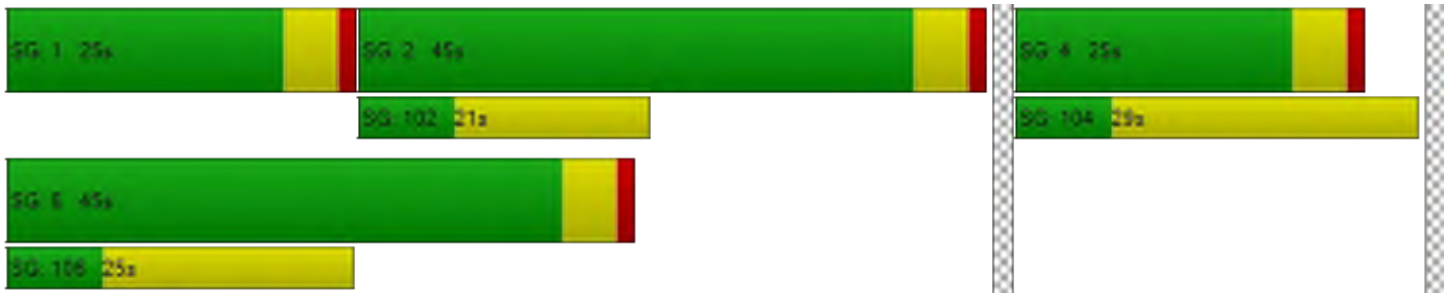
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	19.24	19.24	17.33	0.00	17.91	14.72	9.29	9.35	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			18.61			16.87			9.33		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	12.35											
Intersection LOS	B											
Intersection V/C	0.638											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	12.54	12.54	12.54	12.54
I_p,int, Pedestrian LOS Score for Intersection	2.374	2.167	2.551	2.665
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	902	1803	1803
d_b, Bicycle Delay [s]	22.18	6.69	0.21	0.21
I_b,int, Bicycle LOS Score for Intersection	4.132	2.790	2.318	3.800
Bicycle LOS	D	C	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	42.4
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.992

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	233	1	427	0	0	0	64	466	0	0	1118	396
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	201	0	0	0	0	0	0	0	0	194
Total Hourly Volume [veh/h]	233	1	226	0	0	0	64	466	0	0	1118	202
Peak Hour 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
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]	58	0	57	0	0	0	16	117	0	0	280	51
Total Analysis Volume [veh/h]	233	1	226	0	0	0	64	466	0	0	1118	202
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	64	64		64	64	64	64
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	11	11		43	43	35	35
g / C, Green / Cycle	0.17	0.17		0.67	0.67	0.54	0.54
(v / s)_i Volume / Saturation Flow Rate	0.13	0.14		0.11	0.28	0.59	0.13
s, saturation flow rate [veh/h]	1852	1681		571	1643	1884	1543
c, Capacity [veh/h]	317	287		340	1108	1022	837
d1, Uniform Delay [s]	25.36	25.64		13.99	4.79	14.76	7.75
k, delay calibration	0.04	0.04		0.04	0.04	0.50	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.26	1.85		0.10	0.09	57.49	0.05
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	0.74	0.79		0.19	0.42	1.09	0.24
d, Delay for Lane Group [s/veh]	26.62	27.49		14.09	4.88	72.25	7.80
Lane Group LOS	C	C		B	A	F	A
Critical Lane Group	No	Yes		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.30	3.29		0.19	1.79	27.60	1.18
50th-Percentile Queue Length [ft/ln]	82.48	82.20		4.74	44.76	690.11	29.60
95th-Percentile Queue Length [veh/ln]	5.94	5.92		0.34	3.22	38.84	2.13
95th-Percentile Queue Length [ft/ln]	148.46	147.95		8.53	80.57	971.01	53.29

Movement, Approach, & Intersection Results

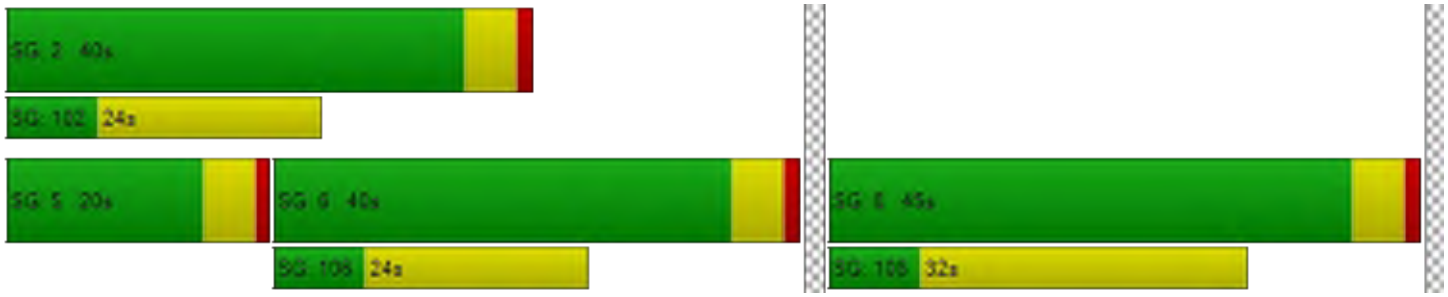
d_M, Delay for Movement [s/veh]	26.62	27.49	27.49	0.00	0.00	0.00	14.09	4.88	0.00	0.00	72.25	7.80
Movement LOS	C	C	C				B	A			F	A
d_A, Approach Delay [s/veh]	27.05			0.00			5.99			62.39		
Approach LOS	C			A			A			E		
d_I, Intersection Delay [s/veh]	42.41											
Intersection LOS	D											
Intersection V/C	0.992											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	22.14	22.14	22.14	22.14
l_p,int, Pedestrian LOS Score for Intersection	2.422	1.907	2.635	3.110
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1242	0	1087	1087
d_b, Bicycle Delay [s]	4.62	32.20	6.71	6.71
l_b,int, Bicycle LOS Score for Intersection	3.186	4.132	2.280	3.904
Bicycle LOS	C	D	B	D

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.083

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	114	1	22	20	3	160	62	741	90	16	1239	16
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	114	1	22	20	3	160	62	741	90	16	1239	16
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	34	0	7	6	1	48	18	221	27	5	369	5
Total Analysis Volume [veh/h]	136	1	26	24	4	190	74	882	107	19	1475	19
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.05	0.08	2.07	0.26	1.22	0.16	0.01	0.00	0.03	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	1249.1	1172.0	200.86	14.44	0.00	0.00	10.23	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	23.03	23.03	23.03	4.39	4.39	10.85	0.58	0.00	0.00	0.08	0.00	0.00
95th-Percentile Queue Length [ft/ln]	575.73	575.73	575.73	109.73	109.73	271.36	14.39	0.00	0.00	2.07	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			334.09			1.01			0.13		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	576.29											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	59.3
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	603	54	637	218	18	587
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	603	54	637	218	18	587
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	169	15	179	61	5	165
Total Analysis Volume [veh/h]	678	61	716	245	20	660
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	766		20		678	
Exiting Flow Rate [veh/h]	294		1351		827	
Demand Flow Rate [veh/h]	603	54	637	218	18	587
Adjusted Demand Flow Rate [veh/h]	678	61	716	245	20	660

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	0.92	0.98
Entry Flow Rate [veh/h]	739	1041	694
Capacity of Entry and Bypass Lanes [veh/h]	632	1353	692
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	632	1250	678
X, volume / capacity	1.17	0.77	1.00

Movement, Approach, & Intersection Results

Lane LOS	F	C	F
95th-Percentile Queue Length [veh]	24.65	8.15	16.10
95th-Percentile Queue Length [ft]	616.36	203.87	402.44
Approach Delay [s/veh]	115.71	15.58	59.95
Approach LOS	F	C	F
Intersection Delay [s/veh]	59.35		
Intersection LOS	F		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	28.9
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.040

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	394	206	277	3	7	236
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	394	206	277	3	7	236
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	105	55	74	1	2	63
Total Analysis Volume [veh/h]	419	219	295	3	7	251
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.33	0.00	0.00	0.00	0.04	0.34
d_M, Delay for Movement [s/veh]	9.29	0.00	0.00	0.00	28.86	13.02
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.48	0.00	0.00	0.00	1.77	1.77
95th-Percentile Queue Length [ft/ln]	36.95	0.00	0.00	0.00	44.13	44.13
d_A, Approach Delay [s/veh]	6.10		0.00		13.45	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.16					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: US 97/SW Quarry Ave

Control Type:	Two-way stop	Delay (sec / veh):	24.7
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.021

Intersection Setup

Name	US 97		US97		Sw Quarry Ave	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	10.00	10.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	350.00	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]	65.00		65.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	US 97		US97		Sw Quarry Ave	
Base Volume Input [veh/h]	16	2624	2111	17	0	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.00	7.00	0.00	0.00	8.00
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]	16	2624	2111	17	0	4
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	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]	4	705	567	5	0	1
Total Analysis Volume [veh/h]	17	2822	2270	18	0	4
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			Yes
Storage Area [veh]	0	0	2
Two-Stage Gap Acceptance			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.03	0.02	0.00	0.00	0.02
d_M, Delay for Movement [s/veh]	22.35	0.00	0.00	0.00	86.08	24.68
Movement LOS	C	A	A	A	F	C
95th-Percentile Queue Length [veh/ln]	0.24	0.00	0.00	0.00	0.07	0.07
95th-Percentile Queue Length [ft/ln]	6.09	0.00	0.00	0.00	1.64	1.64
d_A, Approach Delay [s/veh]	0.13		0.00		24.68	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	0.09					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	89.2
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.057

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	3	332	498	3	309	545
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	3	332	498	3	309	545
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	88	132	1	82	145
Total Analysis Volume [veh/h]	3	353	530	3	329	580
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	0.66	0.01	0.00	0.33	0.01
d_M, Delay for Movement [s/veh]	89.23	27.62	0.00	0.00	10.32	0.00
Movement LOS	F	D	A	A	B	A
95th-Percentile Queue Length [veh/ln]	5.66	5.66	0.00	0.00	1.44	0.00
95th-Percentile Queue Length [ft/ln]	141.50	141.50	0.00	0.00	35.90	0.00
d_A, Approach Delay [s/veh]	28.14		0.00		3.73	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.46					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	8.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	211	324	302	162	124	97
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	211	324	302	162	124	97
Peak Hour Factor	0.9400	1.0000	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	56	81	76	41	31	26
Total Analysis Volume [veh/h]	224	324	302	162	124	103
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	138		231		323	
Exiting Flow Rate [veh/h]	428		478		401	
Demand Flow Rate [veh/h]	211	324	302	162	124	97
Adjusted Demand Flow Rate [veh/h]	224	324	302	162	124	103

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	0.96	0.94	0.94
Entry Flow Rate [veh/h]	572	494	243
Capacity of Entry and Bypass Lanes [veh/h]	1200	1091	993
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1151	1027	929
X, volume / capacity	0.48	0.45	0.24

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	2.63	2.39	0.96
95th-Percentile Queue Length [ft]	65.87	59.87	24.00
Approach Delay [s/veh]	8.32	8.63	6.35
Approach LOS	A	A	A
Intersection Delay [s/veh]	8.08		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	136.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	126	376	79	97	336	30	29	293	147	125	657	206
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	126	376	79	97	336	30	29	293	147	125	657	206
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	36	107	22	28	95	9	8	83	42	36	187	59
Total Analysis Volume [veh/h]	143	427	90	110	382	34	33	333	167	142	747	234
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	483			1056			637			613		
Exiting Flow Rate [veh/h]	697			701			945			542		
Demand Flow Rate [veh/h]	126	376	79	97	336	30	29	293	147	125	657	206
Adjusted Demand Flow Rate [veh/h]	143	427	90	110	382	34	33	333	167	142	747	234

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	673	526	543	1144
Capacity of Entry and Bypass Lanes [veh/h]	844	471	721	739
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	828	471	708	726
X, volume / capacity	0.80	1.12	0.75	1.55

Movement, Approach, & Intersection Results

Lane LOS	C	F	C	F
95th-Percentile Queue Length [veh]	8.42	17.96	6.95	57.07
95th-Percentile Queue Length [ft]	210.57	448.90	173.75	1426.70
Approach Delay [s/veh]	23.07	106.91	22.68	269.83
Approach LOS	C	F	C	F
Intersection Delay [s/veh]	136.02			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	10.8
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.641

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	159	0	194	0	336	171	402	856	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	95	0	0	22	0	0	0
Total Hourly Volume [veh/h]	0	0	0	159	0	99	0	336	149	402	856	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	43	0	27	0	90	40	108	230	0
Total Analysis Volume [veh/h]	0	0	0	171	0	106	0	361	160	432	920	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		39	39	39	39	39	39
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		5	5	11	11	24	24
g / C, Green / Cycle		0.14	0.14	0.29	0.29	0.61	0.61
(v / s)_i Volume / Saturation Flow Rate		0.09	0.06	0.19	0.10	0.36	0.55
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1205	1673
c, Capacity [veh/h]		255	226	535	455	864	1020
d1, Uniform Delay [s]		16.14	15.67	12.39	11.12	5.20	6.63
k, delay calibration		0.04	0.04	0.11	0.11	0.14	0.11
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.15	0.57	1.49	0.46	0.60	3.29
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		0.67	0.47	0.67	0.35	0.50	0.90
d, Delay for Lane Group [s/veh]		17.29	16.23	13.88	11.58	5.79	9.93
Lane Group LOS		B	B	B	B	A	A
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.31	0.77	2.31	0.89	0.80	3.26
50th-Percentile Queue Length [ft/ln]		32.70	19.34	57.65	22.18	20.12	81.38
95th-Percentile Queue Length [veh/ln]		2.35	1.39	4.15	1.60	1.45	5.86
95th-Percentile Queue Length [ft/ln]		58.86	34.82	103.78	39.93	36.21	146.49

Movement, Approach, & Intersection Results

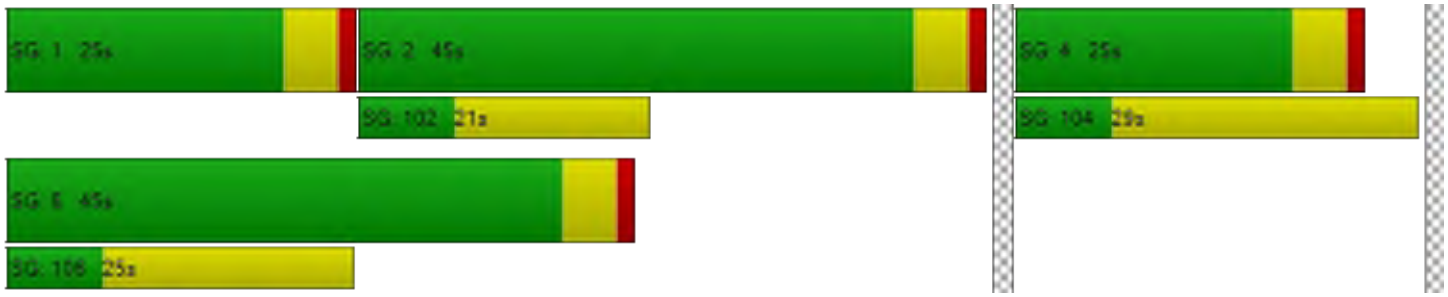
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	17.29	17.29	16.23	0.00	13.88	11.58	5.79	9.93	0.00
Movement LOS				B	B	B		B	B	A	A	
d_A, Approach Delay [s/veh]	0.00			16.88			13.18			8.61		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	10.78											
Intersection LOS	B											
Intersection V/C	0.641											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	10.12	10.12	10.12	10.12
l_p,int, Pedestrian LOS Score for Intersection	2.179	2.146	2.553	2.605
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	1022	2043	2043
d_b, Bicycle Delay [s]	19.58	4.69	0.01	0.01
l_b,int, Bicycle LOS Score for Intersection	4.132	2.724	2.302	3.636
Bicycle LOS	D	B	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	24.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.910

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	335	1	405	0	0	0	91	404	0	0	923	352
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	190	0	0	0	0	0	0	0	0	172
Total Hourly Volume [veh/h]	335	1	215	0	0	0	91	404	0	0	923	180
Peak Hour 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
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]	84	0	54	0	0	0	23	101	0	0	231	45
Total Analysis Volume [veh/h]	335	1	215	0	0	0	91	404	0	0	923	180
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	68	68		68	68	68	68
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	15	15		44	44	35	35
g / C, Green / Cycle	0.21	0.21		0.64	0.64	0.51	0.51
(v / s)_i Volume / Saturation Flow Rate	0.18	0.13		0.14	0.25	0.49	0.12
s, saturation flow rate [veh/h]	1852	1681		662	1643	1884	1543
c, Capacity [veh/h]	395	358		353	1053	956	783
d1, Uniform Delay [s]	25.88	24.32		13.90	5.85	16.29	9.38
k, delay calibration	0.04	0.04		0.04	0.04	0.39	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	2.00	0.61		0.14	0.09	18.78	0.06
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	0.85	0.60		0.26	0.38	0.97	0.23
d, Delay for Lane Group [s/veh]	27.87	24.93		14.04	5.94	35.07	9.43
Lane Group LOS	C	C		B	A	D	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	5.15	3.05		0.37	2.01	16.28	1.28
50th-Percentile Queue Length [ft/ln]	128.71	76.21		9.27	50.25	407.02	32.00
95th-Percentile Queue Length [veh/ln]	8.87	5.49		0.67	3.62	22.90	2.30
95th-Percentile Queue Length [ft/ln]	221.74	137.18		16.69	90.46	572.45	57.61

Movement, Approach, & Intersection Results

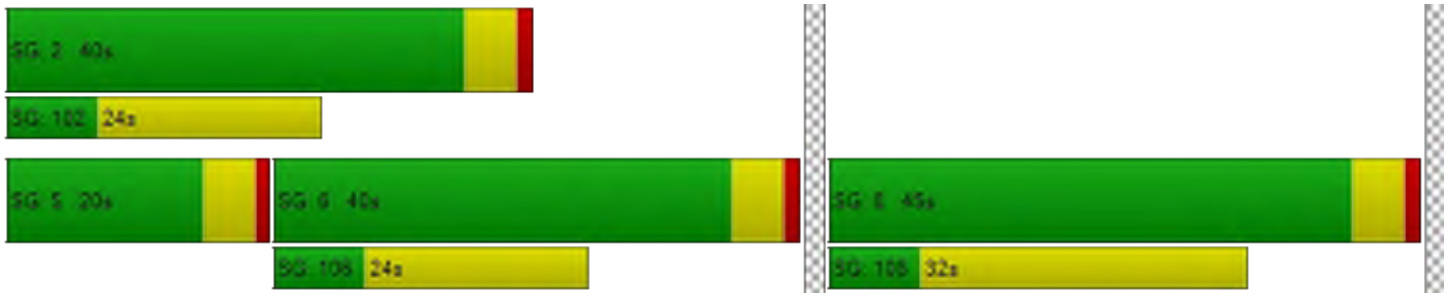
d_M, Delay for Movement [s/veh]	27.87	24.93	24.93	0.00	0.00	0.00	14.04	5.94	0.00	0.00	35.07	9.43
Movement LOS	C	C	C				B	A			D	A
d_A, Approach Delay [s/veh]	26.72			0.00			7.43			30.89		
Approach LOS	C			A			A			C		
d_I, Intersection Delay [s/veh]	24.42											
Intersection LOS	C											
Intersection V/C	0.910											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	24.04	24.04	24.04	24.04
l_p,int, Pedestrian LOS Score for Intersection	2.436	1.911	2.590	2.960
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1171	0	1025	1025
d_b, Bicycle Delay [s]	5.87	34.16	8.12	8.13
l_b,int, Bicycle LOS Score for Intersection	3.318	4.132	2.222	3.509
Bicycle LOS	C	D	B	D

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	40.029

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	115	1	21	19	3	159	64	653	92	15	1002	14
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	115	1	21	19	3	159	64	653	92	15	1002	14
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	34	0	6	6	1	47	19	194	27	4	298	4
Total Analysis Volume [veh/h]	137	1	25	23	4	189	76	777	110	18	1193	17
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	40.03	0.03	0.07	0.96	0.14	0.83	0.13	0.01	0.00	0.02	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	447.16	419.63	67.94	12.09	0.00	0.00	9.78	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	22.57	22.57	22.57	3.34	3.34	6.32	0.45	0.00	0.00	0.07	0.00	0.00
95th-Percentile Queue Length [ft/ln]	564.37	564.37	564.37	83.39	83.39	157.88	11.15	0.00	0.00	1.79	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			114.84			0.95			0.14		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	644.32											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	17.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	263	67	547	151	51	709
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	263	67	547	151	51	709
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	74	19	154	42	14	199
Total Analysis Volume [veh/h]	296	75	615	170	57	797
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	658		57		296	
Exiting Flow Rate [veh/h]	247		1109		733	
Demand Flow Rate [veh/h]	263	67	547	151	51	709
Adjusted Demand Flow Rate [veh/h]	296	75	615	170	57	797

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	0.93	0.98
Entry Flow Rate [veh/h]	371	849	870
Capacity of Entry and Bypass Lanes [veh/h]	706	1303	1021
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	706	1206	1002
X, volume / capacity	0.53	0.65	0.85

Movement, Approach, & Intersection Results

Lane LOS	B	B	C
95th-Percentile Queue Length [veh]	3.10	5.11	10.90
95th-Percentile Queue Length [ft]	77.49	127.71	272.62
Approach Delay [s/veh]	13.26	11.64	24.47
Approach LOS	B	B	C
Intersection Delay [s/veh]	17.39		
Intersection LOS	C		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	27.4
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.033

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	395	202	223	2	6	232
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	395	202	223	2	6	232
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	105	54	59	1	2	62
Total Analysis Volume [veh/h]	420	215	237	2	6	247
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.32	0.00	0.00	0.00	0.03	0.31
d_M, Delay for Movement [s/veh]	8.99	0.00	0.00	0.00	27.39	11.99
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.38	0.00	0.00	0.00	1.52	1.52
95th-Percentile Queue Length [ft/ln]	34.50	0.00	0.00	0.00	37.96	37.96
d_A, Approach Delay [s/veh]	5.94		0.00		12.36	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.12					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: SW Quarry Ave/US 97 SB Ramps

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):	0.011

Intersection Setup

Name	US97 SB Ramps			US97 SB Ramps			Sw Quarry Ave			SW Quarry Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	12.00	12.00	10.00	12.00	10.00	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]	65.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US97 SB Ramps			US97 SB Ramps			Sw Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	16	2650	0	7	0	9	0	2	5	64	53	0
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	6.00	2.00	2.00	7.00	0.00	0.00	2.00	8.00	2.00	2.00	2.00
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]	16	2650	0	7	0	9	0	2	5	64	53	0
Peak Hour Factor	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	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	712	0	2	0	2	0	1	1	17	14	0
Total Analysis Volume [veh/h]	17	2849	0	8	0	10	0	2	5	69	57	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane		No		
Storage Area [veh]	0	0	2	0
Two-Stage Gap Acceptance		No		
Number of Storage Spaces in Median	0	0	1	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.04	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	10.05	10.58	8.64	0.00	0.00	0.00	7.31	0.00	0.00
Movement LOS				B	B	A		A	A	A	A	
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.06	0.06	0.06	0.00	0.00	0.00	0.12	0.12	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	1.60	1.60	1.60	0.00	0.00	0.00	2.99	2.99	0.00
d_A, Approach Delay [s/veh]	0.00			9.26			0.00			4.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	4.45											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 10: SW Quarry Ave/US 97 NB Ramps

Control Type:	Two-way stop	Delay (sec / veh):	9.4
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.024

Intersection Setup

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	21	0	18	0	0	0	0	9	0	0	96	21
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 [%]	2.00	2.00	2.00	2.00	2.00	2.00	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	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]	21	0	18	0	0	0	0	9	0	0	96	21
Peak Hour Factor	1.0000	0.9300	0.9300	1.0000	1.0000	1.0000	0.9300	0.9300	1.0000	1.0000	1.0000	0.9300
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]	5	0	5	0	0	0	0	2	0	0	24	6
Total Analysis Volume [veh/h]	21	0	19	0	0	0	0	10	0	0	96	23
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.36	9.89	8.53	0.00	0.00	0.00	7.45	0.00	0.00	0.00	0.00	0.00
Movement LOS	A	A	A				A	A			A	A
95th-Percentile Queue Length [veh/ln]	0.13	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	3.30	3.30	3.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	8.96			0.00			0.00			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.12											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	88.7
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.056

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	3	333	498	3	306	548
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	3	333	498	3	306	548
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	89	132	1	81	146
Total Analysis Volume [veh/h]	3	354	530	3	326	583
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	0.66	0.01	0.00	0.32	0.01
d_M, Delay for Movement [s/veh]	88.70	27.70	0.00	0.00	10.29	0.00
Movement LOS	F	D	A	A	B	A
95th-Percentile Queue Length [veh/ln]	5.69	5.69	0.00	0.00	1.42	0.00
95th-Percentile Queue Length [ft/ln]	142.16	142.16	0.00	0.00	35.42	0.00
d_A, Approach Delay [s/veh]	28.21		0.00		3.69	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.46					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	8.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	214	328	297	160	124	97
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	214	328	297	160	124	97
Peak Hour Factor	0.9400	1.0000	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	57	82	74	40	31	26
Total Analysis Volume [veh/h]	228	328	297	160	124	103
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	138		235		318	
Exiting Flow Rate [veh/h]	423		482		403	
Demand Flow Rate [veh/h]	214	328	297	160	124	97
Adjusted Demand Flow Rate [veh/h]	228	328	297	160	124	103

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	0.96	0.94	0.94
Entry Flow Rate [veh/h]	580	486	243
Capacity of Entry and Bypass Lanes [veh/h]	1200	1087	998
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1151	1022	934
X, volume / capacity	0.48	0.45	0.24

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	2.71	2.35	0.95
95th-Percentile Queue Length [ft]	67.64	58.73	23.83
Approach Delay [s/veh]	8.43	8.58	6.30
Approach LOS	A	A	A
Intersection Delay [s/veh]	8.10		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	145.4
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	128	377	73	102	344	35	32	298	146	115	675	209
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	128	377	73	102	344	35	32	298	146	115	675	209
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	36	107	21	29	98	10	9	85	41	33	192	59
Total Analysis Volume [veh/h]	145	428	83	116	391	40	36	339	166	131	767	238
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	498			1067			641			619		
Exiting Flow Rate [veh/h]	694			709			973			547		
Demand Flow Rate [veh/h]	128	377	73	102	344	35	32	298	146	115	675	209
Adjusted Demand Flow Rate [veh/h]	145	428	83	116	391	40	36	339	166	131	767	238

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	669	547	552	1157
Capacity of Entry and Bypass Lanes [veh/h]	831	465	718	734
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	816	465	705	722
X, volume / capacity	0.80	1.18	0.77	1.58

Movement, Approach, & Intersection Results

Lane LOS	C	F	C	F
95th-Percentile Queue Length [veh]	8.63	20.35	7.30	59.08
95th-Percentile Queue Length [ft]	215.70	508.70	182.57	1477.11
Approach Delay [s/veh]	23.93	127.87	23.72	282.02
Approach LOS	C	F	C	F
Intersection Delay [s/veh]	145.43			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	11.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.660

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	168	0	186	0	356	154	383	878	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	91	0	0	20	0	0	0
Total Hourly Volume [veh/h]	0	0	0	168	0	95	0	356	134	383	878	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	45	0	26	0	96	36	103	236	0
Total Analysis Volume [veh/h]	0	0	0	181	0	102	0	383	144	412	944	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		41	41	41	41	41	41
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		6	6	13	13	26	26
g / C, Green / Cycle		0.14	0.14	0.32	0.32	0.62	0.62
(v / s)_i Volume / Saturation Flow Rate		0.10	0.06	0.20	0.09	0.35	0.56
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1170	1673
c, Capacity [veh/h]		262	232	595	505	836	1037
d1, Uniform Delay [s]		17.00	16.37	12.12	10.60	5.23	6.88
k, delay calibration		0.04	0.04	0.11	0.11	0.16	0.14
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.22	0.49	1.17	0.31	0.68	4.51
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		0.69	0.44	0.64	0.28	0.49	0.91
d, Delay for Lane Group [s/veh]		18.23	16.86	13.30	10.90	5.92	11.39
Lane Group LOS		B	B	B	B	A	B
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.49	0.79	2.47	0.79	0.85	4.03
50th-Percentile Queue Length [ft/ln]		37.33	19.83	61.81	19.80	21.23	100.85
95th-Percentile Queue Length [veh/ln]		2.69	1.43	4.45	1.43	1.53	7.26
95th-Percentile Queue Length [ft/ln]		67.19	35.69	111.26	35.64	38.21	181.54

Movement, Approach, & Intersection Results

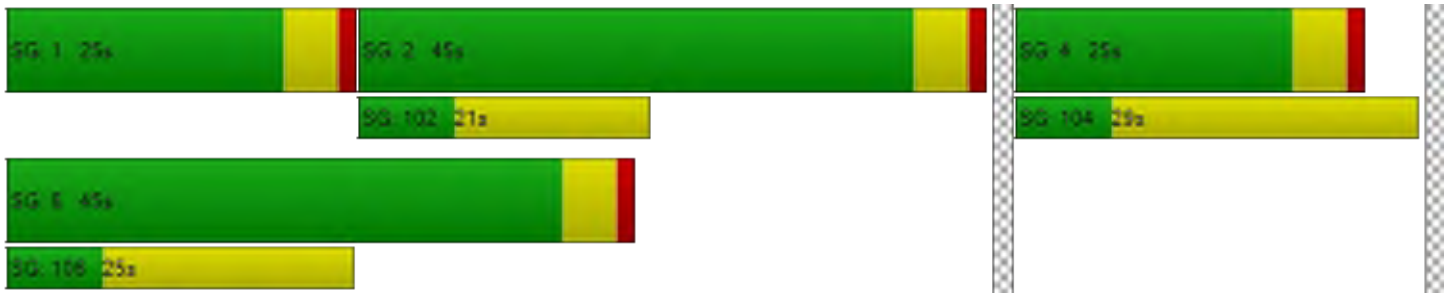
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	18.23	18.23	16.86	0.00	13.30	10.90	5.92	11.39	0.00
Movement LOS				B	B	B		B	B	A	B	
d_A, Approach Delay [s/veh]	0.00			17.73			12.64			9.73		
Approach LOS	A			B			B			A		
d_I, Intersection Delay [s/veh]	11.48											
Intersection LOS	B											
Intersection V/C	0.660											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	11.14	11.14	11.14	11.14
l_p,int, Pedestrian LOS Score for Intersection	2.153	2.145	2.561	2.622
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	967	1934	1934
d_b, Bicycle Delay [s]	20.68	5.52	0.02	0.02
l_b,int, Bicycle LOS Score for Intersection	4.132	2.728	2.308	3.643
Bicycle LOS	D	B	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	25.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.913

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	311	1	417	0	0	0	92	432	0	0	950	387
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	196	0	0	0	0	0	0	0	0	190
Total Hourly Volume [veh/h]	311	1	221	0	0	0	92	432	0	0	950	197
Peak Hour 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
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]	78	0	55	0	0	0	23	108	0	0	238	49
Total Analysis Volume [veh/h]	311	1	221	0	0	0	92	432	0	0	950	197
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	68	68		68	68	68	68
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	14	14		44	44	35	35
g / C, Green / Cycle	0.20	0.20		0.65	0.65	0.52	0.52
(v / s)_i Volume / Saturation Flow Rate	0.17	0.13		0.14	0.26	0.50	0.13
s, saturation flow rate [veh/h]	1852	1681		646	1643	1884	1543
c, Capacity [veh/h]	374	339		347	1070	971	796
d1, Uniform Delay [s]	25.99	24.92		14.17	5.61	16.07	9.10
k, delay calibration	0.04	0.04		0.04	0.04	0.41	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.87	0.80		0.15	0.09	21.39	0.06
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	0.83	0.65		0.26	0.40	0.98	0.25
d, Delay for Lane Group [s/veh]	27.86	25.72		14.32	5.70	37.46	9.16
Lane Group LOS	C	C		B	A	D	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	4.74	3.19		0.35	2.05	17.25	1.36
50th-Percentile Queue Length [ft/ln]	118.46	79.64		8.76	51.18	431.26	34.04
95th-Percentile Queue Length [veh/ln]	8.31	5.73		0.63	3.68	24.06	2.45
95th-Percentile Queue Length [ft/ln]	207.71	143.36		15.77	92.12	601.54	61.28

Movement, Approach, & Intersection Results

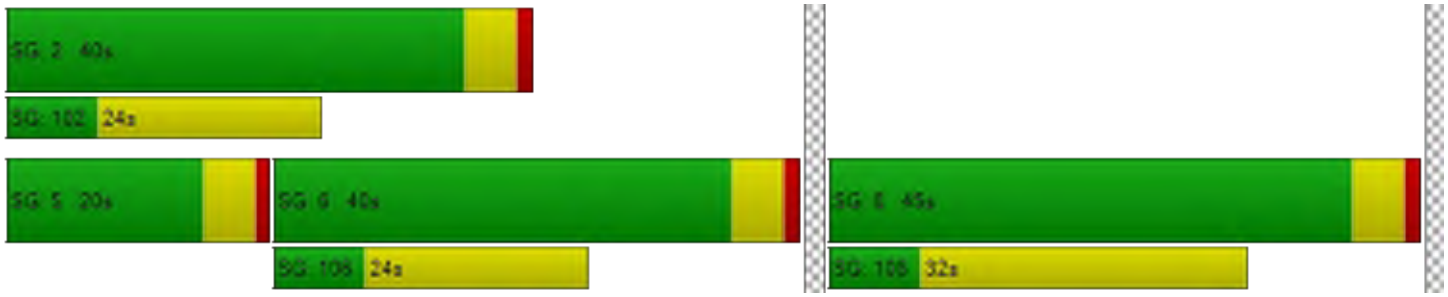
d_M, Delay for Movement [s/veh]	27.86	25.72	25.72	0.00	0.00	0.00	14.32	5.70	0.00	0.00	37.46	9.16
Movement LOS	C	C	C				B	A			D	A
d_A, Approach Delay [s/veh]	26.97			0.00			7.21			32.60		
Approach LOS	C			A			A			C		
d_I, Intersection Delay [s/veh]	25.21											
Intersection LOS	C											
Intersection V/C	0.913											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	23.77	23.77	23.77	23.77
l_p,int, Pedestrian LOS Score for Intersection	2.440	1.947	2.601	3.024
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1181	0	1033	1033
d_b, Bicycle Delay [s]	5.69	33.88	7.92	7.92
l_b,int, Bicycle LOS Score for Intersection	3.298	4.132	2.270	3.612
Bicycle LOS	C	D	B	D

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	103.019

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	114	1	22	19	3	159	64	694	92	15	1064	15
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	114	1	22	19	3	159	64	694	92	15	1064	15
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	34	0	7	6	1	47	19	207	27	4	317	4
Total Analysis Volume [veh/h]	136	1	26	23	4	189	76	826	110	18	1267	18
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	103.02	0.03	0.08	1.21	0.17	0.92	0.14	0.01	0.00	0.02	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	627.50	588.35	90.15	12.65	0.00	0.00	9.99	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	22.85	22.85	22.85	3.68	3.68	7.39	0.48	0.00	0.00	0.07	0.00	0.00
95th-Percentile Queue Length [ft/ln]	571.31	571.31	571.31	91.95	91.95	184.82	12.01	0.00	0.00	1.87	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			156.59			0.95			0.14		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	618.03											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	21.7
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	332	70	555	188	51	699
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	332	70	555	188	51	699
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	93	20	156	53	14	196
Total Analysis Volume [veh/h]	373	79	624	211	57	785
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	668		57		373	
Exiting Flow Rate [veh/h]	293		1174		747	
Demand Flow Rate [veh/h]	332	70	555	188	51	699
Adjusted Demand Flow Rate [veh/h]	373	79	624	211	57	785

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	0.92	0.98
Entry Flow Rate [veh/h]	452	904	858
Capacity of Entry and Bypass Lanes [veh/h]	699	1303	944
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	699	1204	927
X, volume / capacity	0.65	0.69	0.91

Movement, Approach, & Intersection Results

Lane LOS	C	B	D
95th-Percentile Queue Length [veh]	4.77	6.02	13.28
95th-Percentile Queue Length [ft]	119.14	150.44	331.90
Approach Delay [s/veh]	17.34	12.94	32.82
Approach LOS	C	B	D
Intersection Delay [s/veh]	21.74		
Intersection LOS	C		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	27.1
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.033

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	393	197	217	2	6	236
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	393	197	217	2	6	236
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	105	52	58	1	2	63
Total Analysis Volume [veh/h]	418	210	231	2	6	251
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.31	0.00	0.00	0.00	0.03	0.31
d_M, Delay for Movement [s/veh]	8.95	0.00	0.00	0.00	27.08	11.96
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.36	0.00	0.00	0.00	1.53	1.53
95th-Percentile Queue Length [ft/ln]	34.02	0.00	0.00	0.00	38.31	38.31
d_A, Approach Delay [s/veh]	5.96		0.00		12.31	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.18					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: SW Quarry Ave/US 97 SB Ramps

Control Type:	Two-way stop	Delay (sec / veh):	10.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.013

Intersection Setup

Name	US97 SB Ramps			US97 SB Ramps			Sw Quarry Ave			SW Quarry Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	12.00	12.00	10.00	12.00	10.00	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]	65.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US97 SB Ramps			US97 SB Ramps			Sw Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	16	2650	0	7	0	9	0	2	5	88	73	0
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	6.00	2.00	2.00	7.00	0.00	0.00	2.00	8.00	2.00	2.00	2.00
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]	16	2650	0	7	0	9	0	2	5	88	73	0
Peak Hour Factor	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	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	712	0	2	0	2	0	1	1	24	20	0
Total Analysis Volume [veh/h]	17	2849	0	8	0	10	0	2	5	95	78	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane		No		
Storage Area [veh]	0	0	2	0
Two-Stage Gap Acceptance		No		
Number of Storage Spaces in Median	0	0	1	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.06	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	10.75	11.25	8.75	0.00	0.00	0.00	7.34	0.00	0.00
Movement LOS				B	B	A		A	A	A	A	
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.07	0.07	0.07	0.00	0.00	0.00	0.17	0.17	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	1.74	1.74	1.74	0.00	0.00	0.00	4.18	4.18	0.00
d_A, Approach Delay [s/veh]	0.00			9.64			0.00			4.03		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	4.40											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 10: SW Quarry Ave/US 97 NB Ramps

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):	0.033

Intersection Setup

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	27	0	25	0	0	0	0	9	0	0	134	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 [%]	2.00	2.00	2.00	2.00	2.00	2.00	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	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]	27	0	25	0	0	0	0	9	0	0	134	24
Peak Hour Factor	1.0000	0.9300	0.9300	1.0000	1.0000	1.0000	0.9300	0.9300	1.0000	1.0000	1.0000	0.9300
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	0	7	0	0	0	0	2	0	0	34	6
Total Analysis Volume [veh/h]	27	0	27	0	0	0	0	10	0	0	134	26
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.69	10.22	8.60	0.00	0.00	0.00	7.54	0.00	0.00	0.00	0.00	0.00
Movement LOS	A	B	A				A	A			A	A
95th-Percentile Queue Length [veh/ln]	0.19	0.19	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	4.66	4.66	4.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.15			0.00			0.00			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.21											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 1: SE Veterans Way/OR 126

Control Type:	Two-way stop	Delay (sec / veh):	88.8
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.074

Intersection Setup

Name	SE Veterans Way		OR126		OR126	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	13.00	13.00	15.00	13.00
No. of Lanes in Entry Pocket	0	0	0	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	150.00	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		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Veterans Way		OR126		OR126	
Base Volume Input [veh/h]	4	333	497	3	302	551
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	29.00	7.00	5.00	0.00	8.00	8.00
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]	4	333	497	3	302	551
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	89	132	1	80	147
Total Analysis Volume [veh/h]	4	354	529	3	321	586
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	0.66	0.01	0.00	0.32	0.01
d_M, Delay for Movement [s/veh]	88.80	29.11	0.00	0.00	10.25	0.00
Movement LOS	F	D	A	A	B	A
95th-Percentile Queue Length [veh/ln]	5.97	5.97	0.00	0.00	1.38	0.00
95th-Percentile Queue Length [ft/ln]	149.37	149.37	0.00	0.00	34.60	0.00
d_A, Approach Delay [s/veh]	29.78		0.00		3.63	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.76					
Intersection LOS	F					

Intersection Level Of Service Report
Intersection 2: SE Airport Way/SE Veterans Way

Control Type:	Roundabout	Delay (sec / veh):	8.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes		

Intersection Setup

Name	SE Airport Way				SE Veterans Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	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]	45.00		30.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SE Airport Way				SE Veterans Way	
Base Volume Input [veh/h]	216	331	291	157	125	97
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	5.00	7.00	5.00	11.00	2.00
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
Total Hourly Volume [veh/h]	216	331	291	157	125	97
Peak Hour Factor	0.9400	1.0000	1.0000	1.0000	1.0000	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	57	83	73	39	31	26
Total Analysis Volume [veh/h]	230	331	291	157	125	103
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	139		237		311	
Exiting Flow Rate [veh/h]	416		486		402	
Demand Flow Rate [veh/h]	216	331	291	157	125	97
Adjusted Demand Flow Rate [veh/h]	230	331	291	157	125	103

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	0.96	0.94	0.94
Entry Flow Rate [veh/h]	585	477	244
Capacity of Entry and Bypass Lanes [veh/h]	1198	1084	1005
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1150	1020	940
X, volume / capacity	0.49	0.44	0.24

Movement, Approach, & Intersection Results

Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	2.76	2.28	0.95
95th-Percentile Queue Length [ft]	68.90	56.96	23.77
Approach Delay [s/veh]	8.52	8.46	6.27
Approach LOS	A	A	A
Intersection Delay [s/veh]	8.08		
Intersection LOS	A		

Intersection Level Of Service Report
Intersection 3: SW Canal Blvd/SW 27th St/SW Yew Ave

Control Type:	Roundabout	Delay (sec / veh):	154.7
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
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]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW Canal Blvd			SW Canal Blvd			SW 27th St			SW Yew Ave		
Base Volume Input [veh/h]	130	377	67	106	352	39	36	303	146	104	693	212
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 [%]	4.00	1.00	3.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	1.00
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
Total Hourly Volume [veh/h]	130	377	67	106	352	39	36	303	146	104	693	212
Peak Hour Factor	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800	0.8800
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]	37	107	19	30	100	11	10	86	41	30	197	60
Total Analysis Volume [veh/h]	148	428	76	120	400	44	41	344	166	118	788	241
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	512			1078			640			627		
Exiting Flow Rate [veh/h]	690			717			1002			549		
Demand Flow Rate [veh/h]	130	377	67	106	352	39	36	303	146	104	693	212
Adjusted Demand Flow Rate [veh/h]	148	428	76	120	400	44	41	344	166	118	788	241

Lanes

Overwrite Calculated Critical Headway	No	No	No	No
User-Defined Critical Headway [s]	4.00	4.00	4.00	4.00
Overwrite 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	1.00	0.98	0.98
Entry Flow Rate [veh/h]	665	564	562	1168
Capacity of Entry and Bypass Lanes [veh/h]	819	460	719	728
Pedestrian Impedance	1.00	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	804	460	706	716
X, volume / capacity	0.81	1.23	0.78	1.60

Movement, Approach, & Intersection Results

Lane LOS	C	F	C	F
95th-Percentile Queue Length [veh]	8.81	22.47	7.67	61.04
95th-Percentile Queue Length [ft]	220.31	561.74	191.78	1525.97
Approach Delay [s/veh]	24.73	147.30	24.75	294.63
Approach LOS	C	F	C	F
Intersection Delay [s/veh]	154.69			
Intersection LOS	F			

Intersection Level Of Service Report
Intersection 4: US 97 SB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	12.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.680

Intersection Setup

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
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	16.00	16.00	14.00	12.00	12.00	11.00	14.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	1	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	200.00	100.00	100.00	80.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			-3.00			-5.00			5.00		
Curb Present				Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 SB Ramps			US 97 SB Ramps			SW Yew Ave			SW Yew Ave		
Base Volume Input [veh/h]	0	0	0	178	0	178	0	376	136	364	900	0
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 [%]	2.00	2.00	2.00	5.00	0.00	1.00	2.00	2.00	2.00	1.00	2.00	2.00
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	0	0	0	87	0	0	18	0	0	0
Total Hourly Volume [veh/h]	0	0	0	178	0	91	0	376	118	364	900	0
Peak Hour Factor	1.0000	1.0000	1.0000	0.9300	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	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]	0	0	0	48	0	24	0	101	32	98	242	0
Total Analysis Volume [veh/h]	0	0	0	191	0	98	0	404	127	391	968	0
Presence of On-Street Parking				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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

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

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis
Signal Group	0	0	0	4	4	4	0	2	0	1	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	-	-	-	Lead	-	-
Minimum Green [s]	0	0	0	5	5	5	0	10	0	5	10	0
Maximum Green [s]	0	0	0	20	20	20	0	40	0	20	40	0
Amber [s]	0.0	0.0	0.0	4.0	4.0	4.0	0.0	4.0	0.0	4.0	4.0	0.0
All red [s]	0.0	0.0	0.0	1.0	1.0	1.0	0.0	1.0	0.0	1.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	0.0	0.0	1.5	1.5	1.5	0.0	3.0	0.0	2.0	3.0	0.0
Walk [s]	0	0	0	7	7	7	0	7	0	0	7	0
Pedestrian Clearance [s]	0	0	0	22	22	22	0	14	0	0	18	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			No	
I1, Start-Up Lost Time [s]	0.0	0.0	0.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	0.0	0.0	3.0	3.0	3.0	0.0	3.0	0.0	3.0	3.0	0.0
Minimum Recall					No			Yes		No	Yes	
Maximum Recall					No			No		No	No	
Pedestrian Recall					No			No		No	No	
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		C	R	C	R	L	C
C, Cycle Length [s]		44	44	44	44	44	44
L, Total Lost Time per Cycle [s]		5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]		0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]		3.00	3.00	3.00	3.00	0.00	3.00
g_i, Effective Green Time [s]		6	6	15	15	28	28
g / C, Green / Cycle		0.14	0.14	0.35	0.35	0.63	0.63
(v / s)_i Volume / Saturation Flow Rate		0.10	0.06	0.22	0.08	0.34	0.58
s, saturation flow rate [veh/h]		1881	1666	1869	1589	1137	1673
c, Capacity [veh/h]		268	238	653	555	810	1053
d1, Uniform Delay [s]		17.96	17.14	11.85	10.10	5.26	7.15
k, delay calibration		0.04	0.04	0.11	0.11	0.18	0.18
I, Upstream Filtering Factor		1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]		1.31	0.42	0.96	0.21	0.76	5.96
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		0.71	0.41	0.62	0.23	0.48	0.92
d, Delay for Lane Group [s/veh]		19.27	17.57	12.81	10.30	6.02	13.11
Lane Group LOS		B	B	B	B	A	B
Critical Lane Group		Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]		1.70	0.81	2.65	0.70	0.89	4.96
50th-Percentile Queue Length [ft/ln]		42.55	20.35	66.32	17.40	22.13	123.98
95th-Percentile Queue Length [veh/ln]		3.06	1.47	4.77	1.25	1.59	8.61
95th-Percentile Queue Length [ft/ln]		76.60	36.63	119.37	31.31	39.84	215.28

Movement, Approach, & Intersection Results

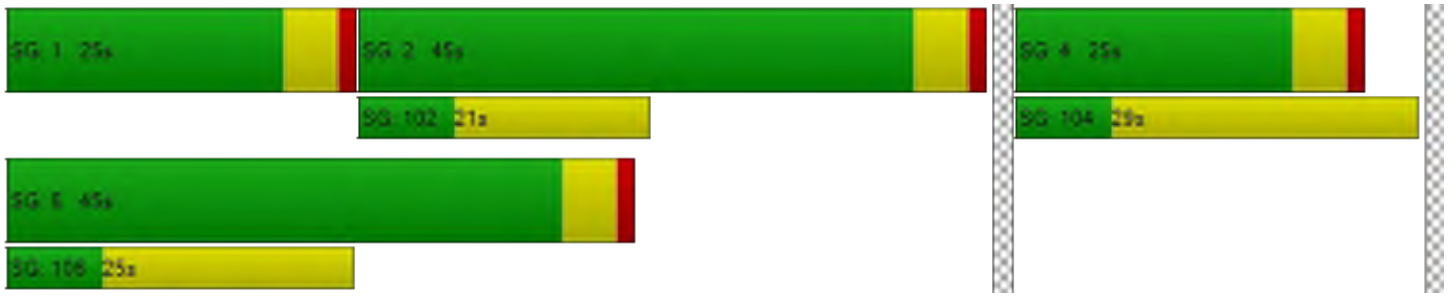
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	19.27	19.27	17.57	0.00	12.81	10.30	6.02	13.11	0.00
Movement LOS				B	B	B		B	B	A	B	
d_A, Approach Delay [s/veh]	0.00			18.69			12.21			11.07		
Approach LOS	A			B			B			B		
d_I, Intersection Delay [s/veh]	12.36											
Intersection LOS	B											
Intersection V/C	0.680											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	12.28	12.28	12.28	12.28
I_p,int, Pedestrian LOS Score for Intersection	2.123	2.144	2.569	2.639
Crosswalk LOS	B	B	B	B
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	913	1827	1827
d_b, Bicycle Delay [s]	21.90	6.46	0.16	0.16
I_b,int, Bicycle LOS Score for Intersection	4.132	2.731	2.311	3.648
Bicycle LOS	D	B	B	D

Sequence

Ring 1	1	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 5: US 97 NB Ramps/SW Yew Ave

Control Type:	Signalized	Delay (sec / veh):	25.9
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.919

Intersection Setup

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	14.00	14.00	14.00	12.00	12.00	12.00	14.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0	1	0	0	0	0	1
Entry Pocket Length [ft]	160.00	100.00	100.00	100.00	100.00	100.00	230.00	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]	30.00			30.00			35.00			35.00		
Grade [%]	-2.00			0.00			5.00			-5.00		
Curb Present	Yes						Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps			US 97 NB Ramps			SW Yew Ave			SW Airport Way		
Base Volume Input [veh/h]	286	1	429	0	0	0	94	460	0	0	977	422
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 [%]	2.00	0.00	7.00	2.00	2.00	2.00	3.00	4.00	2.00	2.00	1.00	3.00
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	202	0	0	0	0	0	0	0	0	207
Total Hourly Volume [veh/h]	286	1	227	0	0	0	94	460	0	0	977	215
Peak Hour 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
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]	72	0	57	0	0	0	24	115	0	0	244	54
Total Analysis Volume [veh/h]	286	1	227	0	0	0	94	460	0	0	977	215
Presence of On-Street Parking	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 major stree	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing major street [	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing minor stree	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing minor street [	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			1		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	16.00

Phasing & Timing

Control Type	Permis	Permis	Permis	Permis	Permis	Permis	ProtPer	Permis	Permis	Permis	Permis	Permis
Signal Group	0	8	0	0	0	0	5	2	0	0	6	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	-	-	-
Minimum Green [s]	0	10	0	0	0	0	5	10	0	0	10	0
Maximum Green [s]	0	40	0	0	0	0	15	35	0	0	35	0
Amber [s]	0.0	4.0	0.0	0.0	0.0	0.0	4.0	4.0	0.0	0.0	4.0	0.0
All red [s]	0.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
Walk [s]	0	7	0	0	0	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	25	0	0	0	0	0	17	0	0	17	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			No	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		No					No	Yes			Yes	
Maximum Recall		No					No	No			No	
Pedestrian Recall		No					No	No			No	
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	C	R
C, Cycle Length [s]	67	67		67	67	67	67
L, Total Lost Time per Cycle [s]	5.00	5.00		5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00		0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00		0.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	13	13		44	44	35	35
g / C, Green / Cycle	0.19	0.19		0.66	0.66	0.52	0.52
(v / s)_i Volume / Saturation Flow Rate	0.15	0.14		0.15	0.28	0.52	0.14
s, saturation flow rate [veh/h]	1852	1680		630	1643	1884	1543
c, Capacity [veh/h]	350	318		348	1087	986	808
d1, Uniform Delay [s]	25.99	25.43		14.14	5.32	15.75	8.78
k, delay calibration	0.04	0.04		0.04	0.04	0.42	0.04
I, Upstream Filtering Factor	1.00	1.00		1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.80	1.14		0.15	0.10	24.06	0.06
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	0.82	0.72		0.27	0.42	0.99	0.27
d, Delay for Lane Group [s/veh]	27.79	26.57		14.29	5.42	39.82	8.85
Lane Group LOS	C	C		B	A	D	A
Critical Lane Group	Yes	No		Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	4.29	3.31		0.33	2.04	18.16	1.43
50th-Percentile Queue Length [ft/ln]	107.20	82.73		8.23	51.09	453.97	35.83
95th-Percentile Queue Length [veh/ln]	7.68	5.96		0.59	3.68	25.15	2.58
95th-Percentile Queue Length [ft/ln]	192.10	148.91		14.81	91.96	628.68	64.49

Movement, Approach, & Intersection Results

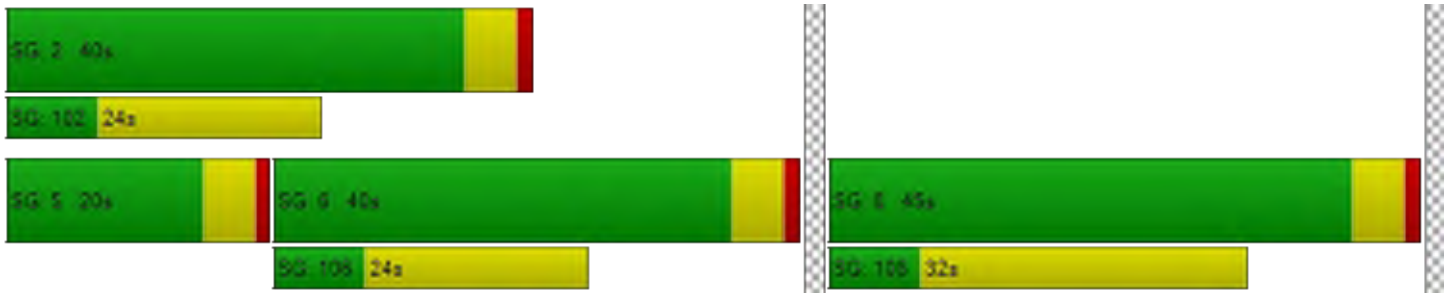
d_M, Delay for Movement [s/veh]	27.79	26.57	26.57	0.00	0.00	0.00	14.29	5.42	0.00	0.00	39.82	8.85
Movement LOS	C	C	C				B	A			D	A
d_A, Approach Delay [s/veh]	27.25			0.00			6.93			34.23		
Approach LOS	C			A			A			C		
d_I, Intersection Delay [s/veh]	25.95											
Intersection LOS	C											
Intersection V/C	0.919											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	23.26	23.26	23.26	23.26
l_p,int, Pedestrian LOS Score for Intersection	2.444	1.985	2.613	3.086
Crosswalk LOS	B	A	B	C
s_b, Saturation Flow Rate of the bicycle lane [bicycles/h]	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1199	0	1049	1049
d_b, Bicycle Delay [s]	5.35	33.36	7.54	7.54
l_b,int, Bicycle LOS Score for Intersection	3.277	4.132	2.320	3.714
Bicycle LOS	C	D	B	D

Sequence

Ring 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: SW 21st St/SW Airport Way

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.082

Intersection Setup

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
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	1	1	0	0	1	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	75.00	100.00	100.00	50.00	100.00	50.00
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]	25.00			25.00			35.00			35.00		
Grade [%]	0.00			0.00			4.00			-3.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	SW 21st St			SW 21st St			SW Airport Way			SW Airport Way		
Base Volume Input [veh/h]	114	1	22	20	3	159	64	734	91	15	1127	15
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	8.00	0.00	25.00	1.00	0.00	8.00	3.00	0.00	1.00	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]	114	1	22	20	3	159	64	734	91	15	1127	15
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
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]	34	0	7	6	1	47	19	218	27	4	335	4
Total Analysis Volume [veh/h]	136	1	26	24	4	189	76	874	108	18	1342	18
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.08	1.59	0.20	1.01	0.15	0.01	0.00	0.03	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.	10000.	10000.	888.39	833.98	121.02	13.25	0.00	0.00	10.19	0.00	0.00
Movement LOS	F	F	F	F	F	F	B	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	23.03	23.03	23.03	4.11	4.11	8.57	0.52	0.00	0.00	0.08	0.00	0.00
95th-Percentile Queue Length [ft/ln]	575.73	575.73	575.73	102.64	102.64	214.26	12.95	0.00	0.00	1.95	0.00	0.00
d_A, Approach Delay [s/veh]	10000.00			219.03			0.95			0.13		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	596.14											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 7: SW 19th Ave/SW Airport Way

Control Type:	Roundabout	Delay (sec / veh):	28.4
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes		

Intersection Setup

Name	SW 19th St		SW Airport Way		SW Airport Way	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	13.00	13.00	13.00	13.00	13.00	13.00
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		35.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW 19th St		SW Airport Way		SW Airport Way	
Base Volume Input [veh/h]	401	72	563	226	51	688
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	7.00	12.00	0.00	2.00
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
Total Hourly Volume [veh/h]	401	72	563	226	51	688
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	113	20	158	63	14	193
Total Analysis Volume [veh/h]	451	81	633	254	57	773
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	677		57		451	
Exiting Flow Rate [veh/h]	341		1239		758	
Demand Flow Rate [veh/h]	401	72	563	226	51	688
Adjusted Demand Flow Rate [veh/h]	451	81	633	254	57	773

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	0.92	0.98
Entry Flow Rate [veh/h]	532	962	846
Capacity of Entry and Bypass Lanes [veh/h]	692	1303	872
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	692	1202	856
X, volume / capacity	0.77	0.74	0.97

Movement, Approach, & Intersection Results

Lane LOS	C	B	E
95th-Percentile Queue Length [veh]	7.32	7.16	16.13
95th-Percentile Queue Length [ft]	182.93	179.02	403.36
Approach Delay [s/veh]	24.20	14.61	45.80
Approach LOS	C	B	E
Intersection Delay [s/veh]	28.39		
Intersection LOS	D		

Intersection Level Of Service Report
Intersection 8: SW Canal Blvd/SW Helmholtz Way

Control Type:	Two-way stop	Delay (sec / veh):	26.6
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.027

Intersection Setup

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	14.00	11.00	11.00	11.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	0	0	0
Entry Pocket Length [ft]	150.00	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		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	SW Canal Blvd		SW Canal Blvd		SW Helmholtz Way	
Base Volume Input [veh/h]	391	192	211	2	5	240
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	6.00	2.00	0.00	20.00	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]	391	192	211	2	5	240
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	104	51	56	1	1	64
Total Analysis Volume [veh/h]	416	204	224	2	5	255
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			Yes
Number of Storage Spaces in Median	0	0	1

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.31	0.00	0.00	0.00	0.03	0.31
d_M, Delay for Movement [s/veh]	8.91	0.00	0.00	0.00	26.65	11.82
Movement LOS	A	A	A	A	D	B
95th-Percentile Queue Length [veh/ln]	1.34	0.00	0.00	0.00	1.51	1.51
95th-Percentile Queue Length [ft/ln]	33.50	0.00	0.00	0.00	37.71	37.71
d_A, Approach Delay [s/veh]	5.98		0.00		12.11	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	6.20					
Intersection LOS	D					

Intersection Level Of Service Report
Intersection 9: SW Quarry Ave/US 97 SB Ramps

Control Type:	Two-way stop	Delay (sec / veh):	11.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.016

Intersection Setup

Name	US97 SB Ramps			US97 SB Ramps			Sw Quarry Ave			SW Quarry Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	11.00	12.00	12.00	12.00	12.00	12.00	10.00	12.00	10.00	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]	65.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US97 SB Ramps			US97 SB Ramps			Sw Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	16	2650	0	8	0	10	0	3	6	112	93	0
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	6.00	2.00	2.00	7.00	0.00	0.00	2.00	8.00	2.00	2.00	2.00
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]	16	2650	0	8	0	10	0	3	6	112	93	0
Peak Hour Factor	0.9300	0.9300	1.0000	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	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	712	0	2	0	3	0	1	2	30	25	0
Total Analysis Volume [veh/h]	17	2849	0	9	0	11	0	3	6	120	100	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane		No		
Storage Area [veh]	0	0	2	0
Two-Stage Gap Acceptance		No		
Number of Storage Spaces in Median	0	0	1	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.07	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	0.00	11.56	12.03	8.89	0.00	0.00	0.00	7.38	0.00	0.00
Movement LOS				B	B	A		A	A	A	A	
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.00	0.08	0.08	0.08	0.00	0.00	0.00	0.21	0.21	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	0.00	2.12	2.12	2.12	0.00	0.00	0.00	5.35	5.35	0.00
d_A, Approach Delay [s/veh]	0.00			10.09			0.00			4.02		
Approach LOS	A			B			A			A		
d_I, Intersection Delay [s/veh]	4.37											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 10: SW Quarry Ave/US 97 NB Ramps

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):	0.043

Intersection Setup

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
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]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 97 NB Ramps						SW Quarry Ave			SW Quarry Ave		
Base Volume Input [veh/h]	33	0	31	0	0	0	0	11	0	0	172	26
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 [%]	2.00	2.00	2.00	2.00	2.00	2.00	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	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]	33	0	31	0	0	0	0	11	0	0	172	26
Peak Hour Factor	1.0000	0.9300	0.9300	1.0000	1.0000	1.0000	0.9300	0.9300	1.0000	1.0000	1.0000	0.9300
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	0	8	0	0	0	0	3	0	0	43	7
Total Analysis Volume [veh/h]	33	0	33	0	0	0	0	12	0	0	172	28
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.06	10.58	8.69	0.00	0.00	0.00	7.62	0.00	0.00	0.00	0.00	0.00
Movement LOS	B	B	A				A	A			A	A
95th-Percentile Queue Length [veh/ln]	0.24	0.24	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	6.00	6.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.37			0.00			0.00			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	2.23											
Intersection LOS	B											

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Appendix K

MEMORANDUM

May 23, 2024 Project# 27371

To: Jessica MacClanahan, John Roberts, Kyle Roberts, Morgan Snyder & Lindsey Cromsigt, City of Redmond

Tyler Deke, Bend MPO

Bob Townsend & David Amiton, ODOT

Chris Doty, Cody Smith, & Tarik Rawlings, Deschutes County

From: Matt Kittelson & Julia Kuhn

RE: Redmond Large Lot Industrial (LLI) Lands Future Planning Considerations

DRAFT

As a follow-up to our ongoing discussions and our March 13, 2024 memorandum ("March memo") regarding the transportation needs associated with increased employment density in the Large Lot Industrial (LLI) lands, this memorandum summarizes technical and policy considerations that can be considered as the City continues to plan for economic development opportunities. This memorandum also incorporates agency discussions regarding the March memo as well as feedback from our March 21st agency meeting. The following topics are summarized herein:

- Projects within the adopted Redmond Transportation System Plan (TSP) and the anticipated funding/implementation timelines
- A comparison of the identified transportation needs in the TSP versus those needs associated with increased employment densities on the LLI lands
- Statewide Policy and Planning Goal considerations
- Potential procedural next steps

Details regarding each are discussed below.

IDENTIFIED NEEDS AND PROJECTS IN THE ADOPTED TSP

As discussed in the March memo, the TSP adopted in 2020 identifies the following changes to the transportation system within the vicinity of the LLI lands. The status of the TSP projects that are included on the City's 5-year Capital Improvements Project (CIP)[1] list are also highlighted below.

- SW Canal Boulevard/SW 27th Street/SW Yew Avenue – this existing roundabout is a documented capacity deficiency and is funded on the City's CIP for design and construction in 2028. As proposed, the intersection will be widened to a two-lane roundabout.
- New roundabouts along SW Canal Boulevard – per the TSP and the CIP, new single lane roundabouts are planned at the SW Badger Avenue and SW Elkhorn Avenue intersections to address noted capacity and safety needs near Ridgeview High School. The SW Badger Avenue

[1] Redmond 5 Year CIP (arcgis.com)

roundabout is funded for construction in 2025 and the SW Elkhorn Avenue roundabout is funded for construction in 2027.

- SW 19th Street/SW Airport Way – to address documented capacity needs as well as to enhance the access safety to the Deschutes County Fairgrounds, this intersection is funded for construction on the CIP as a single lane roundabout by 2027.
- Extension of SE 9th Street and new roundabouts – to address documented capacity and connectivity needs, SE 9th Street is funded to be extended from SE Veteran's Way to OR 126 by 2027. This project will also include construction of a roundabout at the SE Veteran's Way/SE 9th Street intersection and a roundabout at the OR 126/SE 9th Street intersection. This project is currently initiated with a Progressive Design-Build delivery.
- SW 21st Street/SW Airport Way – due to previously identified capacity constraints, this intersection is identified within the TSP to be converted to a right-in-right-out (RIRO) and/or be grade separated, both of which have impacts to the surrounding properties and local streets as well as right-of-way constraints. If converted to a RIRO, the capacity deficiencies at this intersection can be addressed but additional planning is needed to understand where U-turn movements can be made to the west of the intersection and the associated capacity needs. With the construction of the SW 19th Street/SW Airport Way roundabout, U-turns can be accommodated to the east of the SW 21st Avenue intersection if restricted to RIRO but further evaluation would be needed to assess whether the single lane roundabout at SW 19th Street is sufficient to meet the additional capacity needs and/or if widening to a multi-lane roundabout would be needed.
- SW 21st Street extension – the TSP identifies this extension south of SW Airport Way to a future extension of SW Elkhorn Avenue across US 97. No timeline for funding or construction has been identified and this project would need to be considered as part of the potential access restrictions at the SW 21st Street/SW Airport Way intersection as well as the possible extension of SW Elkhorn Avenue.
- SW Yew Avenue/US 97 NB Ramp Terminals – ODOT adopted an alternative mobility target (v/c of 1.0) at this intersection, but this target will be exceeded upon development of the LLI lands unless other broader transportation system changes are made. As part of future planning efforts related to the LLI lands, potential geometric and/or policy considerations will need to be further explored to identify if there are changes that can be made to this intersection and/or along the SW Yew Avenue/SE Yew Avenue/SW Airport Way corridor to address mobility targets.
- US 97 South Redmond Corridor Facility Plan recommendations – The TSP includes, by reference, the adopted Facility Plan recommendations although no funding for construction is available at this time. The total cost of the recommended changes in the Facility Plan is approximately $60 million.
- Extension of SW Elkhorn Avenue from SW 39th Street to SW 19th Street as a grade-separated crossing of US 97. No timeframe for funding or construction has been identified to-date. The TSP estimated the cost of the extension and overcrossing to be approximately $26 million.
- SW Helmholtz Way/SW Canal Boulevard – the TSP identifies a future capacity need to construct a traffic signal or roundabout at this location. No timeframe for funding or construction has been identified. The TSP identifies the cost to be $3.2 million.

DRAFT

NOTED AREAS OF NEED ASSOCIATED WITH INCREASED LLI DENSITIES

As noted in the March memo, the City is planning for up to 9,820 employees within the LLI lands whereas the potential for only 1,000 employees on these lands is considered within the adopted TSP. The corridors and intersections that are anticipated to experience material changes in traffic volumes as a result of increased employment densities include:

- SW Yew Avenue/US 97 Northbound Ramp Terminal - Depending on the level of employment densities realized (i.e., 10 or 15 employees per acre), the SW Airport Way corridor at and to the east of the US 97 northbound ramp terminal could increase between 400 and 500 vehicles per hour compared to the adopted TSP volume projections. This level of increase would result in the adopted alternative mobility target at the US 97 northbound ramps/SW Yew Avenue intersection to be exceeded under either of the increased employment density scenarios. Under the adopted TSP, the mobility target is forecast to be met (i.e., volume-to-capacity ratio of 0.94). As part of future planning efforts for the LLI lands, the following considerations should be explored further:
  - The level of non-single occupancy vehicle travel by future employees on the LLI lands that would be need to achieved that would reduce the traffic volumes at this location to those that would enable the adopted alternative mobility target to be met. In other words, an evaluation of how travel demand management strategies could be employed to offset potential impacts at this location.
  - Whether an increase to the 1.0 alternative mobility target beyond its current maximum is feasible. This evaluation would need to consider if accepting higher congestion at this location is viable inclusive of other system trade-offs that may result, including impacts to system safety and economic viability considerations.
  - The potential for and feasibility of additional geometric changes along the SW Yew Avenue/SW Airport Way corridor and/or at the US 97 northbound off-ramp.
- SW 19th Street/SW Airport Way – the planned single lane roundabout at this location will need to be expanded with additional turn lanes and/or constructed as a multilane to accommodate up to 500 additional vehicles per hour. Based on the March memo, the timing of this expansion need is anticipated to occur in approximately 2035.
- New Southern Interchange – per the modeling data, the potential for a new southern interchange would divert approximately 250 – 350 vehicles per hour from the Yew Avenue corridor to a new southern interchange instead. Further exploration of the overall cost/benefits is needed as part of any alternatives analysis conducted in the future. As discussed in our March memo, there are other non-PM peak hour demand considerations that can be served by an additional overcrossing and/or interchange on US 97, including emergency planning, event management, and system redundancy.
- SW Elkhorn overcrossing and/or interchange – the Bend-Redmond travel demand model does not account for either an Elkhorn overcrossing or a potential interchange to/from the south. Further evaluation of the potential for either configuration and the associated benefits/costs of providing can help inform planning efforts and should be a part of any future alternatives evaluation.

DRAFT

STATEWIDE PLANNING GOAL AND POLICY CONSIDERATIONS

There are a number of applicable state and federal planning goals and policy considerations that should be considered when exploring and evaluating potential transportation network changes that would support future development of the LLI employment densities and other regional needs in the vicinity, including providing for alternative access to the Redmond Municipal Airport during a Cascadia subduction event, events at the Deschutes County Fairgrounds and Expo Center, and overall system redundancy. Some examples of the considerations are provided below.

Oregon Statewide Planning Goals 2 (Land Use Planning), 3 (Agricultural Lands), and 12 (Transportation)

This evaluation would require an assessment of Statewide Planning Goals 2, 3 and 12 to investigate whether an exception to these goals, which would likely be needed to implement an interchange south of the LLI lands, can be justified. This detailed evaluation would need to consider whether the combination of alternative modes of transportation, traffic management measures, and the implications of making changes to existing transportation facilities within the UGB can serve the growth in traffic associated with the economic development anticipated or if an exception to the statewide planning goals is required. As noted above, there are four areas in particular that may need to be further explored, such as but not limited to:

- The level of non-single occupancy vehicle travel by future employees on the LLI lands that may need to be achieved to reduce the traffic volumes at the SW Yew Avenue/Northbound US 97 ramp intersection on to those that would enable the adopted alternative mobility target to be met.
- Whether an increase to the 1.0 alternative mobility target beyond its current maximum is feasible. This evaluation would need to consider if accepting higher congestion at this location is viable inclusive of other system trade-offs that may result, including impacts to system safety and economic viability considerations.
- The potential for additional and feasibility of geometric changes along the SW Yew Avenue/SW Airport Way corridor and/or at the US 97 northbound off-ramp.
- Further evaluation of the feasibility, costs and benefits of a SW Elkhorn Avenue extension and overcrossing and/or a new interchange with US 97 to/from the south.

If a detailed needs and alternatives evaluation is conducted and no options are deemed to be feasible and a southern interchange is identified as needed, per OAR 660-012-0070, a goal exception would be required. This goal exception evaluation would need to identify the needed "size, design and capacity" of needed facilities as well as the "long-term economic, social, environmental and energy consequences" of all potential alternatives within and external to the UGB that are considered.

Interchange Planning and Design Considerations

Whether a new overcrossing and/or interchange is considered within the Redmond UGB (i.e., SW Elkhorn Avenue) or at a location south of the UGB, there are a number of ODOT and Federal Highway Administration (FHWA) policy documents and requirements that must be evaluated.

Section 600 of ODOT's Highway Design Manual (HDM, March 2024) provides a summary of the primary planning and design steps related to considerations of new overcrossings and/or interchanges. As

outlined in this section, there are a number of elements/steps that must be considered, including but not limited to:

- Evaluation of the warrants for overcrossing and interchanges that consider locational characteristics, the designation of the highway, congestion, safety, topography, volume, user benefits, etc.
- Interchange spacing requirements
- Guidance on the traffic studies needed to justify an overcrossing and/or interchange
- The process for applying for an exception to both ODOT standards and the need for approval by FHWA for any added access to US 97
- The purpose of and need for preparing an Interchange Area Management Plan (IAMP). Per ODOT guidance, the IAMP includes the following objectives:
  - *Protect the state and local investment in major facilities;*
  - *Establish the desired function of interchanges;*
  - *Protect the function of interchanges by maximizing the capacity of the interchanges for*
  - *safe movement from the mainline highway facility;*
  - *Balance the need for efficient interstate and state travel with local use;*
  - *Preserve and improve safety of existing interchanges;*
  - *Provide safe and efficient operation between connecting roadways;*
  - *Adequately protect interchanges from unintended and unexpected development while accommodating planned community development;*
  - *Manage the existing interchange capacity and new capacity provided through improved interchange improvements;*
  - *Establish how future land use and transportation decisions will be coordinated in interchange areas between ODOT and the local governments;*
  - *Minimize impacts to farm and forest lands and other resource lands around rural interchanges in accordance with adopted Statewide Planning Goals;*

Major Investment Policy Considerations

As noted in the TSP, City policies, the Comprehensive Plan, and Council priorities focus on strategic investments that support mixed-use neighborhoods, providing options for increased use of walking and cycling, enhancing safety, and continued support for the economic health and prosperity of the region. Further, the highest priority projects for strategic investments are those that (1) protect the existing system and (2) improve the efficiency and safety of existing multimodal facilities.

We also note that ODOT's Highway Plan, Policy 1G (Action 1G.2) notes that any major improvements to state facilities must meet all of the following conditions:

- *The improvement is needed to satisfy a state transportation objective or objectives;*
- *The scope of the project is reasonably identified, considering the long-range projection of need;*
- *The improvement was identified through a planning process that included:*
  - *Thorough public involvement;*
  - *Evaluation of reasonable transportation and land use alternatives including measures for managing the existing transportation system and for reducing demands for highway capacity; and*
  - *Sufficient environmental analysis at the fatal flaw planning level.*

- *The plan includes measures to manage the transportation system, but these measures will not satisfy identified highway needs during the planning period or there is a need to preserve a future transportation corridor for future needs beyond the planning period;*
- *The improvement would be a cost-effective means to achieve the objective(s);*
- *The proposed timing of the improvement is consistent with priorities established in corridor plans and regional transportation plans and the financing program identifies construction as being dependent on the future availability of funds;*
- *Funding for the project can reasonably be expected at the time the project is ready for development and construction;*
- *The local government schedules funding for local street improvements in its local transportation financing program if these are needed to attain the objectives of the major improvement; and*
- *The plan includes policies and implementing measures that protect the corridor and its intended function.*

The above would apply to any of the options that could be considered to meet the long-term needs of the LLI lands. As noted above, the conditions that must be met include the environmental documentation, design exceptions, design decisions, the IAMP, etc. Pending an amendment to the TSP, we recommend that the agencies outline a clear process for evaluating the need for and the study, planning and design considerations related to any major investment that the City may further explore.

Please let us know if you have any questions related to the above and the potential next steps as part of the TSP Amendment.

DRAFT

Appendix L

TECHNICAL MEMORANDUM

ALTERNATE MOBILITY TARGETS

DATE: November 12th 2024

TO: Oregon Department of Transportation Region 4

City of Redmond

FROM: Ken Shonkwiler, Principal Planner

Ben Fuller, PE, Traffic Analyst

Oregon Department of Transportation

SUBJECT: US 97/Evergreen and US 97/Glacier Alternative Mobility Targets

Introduction

It is important for a Transportation System Plan (TSP) to identify a full range of transportation system projects and services that would address the deficiencies that would exist at the end of a 20-year planning horizon. As a base case, it is assumed that the community grows in accordance with its existing adopted land use plan and no additional improvements are made during that period of time.

However, it is also important for a TSP to realistically identify which transportation projects and services are reasonably likely to be implemented over the 20-year planning horizon, based on financial or other constraints. This exercise enables the community and, as appropriate, the state to establish realistic expectations for how that transportation system will likely operate at the end of the 20-year planning horizon.

Because of the financial and other constraints that have been faced by state and local governments over the last 20 years and which are expected to continue into the foreseeable future, it is often the case that the local and/or state roadways will not be improved to the extent that they will be able meet local level-of-service (LOS) standards or, in the case of ODOT, roadway volume-to-capacity (v/c) ratio based mobility targets, at the end of the 20-year planning horizon if the community grows in accordance with its existing, adopted land use plan. In some cases, a community may also choose to not add capacity to major roadways due to design constraints or livability priorities. This is particularly common in larger communities or in those with roadways that experience higher travel demands. In these cases, it is appropriate to adjust roadway performance expectations, as expressed through local LOS standards or state mobility targets, to match the performance that is actually forecasted to exist at the end of the 20-year planning horizon, through the adoption of alternative standards or mobility targets.

In other words, in these situations, adopting alternative standards or mobility targets is simply an exercise in adjusting roadway performance expectations to match realistic expectations for how the roadways are actually forecasted to operate, taking into account constraints and assuming implementation of the existing, adopted local land use plan. In addition to establishing realistic expectations for future system performance, this process will help reduce the potential for state and local investment needs by not continuing to require compliance with standards or targets that both parties acknowledge cannot likely be achieved. The process can point to other strategies to address mobility as well. This memo discusses both constraints and strategies for improving mobility.

This memorandum documents the need for developing alternative mobility targets for the intersections of US 97/SE Evergreen and US 97/SW Glacier/SW Highland in the City of Redmond and describes the proposed new targets. Included is a summary of the methodology and results, and the recommended alternative mobility targets for the study intersections.

Background

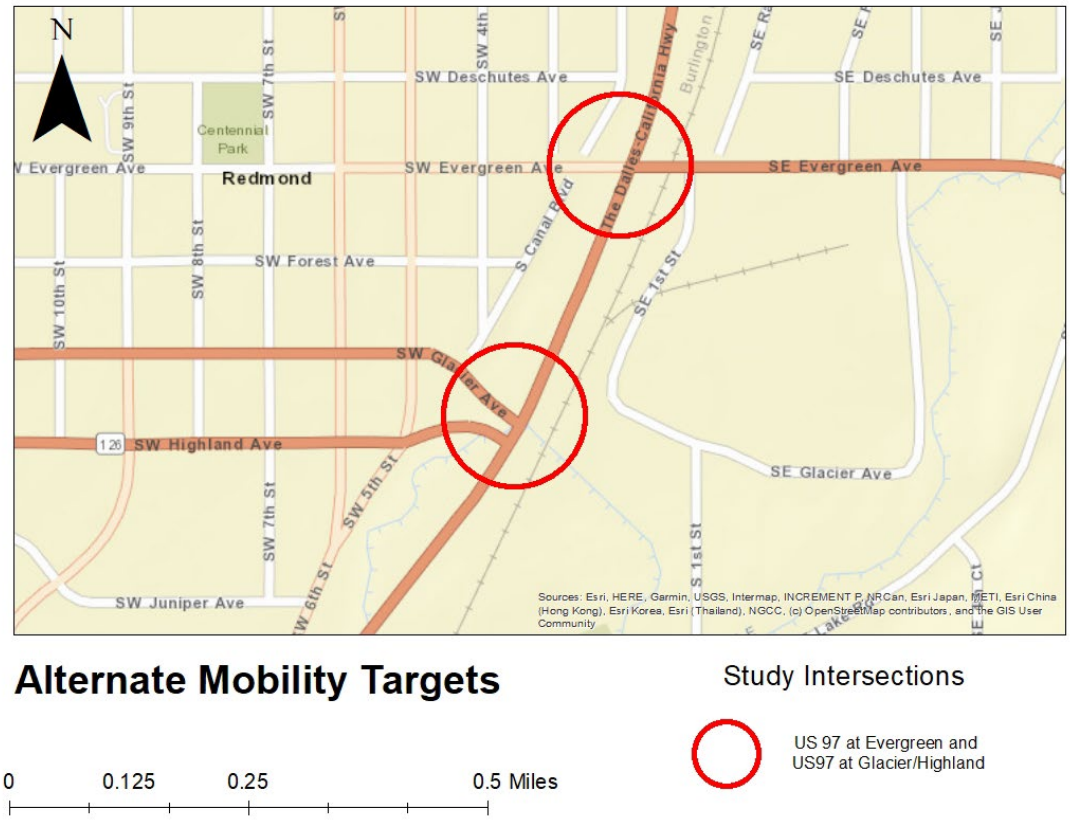
The City of Redmond Transportation System Plan Update (2020) revealed that several intersections on US 97 are not expected to meet ODOT's existing adopted mobility targets at the end of the 20-year planning horizon. US 97/SE Evergreen and US 97/SW Glacier/SW Highland were two intersections identified in the TSP as needing alternate mobility targets due to physical roadway constraints including right of way and the adjacent railroad. The TSP recommended additional targets for ODOT study intersections and directed city staff to work with ODOT to adopt these targets. No alternate mobility targets were adopted by the Oregon Transportation Commission (OTC) as part of the TSP effort.

The US 97 South Redmond Facility Plan was adopted by the OTC in November of 2021 and created a comprehensive plan for the US 97 corridor from the US 97/SW Glacier/SW Highland intersection to US 97/Yew interchange. The facility plan specified and adopted targets at the following corridor intersections:

- US 97/SW Veterans Way
- US 97/SW Pumice Avenue
- US 97/Quartz Street
- US 97/Reindeer Avenue/Salmon Avenue
- US 97/Odem Medo Way
- US 97 Northbound Ramp Terminal/Yew Avenue
- US 97 Southbound Ramp Terminal/Yew Avenue
- US 97/Wickiup Avenue

Following the Redmond TSP Update and the South Redmond Facility Plan, Redmond has updated the city's comprehensive plan and encouraged increased industrial and commercial development on the east side. Notably, this includes the Redmond East Gateway rezone and the Large Lot Industrial Master Plan, but also includes additional outright permitted developments that have driven employment to the city's east side at a rate faster than anticipated in the 2020 TSP.

The City began an update to the TSP for the east-side of US 97 within the Redmond UGB and subsequently updated the supporting travel demand model in 2024. Recognizing the need to address intersections without adopted mobility targets on US 97, ODOT completed the supporting analysis for targets at US 97/SE Evergreen and US 97/SW Glacier/SW Highland while utilizing the updated travel demand model. This memorandum provides the supporting analysis for alternate mobility targets at these locations and is consistent with the recommendations in the City of Redmond TSP Update (2024). Study intersections are shown in Figure 1 below.



The Need for Alternative Mobility Targets

Prior to exploring alternatives to the current mobility targets, evaluation of the disparity between the current targets and forecasted traffic operations confirmed the need for assessing the potential to mitigate conditions through other means. The findings of that evaluation are described below.

Current Mobility Targets

The US 97/SE Evergreen and US 97/SW Glacier/SW Highland intersections must comply with the volume to capacity (v/c) ratio targets in the Oregon Highway Plan (OHP). ODOT v/c ratio targets are based on highway classification, area type, and posted speeds. Table 1 lists the existing OHP Mobility Targets for both intersections.

Table 1: OHP Mobility Targets

Intersection	Speed Limit Major Road/Minor Road (mph)	OHP Mobility Target (volume-to-capacity ratio)
US 97/Evergreen	40/30	0.80
US 97/Glacier/Highland	40/25	0.80

ODOT standard analysis procedure requires intersection operating conditions to be compared to existing OHP Mobility Targets during the 30th highest annual hour of traffic (30 HV). In Redmond, the 30th highest annual hour typically occurs during the summer months, when traffic volumes increase due to vacationers and visitors traveling through Central Oregon on US 97. During an average weekday, traffic volumes on US 97 are approximately 12% lower than during the peak summer month.

Existing and Future Highway Operations

Existing (year 2024) and future (year 2040) traffic operations at US 97/SE Evergreen and US 97/SW Glacier/SW Highland were compared to mobility targets during summer traffic conditions (30 HV). Table 2 summarizes the results of this analysis, along with existing OHP Mobility Targets. As shown, US 97/SE Evergreen does not meet its mobility target under current conditions, and both intersections would fail to meet targets by 2040.

Table 2: Existing Year and Future Year Intersection Operations

Intersection	OHP Mobility Target	2024 Existing Conditions	2040 Future Conditions
US 97/Evergreen	0.80	**1.02**	**1.20**
US 97/Glacier	0.80	0.69	**0.82**

Bold, Red, and Shaded indicates intersection fails to meet its mobility target.

The 2020 Transportation System Plan (TSP) and US 97 South Redmond Facility Plan development process considered a range of improvement options for US 97. This included making spot improvements at intersections, enhancing the transit system, expanding the cycling and walking networks, strategies to help manage peak travel demands, and improvements to maximize the efficiency of the existing street network. Highway widening at both intersections is not feasible due to nearby constraints: the proximity to the rail line, local businesses, and right of way constraints in the US 97 or OR 126 corridor do not provide options for increasing capacity.

ODOT and the City will manage US 97 at Evergreen and Glacier with the expectation that no highway widening projects will be developed during the 20-year planning horizon. Without highway widening, the management approach for both intersections is to maximize the safety and efficiency

of the overall transportation system and increase accessibility and availability of transit, walking and biking facilities, recognizing that it is not currently financially feasible or practical from either a community impact or physical constraint perspective (or both) to construct additional highway capacity on US 97 to reduce congestion.

Factors Limiting the Ability to Meet Existing Mobility Targets

Several factors combine to make compliance with the current mobility targets at US 97/Evergreen and US 97/Glacier difficult. They include:

- **Competition from Multiple Users**
  The importance of US 97 to statewide, regional, and local traffic creates significant demands for both short and long trips along the corridor. These competing users include:
  - Motorists making local trips to homes, work, and shopping
  - Motorists making regional trips through Redmond between other cities, sometimes travelling statewide
  - Freight traveling to and through Redmond (US 97 is a Federal Truck Route)
  - Pedestrians using the most direct route, in some places the only route, connecting their residences with community facilities, employment, and shopping

- **Financial Factors**
  As is true for most agencies, funding for ODOT transportation improvements is limited. Even if all forecasted state and local transportation revenue for projects in Redmond over the next 20 years were spent on highway capacity improvements, it would still fall well short of enabling current mobility targets to be met on US 97.

- **Constraints**
  The railroad tracks immediately east of US 97 limit options to provide an effective, connected transportation system, especially along or parallel to US 97, which is the primary north-south transportation corridor through the city. Development patterns on US 97 and accesses to businesses limit the ability for vehicular throughput to be optimized. These factors provide a challenging environment and create constraints for transportation facilities, making the construction or expansion of transportation facilities cost prohibitive.

Strategies to Enhance Mobility

Recognizing that mobility at US 97/Evergreen and US 97/Glacier will be constrained, the City's Transportation System Plan includes several actions to help relieve congestion:

- Expand the city's local street network, especially in the eastern parts of the city, to improve connectivity and create alternate routes to US 97 for local trips, removing them from the highway or providing additional access points in

the UGB. This could include the city's East Side Arterial project.

- The TSP promotes Transportation Demand Management (TDM), Transportation System Management and Operational strategies (TSMO), connectivity improvements, managing access, and other strategies that support active modes (walking and biking) and greenhouse gas reduction. Implementation of TDM and TSMO measures would be consistent with the TSP.
- While this action would not directly enhance mobility, the City and ODOT should continue to evaluate safety at both intersections. Data driven safety countermeasures from the ODOT Crash Reduction Factor (CRF) manual will assist in improving travel time reliability, especially in the development review process.

However, even with these actions in place, traffic operations at US 97/SE Evergreen and US 97/SW Glacier/SW Highland will not meet existing OHP Mobility Targets at the end of the 20-year planning horizon. The implementation of these actions, along with the OTC adoption of alternative mobility targets for US 97 into the OHP that reflect ODOT and the City's mutual, realistic highway performance expectations, constitutes ODOT's US 97 management strategy in Redmond through the 20-year planning horizon.

Proposed Alternative Mobility Targets

This section describes the proposed alternative mobility targets in detail, including the process used to develop them and the associated analysis methodology.

Alternative Mobility Target Process

Figure 1 shows the ODOT Region 4 methodology for determining alternative mobility targets. Table 3 summarizes the assessment of each study intersection using the methodology.

Step 1: Neither of the signalized study intersections along US 97 would be expected to meet existing OHP mobility targets during the summer of 2040. To be compliant, ODOT would need alternative mobility targets for both study intersections.

Step 2: Of the two study intersections that would not meet current mobility targets during the summer of 2040, US 97/SE Evergreen would be expected to operate with a v/c ratio greater than 1.0. US 97/SW Glacier/Highland would operate with a v/c ratio less than 1.0.

Step 3: US 97/Evergreen would not operate with a v/c ratio less than 1.0 with a 1.0 peak hour factor.

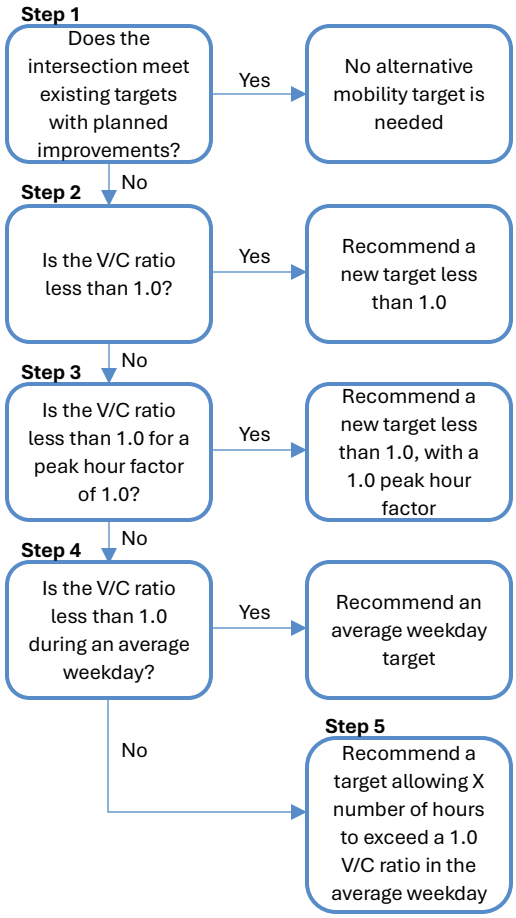


Figure 1: Alternative Mobility Target Methodology

Step 4: US 97/Evergreen would not operate with a PM peak hour factor less than 1.0 on the average weekday.

Step 5: "Hours of congestion" analysis was conducted, which assumes that traffic volumes that exceed capacity in the analysis hour are shifted to the "shoulder" hours, iteratively, until all traffic can be accommodated. Traffic volumes would be equal to or greater than capacity for the US 97/Evergreen intersection for 3 hours under the average weekday scenario.

Table 3: Alternate Mobility Target Analysis

Intersection	Existing OHP Mobility Target	30HV PM Peak		Assuming 0.99 v/c Mobility Target	30HV PM Peak	Average Weekday	
		2024	2040		1.0 Peak Hour Factor	PM Peak	Total Hours V/C ≥ 1.0
US 97/Evergreen	0.80	**1.02**	**1.20**	0.99	**1.18**	**1.06**	3
US 97/Glacier	0.80	0.69	**0.82**	0.99	0.80	0.72	-

Bold, Red, and Shaded indicates intersection fails to meet its mobility target.

Given demand is expected to exceed capacity at US 97/SE Evergreen under 2040 average weekday conditions, an analysis was conducted to estimate the number of hours where demand would meet or exceed capacity. Table 4 presents the results of the analysis, which shows that demand would meet or exceed capacity at US 97/SE Evergreen for 3 hours under average weekday conditions.

Table 4: Hours of Congestion Analysis

Intersection	Assuming 0.99 v/c Mobility Target	Hour			
		1	2	3	4
US 97/Evergreen	0.99	**1.06**	**1.05**	**1.00**	0.97

Bold, Red, and Shaded indicates intersection fails to meet its mobility target.

Recommended Alternative Mobility Targets

Both US 97/SE Evergreen and US 97/SW Glacier/SW Highland are forecasted to exceed the existing OHP Mobility Target values at the end of the 20-year planning horizon. Therefore, the existing adopted OHP target values require an alternative mobility standard for those intersections. The following alternative OHP Mobility Targets are recommended for adoption by the Oregon Transportation Commission (OTC).

- US 97/SE Evergreen – V/C ratio of 0.99 with 3 hours of congestion (V/C ratio ≥ 1.0) acceptable
- US 97/SW Glacier/SW Highland – V/C ratio of 0.99

EXHIBIT B

Outlook

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request to comment on the streets plan

From Jon Jhanke <jonjhanke1955@gmail.com>
Date Wed 6/25/2025 11:23
To Kyle Roberts <kyle.roberts@redmondoregon.gov>

[EXTERNAL]: This email originated from outside of the city. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi, I live on NW 27th St. in Redmond. I see in the plan that someday NW27th St. is planned to be put through to Maple.

I know cities have to continue to build streets as the population grows. As it stands right now a lot of people use NW 27th when coming from Sisters and heading north on HWY 97. They do this to avoid all the stop lights and congestion by continuing on hwy 126 to the intersection with HWY 97.
This includes trucks sometimes and a lot of people with out of state plates. You can see them often going faster than the speed limit on NW 27th.

I am very much against the city putting NW 27th thru to Maple for the following reasons.

1) Extending NW 27th will lead to more traffic, as research shows road expansions often trigger "induced demand," where more roads encourage more driving, potentially worsening congestion . This will make my neighborhood less safe, especially for children and pedestrians, given my street's current 35mph speed limit and residential nature.

2) What you may not know is many of the houses have their bedrooms on NW 27th St. My bed is about 48 feet from the street. It's very noisy now with big trucks, work trucks with trailers that make a huge racket when they go over the seams in the asphalt, and many cars including people who think they are driving race cars on a race track. It is common now on a daily basis to see cars and motorcycles going much faster than the speed limit down NW 27th. Ask any neighbor. If NW 27th is put through to Maple it will indeed become a speedway. This will further diminish residents' quality of life, making our street less livable.

3) If NW 27th is put through it will to some extent reduce my ability to sell this house someday. A reduced sellability often translates into reduced value. If NW 27th is put through I'll be asking the assessor's office to re-evaluate my property taxes as I could contend the value has gone down.

You know in thinking about that, I realize that what I'd actually have to do is get out. I'd move to a community where things like this are less likely to happen.

4) My street's current setup, not connecting to a major road, helps maintain a reasonably peaceful residential environment. Extending it could change this, disrupting the community's character and safety, which is vital for livability.

Is there any timeline on putting NW 27th through to Maple?

Thank you for your consideration of my viewpoint.
Sincerely
Jon Jhanke, Redmond, OR

FINDINGS FOR ADOPTION OF THE 2025 WASTEWATER COLLECTION SYSTEM MASTER PLAN AND INCORPORATION INTO THE PUBLIC FACILITIES PLAN AND AS A SUPPORTING PLAN TO THE REDMOND COMPREHENSIVE PLAN

HEARING DATE: July 9, 2025, 5:30 PM, Redmond City Hall Council Chambers and via digital conference (GoTo Meeting)

HEARINGS BODY: Redmond Urban Area Planning Commission

FILE NUMBER: 711-25-000136-TA

FILE NAME: Redmond Comprehensive Plan Amendment (2025 Wastewater Collection System Master Plan)

REQUEST: A legislative amendment to adopt and incorporate the 2025 Wastewater Collection System Master Plan into the Public Facilities Plan and as a supporting plan to the Redmond Comprehensive Plan

APPLICANT: City of Redmond

REVIEWING STAFF: Kyle Roberts, AICP, Planning Director
Jessica MacClanahan, PE, Director of Public Works / City Engineer

I. BACKGROUND

Summary:
Redmond's Comprehensive Plan 2040 is the blueprint for the City's future development over the next 20 years. The Comprehensive Plan serves as the primary land use planning document, establishing a series of goals and policies that guide future growth and development. City leaders use the Comprehensive Plan to manage expected population and employment growth, coordinate public investments and make decisions about new and existing businesses, housing and neighborhoods, transportation, parks and trails, infrastructure, and more.

A major supporting plan to the Comprehensive Plan is the Public Facilities Plan. The Public Facilities Plan identifies the major public infrastructure needed over the next 20 years to support the City of Redmond's Comprehensive Plan. The Public Facilities Plan contains the Capital Improvement Plans (CIP) for Transportation, Water, Wastewater, and Parks. Individual master plans for Transportation, Water, Wastewater, and Parks provide background, analysis, and justification for the CIPs imbedded in the Public Facilities Plan. Naturally, as growth occurs, frequent updates are made to the master plans, pertinent reports, and documents that ultimately support and implement the Redmond Comprehensive Plan.

Additionally, the series of goals and policies contained in the Comprehensive Plan are, in part, informed by the City's adopted supporting plans. This Comprehensive Plan amendment involves adopting the 2025 Wastewater Collection System Master Plan (CSMP). Adopted in 2007, the City's current CSMP identifies and plans for wastewater infrastructure (i.e., gravity sewer pipelines and pump stations and pressure sewers) needed to accommodate Redmond's growth over a 20-year period. The 2025 CSMP provides a comprehensive evaluation of the existing system's capacity and identifies necessary upgrades to accommodate future growth for the upcoming 20-year timeframe within a defined planning service area. In accordance with Oregon Statewide Planning Goal 11, the CSMP is a component of the City's Public Facilities Plan and is a support document to the City's adopted Comprehensive Plan.

Proposal:
The purpose of this CSMP is to provide the City with a document that depicts future growth scenarios, while optimizing the operations of the existing system through the use of a hydraulic model. The

updated CSMP aligns with land use and growth assumptions from the City's Comprehensive Plan. Three scenarios were analyzed for future planning purposes – a 20-year planning horizon (2045), buildout of the Urban Growth Boundary (UGB), and buildout of the UGB plus additional flow from residential densification due to House Bill 2001. Additionally, this plan evaluates the condition of the existing wastewater collection system. Finally, the analysis and evaluations result in a CIP that allows the City to forecast future project needs.

Exhibits:
The following exhibits make up the record in this matter:

Exhibit A – City of Redmond Wastewater Collection System Master Plan, April 2025
Exhibit B – Public comments

Noticing:
Noticing for the first evidentiary hearing scheduled for July 9, 2025, was noticed as follows:

- Per ORS 197.610, a notice of proposed change to an acknowledged comprehensive plan was submitted to the Department of Land Conservation and Development (DLCD) on June 2, 2025.
- Per Section 8.1110 of the Redmond Development Code, a public hearing notice for the July 9th Planning Commission hearing was published in the *Bend Bulletin* on June 27, 2025.

Applicable Criteria:
The following are the applicable sections from the Oregon Revised Statutes, Oregon Administrative Rules, and the Redmond Development Code:

- Oregon Revised Statutes (ORS) – Chapter 197
- Oregon Administrative Rules (OAR), Chapter 660:
  - Division 11, Public Facilities Planning
  - Division 15, Statewide Planning Goals and Guidelines
  - Division 18, Post-Acknowledgement Amendments
- City of Redmond Development Code:
  Article I – Zoning Standards
  - Section 8.760: Criteria for Amendments

II. FINDINGS & CONCLUSIONS

Findings:
Redmond Development Code, Article I – Zoning Standards: Amendments: Sections 8.750 through 8.770 set forth the procedure and standards for an amendment to the Redmond Comprehensive Plan. Specifically, Section 8.760 sets forth the four review criteria that must be met when evaluating amendment requests. Findings for each criterion are presented below.

8.760 Criteria for Amendments. The burden of proof is upon the applicant. The applicant shall show the proposed change is:

1. In conformity with all applicable State statutes;

FINDING: The following State statutes apply directly to this application:

ORS 197.610, *Submission of proposed comprehensive plan or land use regulation changes to Department of Land Conservation and Development*

ORS 197.610 requires local jurisdictions to submit proposed comprehensive plan or land use regulation changes to Department of Land Conservation and Development (DLCD). Notice of the proposed amendment to the Redmond Comprehensive Plan has been provided to DLCD more than 35 days in advance of the first evidentiary hearing concerning the amendments.

ORS 197.797, *Local quasi-judicial land use hearings; notice requirements; hearing procedures*

ORS 197.797 sets forth noticing requirements. The applicable RDC standards that address amendment and legislative procedures and noticing requirements (i.e., Sections 8.750-8.770 and 8.1100-8.1125) were developed in compliance with the applicable State statute regarding noticing and public hearings. The relevant findings, incorporated by reference herein, show compliance with the aforementioned statutes.

Notice of the proposed Comprehensive Plan amendment has been advertised in the local newspaper (public notice) as required by the RDC and State statute. Regarding statutory public hearing requirements, this proposal is legislative and not quasi-judicial. Sections 8.1100 through 8.1125 of the RDC implement the quasi-judicial statutory requirements in similar fashion and have been met. The Redmond Urban Area Planning Commission and City Council's public hearing and review processes meet the statutory requirements for the purpose of the review.

Based on the above discussion and finding, staff concludes that the proposed amendment complies with criterion #1.

2. In conformity with the State-wide planning goals whenever they are determined to be applicable;

FINDING: The following State-wide planning goals have been determined to apply directly to this application:

Goal 1 – Citizen Involvement - calls for the opportunity for citizens to be involved in all phases of the planning process. The Redmond Urban Area Planning Commission serves as the City's formal citizen advisory commission to fulfill Goal 1 and is made up of Redmond area residents.

Additionally, in terms of engagement, accompanying a press release, the Wastewater Collection System Master Plan was published on the City's website a month in advance of the evidentiary hearings for public review. Additionally, City staff shared the document via an email distribution list comprised of engineers and developers. In mid-June, staff presented an overview of the document to the Central Oregon Builders Association (COBA) as well as to City Council in two separate workshops. Lastly, the agenda for the Planning Commission public hearing, where and when the proposed amendments are discussed, were provided in accordance with law. All documents were available for public review. Public notice advertising the July 9th public hearing was published in the *Bend Bulletin*.

Goal 3 – Agricultural Lands – is not applicable because there are no agricultural lands in the city limits.

Goal 4 – Forest Lands – is not applicable because there are no forest lands in the city limits.

Goal 5 – Natural Resources, Scenic and Historic Areas, and Open Spaces – is not applicable because the proposed amendment will not affect any regulation that implements Goal 5 and the City's acknowledged regulations implementing Goal 5 remain in effect with no change in applicability.

Goal 6 – Air, Water, and Land Resources Quality – requires that all waste and process discharges from future development, when combined with such discharges from existing developments shall not

threaten to violate, or violate applicable state or federal environmental quality statutes, rules, and standards. The CSMP will ensure compliance with applicable state and federal environmental quality statutes, rules, and standards.

Goal 7 – Areas Subject to Natural Hazards – is not applicable because the City's acknowledged regulations implementing Goal 7 remain in effect with no change in applicability.

Goal 8 – Recreational Needs – requires the City to satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts. This goal is not applicable as the amendment will have no effect on the availability of or access to recreational opportunities.

Goal 9 – Economic Development – requires the City to plan and zone enough land to meet the community's projected commercial and industrial needs. The City adopted an Economic Opportunities Analysis (EOA) in 2020. This document serves as the City's compliance document under Goal 9, OAR 660-009-0015, ORS 197.712, and provides the basis for commercial and industrial development policies established in the Comprehensive Plan. Updated information from the CSMP will help the City plan for and implement said policies, for example, determining which lands/areas are serviceable with public facilities.

Goal 10 – Housing – provides for the housing needs of citizens of the state. The City adopted a Housing Needs Analysis (HNA) in 2019. This document serves as the City's compliance document under Goal 10, OAR Chapter 660 Division 008, and ORS 197.296(3). This report concludes that Redmond should plan to accommodate development of 6,963 new dwelling units over the next 20 years in order to house the projected population growth. Planning for public facilities is a vital component in planning for the development of future housing. Updated information from the CSMP will help the City plan for infrastructure needed to accommodate the development of the community's demand for housing.

Goal 11 – Public Facilities and Services – requires cities to plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban development. As mentioned earlier, the current CSMP has reached the end of its planning horizon, necessitating the need to adopt a new CSMP that will plan for wastewater infrastructure for the next 20-year period. In doing so, growth assumptions and flow monitoring have been updated and information and data from the updated CSMP will be used to inform the basis for capital improvement programming to be imbedded into the City's Public Facilities Plan. Ultimately, the Public Facilities Plan's Capital Improvement Program provides for the budgeting and scheduling of identified needed infrastructure projects.

In accordance with Oregon Administrative Rules (OAR), Division 11, the CSMP plans for needed infrastructure within city limits as well as within Redmond's urban growth boundary. In addressing OAR 660-011-0015 and Section 7 of the City-County Joint Management Agreement, it should be noted that no urban growth boundary amendments are planned in conjunction with the adoption of the 2025 CSMP.

Goal 12 – Transportation – requires the City to provide and encourage a safe and convenient and economic transportation system. Per OAR 660-012-0060, the proposed amendment will have no impact on an existing or planned transportation facility.

Goal 13 – Energy Conservation – is not applicable because the City's acknowledged regulations implementing Goal 13 remain in effect with no change in applicability.

Goal 14 – Urbanization – requires the City to provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities. The information and data contained in the updated CSMP will be used to help plan for infrastructure needed to accommodate growth and the estimated buildout of the Urban Growth Boundary as defined in the Comprehensive Plan.

Goal 15 – Willamette River Greenway – is not applicable to the city of Redmond.

Goal 16 – Estuarine Resources – is not applicable to the city of Redmond.

Goal 17 – Coastal Shorelands – is not applicable to the city of Redmond.

Goal 18 – Beaches and Dunes – is not applicable to the city of Redmond.

Goal 19 – Ocean Resources – is not applicable to the city of Redmond.

Based on the above discussion and finding, the proposed amendment is consistent with the statewide planning goals and therefore complies with criterion #2.

3. In conformity with the Redmond Comprehensive Plan, land use requirements and policies; and

FINDING: The following Comprehensive Plan chapter and policies have been determined to apply directly to this amendment:

Chapter 1 of the Comprehensive Plan identifies goals and policies that address citizen involvement. Goal 1 speaks to engagement and the opportunity for the community to be informed and involved in all phases of the planning process. The Urban Area Planning Commission serves as the City's formal citizen advisory committee (as required by State Administrative Rule) and is made up of Redmond area residents. The Planning Commission is formally recognized through City Code and was appointed by the City Council. Thus, the Planning Commission is the appropriate public review and recommendation body to the City to meet this Comprehensive Plan policy.

Chapter 2 of the Comprehensive Plan identifies goals and policies that pertain to land use planning and procedures. Specifically, it speaks to establishing a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions. Most relevant to the proposed Comprehensive Plan amendment, Goal 3 of the chapter addresses implementation tools of the Comprehensive Plan. Policy 2-3-3 identifies the need to "Adopt updates to system plans, as required by state law or necessary to address changing community needs and incorporate these plans by reference in the Comprehensive Plan." Incorporating the CSMP's Capital Improvement Program into the Public Facilities Plan and adding the CSMP as a supporting plan to the Comprehensive Plan will support the implementation of the Comprehensive Plan, primarily Chapter 11.

Chapter 9 of the Comprehensive Plan identifies goals and policies that address economic development in Redmond. Goal 3 of the chapter identifies policies related to infrastructure planning. Policy 9-3-2 states that "The City will ensure that infrastructure planning is cost-effective, supports economic development, is consistent with the City's master plans for new area development, and supports cohesive development patterns across the City." To ensure the planning of public infrastructure is consistent with the City's infrastructure master plans (in this case the CSMP), the CSMP must be incorporated into the City's Public Facilities Plan and identified as an ancillary plan to the

Comprehensive Plan. In order to incorporate the CSMP into the Public Facilities Plan, it must be formally adopted by the local governing body and acknowledged by DLCD.

Chapter 10 of the Comprehensive Plan identifies goals and policies related to housing in Redmond. Policy 10-4-1 of Goal 4, Infrastructure Planning, states the need to "Coordinate land use planning with the Capital Improvement Plan to ensure that infrastructure is available to support residential development…" As mentioned earlier, new data and information from the CSMP will be incorporated into the Public Facilities Plan and Capital Improvement Program, ensuring that needed infrastructure is planned for and ultimately available to support residential development.

Chapter 11 of the Comprehensive Plan addresses public facilities and services. The chapter describes existing public and private facilities and services and known present and future needs based on projected growth. It does not present specific public improvements which may be needed. That information is contained in the City's adopted Public Facilities Plan. The Plan is a support document to the Comprehensive Plan, which describes in detail the water, sewer, transportation, and park facilities needed to accommodate anticipated development and includes cost estimates of facility improvements. The proposed amendment to incorporate the CSMP into the Public Facilities Plan and Comprehensive Plan directly address all three of the goals outlined in Chapter 11 and many of the goals' policies.

Based on the above discussion and finding, staff concludes that the proposed Comprehensive Plan amendment complies with criterion #3.

4. That there is a change of circumstances, further studies justifying the amendment or mistake in the original zoning.

FINDING: The City's current CSMP was adopted in 2007 and planned for a 20-year horizon. As the current CSMP nears the end of its lifespan, the CSMP requires updates due to change in circumstances (i.e., growth and change in the community) and must plan for future growth. Growth assumptions and flow monitoring have been updated in order to plan for the wastewater infrastructure needed for the upcoming 20 years. New information and data will be used to inform the Capital Improvement Program imbedded in the Public Facilities Plan. The new CSMP will provide foundational support to the Comprehensive Plan policies used to implement the Plan and Development Code.

Based on the above finding, staff concludes that the proposed Comprehensive Plan amendment complies with criterion #4.

EXHIBIT A







City of Redmond

Wastewater Collection System Master Plan



Prepared by:

anderson perry

carollo

April 2025

WASTEWATER COLLECTION SYSTEM MASTER PLAN

FOR

CITY OF REDMOND, OREGON

2025



ANDERSON PERRY & ASSOCIATES, INC.

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Walla Walla, Washington

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APPENDICES

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Executive Summary

The purpose of this Wastewater Collection System Master Plan (WWCSMP) is to provide the City of Redmond, Oregon, with a document that depicts future growth scenarios, while optimizing the operations of the existing system through the use of a hydraulic model. This WWCSMP aligns with land use and growth assumptions from the City's Comprehensive Plan. Additionally, this WWCSMP evaluates the condition of the existing wastewater collection system. Finally, the analysis and evaluations result in a Capital Improvement Plan (CIP) that allows the City to forecast future project needs.

This WWCSMP was developed during 2023 to 2024 for final approval in 2025. This WWCSMP includes three future planning scenarios: 20-year (2045), buildout, and buildout with additional flow from residential densification due to House Bill 2001 (HB2001) (flow projections only, this scenario was not modeled). The scope of this WWCSMP includes the following main tasks:

- Basis of Planning
- Wastewater Flow Projections
- Existing System Condition and Assessment
- Capacity Analysis
- CIP

The City is located in central Oregon, situated in the high desert region, east of the Cascade Mountains and south of the Crooked River. The City owns, maintains, and operates gravity sewer pipelines and pump stations. The City collects wastewater from residential, commercial, and industrial customers within the service area and transports it to the City's wastewater treatment plant (WWTP).

Basis of Planning

The wastewater collection system planning service area has several key elements that shape the system design and operation, including physical features such as topography and elevation, climate, land use, and demographics. The City is responsible for managing and operating its wastewater system in accordance with all applicable local, state, and federal regulations. A high-level review and comparison was performed of all the policy, criteria, and standards documents, which ultimately lead to recommendations that will further enhance system management. Chapter 2 of this WWCMSP confirms the service area, the existing and future zoning, and the policies, criteria, and standards.

Wastewater Flow Projections

Accurate wastewater flow projections are important for evaluating collection system capacity, identifying improvement needs, and developing a CIP. The wastewater flow projection process involves defining sewer flows, analyzing flow monitoring data, validating existing flows, determining flow factors, and forecasting future flows.

Sewer Collection System Flow Definitions

Wastewater flow is categorized into average dry weather flow (ADWF) and wet weather flow (WWF). ADWF includes base wastewater production from routine water use and dry weather groundwater infiltration caused by defects in sewer infrastructure. WWF includes inflow and infiltration from stormwater sources and wet weather groundwater infiltration due to elevated groundwater levels during rainy seasons. ADWF and WWF are important in determining the peak wet weather flow (PWWF). PWWF is the highest observed hourly flow following a design storm event and serves as the primary criterion for system design. By integrating ADWF and rainfall-derived inflow and infiltration (RDII) data into a hydraulic model, the PWWF values used for capacity assessment and future infrastructure planning were identified.

Flow Monitoring and Results

A 68-day monitoring program conducted from May to July 2023 gathered data for hydraulic modeling calibration. Temporary flowmeters were installed in seven sewer basins; an eighth permanent flowmeter was previously installed at the WWTP. Rain gauge data supplemented flow analysis data to assess RDII. After analyzing the flow data, it was determined that the WWTP flowmeter data would be excluded from the analysis as it conflicted with the upstream ADS flowmeters. Therefore, the City used the more conservative ADS flow data for the WWCSMP and considered the WWTP basin as unmetered.

During the flow monitoring period, depth and velocity data were collected and converted to hourly data for hydraulic model calibration. The ADWF was determined using the driest days of the monitoring period. Typical diurnal flow patterns for residential, commercial, and industrial users were developed. These patterns were used to calibrate the model for dry weather flows. Hourly patterns for weekdays and weekends were considered, and ADWFs were utilized to fine-tune the model.

Flow Factor Development and Results

Flow factors, expressed in gallons per acre per day (gpad), were developed for each land use type to forecast future wastewater flows. These factors along with the flow monitoring data were used to estimate the wastewater generation for vacant or unserved parcels. A weighted average flow factor for each land use type was calculated and used to represent the wastewater generation by land use across the City. To find the ADWF of the unmetered basin (WWTP basin), a weighted average was calculated from the flow factors of the seven metered sewer basins.

Flow Projections

The ADWF was projected for three future scenarios: 20-year (2045), buildout, and buildout with additional flow from residential densification due to HB2001. The 20-year ADWF was projected assuming that wastewater flow increases proportionally to population growth. Buildout ADWF was projected assuming all currently vacant and unserved parcels will be fully developed and served by the City at buildout of the planning service area. Projections indicate an increase in ADWF from 2.82 million gallons per day (MGD) to 4.42 MGD by 2045, and to 6.18 MGD at buildout. The ADWF at full buildout with residential densification (HB2001) is estimated to be 6.21 MGD.

WWF projections were modeled for the design storm and RDII. The City selected the 10-year, 24-hour design storm for infrastructure sizing, which corresponds to a rainfall of 1.5 inches. This design storm was applied to both existing and future service areas using a synthetic rainfall distribution curve. Future RDII flows were projected using a factor of 1,500 gpad applied to new development. The PWWF, including ADWF and projected RDII, was modeled for the 20-year (2045) and build-out (urban growth boundary only) scenarios. For the 20-year and build-out scenario, PWWF is estimated at 9.3 MGD and 11.1 MGD, respectively.

Existing System Condition and Assessment

The City's wastewater collection system includes approximately 850,000 feet of pipe and forcemains and ten pump stations, which transport raw wastewater to the WWTP. An assessment of the system's current conditions identified projects that will extend its lifespan and prevent future failures, forming the foundation for a CIP to guide maintenance, improvements, and expansion efforts.

Pipes

The system includes both gravity pipelines (835,000 feet) and forcemains (15,000 feet), with the majority being 6- and 8-inch polyvinyl chloride (PVC) pipes. A proposed 48-inch interceptor pipe is planned for construction in 2025 and is included in the totals. The system also includes approximately 3,700 manholes and six different types of pipe material, the most common being PVC. The condition assessment of the collection system focused on identifying deficiencies, with data from the City's Geographic Information System database, closed-circuit television (CCTV) inspections, and maintenance records. The assessment revealed that the majority of the piping was installed in the 1970s and 2000s, and piping nearing the end of its useful life should be prioritized for inspection. Recent CCTV inspections identified only four pipe deficiencies, which are scheduled for repair in 2024, and no major system replacements are recommended at this time.

Pump Stations

The City owns and operates ten pump stations. The evaluation confirmed that the pump stations are functioning well, with no immediate capital improvement projects needed at this time. Upgrades to the Yew Avenue Pump Station are planned to accommodate future growth and improve electrical components. It is recommended that the City maintain its current practices for pump station maintenance and finalize standards for the construction and repair of future and existing stations.

Capacity Analysis

As the City of Redmond continues its growth and expansion, the ability of its sewer infrastructure to manage increasing wastewater flows has become a concern. An evaluation of the system's ability to handle current and future flows was conducted using the updated hydraulic model, assessing pipes and pump stations against established performance criteria. Recommended projects were identified to address capacity deficiencies and accommodate future needs.

Model Update and Analysis

The hydraulic model, updated to reflect the City's current infrastructure and calibrated with recent flow data, was used to assess the capacity of the pipes and pump stations under three conditions: existing, 20-year planning horizon, and buildout. The model was converted from InfoSWMM to

InfoWorks ICM due to the discontinuation of InfoSWMM. The analysis aimed to determine whether the system meets established performance criteria, including minimum freeboard standards and pump station capacity requirements.

Gravity Collection System Evaluation

The evaluation of the gravity collection system focused on identifying areas where sewer pipes and pump stations may be insufficient to convey PWWF. A particular concern is the potential for backwater effects, where restrictions in the system cause flow to back up, exceeding the City's minimum freeboard criteria and potentially leading to sanitary sewer overflows. The analysis revealed that these backwater conditions could prevent the full PWWF from being conveyed downstream.

Key causes of the identified deficiencies include misaligned inverts, shallow manholes, pipe restrictions, undersized pipes, and inadequate pump station capacity. The capacity analysis revealed no significant deficiencies under existing conditions and for the 20-year planning horizon. However, the build-out scenario, which considers growth and new developments under HB2001, highlighted significant deficiencies in several areas, including the sewer system along Black Butte Trunk and at the Yew Avenue and Lawson Crossing Pump Stations. These deficiencies are a result of increased flow from planned expansion areas, particularly southern, eastern, and western parts of the City, putting additional strain on the infrastructure. The Lawson Crossing and Yew Avenue Pump Stations, in particular, require significant upgrades to meet future flow demands and avoid system overflows.

Improvement Alternatives

To address the identified capacity deficiencies, several proposed system improvements and alternatives were developed. These projects were designed to accommodate future growth and will be implemented when new development connects to the existing system. The proposed improvements include upsizing portions of Black Butte Trunk and upgrading the Yew Avenue and Lawson Crossing Pump Stations to handle increased PWWF.

Capital Improvement Plan

As the City continues to grow, its existing wastewater collection system will near capacity, necessitating infrastructure improvements to accommodate future development. The proposed projects were designed to enhance the system's capacity, ensuring it remains effective and reliable for the growing population. These proposed projects are part of a comprehensive CIP, which includes recommendations for updating the Sewer System Development Charge and hookup fees.

The proposed projects fall into three categories; short, medium, and long-term improvements, with an estimated timeline over the next 20 years. These projects focus on upgrading existing infrastructure to handle increased wastewater flow (Improvement Program), as well as expanding the system to serve new developments (Expansion Program). The Improvement Program includes three projects: two pipeline improvement projects and one lift station upgrade. The Expansion Program includes four projects: installation of three new pipelines and construction of one new lift station.

Cost estimates for the proposed projects are based on the Class 5 estimate from the American Association of Cost Estimators using prior bid data and completed projects, as well as engineering judgment and work experience. Final costs are subject to adjustments based on inflation, scope

changes, and future material prices. Costs were developed as either unit or lump sum costs. All pipeline projects were shown as unit costs that encompassed assumptions such as excavation and backfill, surface restoration of unimproved and improved areas, and traffic control. Pump stations were assigned lump sum costs that include labor, material, operation, and other indirect costs.

The total estimated costs for the proposed improvements and expansion is approximately $66 million, with $4.5 million allocated for system upgrades and $61.5 million for expansion projects. These investments will ensure that the City's wastewater collection system remains capable of supporting future growth.

Chapter 1 - Introduction

The City of Redmond owns, operates, and maintains the wastewater infrastructure that serves its residents, businesses, and industries. This infrastructure includes gravity sewer pipelines and pump stations and pressure sewers. The City also owns and operates a wastewater treatment plant (WWTP), which is evaluated under a separate wastewater facilities plan. The Wastewater Collection System Master Plan (WWCSMP) provides a comprehensive evaluation of the existing system's capacity and identifies necessary upgrades to accommodate future growth within the defined planning service area.

Objective

The primary objective of this WWCSMP is to identify capacity deficiencies that necessitate system improvements and to determine future growth triggers for expansion projects. The City's most recent wastewater master plan was completed in 2007 (2007 Plan).

The scope of this WWCSMP encompasses the following main tasks:

- Basis of Planning
- Wastewater Flow Projections
- Existing System Condition and Assessment
- Capacity Analysis
- Capital Improvement Plan

Background

Wastewater is collected from residential, commercial, and industrial users within the service area and transported to the City's WWTP. The 2007 Plan forecasted growth and the subsequent capital projects to accommodate increased wastewater flows throughout the system. Portions of some of the recommended projects have been completed since the adoption of the 2007 Plan. It is important to note several updates to the nomenclature from the 2007 Plan for existing and future pipes within the system: the Eastside Sewer Interceptor is now referred to as the East Spruce Interceptor; the 2007 Far West Interceptor is now referred to as the West Spruce Interceptor; the Line D Interceptor is now referred to as the Cascade Trunk; and Line K is now referred to as Black Butte Trunk.

The current land use assumptions for this WWCSMP are based on data from the City's Geographical Information System, with future land use assumptions informed by the City's zoning designations defined in City's Comprehensive Plan. The planning service area consists of the City's urban growth boundary (UGB), along with three additional areas northeast of the UGB expected to be developed within the 20-year planning horizon. While the capacity analysis focuses on the planning service area, wastewater flow projections were also conducted for the entire urban reserve area.

Report Organization

The WWCSMP contains six chapters. The chapters are briefly described below:

- Chapter 1 - Introduction. This chapter presents the background information for this WWCSMP and its objectives.
- Chapter 2 - Basis of Planning. This chapter presents the planning elements of the City and the wastewater collection system evaluated to support the projects and programs proposed in this WWCSMP and the CIP.
- Chapter 3 - Wastewater Flow Projections. This chapter presents the data and methods used to estimate future flow projections, verify previous flow data, and develop flow factors.
- Chapter 4 - Existing System and Condition Assessment. This chapter presents an overview of the existing system and a comprehensive condition assessment that will be used to identify where future projects will help upgrade and improve the system.
- Chapter 5 - Capacity Analysis. This chapter presents a summary of the existing system's capacity to safely and adequately convey present and future wastewater flows, and recommends projects to enhance system capacity.
- Chapter 6 - Capital Improvement Plan. This chapter presents a summary of all the CIP projects and the associated costs.

Chapter 2 - Basis of Planning

Introduction

This chapter introduces the planning elements used to evaluate the City of Redmond's wastewater collection system and its capacity for future growth and development. This chapter establishes foundational knowledge of the City's wastewater collection system planning service area, including its physical features, climate, land use, and population, and summarizes policies and criteria that shape and govern the system. This information supports the development of projects and programs that comprise this Wastewater Collection System Master Plan's (WWCSMP) Capital Improvement Plan (CIP).

The Geographic Information System shapefile data used to develop maps for this WWCSMP were provided by the City on July 3, 2023, and August 22, 2023.

Wastewater Collection System Planning Service Area

The City maintains and operates its wastewater collection system within the city limits. In the future, the unincorporated community of Terrebonne's wastewater (through creation of a special sewer service district) will also be received by the City of Redmond. Wastewater from Terrebonne will flow directly to the wastewater treatment plant (WWTP), not contributing any flow to the City's collection system.

This WWCSMP evaluates the wastewater collection system for its ability to serve the customers within the planning service area for the next 20 years and at buildout. The planning service area consists of the Redmond urban growth boundary (UGB), with the addition of three areas outside the UGB to the northeast that are expected to be developed within the 20-year planning horizon. While the capacity analysis for the wastewater collection system was performed for the planning service area, wastewater flows were also projected for the entire urban reserve area (URA) as described in Chapter 3. Figure 2-1 shows the planning service area, city limits, Redmond UGB, Redmond URA, and the community of Terrebonne. It also shows the parcels currently served by the collection system.

Physical Features

The City is located in central Oregon, situated in the high desert region, east of the Cascade Mountains and south of the Crooked River. The City is positioned along major transportation routes at the intersection of U.S. Route 97 and Oregon Route 126, making it accessible from various parts of the state.

The elevation in the City ranges from approximately 2,900 to 3,077 feet above sea level. The area around the City is generally characterized by a mix of high desert terrain, rolling hills, and plateaus, with the Cascade Mountains to the west. The City is not considered mountainous; however, it is in close proximity to mountainous regions. Figure 2-2 illustrates the City's topography.

The City is located within the Deschutes River Basin, a nearly 10,700 square mile watershed situated between the Cascade Mountains and the high desert plateaus of the region. The surface water system within the wastewater collection planning service area drains to the Deschutes River. Figure 2-2 illustrates waterbodies within and surrounding the City.

Climate

The City experiences warm, dry summers and cool, moist winters. July and August are the warmest months, with an average maximum temperature of 86 degrees Fahrenheit (˚F). The driest period of the year is also July and August when the average monthly rainfall is 0.52 inch.

During the wet winter season, rainfall is generally light with periods of intense rainfall. The wettest period of the year is November and December. The most rainfall occurs in December with an average precipitation of 1.2 inches. December is also the coldest month of the year with an average minimum temperature of 21˚F.

Table 2-1 displays the City's temperature and rainfall statistics per month of the year.

TABLE 2-1
TEMPERATURE AND RAINFALL STATISTICS

Month	Average Maximum Temperature (˚F)	Average Minimum Temperature (˚F)	Average Monthly Rainfall (inches)
January	42	23	0.97
February	47	24	0.65
March	54	26	0.66
April	60	29	0.73
May	67	35	1.02
June	76	41	0.64
July	86	46	0.53
August	85	45	0.50
September	76	38	0.41
October	64	31	0.65
November	49	26	0.96
December	40	21	1.16

Source: U.S. climate data for Redmond, Oregon (www.usclimatedata.com)

Land Use

Understanding the City's land use designations is foundational to forecasting wastewater flows and assessing a wastewater system's capacity. Figure 2-3 displays the City's zoning designations, which are considered to be the City's future land use, as defined in the Redmond Comprehensive Plan.

More than half (54 percent) of the 11,940 acres of land within the City's planning service area is currently not served by the City because it is vacant or reliant on septic systems. Table 2-2 presents the distribution of land use within the planning service area in terms of acreage and percentage. The land use category representing the largest percentage of the planning service area is high density residential at 22.9 percent, followed by industrial at 19.8 percent and airport at 18.3 percent.

TABLE 2-2
FUTURE LAND USE SUMMARY

Land Use Category	Total Planning Service Area (acreage)[1]	Percent of Total Area
Low Density Residential	1,211	10
Medium Density Residential	889	7
High Density Residential	2,735	23
Airport	2,188	18
Commercial	899	8
Park	561	5
Public Facility	406	3
Mixed-Use	265	2
Industrial	2,358	20
Fairgrounds	428	4
TOTAL	**11,940**	**100**

[1]*The total acreage excludes right-of-way*

Demographics

This section provides the current and future demographics for the Redmond community. Population projections are used to estimate the future wastewater flows. The Population Research Center (PRC) at Portland State University (PSU) provides population projections for the State of Oregon under the Oregon Population Forecast Program. According to the PSU PRC's forecast, the City's 2022 population was approximately 37,000 and is projected to grow 57 percent from 2022 to 2045 as shown on Table 2-3.

TABLE 2-3
POPULATION PROJECTIONS

	2022	2040	2045	2047	2050	2055	2060	2065	2070	2072
Redmond	37,342	54,419	58,462	60,060	62,500	66,722	71,144	75,770	80,607	82,601
Percentage Growth from 2022	-	46	57	61	67	79	91	103	116	121

Source: PSU - Population Research Center: Population Forecasts

Policies, Criteria, and Standards

The City is responsible for managing and operating its wastewater collection system in accordance with all applicable local, state, and federal regulations. To best manage its system and reliably comply with regulations, the City has adopted system policies, criteria, and standards that guide the planning and implementation of its wastewater infrastructure and service operations and document the City's commitments to current and prospective customers. The City's wastewater policies are organized into the following categories in the sections that follow:

- Evaluation criteria
    - Performance criteria
    - Design standards
- Service policies
- Coordination with other agencies
- Environmental standards
- Maintenance standards
- CIP policies
- Financial policies

Carollo Engineers, Inc., performed a high-level review of the City's current policies, criteria, and standards and compared them against similar documents developed by other wastewater agencies. While not comprehensive, this review confirms the City's protocols and recommends new policies that may further enhance the management of the wastewater collection system.

Performance Criteria

Performance criteria define the standard against which the collection system is evaluated as part of this WWCSMP. The City established the wastewater collection system performance criteria outlined below as part of this 2024 WWCSMP effort.

- The design storm used for evaluation has a 10-year summer-time frequency, which has a 24-hour duration and follows the Natural Resources Conservation Service Type II distribution.
- Existing pipes shall adhere to a minimum freeboard requirement of 2.0 feet.
- For new pipes during peak wet weather flows, the maximum depth versus diameter shall be 0.8.

As part of the WWCSMP, the collection system was also evaluated against the following design standards from the City of Redmond Public Works 2010 Standards and Specifications, which are available on the City's official website.

- Flow Calculation:
    - Gravity. Flow calculations will be based on Manning's equation using an n value of 0.013.
    - Pressure. Flow calculations will be based on the Hazen-Williams equation using the following values for C.
        - Concrete: 120
        - Cast iron/steel: 125
        - Polyvinyl chloride: 135
- Pump Flow Rate: A single pump pumping capacity should sufficiently exceed the peak inflow rate to be effective.

- Minimum Velocity: 2 feet per second (fps) for gravity sewers. Three fps for pressure and inverted siphons.
- Maximum Velocity: Velocity shall not exceed 8 fps for pressure sewers.
- Minimum Diameter: For gravity sewer, the minimum size shall be 8 inches. Size of pressure lines will be determined by the design engineer.
- Depth: Minimum cover for all standard sewer lines except sewer services shall be 36 inches.

Service Policies

Table 2-4 presents the City's wastewater service policies, as detailed in the Redmond City Code, Chapter 4, Utilities. The full text is available on the City's official website.

TABLE 2-4
SERVICE POLICIES

Subject	Policy Summary
4.005 - Public Service Designated	Furnishing of water, sewer, stormwater, and garbage disposal services…is a public service for which a single public service charge may be made.
4.007 - Companion Service	Water service and sewer service are deemed to be companion services. Both services must be obtained jointly unless an exemption is granted by the City Manager.
4.009 - Application for Service	1. Application for sewer and water connections shall be made either in conjunction with a building permit application or for an existing structure. Application shall be made to the City upon forms provided by the City. 2. Application approval shall be conditional upon the availability of sewer and water as determined by the City, and upon the payment in full of system development charges set forth in this code including, but not limited to, Parks and Streets Systems Development Charges, or establishment of an installment plan for payment of those charges pursuant to contract as authorized by of Section 4.057 of this chapter. Approval for either connection expires upon building permit expiration, as defined by the Oregon State Structural Specialty Code and Fire and Life Safety Regulations. Thereafter, a new application shall be required. If water or sewer approval has expired, the City shall refund the applicable system development charges less ten percent administrative cost.
4.011 - Availability of Service	Water, sewer, garbage, and irrigation services shall not be made available to any property or person for which delinquent payments are owed for such services until the owner or user has made arrangement with the City to pay the delinquencies.
4.050 - Property Owner Responsibility	1. No plumber or other person shall uncover, use, alter, disturb, or make any connection with a City water or sewer main or connect any pipe after it has been disconnected by the City, without first obtaining a permit from the Director of Public Works. A City of Redmond Street Cut Permit is required to excavate new building sewer in the right-of-way or expose existing building sewer for repair within the right-of-way. 2. The owner is responsible for all costs and expenses relating to the installation and connection of the building sewer. The owner shall indemnify the City from loss or damage that may directly or indirectly result from the installation of the building sewer. 3. The connection of the building sewer into the sewer main shall conform to the requirements of the State of Oregon Building and Plumbing Codes and City of Redmond Standards and Specifications.

Subject	Policy Summary
	4. The owner shall notify the City when building sewer is ready for connection and inspection to a public sewer. Only City of Redmond staff will make the physical connection to existing or active sewer mains. 5. Streets, sidewalks, and other public property disturbed in the course of work shall be restored in accordance with the City of Redmond Public Works 2010 Standards and Specifications unless the City approves otherwise in writing. 6. The owner of property served by a building sewer shall be responsible for maintenance and repair of the building sewer to the point of the service connection to the City sewer. This responsibility includes any costs of maintenance or repair of the building sewer. In the event of any break, leak or other damage to a building sewer, the owner of the property served by the building sewer shall cause repairs to be made immediately to minimize any sewer spillage or damage to surrounding property. 7. The owner shall, at the owner's personal own risk and expense, furnish, install and keep in good and safe condition equipment that may be required for receiving, controlling, applying, and utilizing water or sewer services. The City shall not be responsible for loss or damage caused by the improper installation of the equipment, or for the negligence, want of proper care or wrongful act of the customer in installing, maintaining, using, operating, or interfering with the equipment. 8. The service connection at the water main or sewer main, whether located on public or private property, is the property of the City, and the City reserves the right to repair, maintain, and replace it. 9. The water service from the connection to the water main to and including the water meter is the property of the City of Redmond. 10. The water service pipes must be arranged so that the supply to each separate house or premises may be controlled by a separate stopcock placed within or near the line of the street curb. 11. The point of service connection with the public sewer or water system shall be as determined by the City. Building sewers are not allowed to enter the public sewer at manholes unless authorized by the City. 12. Irrigation only water services are subject to approval by City Engineer or Public Works Director. 13. Old building sewers may be used in connection with new buildings only if the City determines that they meet all the requirements of this chapter and are in acceptable condition. 14. Shared building sewer lines (defined as building sewers serving more than one lot, parcel, or tax lot) are prohibited in new construction. It is the responsibility of the owner(s) having existing shared building sewer lines to maintain these lines and replace them as needed.
4.052 - Protection of Pipes from Freezing	Service pipes inside the property line shall be buried at sufficient depth to prevent freezing. Service lines from the point of connection to the structure shall be kept in repair at the expense of the owner. The owner shall be held responsible for all damage resulting from breaks inside the shutoff. No deduction shall be made in water charges for want of supply caused by freezing or any other cause, or from waste or leakage in the service pipes. In an emergency situation, the City may turn off water to buildings with frozen pipes at no charge to the owner.
4.054 - Connection Outside the City	Any proposal to connect structures located outside the City to either the sewer or water system shall be by contract of the owner/developer with the City. A consent to annex to the City shall be required before services are provided to the property.

Subject	Policy Summary
4.056 - Connection Expenses	1. All expenses for connections to the sewer or water system shall be borne solely by the property owner and shall not be part of the system development charge. The costs incurred in the purchase and installation of a water meter are also separate from the system development charge. 2. The City may require as an additional expense for connection reimbursement fees for the installation of sewer and water lines which benefit the affected property.
4.300 - Authorize or Duly Authorized Representative of the User	1. If the User is a corporation: A. The president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or B. The manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiate and direct other comprehensive measures to ensure long-term environmental compliance with environmental laws and regulations; can ensure that the necessary systems are established or actions taken to gather complete and accurate information for wastewater discharge permit requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures. 2. If the User is a partnership or sole proprietorship: a general partner or proprietor, respectively. 3. If the User is a Federal, State, or local governmental facility: a director or highest official appointed or designated to oversee the operation and performance or the activities of the government facility, or their designee. 4. The individuals described in paragraphs 1 through 3, above, may designate a Duly Authorized Representative if the authorization is in writing, the authorization specifies the individual or position responsible for the overall operation of the facility from which the discharge originates or having overall responsibility for environmental matters for the company, and the written authorization is submitted to the City.
4.302 - Public Sewer Connection Required	1. The owner of any building in the City and abutting any street, alley, or right-of-way where a public sanitary sewer is located shall, at the owner's sole cost and expense, connect the building directly thereto consistent with Sections 4.300 to 4.348. For building sewer construction, the connection shall be made within 120 days from the date of official notice provided the sewer is within 200 feet of the building or within 300 feet of a property injecting sewage into a drywell. The owner shall extend the sewer main to and through the owner's property frontage. This connection requirement shall not inhibit the right of the City to cause removal of the connection as a result of violations of this chapter. For existing facilities that use drill holes for sewage disposal, the drill hole must be closed in a manner consistent with Oregon rules and connection shall be made within 90 days from the date of public sewer service availability to the property, provided the sewer is within 300 feet of property and is otherwise consistent with Oregon requirements. The notice shall be sent by First-Class Mail to all owners of property abutting any street, alley, or right-of-way where a public sewer is available. A. Single-family dwellings and buildings or structures accessory thereto, existing and connected to an approved private sewage disposal system prior to the time of connecting the premises to the public sewer shall be

Subject	Policy Summary
	permitted, when no hazard, nuisance, or insanitary condition is evidenced and written permission has been obtained from the authority having jurisdiction, remain connected to such properly maintained private sewage disposal system when there is insufficient grade or fall to permit drainage to the sewer by gravity and if otherwise consistent with Oregon requirements. 2. No person shall place, deposit or permit to be placed or deposited on public or private property in the City any human or bulk animal excrement, garbage, sewage or other objectionable waste. 3. No person shall cause or suffer the release to any natural outlet any sanitary sewage, industrial wastes or other items, except where treatment has been provided consistent with Sections 4.300 to 4.348. 4. In the event a property's connection to a public sewer is impractical, the owner or person lawfully in possession thereof (if different) may, during the 120 day period described in subsection (1) above, file written objections with the City Manager, briefly describing the nature of the impracticality. The City may not enforce this section until the City Manager renders his/her decision on the objections.
4.304 - Private Sewage Disposal	1. Except as provided by this chapter, no person shall construct, maintain, operate or use any privy, privy vault, septic tank, cesspool, or other private sewage disposal system. 2. If a public sewer is not available, a building sewer shall be connected to a lawfully installed and maintained private sewage disposal system. The owner shall operate and maintain the private sewage disposal facilities in a sanitary manner at all times, at no expense to the City. 3. If a public sewer becomes available to a building served by a private sewage disposal system, a connection from the building shall be made to the public sewer consistent with the requirements of this chapter. The private sewage disposal facilities shall be abandoned, removed or filled with suitable material unless the Director otherwise permits. No connections shall be made to the effluent side of existing septic tanks or cesspools. 4. Persons owning/operating public or private sewers in the City shall provide the City, if requested, two (2) sets of plans for the existing system. Changes or additions to the public or private sewer system shall be provided to the City within 60 days of the change or addition being made.
4.306 - Sewer Construction Permits	1. Other than building sewers and service connections, public or private sewers require a city permit prior to construction. Applications for a permit shall be on a form supplied by the City. The application shall be submitted with at least three sets of construction plans and specifications. The construction plans and specifications shall be prepared and submitted under the signature and seal of a registered, professional engineer. The permit is in addition to any other permits or approvals that may be required by any federal, state or local agency. 2. City standard specifications shall be followed for design or construction of sewer works. Standard specifications may be obtained from the Public Works Department upon request, at a fee established by the City Council.
4.308 - Connection Permits	1. No unauthorized person shall uncover, make connections with or opening into, use, alter, or disturb any public sewer or appurtenance thereof without first obtaining a written permit from the City. 2. There are two classes of building sewer permits: (1) residential and commercial service, and (2) service to establishments producing industrial waste. In either, the owner or owner's agent shall make application on a special form furnished by the City. The permit application shall include plans, specifications, or other information considered pertinent by the Director. Permit and inspection fees shall be paid the

Subject	Policy Summary
	City in advance, consistent with the schedule established by the City Council at the time the application is filed. 3. Each applicant must agree to conform to the rules and regulations for connection to the public sewer, and shall give the location of the property; street number of the building or buildings to be connected; name of the owner of the property to be connected; name of the person, firm, or corporation engaged to make the connection; and such other information or plans as may be required by the City, including real property description.
4.310 - Connection Inspections	1. Reasonable notice shall be given the City to inspect all sewer connections before their completion and while the connections are still uncovered. All work, including trench backfill, must be done consistent with specifications prescribed by the City and subject to the approval of the City. 2. Materials and Manner of Construction - Service connections and building sewers shall be constructed to conform to provisions of the City of Redmond Standard Specifications and the Oregon Plumbing Specialty Code. Physical connection to public sewer mains shall be made only by an individual authorized by the Director.
4.314 - Building Sewer	1. Existing building sewers may be used in connection with new buildings only when the Director determines, based on examination and test, that the system meets all requirements of this Chapter. 2. The connection of the building sewer shall be made to the public sewer. If no service connection is available at a suitable location, the owner shall be responsible for connecting to the gravity sewer as follows: A. The City shall install a tap in the public sewer at the location specified by the Director after the owner has exposed the public sewer. The building sewer shall be to and connected to the tap as directed by the Director at no expense to the City. The owner shall be responsible for all costs incurred by the City in connection to the public sewer. B. All excavations for building sewer installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways, and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the Director.

Source: Redmond City Code, Revised January 2003.

Coordination with Other Agencies

The City works closely with the neighboring community of Terrebonne with which the City has an intergovernmental agreement (IGA). In the future, the City of Redmond will receive Terrebonne's wastewater at the WWTP. The community of Terrebonne is shown on the map on Figure 2-1.

Environmental Standards

Table 2-5 summarizes the City's environmental standards as they relate to the wastewater collection system. These standards were derived from the City Comprehensive Plan and the Redmond City Code.

TABLE 2-5
ENVIRONMENTAL STANDARDS

Subject	Policy
Goal 5: Open Space Resources	The open space resources under policy 5-1-7 is designed to prohibit the extension of the WWTP further south into the Dry Canyon and explore opportunities to move treatment processes to the existing irrigation site. Propose opportunities to relocate public utilities out of the Dry Canyon Preservation Area.
Goal 6: Air, Water, and Land Resources Quality	Reduce Impacts. Redmond will uphold the carrying capacity of air, water, and land resources by reducing impacts from pollutants consistent with federal and state standards. Improve Quality. Redmond will improve the quality of air, water, and land resources.
Goal 7: Natural Hazards	Redmond will minimize the risk of natural hazards and the impacts to life and property through hazard mitigation planning. Building capacity for community resilience and adaptation. Redmond will support and invest in seismic retrofits and infrastructure redundancies.
Goal 15: Livability	Redmond will develop a variety of safe, reliable, and economical mobility choices to decrease transportation costs, improve air quality, reduce greenhouse gas emissions, and promote healthy lifestyles.
Tree Permits	Permits are required prior to planting, removing, or pruning any tree located in a public area. Work done under such permit shall be performed in accordance with the terms and provisions of the Redmond City Code under Section 3.611.

Sources: Redmond Comprehensive Plan; Redmond City Code, Revised January 2003

Maintenance Standards

The City's maintenance standards are outlined in Redmond City Code, Section 4.165, Maintenance Requirements and the City of Redmond Public Works 2010 Standards and Specifications, Section 14.3.08, and are summarized on Table 2-6. It is recommended that the City establish a policy to clean and inspect all of its sewer pipelines on a five-year schedule.

TABLE 2-6
MAINTENANCE STANDARDS

Subject	Standard
BMPs	Schedules of activities, practice prohibitions, maintenance procedures, and other practices implementing Section 4.326 1. and 2. BMPs include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal or drainage from raw materials storage.
Sewer Testing	Clearing of all debris shall be made prior to CCTV inspection.

BMPs = best management practices

CCTV = closed-circuit television

Source: Redmond City Code, Revised January 2003

Source: City of Redmond Public Works 2010 Standards and Specifications

Fats, Oils, and Grease Inspection Program

The City has a fats, oils, and grease inspection program defined in the Redmond City Code, Section 4.165, Maintenance Requirements, and the City of Redmond Public Works 2010 Standards and Specifications, Division III - Sanitary Sewer Facilities. The full text can be found on the City of Redmond's official website.

Capital Improvement Plan Policies

Each year the City of Redmond develops a five-year CIP to establish long-term priorities for capital investments. The budget is projected with the goal of avoiding negative enterprise budget balances. In addition, the City Council conducts an annual review of the budget for the fiscal year. With these annual updates, it is recommended that the City ensures that the five-year plan aligns with the WWCSMP.

Financial Policies

Provided on Table 2-7, the City's financial policies regarding its wastewater collection system are as defined in the Redmond City Code, Chapter 4, Utilities.

TABLE 2-7
FINANCIAL POLICIES

Subject	Policy
1.13 - Deposits	1. The City Manager or his designee may require a deposit in a sum which is set by resolution for those accounts: A. Which appear on the shut-off list two or more times within a 12 month period; or B. For which payment for services is made by a check which is not paid upon first presentation, twice within a 12 month period; or C. For which payment is made by check when the account has appeared on the shut-off list and the non-paid check is tendered to avoid shut-off. D. Deposits held for cause due to paragraphs (A) thru (C) shall be held for a period of 1 year or until service is terminated. 2. The City Manager or his designee may allow the deposit to be paid in installments in order to avoid undue hardship, provided the period does not exceed three months and there are no violations within the grace period.
4.015 - Billing and Collection Procedures	Water meters shall be read at regular intervals for the preparation of water, sewer, stormwater, garbage, and irrigation bills…Water, sewer, stormwater, garbage and irrigation service will be billed monthly or bi-monthly, at the discretion of the City. The billing charges will be calculated from the actual amount of water used, the amount of wastewater discharged, or the monthly user charges, whichever is greater or at the discretion of the City. Water, sewer, stormwater, garbage, and irrigation charges may be billed together in the same bill.
4.017 - Responsibility for Payment of Bills	The property owner is responsible for payment of all charges prescribed in this chapter.
4.019 - Abandoned and Non-Revenue-Producing Services	If a service connection to a property has been abandoned or not used for a period of one year or longer, the City may remove it. Once removed, service shall be restored only upon the customer's application and payment for a new service connection.

Subject	Policy
4.021 - Collection of Rates and Charges	The Manager or designee shall collect all rates and charges set forth in this chapter. All delinquent rates and charges shall be liens against the property to which service is given.
4.023 - City Liability	The City shall not be liable for damage to a customer's property which may result when water service is turned on, discontinued, or interrupted for improvements or repairs. The City may shut off water from the mains at any time, without notice, for repairs or other necessary purposes. The City shall not be responsible for any damage resulting to tanks, boilers, or other property. No liability shall exist on the part of the City for any damage resulting from the breaking of mains, pipes, service pipes or cocks; and no deduction shall be made for any time that the mains or service pipes may be out of use or service discontinued on account of freezing of pipes or mains.
4.056 - Connection Expenses	All expenses for connections to the sewer or water system shall be borne solely by the property owner and shall not be part of the system development charge. The City may require as an additional expense for connection reimbursement fees for the installation of sewer and water lines which benefit the affected property.
4.102 - Sewer Rates	The charges for sewer will be based on the number of equivalent dwelling units and a usage factor. The sewer rates are established by resolution.
4.312 - Connection Costs	All costs and expenses incidental to the installation and connection of the building sewer shall be borne by the owner.

Source: Redmond City Code, Revised January 2003

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LEGEND

PS PRESSURE PUMP STATION

SEWER FORCE MAINS

- < 6 INCHES
- 6- 8 INCHES

SEWER GRAVITY LINES

- 6-8 INCHES
- 6-8 INCHES INTERCEPTOR
- 10-18 INCHES
- 10-18 INCHES INTERCEPTOR
- 20-28 INCHES
- 20-28 INCHES INTERCEPTOR
- ≥ 30 INCHES
- ≥ 30 INCHES INTERCEPTOR
- CITY LIMITS
- URBAN GROWTH BOUNDARY
- SERVICE AREA
- URBAN RESERVE AREA

4,000 0 4,000

SCALE IN FEET

Terrebonne

Redmond

EAST-UPAS INTERCEPTOR

EAST SPRUCE INTERCEPTOR

WEST SPRUCE INTERCEPTOR

WEST 19TH ST INTERCEPTOR

WAVERLY PUD

LAWSONS CROSSING

NOLANS ADDITION

PUBLIC WORKS

PUBLIC WORKS WATER WAREHOUSE

PUBLIC WORKS WASH BAY

WEST CASCADE TRUNK

WEST 27TH ST TRUNK

CANYON INTERCEPTOR

MAJESTIC RIDGE

REINDEER

AIRPORT TERMINAL SANITARY

UMATILLA

CASCADE VIEW

XERO

CASCADE VIEW PHASE 7

YEW

3071 ft

Tetherow Butte

3205 ft

Forked Horn Butte

Smith Rock State Park

Redmond Municipal Airport

Juniper Golf Course

The Greens Redmond

NW 27th

NW 31st St

NW 10th St

NW 16th St

NE 9th St

NE 1st St

NE 5th St

NE 33rd St

NE 37th St

NE 17th St

NE 29th St

NW 83rd Pl

NW 83rd St

NW Odem Ave

NE Smith Rock Way

NE Upas Ave

NE Maple Ave

NW Larch Dr

NW 55th St

NW 67th St

NW Helmholtz Way

W Antler Ave

E Antler Ave

SW 17th St

SW 23rd St

SW 24th St

SW Highland Ave

SW Salmon Ave

SW Obsidian Ave

SW Quarry Ave

SW Canal Blvd

SW 58th St

SW 58th Pl

SE Airport Way

SE Sherman Rd

SW Highway 126

NE Upas Ave

Falcon Crest Dr

126

370

97

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User

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CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

EXISTING COLLECTION SYSTEM

FIGURE
2-1

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LEGEND

- PS — PRESSURE PUMP STATION

SEWER FORCE MAINS

- < 6 INCHES
- 6- 8 INCHES

SEWER GRAVITY LINES

- 6-8 INCHES
- 6-8 INCHES INTERCEPTOR
- 10-18 INCHES
- 10-18 INCHES INTERCEPTOR
- 20-28 INCHES
- 20-28 INCHES INTERCEPTOR
- ≥ 30 INCHES
- ≥ 30 INCHES INTERCEPTOR
- CITY LIMITS
- URBAN GROWTH BOUNDARY
- SERVICE AREA
- URBAN RESERVE AREA

Terrebonne
Redmond
Smith Rock State Park
Tetherow Butte
3071 ft
Forked Horn Butte
3205 ft
Juniper Golf Course
Redmond Municipal Airport
The Greens Redmond

EAST UPAS INTERCEPTOR
EAST SPRUCE INTERCEPTOR
WEST SPRUCE INTERCEPTOR
WEST 19TH ST INTERCEPTOR
WAVERLY PUD
LAWSONS CROSSING
NOLANS ADDITION
PUBLIC WORKS WASH BAY
PUBLIC WORKS WATER WAREHOUSE
WEST CASCADE TRUNK
WEST 27TH ST TRUNK
CANYON INTERCEPTOR
MAJESTIC RIDGE
CASCADE VIEW
XERO
CASCADE VIEW PHASE 7
YEW
REINDEER
AIRPORT TERMINAL SANITARY
UMATILLA

4,000 0 4,000
SCALE IN FEET

CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

TOPO AND SURFACE WATERS

FIGURE
2-2

anderson perry

Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap

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LEGEND

- CITY LIMITS
- URBAN GROWTH BOUNDARY
- SERVICE AREA
- URBAN RESERVE AREA

COMPREHENSIVE_PLAN_2040 ZONE

- AIRPORT
- AIRPORT COMP
- C1
- C2
- C3
- C4
- C4-A
- C5
- FG
- LL INDUSTRIAL
- M1
- M2
- MUE
- MUE-WRAP
- MULW
- MUN
- OSPR
- PARK
- PF
- R1
- R2
- R3
- R4
- R5

4,000 0 4,000

SCALE IN FEET

Terrebonne
NE Smith Rock Way
NW Odem Ave
N Highway 97
NE 5th St
Northwest Way
NE Oneil Way
NE 17th St
NW Helmholtz Way
NW Maple Ave
NW 19th St
Dalles California Hwy
NE 9th St
W Highway 126
Redmond
SW Highland Ave
E Highway 126
SW Highway 126
S Highway 97
Redmond Municipal Airport
The Greens Redmond
Juniper Golf Course
SW Canal Blvd
SW 61st St

Oregon State Parks, State of Oregon GEO, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc,

anderson perry

CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

ZONING

FIGURE
2-3

Chapter 3 - Wastewater Flow Projections

Introduction

Accurate wastewater flow projections are the foundation for analyzing collection system capacity, identifying areas that need improvement, and developing a Capital Improvements Plan. This chapter describes the data and methods used to develop modeled sewer flows. This includes establishing sewer flow definitions, reviewing the results of the 2023 flow monitoring program, confirming existing flows, establishing flow factors, and forecasting future flows.

Sewer Collection System Flow Definitions

This section defines commonly used terminology for the wastewater collection system analysis and evaluations conducted as part of this Wastewater Collection System Master Plan (WWCSMP). In general, wastewater consists of the following two components: average dry weather flow (ADWF) and wet weather flow (WWF). Wastewater flow components are depicted on Figure 3-1.

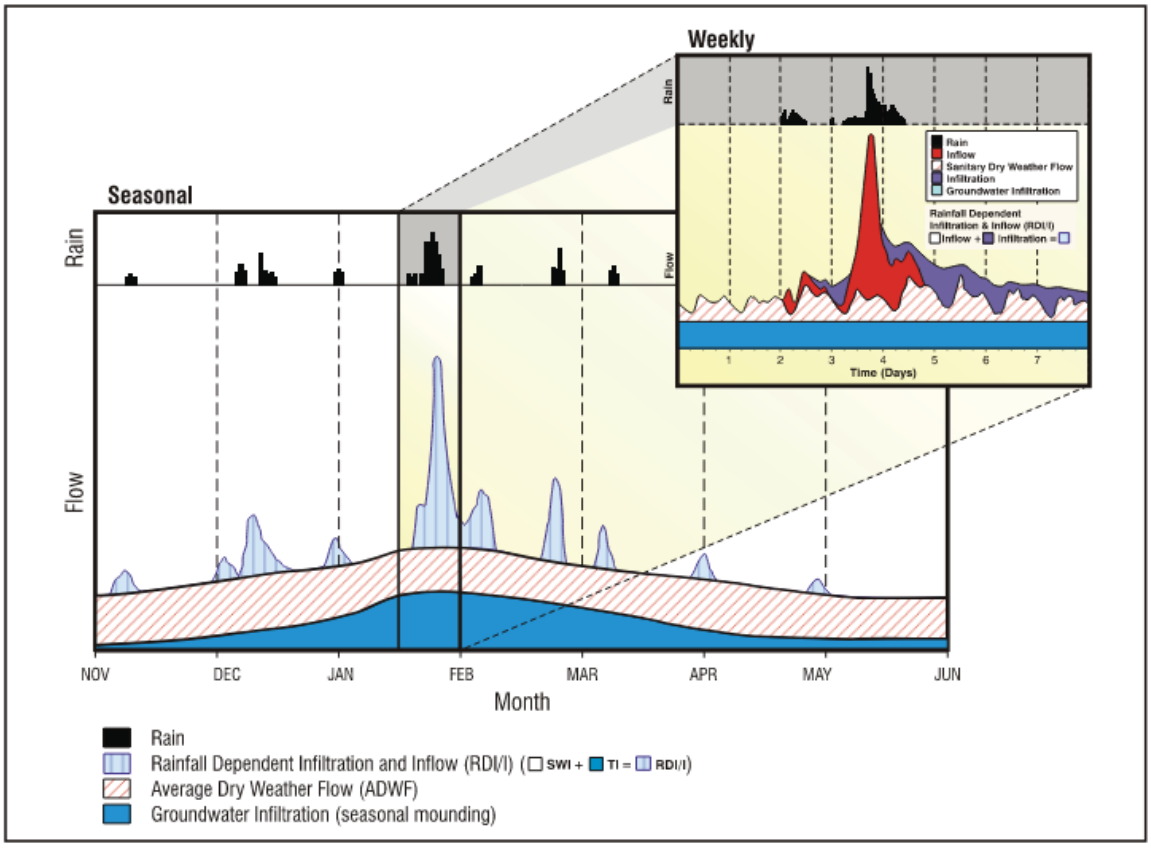
Average Dry Weather Flow

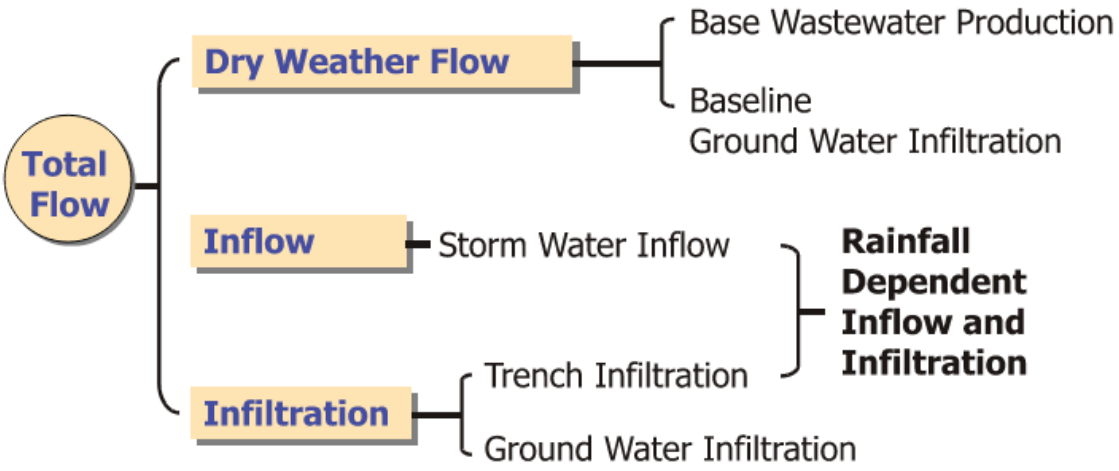
ADWF is the average flow that occurs on a daily basis during the dry weather season. ADWF is representative of routine wastewater discharges into the collection system from customers as well as baseline groundwater infiltration into pipes and manholes.

ADWF has two primary components:

1. Base Wastewater Production (BWWP): The flow generated by routine water usage of a city's residential, commercial, and industrial customers.

2. Dry Weather Groundwater Infiltration (DWGI): Infiltration that enters the sewer system when the relative depth of the groundwater table is higher than the depth of the pipeline and the sanitary sewer pipe allows infiltration through defects such as cracks, misaligned joints, and broken pipelines. DWGI (or base infiltration) cannot easily be separated from BWWP by flow measurement techniques. Therefore, DWGI is typically grouped with BWWP.





Note: This figure is not based on flow data specific to the City or this Master Plan

Figure 3-1 Typical Wastewater Flow Components

Wet Weather Flow Components

WWF includes two components:

1. Inflow and Infiltration (I/I): Inflow is stormwater that enters the sewer system via a direct connection to the system such as improper storm drain connections. Infiltration is stormwater that enters the sewer system by percolating through the soil and then through defects in pipelines, manholes, and joints. The stormwater I/I response in the sewer system to rainfall is seen immediately (inflow) or within hours after the storm (infiltration). If too much I/I enters the sewer system, sanitary sewer overflows could occur. Rainfall-derived inflow and infiltration (RDII) refers to the portion of rainfall that enters the collection system through I/I.

2. Wet Weather Groundwater Infiltration (GWI): Wet weather GWI is not specific to a single rainfall event but rather affects the sewer system over the entire wet weather season. The depth of the groundwater table rising above the pipe invert elevation causes wet weather GWI. Sewer pipes within proximity to a waterbody can be greatly influenced by groundwater effects.

Peak Wet Weather Flow (Design Flow)

Peak wet weather flow (PWWF) is the highest observed hourly flow that occurs following the design storm event and is typically used for designing sewers and pump stations (therefore referred to as the "design flow"). PWWF occurs when wet weather RDII causes flows in the collection system to increase. While there is a peak flow associated with each storm event, in this WWCSMP the PWWF represents the peak flow resulting from the design storm defined in Chapter 2. PWWFs are modeled by simulating a storm event in the hydraulic model after RDII unit hydrographs have been assigned to the collection system and calibrated. The combination of the ADWF and the RDII occurring from the storm event results in increased wet weather flows; during the design storm, these wet weather flows constitute the PWWF for the system.

Flow Monitoring Program

The City of Redmond contracted with ADS to conduct a temporary flow monitoring program within the City's wastewater collection system. The purpose of the flow monitoring program was to provide actual collection system flow data to be used to calibrate the hydraulic model and estimate I/I for each sewer basin. The temporary flow monitoring data were collected for 68 days from May 18, 2023, to July 24, 2023. The "City of Redmond, OR 2023 Sanitary Sewer Flow Study," prepared by ADS, dated August 17, 2023, summarizes the flow monitoring program and is included in Appendix A.

Flow Monitoring Program Description

Flow Monitoring Sites and Tributary Areas

Eight sewer basins were monitored during the flow monitoring period. Seven were monitored by ADS while flow data for the eighth basin were collected from a permanently installed flowmeter at the wastewater treatment plant (WWTP) for the flow monitoring period. The temporary flowmeters were installed, maintained, and monitored by ADS at locations selected

by the City. The meter sites were selected to best isolate the critical areas within the wastewater collection system so the hydraulic model could be accurately calibrated for those areas. The eight flow monitoring locations, as well as the area tributary to each site, are shown on Figure 3-2.

Table 3-1 lists the flow monitoring locations and the diameters of the sewer pipes where the meters were installed. Figure 3-3 provides a schematic illustrating how the flow monitoring basins relate to one another.

TABLE 3-1
FLOW MONITORING LOCATIONS

Monitor Site Manhole ID	Pipe Diameter (inches)	Location
MH0163	18	At the intersection near S.W. Black Butte Boulevard and S.W. 15th Street
MH0087	18	Along S.W. 27th Place, 350 feet north of S.W. Quartz Avenue
MH17C073	15	Along S.W. 35th Street, approximately 40 feet north of S.W. Indian Avenue
MH03B042	27	Along N.E. 3rd Street between N.E. Quince Lane and N.E. Quince Avenue
MH04C002	24	Along Dry Canyon Trail approximately 470 feet south of N.W. Quince Avenue and 275 feet west of N.W. Canyon Drive
MH04C042	8	Along Dry Canyon Trail approximately 175 feet west of the intersection between N.W. Quince Avenue and N.W. Canyon Drive
MH04B057	30	Along Dry Canyon Trail approximately 400 feet west of the intersection between N.W. Canyon Drive and N.W. Quince Avenue and 180 feet north of N.W. Quince Avenue
WWTP	36	3100 N.W. 19th Street

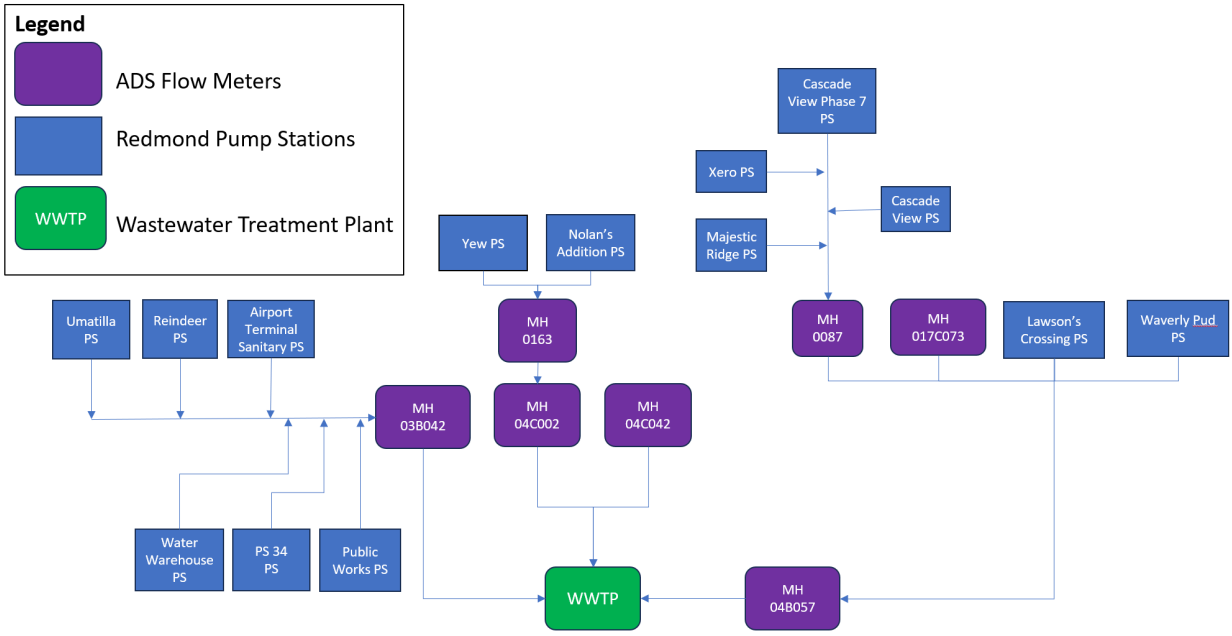


Figure 3-3 Flow Monitoring Schematic

Flowmeter Installation and Flow Calculation

ADS installed seven ADS Model Triton+ monitors selected for this task. These meters are an area velocity flow monitor that use both the Continuity and Manning's equations to measure flow. The monitor consists of data acquisition sensors and a battery-powered microcomputer. The microcomputer includes a processor unit, data storage, and an on-board clock to control and synchronize the sensor recordings.

ADS analyzed the data retrieved from each flowmeter and made adjustments as needed for calibration based on the field measurements. The flow at each meter was then calculated at five-minute intervals based on the continuity equation:

$$Q = V \times A$$

where,

Q = Pipeline flow rate, cubic feet per second

V = Average velocity, feet per second

A = Cross sectional flow area, square feet

Rain Gauges

Two sets of rain gauge data identified as Korredmo83 and Korredmo146 were obtained from Weather Underground (wunderground.com) for the flow monitoring period. The rain gauge locations are near the intersection of S.W. Reservoir Drive and S.W. Cascade Vista Drive for Korredmo83, and near N.W. Fir Avenue and N.W. 17th Street for Korredmo146. The geographical location of these rain gauges is shown on Figure 3-2. The City provided data from a rain gauge located at the WWTP, but it was not used because it was incomplete over the flow monitoring period. The data from the WWTP rain gauge was compared to the data from the two Weather Underground rain gauges and all sites were found to be consistent.

Flow Monitoring Results

This section summarizes the results of the flow monitoring program, including dry weather flow data, rainfall data, and WWF data. Data collected from meter MH04C042 are presented throughout this chapter as an example of the type of data and the results from the flow monitoring program. Refer to Appendix B for additional data summaries and other information associated with the remaining meter sites.

After analyzing the flow data, the WWTP meter data were deliberately omitted from the flow monitoring analysis. The ADWF calculated for the seven basins ADS monitored, excluding the WWTP basin, yielded a total of 2.5 million gallons per day (MGD). The WWTP flowmeter also recorded an ADWF of 2.5 MGD, which does not align with the ADS meter flows because it would indicate that no flow was generated from the WWTP basin, which is downstream of all the ADS flowmeters and upstream of the WWTP. Since using the WWTP flow data would result in a basin of the system not contributing to flow, the City decided to use the more conservative ADS flow monitoring data for the WWCSMP analysis and treat the WWTP area as an unmetered basin.

Dry Weather Flow Data

During the flow monitoring period, depth and velocity data were collected at each meter at five-minute intervals. The five-minute data were aggregated to hourly data for calibrating the hydraulic model. ADWF was estimated using the driest days from the flow monitoring period meeting the following criteria:

- No rain occurring within the previous two-day period;
- Selected days must exhibit average-day flows within 85 percent to 115 percent of the average-day flows of remaining dry days;
- In addition, those dry days that exhibited unusual flow patterns were not used to generate net dry day flow values for a basin.

Characteristic dry weather 24-hour diurnal flow patterns for each meter site were developed based on the hourly data. The hourly flow data were used to calibrate the hydraulic model for the observed dry weather flows during the flow monitoring period.

Typically, a diurnal pattern with mostly residential uses has two peaks, with the more pronounced peak following the wake-up hours of the day, and a less pronounced peak occurring in the evening. Commercial and industrial diurnal patterns, though they vary depending on the type of use, typically have a more consistent higher flow pattern during business hours, and lower flows at night. Hourly patterns for weekday and weekend flows vary and were separated to better understand dry weather flow. In addition, the average weekday and weekend dry weather levels and velocities at each site based on the data provided by ADS, were used to calibrate the model for dry weather flow.

Chart 3-1 illustrates the typical variation in weekday and weekend flow within the City, derived from data collected from meter MH04C042. This meter predominantly collects from low to medium density residential areas, commercial areas, parks, and vacant parcels. Similar graphics associated with the remaining sites are included in Appendix B. Table 3-2 summarizes the dry weather flows at each meter. On Table 3-2, the gross ADWF refers to the total ADWF that flows through that meter, while the net

ADWF refers to only the ADWF flow contributed by that meter's basin, not including upstream meter basins. The meter relationship column on Table 3-2 indicates which meter basins are upstream of the subject meter basin and, therefore, are subtracted from the gross ADWF to calculate the net ADWF.

CHART 3-1
TYPICAL WEEKDAY VERSUS WEEKEND DRY WEATHER FLOW VARIATION
(METER MH04C042 DIURANAL PATTERN)

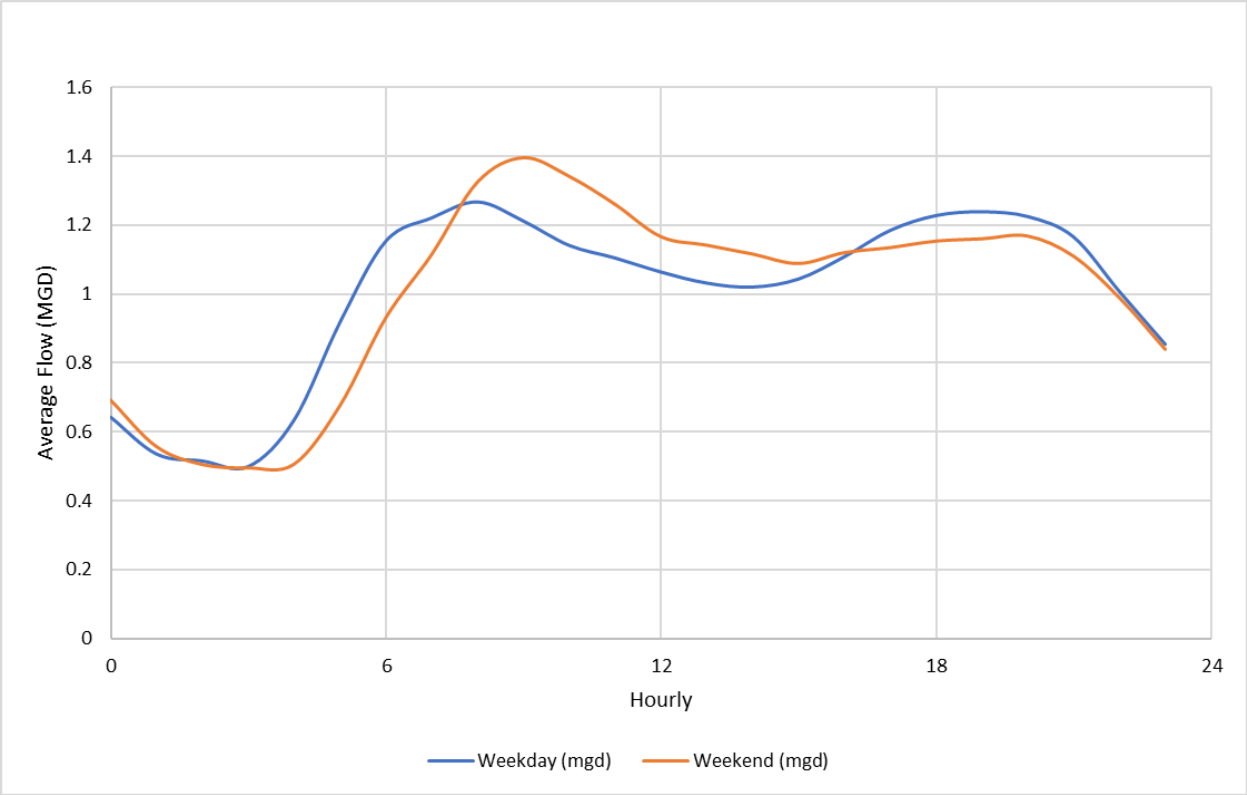


TABLE 3-2
EXISTING AVERAGE DRY WEATHER FLOW SUMMARY

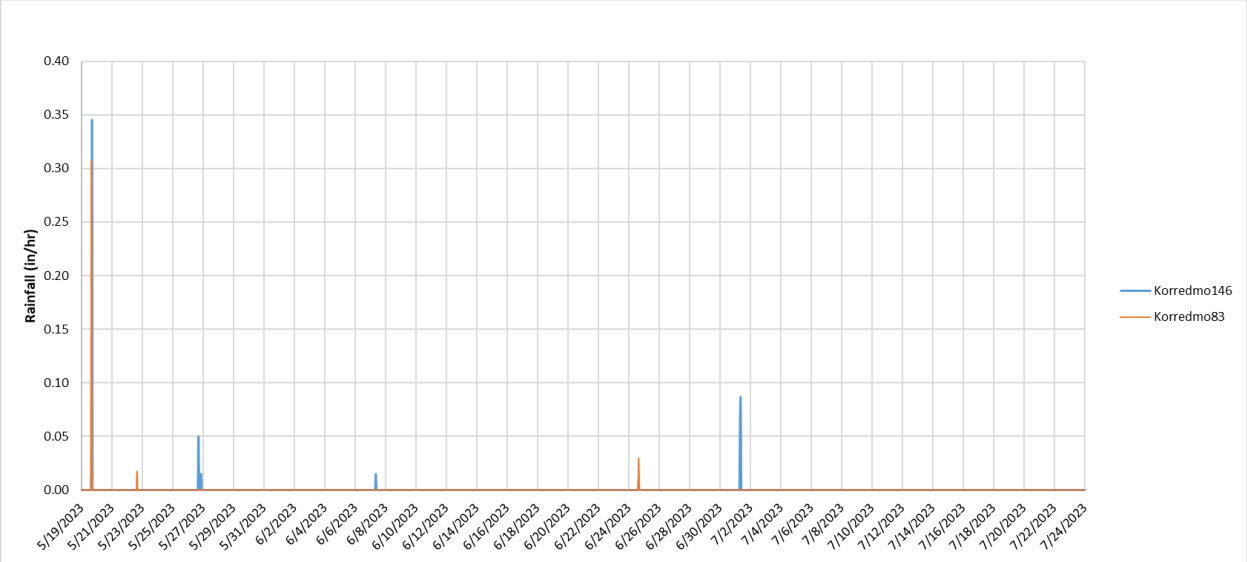
Monitor Site	Meter Relationship	Gross ADWF (MGD)	Net ADWF (MGD)
MH0163	+MH0163	0.73	0.73
MH0087	+MH0087	0.19	0.19
MH17C073	+MH17C073	0.28	0.28
MH03B042	+MH03B042	0.42	0.42
MH04C002	+MH04C002 - MH0163	1.19	0.47
MH04C042	+MH04C042	1.12	0.12
MH04B057	+MH04B057 - MH017C073 - MH0087	0.87	0.40

Note: The WWTP basin is excluded from Table 3-2 because the basin's existing ADWF does not align with ADS' existing ADWF. Therefore, WWTP basin is considered an unmetered basin.

Rainfall Data Overview

Rainfall data were obtained from Weather Underground and depicted on Chart 3-2, were analyzed for the period spanning from May to July 2023, corresponding with the flow monitoring period. Rain gauge locations are shown on Figure 3-2. Chart 3-2 illustrates the hourly rainfall intensity, with the maximum recorded intensity during the flow monitoring period being 0.35 inch per hour on May 19, 2023. While some slight precipitation was recorded on other days, the May 19 event is the only event considered a storm event during the monitoring period. This level of intensity is reasonable considering the City's location in a semi-arid region with relatively low annual precipitation. The total rainfall recorded over the duration of the flow monitoring period for both Korredmo83 and Korredmo146 are approximately 3.29 and 3.50 inches, respectively.

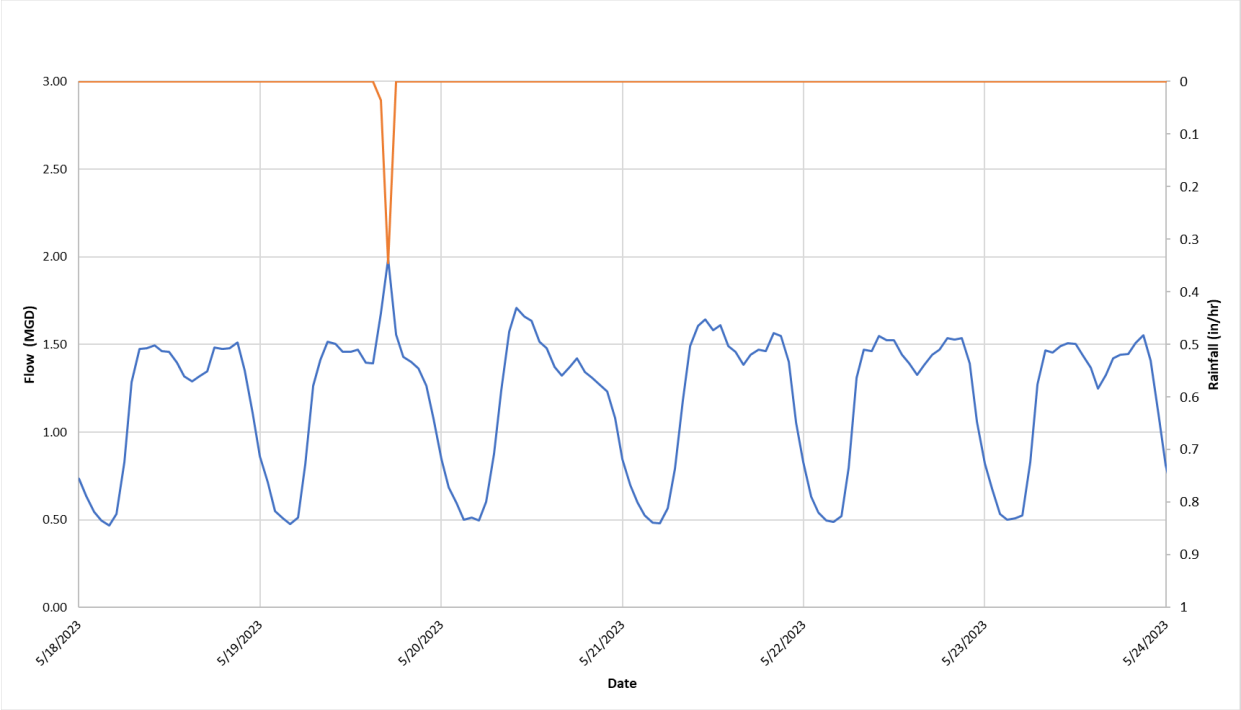
CHART 3-2
KORREDMO83 AND KORREDMO146 RAIN GAUGE HOURLY INTENSITY



Wet Weather Flow Data

The flow monitoring data were evaluated to determine how the collection system responds to wet weather events, focusing on the rainfall that occurred on May 19. Chart 3-3 presents the hydrograph for meter MH04C002 during this event. Notably, the analysis revealed a direct inflow response at meter MH04C002. After discussing these findings with the City, City staff found a storm drain directly connected to the sewer pipeline, which they capped to disconnect it from the sewer pipelines and eliminate its influence on the sewer system. Similar graphs were generated for the remaining monitoring sites and can be found in Appendix B. Appendix B also provides capacity indicators for the collection system during the flow monitoring period, such as the depth versus diameter ratio at the meter sites.

CHART 3-3
KORREDMO83 AND KORREDMO146 RAIN GAUGE HOURLY INTENSITY
(FLOW VS. TIME, METER MH04C002)



in/hr = inches per hour

Existing Average Dry Weather Flows

Existing ADWF were calculated using data from the flow monitoring program for each of the seven monitoring basins. Additionally, a separate assessment was conducted for the City's two largest industrial customers. Sewer flow data provided for these customers were used to estimate their respective contributions to the overall sewer flows.

Large Industrial and Special Use Customers

The City serves two large industrial customers within the planning service area:

- PCC Schlosser, Inc.
- Eberhard Creamery, Inc.

The City provided significant industrial user wastewater discharge volumes for 2022, which were compared to the estimated ADWF based on the land use flow factors. PCC Schlosser, Inc., was determined to have an average daily flow approximately four times higher than the average industrial user, while Eberhard Creamery, Inc., had an average daily flow approximately 20 times higher. Because these users have significantly higher than average flows based on the land use flow factors, their actual ADWF values were modeled as shown on Table 3-3.

In addition to the large users listed above, the City serves the following special users:

- Juniper Golf Course
- Roberts Field Airport
- Deschutes County Fair and Expo Center (fairgrounds)

These entities were identified as special users based on anticipated flows. The golf course was categorized as a park, which is assumed to have zero wastewater generation, with the clubhouse and facilities assumed to generate wastewater similar to commercial land use. The airport was categorized as public land use, excluding the runways from the developed acreage to avoid overestimating sewer flows. A unique land use category and associated flow factor was established for the fairgrounds using water use records.

The location of these customers is illustrated on Figure 3-4.

Existing Average Dry Weather Flow Summary

Since the WWTP basin was considered an unmetered portion of the wastewater collection system, the weighted average flow factors developed for the seven flowmeter basins were used to estimate the existing average dry weather flows for that basin.

The existing ADWF determined from the flowmeters available for each wastewater basin are summarized on Table 3-3 along with the existing flows from the two largest customers in the collection system. The net ADWF presented in the last column on Table 3-3 is the net ADWF excluding large customers used to develop the planning flow factors in the following section.

TABLE 3-3
DRY WEATHER FLOW ESTIMATES

Meter Basin	Total Large and Special Customers Flow (MGD)	ADWF (without the Large and Special Users) (MGD)	Total ADWF[1] (with the Large and Special Users) (MGD)
MH0163	0.002[(2)]	0.73	0.73
MH0087		0.19	0.19
MH17C073		0.28	0.28
MH03B042	0.066	0.35	0.42
MH04C002		0.47	0.47
MH04C042		1.12	1.12
MH04B057		0.40	0.40

[1]Same as Net ADWF from Table 3-2.

[2]The large customer flow was projected for Juniper Golf Course at 0.002 MGD.

Flow Factor Development

To develop wastewater flow projections and allocate future flows to the collection system, relationships between land use and wastewater generation were developed. These relationships, called planning wastewater flow factors, are rates expressed in gallons per acre per day (gpad). A unique flow factor was established for each land use type using average wastewater flows generated during the flow

monitoring period. The land use flow factors were used to estimate future flows from vacant or unserved parcels within the planning service area to forecast buildout sewer flows. Details of flow factor development are included in Appendix C.

Flow Factor Development Methodology

For this WWCSMP, flow factors were developed using the following procedures:

- Average flows for each meter basin were derived from the meter data. These values are presented on Table 3-2.
- Using Geographic Information System data, the acreage for each land use type contained in each meter basin was calculated.
- Preliminary flow factors for each land use type were assumed based on typical industry values, which for residential land use can be estimated from the approximate number of dwelling units per acre, an assumed per capita wastewater generation rate, and the typical number of people per dwelling unit for each land use type.
- The flow factors for each meter basin were adjusted up or down (balanced) within a reasonable amount (based on engineering judgment) until the calculated average flows from each basin matched what was measured during the flow monitoring period. Flow factors were developed using the field-estimated ADWF, excluding parks and the five large industrial and special use customers.
- Once the flow factors for each of the seven meter basins were balanced, a weighted average of the flow factors for each land use type was calculated based on the acreage contribution from each basin. The weighted average flow factors for each land use type represents wastewater generation by land use for the City as a whole and are used to project future wastewater flows.
- The ADWF for the unmetered basin (WWTP basin) was estimated using the weighted average flow factors developed from the seven metered basins.

For example, the ADWF for flowmeter MH17C073 during the flow monitoring period was approximately 0.19 MGD. The tributary service area upstream of this flowmeter is developed, with buildings falling into a variety of zoning categories, including Low Density Residential, Medium Density Residential, High Density Residential, Mixed-Use, and Public Facility. The preliminary flow factors were multiplied by the acreages for each land use designation and adjusted until the flows equaled 0.19 MGD. This process was repeated for each flowmeter basin, and weighted flow factors were calculated for each land use category.

Existing Flow Factors

The existing customer flow factors developed for each flowmeter basin and each land use type are presented on Table 3-4. Column 2 of Table 3-4 presents the system-wide weighted average flow factors.

TABLE 3-4
BASIN-SPECIFIC FLOW FACTORS BY LAND USE CLASSIFICATION SUMMARY

Land Use Classification	Flowmeter Basins - gpad							
	Average[1]	MH0087	MH03B042	MH17C073	MH0163	MH04B057	MH04C002	MH04C042
Vacant	0	0	0	0	0	0	0	0
Low Density Residential	510	550	0	350	550	500	600	700
Medium Density Residential	790	700	0	0	650	0	950	1,200
High Density Residential	920	900	700	600	1,000	1,075	1,400	0
Airport[2]	570	0	0	0	0	0	0	0
Commercial	600	0	500	0	570	600	650	550
Park	0	0	0	0	0	0	0	0
Public Facility	570	600	450	460	650	0	800	0
Mixed Used	680	700	650	450	750	0	1,000	0
Industrial	400	0	400	0	400	0	0	0
Fairgrounds	100	0	0	0	100	0	0	0

[1]The average gpad shown on Table 3-4 is applied to the WWTP basin, as it is considered an unmetered basin.

[2]The airport has a total of 1,250 acres, but the wastewater flow factor applies only to the 20-acre building footprint where wastewater is generated; the remaining acreage is vacant and exempt from the flow factor.

Table 3-5 presents the estimated existing ADWF using the basin-specific flow factors. As with most cities, residential land use makes up most of the developed land and wastewater flow. For the City of Redmond, residential customers make up approximately 70 percent of the current ADWF. The flow factors generate an ADWF from the metered basins of 2.76 MGD, a 0.02 percent difference from the measured ADWF observed during the flow monitoring program of 2.81 MGD.

TABLE 3-5
ESTIMATED EXISTING AVERAGE DRY WEATHER FLOW
USING BASIN-SPECIFIC FLOW FACTORS

Existing Land Use Classification	Total Developed Area (acres)	Estimated Existing ADWF (MGD)
Low Density Residential	656	0.34
Medium Density Residential	454	0.36
High Density Residential	1,350	1.25
Airport	20[1]	0.01
Commercial	525	0.32
Park	77	0
Public Facility	311	0.18
Mixed-Use	88	0.06
Industrial	518	0.21
Fairgrounds	288	0.03
Total Estimated ADWF		**2.76**
Measured ADWF[2]		**2.81**
Percent Difference[3]		**-0.02%**

[1]The airport has a total of 1,250 acres, but the wastewater flow factor applies only to the 20-acre building footprint where wastewater is generated; the remaining acreage is vacant and exempt from the flow factor.

[2]The Measured ADWF was established from the City's flow monitoring program data conducted by ADS. Given that the WWTP basin lacks dedicated flowmeters, the average flow factor derived from the seven flowmeters was applied, categorized by land use, to the WWTP basin's land use. Subsequently, the ADWF specific to the WWTP basin was incorporated into the Measured ADWF.

[3]Percent Difference = (Total Estimated ADWF - Measured ADWF)/ Total Estimated ADWF.

Buildout Flow Factors

It was assumed that at buildout the flow factor for each parcel (both currently served and currently unserved) within the planning service area will be either the system-wide average flow factor (shown in the second column of Table 3-4) or its basin-specific flow factor (also shown on Table 3-4, columns 3 through 9), whichever is greater. Table 3-6 presents the flow factors for each basin and land use type applied to parcels for the build-out scenarios based on this methodology.

TABLE 3-6
BASIN-SPECIFIC FUTURE PLANNING FLOW FACTORS BY LAND USE CLASSIFICATION

	Flowmeter Basins - gpad						
Land Use Classification	MH0087	MH03B042	MH17C073	MH0163	MH04B057	MH04C002	MH04C042
Low Density Residential	550	510	510	550	510	600	700
Medium Density Residential	790	790	790	790	790	950	1,200
High Density Residential	920	920	920	1,000	1,075	1,400	920
Airport	570	570	570	570	570	570	570
Commercial	600	600	600	600	600	650	600
Park	0	0	0	0	0	0	0
Public Facility	600	570	570	650	570	800	570
Mixed Used	700	680	680	750	680	1,000	680
Industrial	400	400	400	400	400	400	400
Fairgrounds	100	100	100	100	100	100	100

Average Dry Weather Flow Projections

The ADWFs were projected for the planning service area for the following three future scenarios:

- 20-year (2045)
- Buildout
- Buildout with additional flow from residential densification due to House Bill 2001 (HB2001) (Buildout with HB2001)

ADWF was also estimated for the urban reserve area (URA) at buildout; however, this scenario was not modeled as part of the WWCSMP.

Table 3-7 presents the estimate of existing ADWF and ADWF projections by flowmeter basin. For the 20-year scenario, the ADWF is anticipated to increase from a current value of 2.82 MGD to 4.42 MGD. For the build-out scenario, the ADWF is estimated at 6.18 MGD. Considering densification from HB2001 increases the total ADWF to 6.21 MGD at buildout. The methodology for projecting flows for each scenario is described in the sections that follow.

TABLE 3-7
ADWF PROJECTIONS SUMMARY BY FLOWMETER BASIN

Flowmeter Basin	Existing ADWF (MGD)	20-Year ADWF (MGD)	Buildout ADWF (MGD)	Buildout with HB2001 ADWF (MGD)	Buildout URA ADWF (MGD)[1]
MH0163	0.74	1.0	1.33	1.34	1.35
MH0087	0.18	0.23	0.28	0.30	0.28

Flowmeter Basin	Existing ADWF (MGD)	20-Year ADWF (MGD)	Buildout ADWF (MGD)	Buildout with HB2001 ADWF (MGD)	Buildout URA ADWF (MGD)[1]
MH17C073	0.28	0.65	0.99	0.99	1.18
MH03B042	0.40	0.67	0.92	0.92	1.09
MH04C002	0.43	0.44	0.46	0.46	0.46
MH04C042	0.11	0.12	0.12	0.13	0.12
MH04B057	0.43	0.82	1.39	1.39	1.84
WWTP	0.24	0.39	0.58	0.58	0.87
TOTAL FLOW	**2.82**	**4.32**	**6.07**	**6.11**	**7.19**

[1]Collection system was not evaluated for ability to convey Buildout URA scenario flows as part of this WWCSMP.

Largest Industrial Customer Flow Projections

All future scenarios assume that the discharge flows from PCC Schlosser, Inc., will remain at 0.046 MGD and from Eberhard Creamery, Inc., at 0.02 MGD. Figure 3-5 illustrates the location of these large users.

20-year Average Dry Weather Flow Projections

Twenty-year ADWF was projected assuming that wastewater flow increases proportionally to population growth. As described in Chapter 2, population growth of 57 percent between year 2022 and 2045 is anticipated based on Portland State University Population Research Center projections.

Additionally, the City identified three specific areas where growth would be concentrated in the next 20 years. These areas are identified on Figure 3-6. For each area, the City estimated the percentage of acreage that will be developed within the 20-year planning horizon as shown on Table 3-8. In the hydraulic model, future flows for those specific areas were applied according to the City's growth assumptions. Additional flow to reach the 57 percent increase in flow was distributed over the rest of the planning service area, which resulted in unserved parcels contributing 40 percent of their buildout flow for the 20-year planning period.

TABLE 3-8
GROWTH ASSUMPTIONS FOR HIGH-GROWTH AREAS

20-year Projection High-growth Areas	Percent of Acreage to Develop within 20-year Planning Period
N.E. Residential Area	30
North Commercial Area	50
Core 3 Area[1]	100

[1]Core 3 Area is expected to be fully built-out by 20-year planning period.

Buildout Average Dry Weather Flow Projections

Buildout ADWF were projected based on the assumption that all currently vacant and unserved parcels will be fully developed and served by the City at buildout of the planning service area. The flow factors

for each land use type shown on Table 3-6, were applied to the planning service area parcels to project future flow from existing customers and additional wastewater flow generated from new development.

House Bill 2001 Assumptions

Within Oregon's metropolitan areas, HB2001 allows citizens to construct duplexes, triplexes, fourplexes, cottage clusters, and townhouses in areas designated for single-family dwellings. The City identified zones where single-family residential redevelopment is most likely due to HB2001. These areas are shown on Figure 3-6. The City's indicators of areas that are more likely to densify consist of the following:

- Fully served by City services.
- Proximity to marketable amenities such as parks, canals, and schools.
- Proximity to collectors and arterials.
- Lower cost of land purchase or land held in anticipation.
- Currently consists of single-family or is vacant. Not a townhome development. Not a school, park, institutional, or commercial area.
- Large yards.
- Areas where many acres of land of this characteristic exist.

It was assumed that at buildout within those areas, 10 percent of the low density single-family parcels would be redeveloped to fourplexes, tripling wastewater flow from current levels. To account for this higher density, the system-wide, residential flow factor of 510 gpad was increased by 20 percent resulting in a flow factor of 612 gpad. Because the basin-specific low density residential flow factor for basin MH04C002 is higher than 612 gpad, a flow factor of 840 gpad was developed for that basin to account for HB2001 densification. The adjusted low density residential flow factors of 612 gpad and 840 gpad were applied uniformly across the high-likelihood areas identified by the City.

These assumptions were applied to the build-out scenario to create the buildout with HB2001 scenario. As shown on Table 3-7, the build-out scenario predicts ADWF of 6.08 MGD, while buildout with HB2001 is projected at 6.10 MGD, indicating that densification due to HB2001 may have an insignificant effect on build-out flows.

Buildout Urban Residential Area Average Dry Weather Flow Projections

Buildout URA ADWF projections were developed using the same methodology as that described in the Buildout ADWF Projections section above. As shown in Chapter 2, the City's URA is a larger area than the planning service area. The buildout URA ADWF estimate accounts for flow contributed from the additional acreage of the URA outside the planning service area. This scenario is not modeled as part of the WWCSMP.

Wet Weather Flow Projections

Peak WWF in a sewer system can be more than ten times the dry weather flow, causing utilities to construct high-capacity infrastructure to convey and treat these extraneous flows. This section describes

the methodology used for developing existing and future peak flow projections within the City's sanitary sewer system, which was subsequently used for performing the capacity analysis as described in Chapter 5.

Design Storm

Design storms are rainfall events used to analyze the performance of a collection system under peak flows and have a specific recurrence interval and rainfall duration. The National Oceanic and Atmospheric Administration (NOAA) publishes isopluvial (rainfall contour) maps that can be used to approximate the total rainfall depth for a range of design storms. The Oregon Department of Environmental Quality (DEQ) has the following requirements for design storm events when designing collection systems (Oregon Administrative Rules 340-041-0009, items 7 and 8):

- Sewer Overflows in Winter: Domestic waste collection and treatment facilities are prohibited from discharging raw sewage to Waters of the State during the period of November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm.
- Sewer Overflows in Summer: Domestic waste collection and treatment facilities are prohibited from discharging raw sewage to Waters of the State during the period of May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm.

The City selected the 10-year, 24-hour design storm for sizing the City's sewer infrastructure. Total rainfall for the 10-year, 24-hour storm for the Redmond area is predicted to be 1.5 inches. This means that in Redmond there is a ten percent chance (1/10) that 1.5 inches or more of rain will fall in any 24-hour period in a given year.

When distributing the design storm, it is possible to utilize a synthetic distribution or to establish a custom distribution based on historical data. Given the City's limited historical rainfall data, the design storm was developed using resources from the Natural Resources Conversation Service (NRCS). The NRCS method is commonly used to distribute rainfall volume and establish a peak intensity over a given storm duration. This method includes the use of developed normalized rainfall hyetograph distribution curves based on the storm's geographical location.

A Type II distribution curve was used for the City's design storm. Chart 3-4 shows the distribution curves recommended by NRCS based on geographical location. Chart 3-5 shows the design storm developed for the City's capacity analysis. Applying the synthetic distribution curve to the total rainfall volume resulted in an hourly peak rainfall intensity of 0.64 inch.

CHART 3-4
NATURAL RESOURCES CONSERVATION SERVICE DISTRIBUTION RAINFALL CURVE LOCATIONS

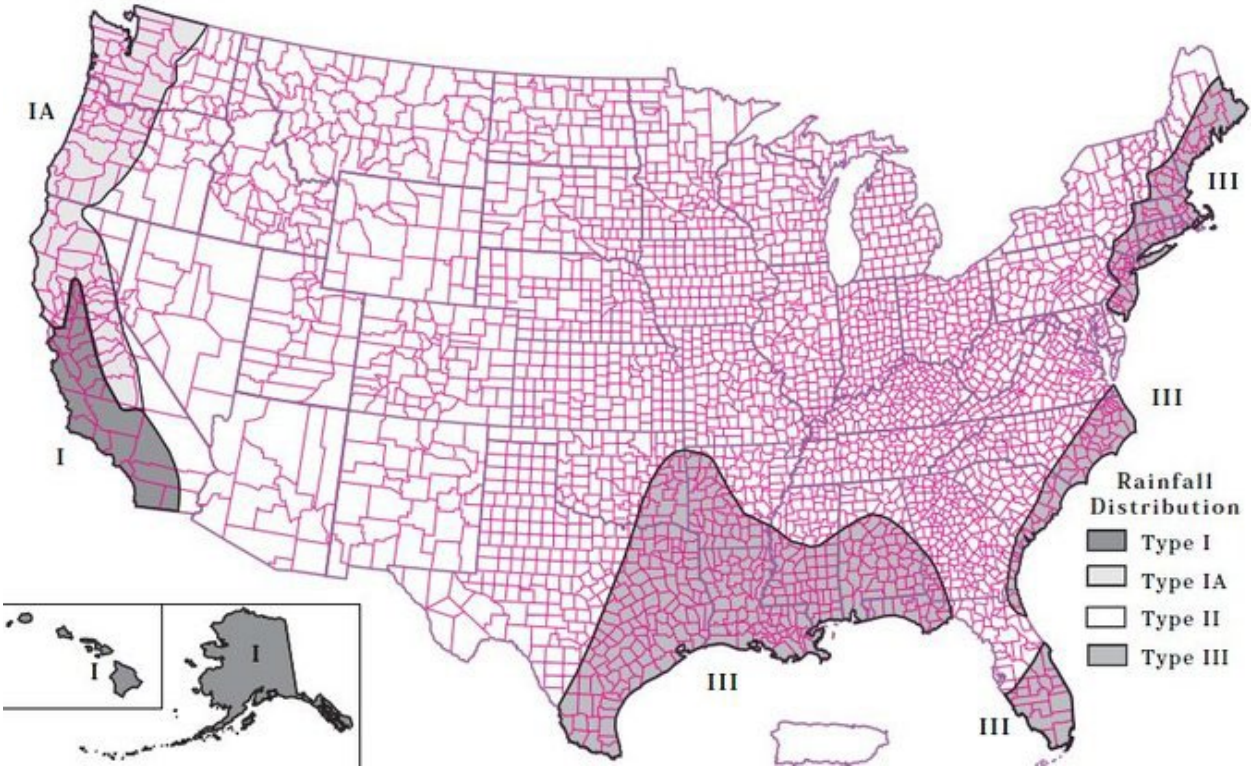
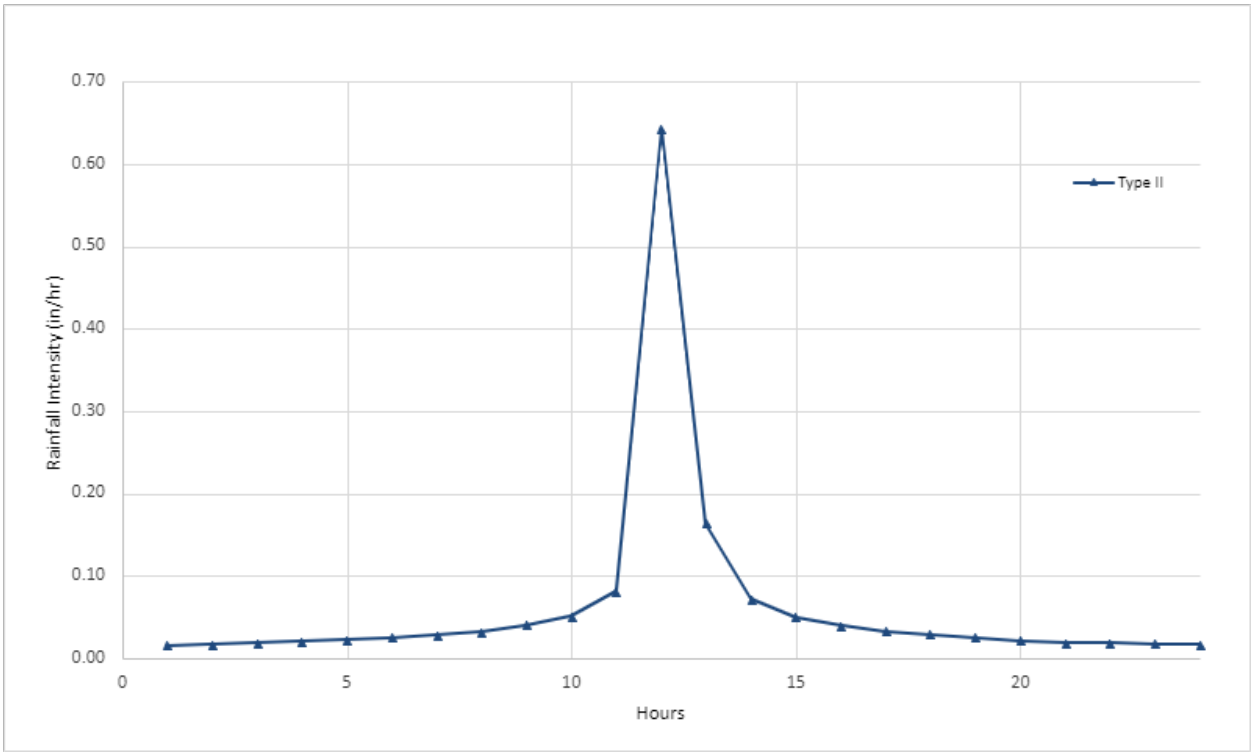


CHART 3-5
DESIGN STORM HYETOGRAPH (NOAA/SCS - 10-YR, 24-HR DESIGN STORM)



Rainfall-derived Infiltration and Inflow Assumptions for Existing and Future Service Areas

For modeling existing RDII flows in the collection system, the RTK parameters developed during wet weather calibration were used. To project future RDII in areas currently connected to the collection system, an assumption of 7 percent degradation per decade was used with a limit of 28 percent over four decades for both the 20-year scenario and build-out scenarios. However, as these percentages did not alter the R value in the model significantly, a conservative approach was taken by adding an R value of 0.001 to all flowmeter basins for both the 20-year and build-out scenarios. This resulted in identical RTK parameters for the 20-year and build-out scenarios giving that the added 0.001 for R exceeds 28 percent degradation.

To predict future peak flows, RDII for areas to be served in the future was defined using a direct inflow technique. Instead of simulating RDII response using RTK parameters, RDII was simulated assuming a constant RDII flow factor per acre of new development and applying the system-wide wet weather response pattern at the WWTP. An RDII flow factor of 1,500 gpad was selected for areas of future development to reflect improved construction methods and integrity of new materials.

An assumption of 7 percent degradation per decade was applied, with a limit of 28 percent over four decades, to the existing infrastructure for both the 20-year and buildout planning service areas. However, as this percentage did not alter the R value in the model significantly, a conservative approach was taken by adding an R value of 0.001 to all flowmeters for both the 20-year and

buildout planning service areas. It is crucial to highlight that the RTK parameters for both the 20-year planning service area and buildout planning service area are identical, given that the added 0.001 for R values already exceeds 28 percent degradation.

To predict future peak flows, RDII in the future service areas must be defined. A direct inflow technique was used for both the 20-year and buildout planning service areas were used. Instead of simulating RDII response using RTK parameters, RDII was simulated by assuming a constant RDII flow factor per acre of new development and applying the system-wide pattern. RDII flow factors can range from 1,000 to more than 10,000 gpad in the Pacific Northwest. An RDII flow factor of 1,500 gpad was selected for estimating RDII in areas of new development to reflect improved construction methods and integrity of new materials within the planning service area boundary. Additionally, this value also meets the DEQ recommendation.

Existing and Projected Peak Wet Weather Flow

The PWWF represents the maximum hourly flow rate under the selected design storm and growth conditions. PWWF is composed of ADWF plus the peak RDII rate predicted by the hydraulic model using the assumptions described above. The PWWF estimated by the hydraulic model for the planning scenarios is presented on Table 3-9 along with the ratio between PWWF and ADWF. PWWF for the 20-year scenario is estimated to be 9.3 MGD, and PWWF for the buildout scenario is estimated at 11.1 MGD.

TABLE 3-9
EXISTING AND PROJECTED WASTEWATER FLOWS TO WASTEWATER TREATMENT PLANT

Scenario	Modeled ADWF (MGD)	PWWF (MGD)[1]	Peaking Factor (PWWF:ADWF)[2]
Existing System	2.82	5.3	1.9
20-year	4.32	9.3	2.2
Buildout	6.08	11.1	1.8
Buildout with HB2001	6.10	11.1	1.8

[1]The PWWF flow (design flow) is the peak hourly flow.

[2]The peaking factor is the PWWF divided by the ADWF. Peaking factors change over time based on system degradation and system improvements in the modeling parameters.

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LEGEND

- RAIN GAUGE
- FLOW MONITORING LOCATION
- CITY LIMITS
- URBAN GROWTH BOUNDARY

BASINS

- MH0087
- MH0163
- MH03B042
- MH04B057
- MH04C002
- MH04C042
- MH17C073
- WWTP

KORREDM0146

KORREDM083

4,000 0 4,000

SCALE IN FEET

Oregon State Parks, State of Oregon GEO, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc,

anderson perry

CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

WASTEWATER BASINS

FIGURE
3-2

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LEGEND

- CITY LIMITS
- URBAN GROWTH BOUNDARY

SIGNIFICANT INDUSTRIAL USERS

- DESCHUTES COUNTY FAIR & EXPO CENTER
- EBERHARDS DAIRY PRODUCTS
- JUNIPER GOLF COURSE
- PCC SCHLOSSER
- REDMOND MUNICIPAL AIRPORT

4,000 0 4,000

SCALE IN FEET

Terrebonne

Redmond

Redmond Municipal Airport

Juniper Golf Course

The Greens Redmond

NW 31st St
NW 19th St
NW 16th St
NE Smith Rock Way
NE 33rd St
NW 83rd Pl
NW Odem Ave
NW 10th St
NE 5th St
Northwest Way
N Highway 97
NE Oneil Way
NW 17th St
NE 29th St
NE Walnut Ave
NE Upas Ave
NE King Way
NW Helmholtz Way
NW 15th St
NW 8th St
NW 22nd St
NW 6th St
Dalles California Hwy
NE 9th St
NW Larch Dr
NW Maple Ave
NE Maple Ave
NW 23rd St
W Antler Ave
E Antler Ave
W Highway 126
SW Highland Ave
SW 35th St
SW 23rd St
SW 15th St
SW Canyon Dr
SW Highway 126
Falcon Crest Dr
SW Obsidian Ave
SW Quartz Ave
SW 27th St
SW 31st St
SW Salmon Ave
SE Airport Way
SW Whitkiup Ave
SW 58th St
S Highway 97
SW Canal Blvd
SE Sherman Rd
SW McVey Ave
SW Quarry Ave
SW 61st St
SW 77th St
Young Ave
Cline Falls Rd

Oregon State Parks, State of Oregon GEO, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc,

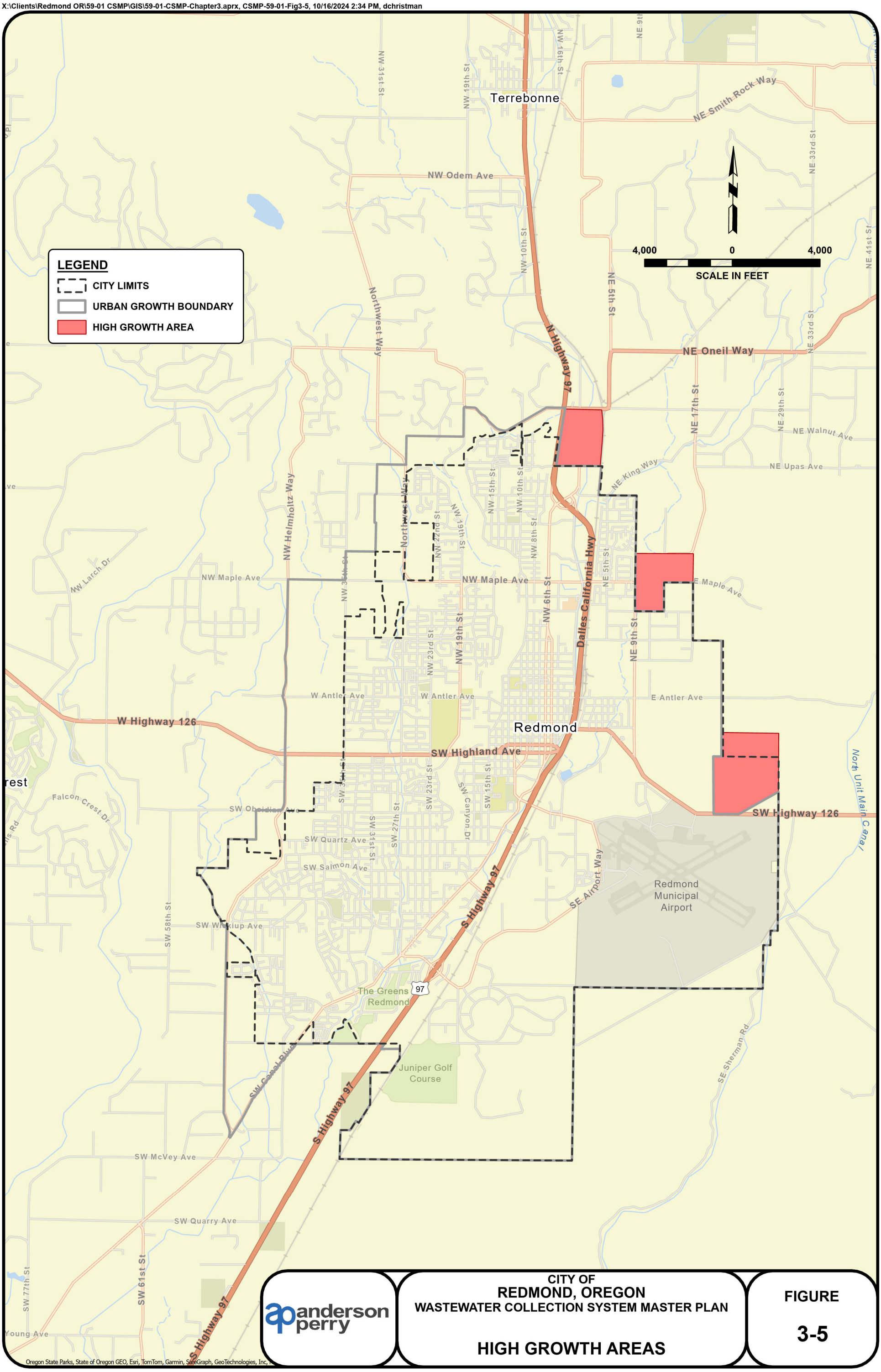
anderson perry

CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

SIGNIFICANT INDUSTRIAL USERS

FIGURE
3-4

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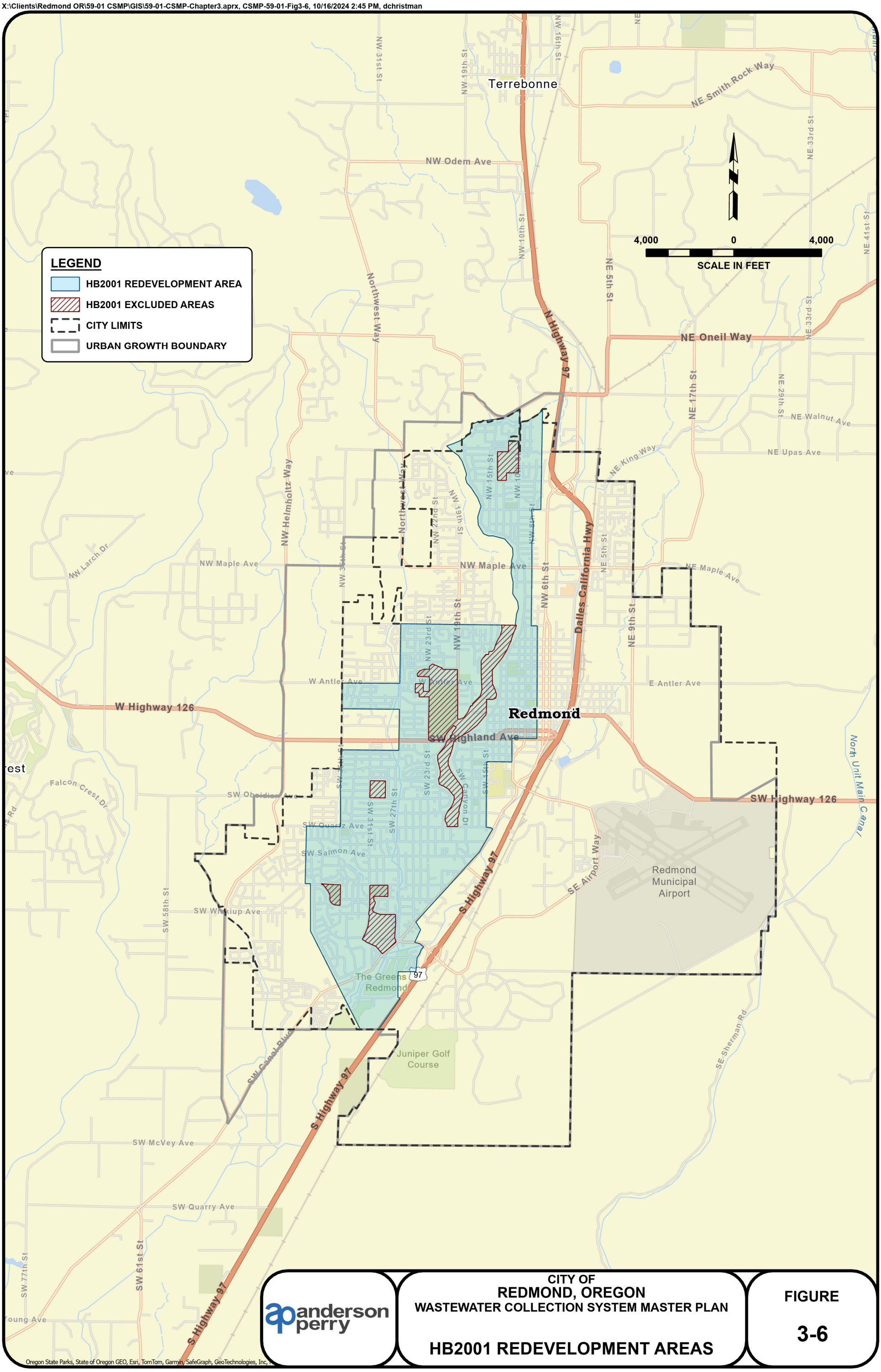
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CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

HIGH GROWTH AREAS

FIGURE
3-5

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CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

HB2001 REDEVELOPMENT AREAS

FIGURE
3-6

Chapter 4 - Existing System Condition and Assessment

Introduction

This chapter gives an overview of the City of Redmond's existing wastewater collection system to provide a foundation for a Capital Improvement Plan (CIP) that will act as a guide for the City to maintain, improve, and expand the collection system.

The City currently owns and maintains approximately 850,000 feet of pipe and forcemains and ten pump stations, which convey raw wastewater from sewer services to the wastewater treatment plant (WWTP) as shown on Figure 4-1. This chapter assesses the current conditions of the collection system to identify projects that will extend its useful life and prevent future failures.

Pipes

The existing wastewater collection system is composed of a variety of pipes ranging in size from 6 to 48 inches in diameter. Using information from the City's sewer system Geographic Information System (GIS) database, this information will be used to evaluate the existing system's current conditions to identify possible deficiencies now and in the future. The data from GIS designate the existing pipes as either interceptors or sewer pipes. The tables in this Wastewater Collection System Master Plan (WWCSMP) do not distinguish between the two.

On Table 4-1, the existing collection system pipes are summarized to show the length of pipe by diameter. A proposed 48-inch diameter interceptor pipe to the Redmond Wetlands Complex anticipated to be under construction in 2025, is included in the data. The table also differentiates between the length of gravity pipes and forcemains.

The existing collection system has a total of 850,608 linear feet of pipe, of which 835,658 feet are gravity pipes, and 14,950 feet are forcemains. Most of the existing collection system is composed of 6- and 8-inch diameter sewer pipes, referred to as collectors. Trunk sewer pipes are the larger sections that convey wastewater from collectors to interceptors. There are also 3,668 manholes in the collection system that are owned and maintained by the City.

TABLE 4-1
EXISTING COLLECTION SYSTEM PIPING SUMMARY

Pipe Diameter	Length of Pipe (feet)
Less than 6 inches	9,512
6 to 8 inches	628,420
10 to 18 inches	143,488
20 to 28 inches	44,408
30 to 36 inches	10,354
48 inches[1]	14,426
TOTAL	**850,608**
Gravity Pipes	**835,658**
Forcemains	**14,950**

[1] Approximately 14,426 linear feet of 48-inch pipe is a planned capital improvement project and was not in existence during the preparation of this WWCSMP.

The collection system is composed of six types of materials including concrete, ductile iron (DI), polyvinyl chloride (PVC), steel, polyethylene (PE), and fiberglass reinforced plastic (FRP). Table 4-2 summarizes the length of all pipes by material and diameter.

The most common material in the existing collection system is PVC, accounting for 613,933 linear feet of the total 850,608 linear feet of pipe. The most common pipe size is 6- to 8-inch, accounting for 628,420 linear feet of the total length of the system. There is a total length of 5,963 feet of pipe within the system with an unknown material type, most of which is sized at 6 inches or less.

TABLE 4-2
EXISTING COLLECTION SYSTEM PIPE DATA

Gravity Sewer Pipes								
Diameter	**Concrete**	**DI**	**PE**	**PVC**	**Steel**	**FRP[1]**	**Unknown**	**Total**
6 to 8 inches	155,859	609	-	465,899	79		535	**622,981**
10 to 18 inches	43,243	253	-	99,721	-		272	**143,489**
20 to 28 inches	10,401	110	-	33,897	-		-	**44,408**
30 to 36 inches	-	55	5,002	5,297	-		-	**10,354**
48 inches						14,426		**14,426**
TOTAL	**209,503**	**1,027**	**5,002**	**604,814**	**79**	**14,426**	**807**	**835,658**
Forcemains								
Less than 6 inches	-	-	-	4,355	-	-	5,157	**9,512**
6 to 8 inches	-	675	-	4,763	-	-	-	**5,438**
TOTAL	-	**675**	-	**9,118**	-	-	**5,157**	**14,950**
Collection System Totals								
TOTAL	**209,503**	**1,702**	**5,002**	**613,932**	**79**	**14,426**	**5,964**	**850,608**

[1]Redmond Wetlands Complex planned interceptor pipe.

Collection System Condition Assessment

The existing collection system condition was assessed using available information. The condition assessment focused on recent maintenance issues, deficiencies identified during the closed-circuit television (CCTV) inspection, and pipes that have been identified as nearing the end of useful life based on their year of installation and material.

Useful Life

"Useful life" is a term that describes the anticipated amount of time a pipe will remain operational if maintained and installed properly. Pipes beyond their original useful life may remain operational, but could require an increased level of maintenance and have a greater risk of failure. The main factor in useful life is the type of pipe material used, but other factors that can play a role are wastewater characteristics, soil conditions, and installation. Before the City's WWTP and original collection system were constructed in the 1970s, septic drainfields were the primary mechanism used for wastewater treatment and disposal. Following construction of the WWTP and original collection system in the 1970s, the collection system was expanded as the City grew. Table 4-3 shows the expected useful life of pipes based on their material. Only the pipe materials present in the City's system are presented, and pipes with an unknown material were given a useful life assumption of 50 years.

TABLE 4-3
USEFUL LIFE OF PIPE MATERIAL

Pipe Material	Original Useful Life Assumption (years)
Concrete	60
DI	70
PVC	70
Steel	70
PE	70
FRP	80
Unknown Material	50

Once the useful life of the pipe is known, it can be used to calculate the remaining useful life (RUL). To evaluate the RUL of pipes throughout the collection system, the total linear feet of pipe based on material and installation date was tabulated are shown on Table 4-4. The period of record for the pipes ranges from 1970 to the present. The cells highlighted show the RUL for each pipe material based on installation year.

The majority of the pipes within the existing collection system were installed in the 1970s and 2000s.

TABLE 4-4
PIPE LENGTH BY DECADE INSTALLED AND MATERIAL TYPE

Total Length of Gravity Sewer Pipes (feet) by Decade Installed

Material Type	Unknown	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2009	2010 to 2019	2020 to Present	Planned	Total
Concrete	1,832	205,444	20	1,779	63		365		**209,503**
DI	103	545		110	171	55	43		**1,027**
PE	0				5,002				**5,002**
PVC	22,604	42,353	14,013	131,025	269,052	79,071	46,696		**604,814**
Steel	0	79							**79**
FRP	0							14,426	**14,426**
Unknown	338	174			294				**807**
TOTAL (feet)	**24,877**	**248,595**	**14,033**	**132,914**	**274,583**	**79,126**	**47,104**	**14,426**	**835,658**

Total Length of Forcemain Pipes (feet) by Decade Installed

Material Type	Unknown	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2009	2010 to 2019	2020 to Present	Planned	Total
DI	675				0				675
PVC	6,709				2,409				9,118
Unknown	5,137				20				5,157
TOTAL (feet)	**12,521**				**2,429**				**14,950**

Legend

	Unknown
	Over 30 years of RUL
	Between 20 and 30 years of RUL
	Between 10 and 20 years of RUL
	Between 0 and 10 years of RUL
	0 years of RUL

Pipes reaching the end of useful life are potentially at a higher risk of failure, so it is recommended that these pipes be routinely inspected. Figure 4-2 shows gravity pipes and forcemains with greater than 20 years to the end of their useful life and those with less than 20 years to the end of their useful life. This figure can be used to help focus inspections and potentially plan for future improvements.

Collection System Summary

According to the City, CCTV inspection of the entire collection system is completed every three to five years. Based on the most recent inspections, only four pipe deficiencies were identified through the CCTV inspection, and the repairs of these deficiencies were scheduled to be completed in 2024. The scheduled repairs included installing cured-in-place liner and lining a manhole with epoxy to address root penetration. Based on the frequency of inspection and resulting corrective action, no existing system repair or replacement projects will be recommended in the CIP.

Pump Stations

The City owns and operates ten wastewater pump stations; each station is equipped with pumps and portable backup power. The pump locations within the existing collection system are shown on Figure 4-3, and pump station information and design data are summarized on Figure 4-4. The following is an overview and condition assessment of each pump station. The condition assessment was based on current pictures from site visits, as well as information from the Lift Station Standard Operating and Maintenance Procedures from the City, pumpswere not removed for inspection.

Cascade View Pump Station

The Cascade View Pump Station was installed in 1994. The pump station is located at 3250 S.W. 34th Street and enclosed by a wooden fence and gate. The pump station consists of a 6-foot diameter concrete wetwell, a fiberglass valve vault, and exterior set electrical and control panels. The wetwell is secured with a galvanized metal lid and double-door aluminum hatch with fall protection. The valve vault is secured with a galvanized metal lid and single-door aluminum hatch. The wetwell depth is 9.1 feet. The pump station has two submersible Hydromatic pumps installed on a guide rail system with a firm capacity (defined as capacity with the largest pump out of service) of 38 gallons per minute (gpm). The pumps feed into a 4-inch, 320-foot long forcemain running north along S.W. 34th Street.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. The portable generator, when mobilized, is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

A bypass pumping connection has been retrofitted on the disk of one of the check valves.

Cascade View Pump Station Condition Assessment

The condition of the concrete wetwell is fair with a few areas of pitting. The condition of the fiberglass valve vault and pump guide rail system is good. The electrical and control components

are showing minimal signs of deterioration and appear to be in good condition. The exterior of the discharge valve assembly appears to be in adequate condition with minor signs of corrosion.

Yew Avenue Pump Station

According to Record Drawings, the original Yew Pump Station was installed prior to 1992, at which time the pump station forcemain was extended. The pump station was replaced circa 2005 with a fiberglass package system on a concrete slab; the pump station currently remains in service. The pumps were last replaced circa 2012 with Flygt N-Technology pumps.

The pump station is located at 3715 S.W. Airport Way and is enclosed by a concrete masonry unit wall, with two chain link fence access point gates with privacy inserts. The pump station consists of a 6-foot diameter fiberglass wetwell and 6-foot diameter valve vault (both of which are part of the same fiberglass assembly) and exterior set electrical and control panels. The valve vault is secured with a galvanized metal lid with a single-door aluminum hatch. The wetwell is secured with a galvanized metal lid with a double-door aluminum access hatch and fall protection. The wetwell has a depth of 16.1 feet. The pump station has two 7.5 horsepower submersible pumps installed on a guide rail system with a firm capacity of approximately 434 gpm according to a drawdown test completed by the City in 2022. The pumps feed into an 8-inch, 4,335-foot long PVC forcemain with a discharge manhole located near the centerline of S.W. Canal Boulevard, at the intersection of S.W. Umatilla Avenue.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. When mobilized, the portable generator is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

Yew Avenue Pump Station Condition Assessment

The condition of the fiberglass wetwell and valve vault are fair. The condition of the pump guide rail system is fair with signs of deterioration, and the exterior of the discharge manifold components is fair with signs of surface corrosion and a deteriorating paint system. The electrical and control components are in fair condition; however, the clearance from the existing electrical and control components to the wetwell vent does not comply with current electrical codes.

Nolans Addition Pump Station

The Nolans Addition Pump Station was installed in 1995. The pump station is located at 2498 S.W. Glacier Avenue and is enclosed by a wooden fence with a gate. The pump station consists of a 5-foot diameter concrete wetwell, a valve vault, and exterior set electrical and control panels. Both the wetwell and valve vault are secured with their own galvanized metal lid and single-door aluminum hatch and the wetwell has fall protection. The wetwell has a depth of 16.1 feet and has been rehabilitated with an epoxy coating. The pump station has two submersible Flygt pumps installed on a guide rail system with a firm capacity of 181 gpm. The pumps feed into a 6-inch, 1,082-foot long PVC forcemain that runs east along S.W. Glacier Avenue.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. When

mobilized the portable generator is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

Nolans Addition Pump Station Condition Assessment

The condition of the concrete wetwell is fair, the condition of the guide rail system is fair, and the electrical and control components are in good condition with no signs of deterioration. The valve vault and its components need to be evaluated to assess their condition.

Reindeer Pump Station

The Reindeer Pump Station was installed in 1996. The pump station is located at 356 S.W. Reindeer Avenue and is enclosed by a wooden fence and gate. The pump station consists of a 6-foot diameter fiberglass wetwell, a fiberglass valve vault, and exterior set electrical and control panels. The wetwell is secured with a galvanized metal lid and double-door aluminum hatch with fall protection. The valve vault is secured with a galvanized metal lid and single-door aluminum hatch. The wetwell has a depth of 12 feet. The pump station has two submersible Hydromatic pumps installed on a guide rail system with a firm capacity of 126 gpm. The pumps feed into a 4-inch, 762-foot long forcemain that runs east along S.W. Reindeer Avenue.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. When mobilized, the portable generator is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

Reindeer Pump Station Condition Assessment

The condition of the fiberglass wetwell is good, the condition of the guide rail system is good, the condition of the fiberglass valve vault is good, and the valve assembly is in fair condition with minor signs of corrosion. The electrical and control panels are in fair condition with minor signs of deterioration.

Cascade View Phase 7 Pump Station

The Cascade View Phase 7 Pump Station was installed in 2002. The pump station is located at 3850 S.W. 35th Place and is enclosed by a wooden fence with a gate. The pump station consists of a 6-foot diameter fiberglass wetwell, a fiberglass valve vault, and exterior set electrical and control panels. The wetwell is secured with a galvanized metal lid and double-door aluminum hatch with fall protection, and the valve vault is secured with a galvanized metal lid and single-door aluminum hatch. The wetwell has a depth of 15.75 feet. The pump station has two submersible Flygt pumps installed on a guide rail system with a firm capacity of 99 gpm. The pumps feed into a 4-inch, 1,258-foot long forcemain that runs northwest on S.W. Cascade Vista Drive.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. When mobilized, the portable generator is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

Cascade View Phase 7 Pump Station Condition Assessment

The condition of the fiberglass wetwell is fair with minor signs of deterioration, the guide rail system is in good condition, the fiberglass valve vault is in fair condition with minor signs of deterioration, the valve assembly is in good condition, and the electrical and control panels are in good condition with no signs of deterioration.

Umatilla Pump Station

The Umatilla Pump Station was installed in 2003. The pump station is located at 2654 S.W. 6th Street and is enclosed by a wooden fence with a gate. The pump station consists of an 8-foot diameter fiberglass wetwell, a fiberglass valve vault, and exterior set electrical and control panels. Both the wetwell and valve vault are secured with their own galvanized metal lid and single-door aluminum hatches and the wetwell has fall protection. The wetwell has a depth of 14.4 feet. The pump station has two submersible Flygt pumps installed on a guide rail system with a firm capacity of 192 gpm. The pumps feed into a 4-inch, 730-foot long forcemain that runs south along S.W. 6th Street.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. When mobilized, the portable generator is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

Umatilla Pump Station Condition Assessment

The condition of the fiberglass wetwell is fair with minor signs of deterioration, the guide rail system is in good condition, the fiberglass valve vault is in fair condition with minor signs of deterioration, the valve assembly is in good condition, and the electrical and control panels are in good condition with no signs of deterioration.

Lawsons Crossing Pump Station

The Lawsons Crossing Pump Station was installed in 2007. The pump station is located at 3498 N.W. Dogwood Avenue and is enclosed by a wooden fence with a gate. The pump station consists of a 10-foot diameter fiberglass wetwell, a fiberglass valve vault, and exterior set of electrical and control panels. The wetwell is secured with a galvanized metal lid and double-door aluminum hatch with fall protection. The valve vault is secured with a fiberglass lid and single-door aluminum hatch. The wetwell has a depth of 24.8 feet. The pump station has two submersible Flygt pumps installed on a guide rail system with a firm capacity of 163 gpm. The pumps feed into a 4-inch, 1,223-foot long PVC forcemain running south along N.W. 35th Street.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. When mobilized, the portable generator is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

Lawsons Crossing Pump Station Condition Assessment

The condition of the concrete wetwell is fair, the condition of the guide rail system is good, and the electrical and control components are in good condition with no signs of deterioration. The valve vault and its components need to be evaluated to assess the conditions.

Waverly Public Utility District Pump Station

The Waverly Public Utility District Pump Station was installed in 2007. The pump station is located at 798 N.W. 29th Street and is enclosed by a wooden fence with a gate. The pump station consists of 8-foot diameter fiberglass wetwell, a fiberglass valve vault, and exterior set of electrical and control panels. The wetwell is secured with a galvanized metal lid and double-door aluminum hatch with fall protection. The valve vault is secured with a galvanized metal lid and single-door aluminum hatch. The wetwell has a depth of 16.2 feet. The pump station has two submersible Hydromatic pumps installed on a guide rail system with a firm capacity of 76 gpm. The pumps feed into a 4-inch, 543-foot long forcemain running west along N.W. Hemlock Avenue.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. When mobilized, the portable generator is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

Waverly Public Utility District Pump Station Condition Assessment

The condition of the fiberglass wetwell is good, the guide rail system is in good condition, the fiberglass valve vault is in fair condition with minor signs of deterioration, the valve assembly is in good condition, and the electrical and control panels are in good condition with no signs of deterioration.

Majestic Ridge Pump Station

The Majestic Ridge Pump Station was installed in 2002. The pump station is located at 4334 S.W. Salmon Avenue and is enclosed by a wooden fence with a gate. The pump station consists of an 8-foot diameter fiberglass wetwell, a fiberglass valve vault, and exterior set electrical and control panels. The wetwell is secured with a galvanized metal lid and double-door aluminum hatch with fall protection. The valve vault is secured with a galvanized metal lid and single-door aluminum hatch. The wetwell has a depth of 19.4 feet. The pump station has two submersible Flygt pumps installed on a guide rail system with a firm capacity of 130 gpm. The pumps feed into a 4-inch, 1,490-foot long PVC forcemain running east along S.W. Salmon Avenue.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. When mobilized, the portable generator is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

Majestic Ridge Pump Station Condition Assessment

The condition of the fiberglass wetwell is good, the guide rail system is in good condition, the fiberglass valve vault is in good condition, the valve assembly is in good condition, and the

electrical and control panels are in good condition with no signs of deterioration. The City plans to decommission this pump station concurrently with private development in the vicinity, anticipated to occur in 2025.

Xero Pump Station

The Xero Pump Station was installed in 2001. The pump station is located at 3515 S.W. Xero Avenue and is enclosed by a wooden fence with a gate. The pump station consists of an 6-foot diameter concrete wetwell, a fiberglass valve vault, and exterior set electrical and control panels. The wetwell is secured with a galvanized metal lid and double-door aluminum hatch with fall protection. The valve vault is secured with a galvanized metal lid and single-door aluminum hatch. The wetwell has a depth of 15.2 feet. The pump station has two submersible pumps installed on a guide rail system with a firm capacity of 153 gpm. The pumps feed into a 4-inch, 517-foot long forcemain running west along S.W. Xero Avenue.

On-site auxiliary power is not provided. In the event of loss of utility power, the City receives notification of the loss of power and responds by mobilizing a portable generator set. When mobilized the portable generator is connected to the electrical supply via a quick disconnect, and the source of power supply is set with a transfer switch.

Xero Pump Station Condition Assessment

The condition of the concrete wetwell is good, the guide rail system is in good condition, the fiberglass valve vault is in good condition, the valve assembly is in good condition, and the electrical and control panels are in good condition with no signs of deterioration.

Pump Station Summary

Based on the desktop evaluation of the existing pump stations, no capital improvement projects are recommended. The City is currently planning upgrades for the Yew Avenue Pump Station to accommodate flows from proposed development as well as for upgrades to the electrical components and the addition of backup power. It is recommended the City continue its current maintenance practices as well as complete its pump station design standards to standardize construction of new pump stations and repair/replacement of existing pump stations.

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LEGEND

- PS — PRESSURE PUMP STATION

SEWER FORCE MAINS

- < 6 INCHES
- 6- 8 INCHES

SEWER GRAVITY LINES

- 6-8 INCHES
- 6-8 INCHES INTERCEPTOR
- 10-18 INCHES
- 10-18 INCHES INTERCEPTOR
- 20-28 INCHES
- 20-28 INCHES INTERCEPTOR
- ≥ 30 INCHES
- ≥ 30 INCHES INTERCEPTOR
- CITY LIMITS
- URBAN GROWTH BOUNDARY

EAST UPAS INTERCEPTOR
EAST SPRUCE INTERCEPTOR
WEST SPRUCE INTERCEPTOR
WEST 19TH ST INTERCEPTOR
WAVERLY PUD
LAWSONS CROSSING
NOLANS ADDITION
WEST CASCADE TRUNK
WEST 27TH ST TRUNK
CANYON INTERCEPTOR
MAJESTIC RIDGE
CASCADE VIEW
XERO
YEW
PUBLIC WORKS
WATER
PUBLIC WORKS WASH BAY
WAREHOUSE
REINDEER
AIRPORT TERMINAL SANITARY
UMATILLA

Redmond
Redmond Municipal Airport
Ridgeview High School
Juniper Golf Course
The Greens at Redmond
Tetherow Butte
Forked Horn Butte

3,000 0 3,000
SCALE IN FEET

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CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

EXISTING COLLECTION SYSTEM MAP

FIGURE
4-1

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LEGEND

- FORCEMAINS WITH UNKOWN YEAR BUILT
- FORCEMAINS WITH GREATER THAN 20 YEAR END OF LIFE
- GRAVITY LINES WITHIN 20 YEAR END OF LIFE
- GRAVITY LINES WITH GREATER THAN 20 YEAR END OF LIFE
- CITY LIMITS
- URBAN GROWTH BOUNDARY

3,000 0 3,000

SCALE IN FEET

Esri, NASA, NGA, USGS, FEMA, Oregon State Parks, State of Oregon GEO, Esri, TomTom, Garmin, Sat

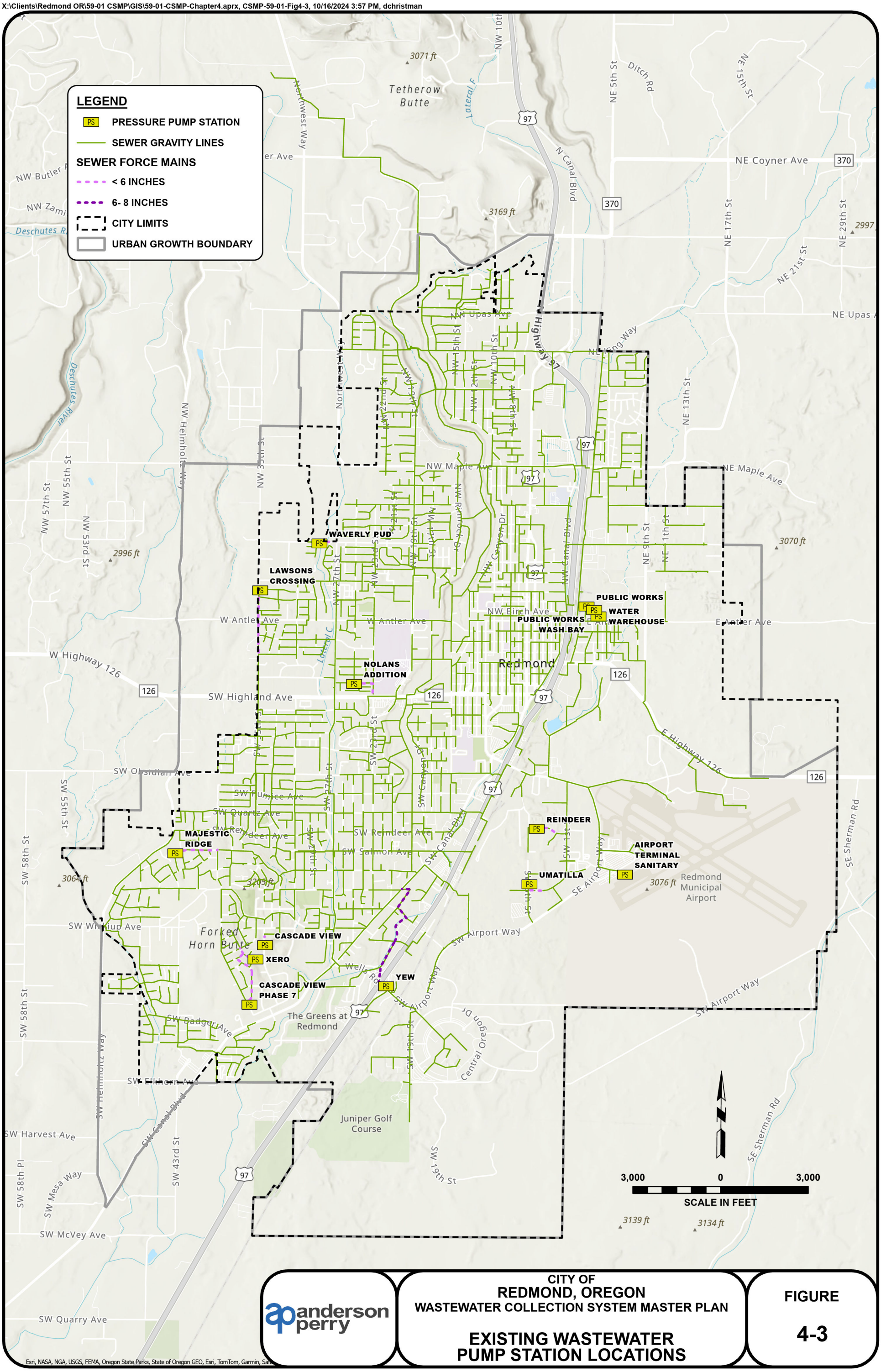
anderson perry

CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

SEWER LINE END OF USEFUL LIFE MAP

FIGURE
4-2

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CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

EXISTING WASTEWATER PUMP STATION LOCATIONS

FIGURE
4-3

CITY OF REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN
EXISTING WASTEWATER PUMP STATION SUMMARY

Pump Station	Address	Pump Quantity	Pump Type	Year Built	Pump Manufacturer and Model	Hp	Design Duty Point		Startup		Current Firm Capacity (gpm)	Forcemain Length (ft)	Forcemain Material	Backup Power
							Rate (gpm)	TDH (ft)	Rate (gpm)	TDH (ft)				
Xero (PS1)	3515 S.W. Xero Avenue	Two	Submersible	2001							153	517	Unknown	Portable
Cascade View (PS2)	3250 S.W. 34th Street	Two	Submersible	1994/2011	Hydromatic Model S4NRC/S4NVX	2	65	18	80/92		38	320	Unknown	Portable
Yew (PS3)	3715 S.W. Airport Way	Two	Submersible	1992/2011	Flygt Model NP-3127.090	7.5	650	26	515/555	32/34	434	4,351	DI/PVC	Portable
Nolans Addition (PS6)	2498 S.W. Glacier Avenue	Two	Submersible	1995/2011	Flygt Model NP-3102.090	5	386	25	314/356	26/28	181	1,082	PVC	Portable
Reindeer (PS8)	356 S.W. Reindeer Avenue	Two	Submersible	1996	Hydromatic Model S4MRC/S4MVX	5	95	28			126	762	Unknown	Portable
Majestic Ridge (PS10)	4334 S.W. Salmon Avenue	Two	Submersible	2002	Flygt						130	1,490	PVC	Portable
Cascade View Phase 7 (PS14)	3850 S.W. 35th Place	Two	Submersible	2002/2011	Flygt Model NP-3127.090	11	233	102	113/113	130	99	1,258	Unknown	Portable
Umatilla (PS20)	2654 S.W. 6th Street	Two	Submersible	2003/2011	Flygt Model NP-3102.090	5	257	36	131/137	43	192	730	Unknown	Portable
Lawsons Crossing (PS29)	3498 N.W. Dogwood Avenue	Two	Submersible	2007/2021	Flygt Model XPC N80-7800	10	385	72			163	2,244	PVC	Portable
Waverly PUD (PS30)	798 N.W. 29th Street	Two	Submersible	2007	Hydromatic Model S4MRC/S4MVX	5	140	36			76	543	Unknown	Portable

DI = ductile iron
ft = feet
gpm = gallons per minute
Hp = horsepower
PUD = Public Utility District
PVC = polyvinyl chloride
TDH = total dynamic head

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CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN
EXISTING WASTEWATER PUMP STATION SUMMARY

FIGURE
4-4

Chapter 5 - Capacity Analysis

Introduction

As the City of Redmond continues to develop and expand its boundaries, some of the City's sewer infrastructure may reach capacity for adequately handling sanitary flows. This chapter presents an evaluation of the available capacity of the existing system to convey current and future sewer flows. Using the City's updated hydraulic model, each pipe and pump station in the modeled system was evaluated for meeting the established performance criteria presented in Chapter 2. This chapter also presents recommended projects that would address capacity deficiencies to serve future users.

Model Update

The hydraulic model is a skeletonized model and includes pipes 10 inches in diameter and greater with some 8-inch diameter pipes included for system connectivity. The hydraulic model was converted from InfoSWMM to InfoWorks ICM due to discontinuation of the InfoSWMM software. The model was updated to reflect the City's existing system and includes infrastructure projects completed since the last model update. The model was calibrated using flow data from May 18, 2023, to July 24, 2023, collected as part of the 2023 Sanitary Sewer Flow Study completed by ADS and described in Chapter 3. For more information on the update, conversion, and calibration of the hydraulic model, refer to the Model Conversion and Model Development Technical Memorandums included in Appendices D and E.

Capacity Analysis

A capacity analysis of the modeled collection system was performed using the City's calibrated hydraulic model and the evaluation criteria outlined in Chapter 2. The capacity analysis entailed identifying areas in the sewer system where the performance criteria for surcharging was exceeded or where the capacity of pump stations was exceeded. The collection system was evaluated for handling the flows for three development scenarios:

- 20-year (2045)
- Build-out (urban growth boundary)
- Build-out planning service area with House Bill 2001 (HB2001)

Gravity Collection System Evaluation

This section describes the evaluation of the gravity collection system and presents the results of the evaluation.

Surcharge Due to Backwater

Sewer pipes that lack sufficient capacity to convey flows could produce backwater effects in the collection system and could potentially lead to sanitary sewer overflows. As backwater conditions develop, the hydraulic grade line (HGL) of upstream pipes that would otherwise have capacity may encroach within 2 feet below the manhole rim, which corresponds to the City's minimum freeboard

performance criterion. If the downstream pipe capacity is increased, then the upstream pipe may no longer trigger a deficiency. An illustration of backwater effects is shown on Figure 5-1.

Additionally, restrictions causing backwater in the collection system prevent the full peak wet weather flow (PWWF) from flowing downstream. Therefore, the PWWF observed in the system (with no improvements) may underestimate the total flow if all capacity constraints are removed. For this reason, the hydraulic model was used to analyze the collection system to identify the pipeline segments that cause the surcharged condition. The location and extent of improvement projects do not always align with the area of modeled surcharging. Surcharging can also occur in the downstream system when the PWWF is no longer restricted through a capacity-constrained segment of the system.

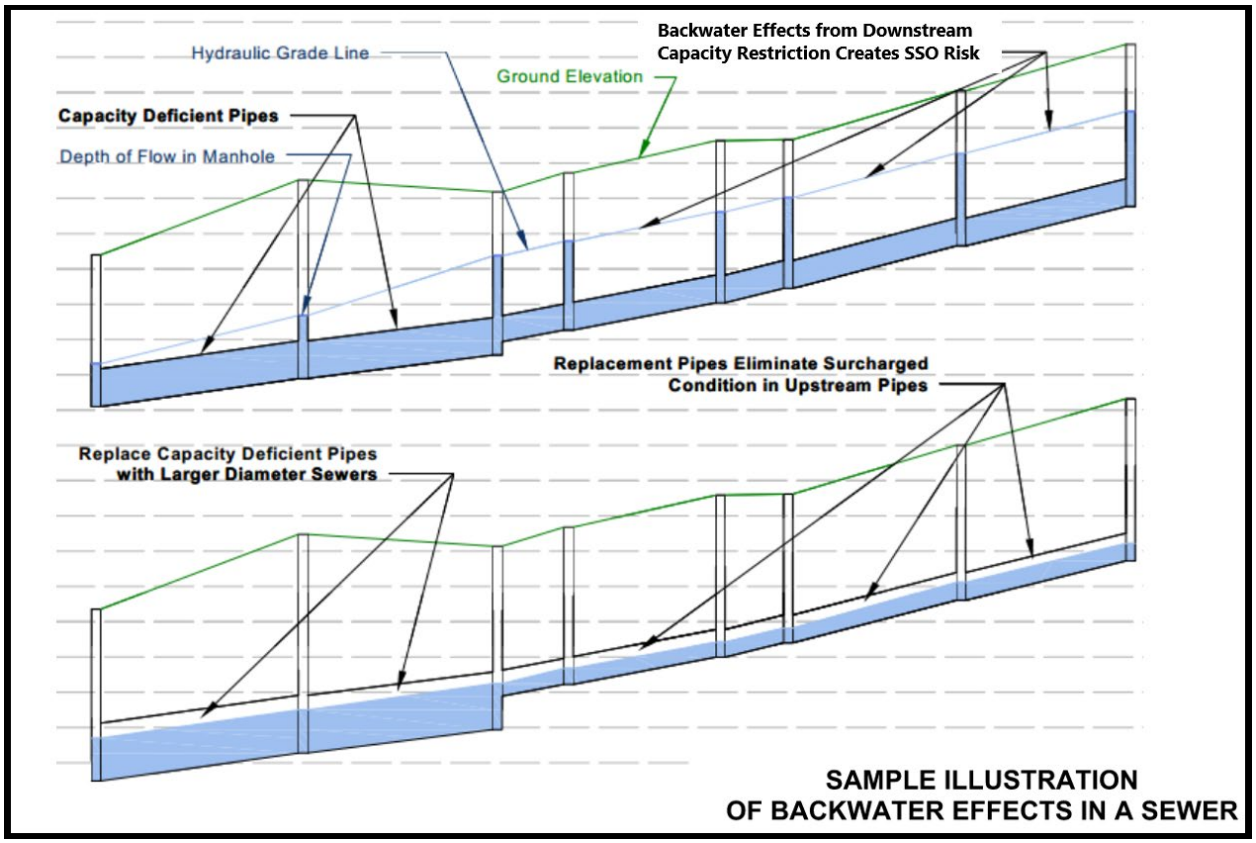


Figure 5-1 Sample Illustration of Backwater Effects in a Sewer

Key Causes for Deficiencies

The calibrated hydraulic model was run with the design storm, then analyzed against the City's performance criteria to determine manholes that are failing the freeboard criteria. The key causes triggering modeled deficiencies in the City's collection system include:

- Misaligned inverts
- Shallow manholes
- Pipe restrictions (a single or few smaller diameter pipes between larger diameter pipe)

- Pipe diameter too small to convey the PWWF
- Pump station firm capacity (capacity assuming the largest pump in the station is out of service) is insufficient to pump the PWWF
- Backwater condition

Existing Conditions and 20-Year Planning Horizon Deficiencies

For existing conditions and the 20-year planning horizon, the PWWF was routed through the hydraulic model. No modeled deficiencies were identified where the HGL encroached within 2 feet below the manhole rim. Therefore, the system has capacity to serve its existing customers. Future capacity deficiencies were identified that will require improvements to accommodate growth in currently undeveloped areas.

Buildout Planning Service Area Deficiencies

The buildout system analysis was performed in a similar manner to the existing and 20-year planning horizon system analyses. The buildout condition evaluated whether the sewers would be adequately sized to convey the buildout PWWFs, representing full development of the planning service area boundary, and included the preliminary assumptions for serving all expansion areas (refer to Chapter 2 for the planning service area boundary definition). Due to the State's recent passing of HB2001, the buildout condition also accounted for increased sewer flow as a result of HB2001 as described in Chapter 3.

The additional projected flow from new development in the build-out scenario would exceed existing infrastructure capacity, leading to deficiencies. Modeled deficiencies were identified in Black Butte Trunk (MH0309 and MH0297), at S.W. Odem Medo Road (MH21C004 and MH21C003) near the Canyon Interceptor and at the Yew Avenue and Lawson Crossing Pump Stations. Figure 5-2 shows the location of the deficiencies during buildout conditions. Deficiencies are those where the City's freeboard criteria (less than 2 feet below the manhole rim) is triggered or where manholes are flooding. The figure also shows pipelines that are full (depth versus diameter greater than or equal to 1). These pipelines are not deficiencies but an indication of what pipe segments may be causing the manhole deficiencies. The deficiencies shown on Figure 5-2 are primarily caused by the added flows from expansion areas in the south, east, and west of the City, which put additional stress on the main sewers downstream.

Pump Station and Forcemain Evaluation

Pump stations should have adequate capacity to convey peak flows to prevent unwanted sewage overflows at pump stations. In accordance with the established performance criteria, the City's existing modeled pump stations were evaluated to determine if each one has firm capacity to convey existing and future PWWFs. The firm capacity of a pump station is defined as the capacity with the largest pump out of service.

If a pump station has inadequate firm capacity to pump the PWWFs, the water level in the wetwell may rise to the overflow point, discharging sewage to the surrounding area, which could enter the storm drain system and eventually discharge to waterbodies. The following sections present the

pump station capacity evaluation results, which compares the estimated existing and future peak flows to the pump station firm capacities.

The City's hydraulic model includes two pump stations that have the potential to receive flow from an expanding service area. Table 5-1 summarizes the results of the pump station evaluation.

TABLE 5-1
PUMP STATION EVALUATION RESULTS

				Modeled PWWF (MGD)			Deficient?
Pump Station Name	**No. of Pumps**	**Firm Capacity (MGD)**	**Total Capacity (MGD)**	**Existing**	**20-year**	**Buildout[1]**	**Yes/No**
Lawson Crossing	2	0.54	1.08	0.03	0.81	0.84	Yes
Yew Avenue	2	0.55	1.10	0.51	0.65	2.1	Yes

[1]Assumes improvements in the system are implemented, so PWWF represents unconstrained flow into the pump station.

MGD = million gallons per day

Based on the analysis and the results summarized on Table 5-1, both the Lawson Crossing and Yew Avenue Pump Stations are considered deficient in the 20-year planning horizon. Additionally, projected peak flow at buildout would exceed the total capacity at the Yew Avenue Pump Station, which would put it at risk of overflow under build-out conditions.

The Lawson Crossing Pump Station could have a significant increase in projected flows at buildout from a large area to the west. Since the area is currently undeveloped, the routing of this flow is unknown. For modeling purposes, the undeveloped area west of the system was directed to Lawson Crossing Pump Station.

The Yew Avenue Pump Station cannot adequately serve future upstream development due to a substantial amount of projected flow from the undeveloped area to the south, causing capacity deficiencies and potential flooding. Significant upgrades are necessary to handle build-out flows.

The Improvement Alternatives section presents options for serving future development to the west and south that mitigate Lawson Crossing and Yew Avenue Pump Station capacity deficiencies.

Capacity Evaluation Summary

The City's model indicates that there are capacity deficiencies in the sewer system for 20-year and build-out scenarios. These deficiencies are mainly located in areas with significant planned growth, leading to increased system flows. Both the Lawson Crossing and Yew Avenue Pump Stations are considered deficient due to firm capacity criteria beginning in the 20-year planning horizon and worsening under buildout conditions. Figure 5-2 shows the extent of system capacity deficiencies identified in this analysis based on the established performance criteria.

Following completion of the existing, 20-year, and buildout system analyses, improvement projects and improvement project alternatives were identified to mitigate modeled future system capacity deficiencies. During the development of this Wastewater Collection System Master Plan, the City

also requested separate analysis with specific developer provided details for two areas. The results of these analyses are included in Appendices F and G.

Improvement Alternatives

All of the projects address future deficiencies and are not needed until future development is connected to the existing system. The improvement projects include upsizing portions of Black Butte Trunk and alternatives for addressing deficiencies at the Yew Avenue and Lawson Crossing Pump Stations. The improvement projects are sized to meet PWWF at build-out conditions. The improvements are summarized on Tables 5-2 through 5-7. Figures 5-3 through 5-5B show Yew Avenue Pump Station Alternatives 1 through 3, respectively. Black Butte Trunkand Lawson Crossing Pump Station improvements are independent from the Yew alternative selected and, therefore, are shown on all three figures.

Black Butte Trunk

Modeling shows surcharging in Black Butte Trunk under build-out conditions where the HGL is within 2 feet from the manhole rim. Surcharging is caused by anticipated future flows in the east part of the planning service area. This proposed project consists of upsizing a total of 2,497 linear feet (LF) of 12-inch diameter pipe to 15-inch diameter pipe along S.W. Highway 126, S.E. 9th Street, and S.E. 7th Street. Table 5-2 summarizes the improvements in Black Butte Trunk.

TABLE 5-2
BLACK BUTTE TRUNK IMPROVEMENTS SUMMARY

Description	Upstream Manhole	Downstream Manhole	Existing Diameter (inches)	Proposed Diameter (inches)	Length (LF)	Type
Black Butte Trunk	MH0309	MH15D006	12	15	902	Gravity
	MH15C012	MH15B062	12	15	986	Gravity
	MH0297	MH0295	12	15	609	Gravity

Yew Avenue Pump Station Alternatives

Significant development is anticipated in the south part of the service area, increasing anticipated sewer flows upstream of the Yew Avenue Pump Station and leading to capacity limitations in the gravity pipe and pump station during build-out conditions. Currently, the City is completing an infrastructure master plan of the property currently owned by the Oregon Department of State Lands. Four alternatives to improve conveyance in this area of the system were evaluated using the hydraulic model for the build-out scenario. The results are discussed below.

Yew Avenue Alternative 1 - All Flow to Yew Avenue Pump Station

This alternative includes upsizing a portion of the 12-inch trunk that conveys flows to the Yew Avenue Pump Station, replacing the existing Yew Avenue Pump Station and the forcemain, as well as upsizing portions of the Canyon Interceptor. Replacing the existing gravity pipe and Yew Avenue Pump Station with a larger station to relieve upstream capacity deficiencies triggers capacity deficiencies in the downstream forcemain and Canyon Interceptor from the increased

flows. The Canyon Interceptor would require upsizing in this alternative. Additionally, because Yew Avenue Alternative 1 does not include construction of the East Spruce Interceptor, flow in the existing built portion of the East Spruce Interceptor would be routed to the pipe in S.W. Odem Medo Road and would exceed the pipe's capacity. See Figure 5-3 and Tables 5-3 and 5-4 for a summary of the improvements necessary for Yew Avenue Alternative 1.

TABLE 5-3
YEW AVENUE ALTERNATIVE 1 PIPE IMPROVEMENTS SUMMARY

Description	Upstream Manhole	Downstream Manhole	Existing Diameter (inches)	Proposed Diameter (inches)	Length (LF)	Type
Yew Avenue Pump Station	MH0735	Yew Wetwell	12	18	4,051	Gravity
	Yew Avenue Pump Station Discharge	MH20D027	8	10	4,351	Forcemain
Canyon Interceptor	MH20D027	MH20D031	12	18	739	Gravity
	MH20D031	MH16B049	15, 18	21	9,771	Gravity
S.W. Odem Medo Road	MH21C003	MH20D031	8	12	969	Gravity

TABLE 5-4
YEW AVENUE ALTERNATIVE 1 PUMP STATION IMPROVEMENTS

Structure	Existing Firm Capacity (MGD)	Firm Capacity Needed (MGD)
New Yew Avenue Pump Station	0.55	2.1

Yew Avenue Alternative 2 - All Flow to East Spruce Interceptor

This alternative involves completion of the East Spruce Interceptor, which would connect upstream of Yew Avenue Pump Station and route flow along S.W. 19th Street to Highway 97 intersecting E. Antler Avenue, which was recommended in the City's 2007 Wastewater (Collection System) Master Plan (2007 MP). The proposed project would consist of installing 13,563 LF of new gravity mains. A portion (2,607 LF) of the recommended East Spruce Interceptor along S.W. Airport Way was completed in 2008. For this alternative, all flows from development in the southern part of the service area would be routed to the East Spruce Interceptor via gravity instead of to the Yew Avenue Pump Station. Because flows are routed to the East Spruce Interceptor, the Yew Avenue Pump Station and the Canyon Interceptor do not need to be upgraded. In this alternative, the East Spruce Interceptor is not connected to the pipe in S.W. Odem Medo Road to avoid triggering future deficiencies. See Figure 5-4 and Table 5-5 for a summary of the improvements for Yew Avenue Alternative 2.

TABLE 5-5
YEW AVENUE ALTERNATIVE 2 IMPROVEMENTS SUMMARY

Description	Upstream Manhole	Downstream Manhole	Existing Diameter (inches)	Proposed Diameter (inches)	Length (LF)	Type
East Spruce Interceptor	MH29A032	MH0055	-	15	749	Gravity
	MH21C023	New Junction 140	8	15	1,277	Gravity
	New Junction 140	New Junction 164	-	15	8,622	Gravity
	New Junction 164	New Junction 168	-	18	1,555	Gravity
	New Junction 168	MH10C010	-	21	1,205	Gravity
	MH10C010	MH0269	-	24	155	Gravity

Yew Avenue Alternative 3 - Combination of Yew Avenue Pump Station and East Spruce Interceptor

This alternative aims to avoid triggering any deficiencies along the Canyon Interceptor or Yew Avenue Pump Station forcemain, while delaying and minimizing the scope of the East Spruce Interceptor expansion. The improvement project involves upsizing 4,051 LF of existing 12-inch gravity main upstream of the Yew Avenue Pump Station to 18-inch diameter, installing 12,286 LF of new 12-inch diameter gravity mains in the East Spruce Interceptor, and constructing a new pump station with a firm capacity to 1.6 MGD, which is the capacity limit of the downstream Canyon Interceptor. Therefore, Yew Avenue Alternative 3 would not require upsizing gravity mains in the Canyon Interceptor, nor would it require upsizing the forcemain for the Yew Avenue Pump Station, and it would reduce the diameter of pipe needed for the East Spruce Interceptor. See Figure 5-5A and Tables 5-6 and 5-7 for a summary of the improvements for Yew Avenue Alternative 3.

TABLE 5-6
YEW AVENUE ALTERNATIVE 3 PIPE IMPROVEMENTS SUMMARY

Description	Upstream Manhole	Downstream Manhole	Existing Diameter (inches)	Proposed Diameter (inches)	Length (LF)	Type
Yew Avenue Pump Station	MH0735	Yew Wetwell	12	18	4,051	Gravity
East Spruce Interceptor	MH29A032	MH0269	-	12	12,286	Gravity

TABLE 5-7
YEW AVENUE ALTERNATIVE 3 PUMP STATION IMPROVEMENTS SUMMARY

Structure	Existing Firm Capacity (MGD)	Firm Capacity Needed (MGD)
New Yew Avenue Pump Station	0.55	1.60

Yew Avenue Alternative 4 - Combination of Yew Avenue Pump Station and East Spruce Interceptor (Preferred Alternative)

This alternative includes improvements, as presented in Alternative 2, to the East Spruce Interceptor plus the new Yew Avenue Pump Station shown in Alternative 3, without the 12-inch gravity main upgrades upstream of the Yew Avenue Pump Station. Splitting flows between the Yew gravity pipe and the East Spruce Interceptor would eliminate the surcharging that made it necessary to upgrade the 12-inch pipe to an 18-inch pipe, while still allowing maximum flow through the Yew Avenue Pump Station. This alternative gives the City the most flexibility to accommodate any growth scenario. See Figure 5-5B and Tables 5-5 and 5-7 for a summary of the improvements for Alternative 4.

Western Redmond Region Sewer Expansion Alternatives

Various unsewered rural areas located within the service area in the western part of the City are planned to be redeveloped. These areas, as shown on Figure 5-6, include the area labelled "NW Redmond Future Sewer Service Area," the West Redmond Area Plan (WRAP) development and those regions south and west of S.W. Helmholtz Way and S.W. Obsidian Avenue, labeled "SW Redmond Future Sewer Service Area." This section discusses alternatives to providing sewer service to these areas.

Challenges to providing sewer service to these regions primarily arise from topography in which connection to existing interceptor sewers through new gravity mains is either not possible or would result in excessively deep excavations. This section evaluates gravity and pumped alternatives to serving these areas, which could be interim or permanent, depending on the City's long-term planning goals.

Western Region Sewer Expansion Alternative 1 - Adopt the Recommended Alternative of the 2007 Wastewater Master Plan

Under this alternative, construction of the West Spruce Interceptor as described as the Far West Interceptor in the 2007 MP would be adopted. The West Spruce Interceptor has been partially constructed and currently extends to the intersection of Northwest Way and N.W. Spruce Avenue. The continuation of the 2007 MP alignment of the West Spruce Interceptor extends to and along the WRAP development, then along the city limits west of Helmholtz Way, and continues south serving those future development areas.

Per the 2007 MP, the depth of the West Spruce Interceptor is not adequate to serve most of the WRAP development by gravity. Under this alternative, in addition to constructing the West Spruce Interceptor, a regional pump station to serve most of the WRAP development would be needed.

The natural topography of the WRAP area drains to the north, with a low-lying area that meanders near the center of the area with respect to west to east. Therefore, the most economical location for the WRAP regional pump station is on its most northern boundary, at the boundary's lowest lying area.

With development predicted to occur first in the more southern areas of the WRAP area, until the regional pump station and/or a gravity sewer are constructed through the entire area from north to south, most new development within the WRAP would need to initially be served by interim pump stations. These interim pump stations could be located anywhere north of any planned development, as that development occurs. However, the City should avoid acquiring multiple small pump stations. Instead, if development starts in the southern regions and progresses to the north, each new interim pump station constructed should be designed with adequate capacity to serve all upstream areas, and at the time each new interim pump station is constructed, all upstream interim pump stations should be decommissioned.

Under this alternative (adopting the 2007 MP alignment), all new development south of S.W. Obsidian Avenue could be served by gravity sewers, though interim pump stations would be needed until such time that the West Spruce Interceptor is constructed to that location.

See Figure 5-7 for a plan view of Alternative 1 improvements. See Table 5-8 for a summary of the estimated pipe diameter and length installed to complete Alternative 1.

TABLE 5-8
ALTERNATIVE 1 PIPE SUMMARY

Description	Upstream Manhole	Downstream Manhole	Proposed Diameter (inches)	Length (LF)	Type
West Spruce Interceptor	S.W. Canal Boulevard and S.W. Helmholtz Way	S.W. Canal Boulevard	10	2,100	Gravity
	S.W. Canal Boulevard	S.W. Wickiup Avenue and S.W. Helmholtz Way	12	10,700	Gravity
	S.W. Wickiup Avenue and S.W. Helmholtz Way	S.W. Obsidian Avenue and S.W. Helmholtz Way	15	5,200	Gravity
	S.W. Obsidian Avenue and S.W. Helmholtz Way	N.W. Cedar Avenue and N.W. 35th Street	24	9,500	Gravity
	N.W. Cedar Avenue and N.W. 35th Street	MH0444	27	9,900	Gravity
WRAP Pump Station	WRAP Pump Station	S.W. 35th Street and N.W. Hemlock Avenue	6	500	Pressure

Western Sewer Expansion Alternative 2 - Revise the Recommended Alternative of the 2007 Wastewater Master Plan

Under this alternative, the City would construct the West Spruce Interceptor along the alignment as shown in the 2007 MP. However, the proposed pipe depth and diameter would increase. Using a 30-inch pipe at minimum grade, extending from the existing Far West location to the upper portion of the WRAP development area would result in a sewer line deep enough so most of the WRAP development area could be served by gravity sewers.

See Figure 5-8 for a plan view of Alternative 2 improvements. See Table 5-9 for a summary of the estimated pipe diameter and length installed to complete Alternative 2.

TABLE 5-9
ALTERNATIVE 2 PIPE SUMMARY

Description	Upstream Manhole	Downstream Manhole	Proposed Diameter (inches)	Length (LF)	Type
West Spruce Interceptor	S.W. Canal Boulevard and S.W. Helmholtz Way	S.W. Canal Boulevard	10	2,100	Gravity
	S.W. Canal Boulevard	S.W. Wickiup Avenue and S.W. Helmholtz Way	12	10,700	Gravity
	S.W. Wickiup Avenue and S.W. Helmholtz Way	S.W. Obsidian Avenue and S.W. Helmholtz Way	15	5,200	Gravity
	S.W. Obsidian Avenue and S.W. Helmholtz Way	N.W. Cedar Avenue and N.W. 35th Street	24	9,500	Gravity
	N.W. Cedar Avenue and N.W. 35th Street	MH0444	30	9,900	Gravity

Western Sewer Expansion Alternative 3 - WRAP Interceptor to Connect to the Future 48-inch Interceptor on N.W. Northwest Way

Under this alternative, the City would develop a new alignment for a gravity sewer to serve the WRAP and SW Redmond Future Sewer Service areas, which would connect to a new 48-inch interceptor, downstream of the existing wastewater treatment facility. The diameter previously proposed for the West Spruce Interceptor would be downsized as the total drainage area and associated flow would be reduced under this alternative. The revised alignment for the West Spruce Interceptor would terminate near Maple and N.W. 35th Street and would only serve those areas northeast of N.W. 35th Street and N.W. Hemlock Avenue.

See Figure 5-9 for a plan view of Alternative 3 improvements. See Table 5-10 for a summary of the estimated pipe diameter and length installed to complete Alternative 3.

TABLE 5-10
ALTERNATIVE 3 PIPE SUMMARY

Description	Upstream Manhole	Downstream Manhole	Proposed Diameter (inches)	Length (LF)	Type
West Spruce Interceptor	West of N.W. 35th Street and N.W. Hemlock Avenue	N.W. 35th Street and N.W. Maple Avenue	12	3,000	Gravity
	N.W. 35th Street and N.W. Maple Avenue	East quarter of Tax Lot 1513050000901	15	3,300	Gravity
	East quarter of Tax Lot 1513050000901	MH0444	18	3,000	Gravity

Description	Upstream Manhole	Downstream Manhole	Proposed Diameter (inches)	Length (LF)	Type
Northwest Way Interceptor	S.W. Canal Boulevard and S.W. Helmholtz Way	S.W. Canal Boulevard	10	2,100	Gravity
	S.W. Canal Boulevard	S.W. Wickiup Avenue and S.W. Helmholtz Way	12	10,700	Gravity
	S.W. Wickiup Avenue and S.W. Helmholtz Way	S.W. Obsidian Avenue and S.W. Helmholtz Way	15	5,200	Gravity
	S.W. Obsidian Avenue and S.W. Helmholtz Way	Northwest Way and N.W. Euston Lane	24	30,100	Gravity

Western Sewer Extension Alternative 4 - Connect Upper Portion of 2007 Wastewater Master Plan Far West Interceptor to Cascade Trunk and Construct WRAP Regional Pump Station (Preferred Alternative)

Under this alternative, a portion of the Far West Interceptor above S.W. Obsidian Avenue as described in the 2007 MP would be constructed, and that portion, referred to herein as the Obsidian Interceptor would then connect to the Cascade Trunk Interceptor at S.W. Obsidian and S.W. 35th Street, a regional pump station and forcemain to serve the WRAP development area would be constructed, and the West Spruce Interceptor as described in the Western Region Sewer Expansion Alternative 3 would be constructed to only serve those areas northeast of N.W. 35th Street and N.W. Hemlock Avenue.

See Figure 5-10 for a plan view of the Alternative 4 improvements. See Table 5-11 for a summary of the estimated pipe diameter and length installed to complete Alternative 4.

TABLE 5-11
ALTERNATIVE 4 PIPE SUMMARY

Description	Upstream Manhole	Downstream Manhole	Proposed Diameter (inches)	Length (LF)	Type
West Spruce Interceptor	West of N.W. 35th Street and N.W. Hemlock Avenue	N.W. 35th Street and N.W. Maple Avenue	12	3,000	Gravity
	N.W. 35th Street and N.W. Maple Avenue	East quarter of Tax Lot 1513050000901	15	3,300	Gravity
	East quarter of Tax Lot 1513050000901	MH0444	18	3,000	Gravity

Description	Upstream Manhole	Downstream Manhole	Proposed Diameter (inches)	Length (LF)	Type
Obsidian Interceptor	S.W. Canal Boulevard and S.W. Helmholtz Way	S.W. Canal Boulevard	10	2,100	Gravity
	S.W. Canal Boulevard	S.W. Wickiup Avenue and S.W. Helmholtz Way	12	10,700	Gravity
	S.W. Wickiup Avenue and S.W. Helmholtz Way	Southeast corner of Tax Lot 1513190000400	15	5,250	Gravity
	Southeast corner of Tax Lot 1513190000400	MH17C102	18	5,250	Gravity
WRAP Collection System	Southeast corner of Tax Lot 1513180002101	North of Highway 126	12	2,250	Gravity
	North of Highway 126	South of W. Antler Avenue	15	2,100	Gravity
	South of W. Antler Avenue	WRAP Pump Station	18	3,200	Gravity
	WRAP Pump Station	N.W. 27th Street and N.W. Elm Avenue	8	5,200	Pressure

Western Sewer Expansion Alternative 5 - Construct WRAP and Southwest Regional Pump Stations

Under this alternative, two regional pump stations would be constructed, one to serve the WRAP development area and one to serve the future development areas south of S.W. Obsidian Avenue in the western portion of the City. A portion of the Far West Interceptor above S.W. Obsidian Avenue as described in the 2007 MP, referred to herein as the Obsidian Interceptor and the portion of the Far West Interceptor northeast of N.W. 35th Street and N.W. Hemlock Avenue, referred to herein as the West Spruce Interceptor, as described in Alternative 4 would be constructed.

See Figure 5-11 for a plan view of Alternative 5 improvements. See Table 5-12 for a summary of the estimated pipe diameter and length installed to complete Alternative 5.

TABLE 5-12
ALTERNATIVE 5 PIPE SUMMARY

Description	Upstream Manhole	Downstream Manhole	Proposed Diameter (inches)	Length (LF)	Type
West Spruce Interceptor	West of N.W. 35th Street and N.W. Hemlock Avenue	N.W. 35th Stret and N.W. Maple Avenue	12	3,000	Gravity

Description	Upstream Manhole	Downstream Manhole	Proposed Diameter (inches)	Length (LF)	Type
	N.W. 35th Street and N.W. Maple Avenue	East quarter of Tax Lot 1513050000901	15	3,300	Gravity
	East quarter of Tax Lot 1513050000901	MH0444	18	3,000	Gravity
Obsidian Interceptor	S.W. Canal Boulevard and S.W. Helmholtz Way	S.W. Canal Boulevard	10	2,100	Gravity
	S.W. Canal Boulevard	S.W. Wickiup Avenue and S.W. Helmholtz Way	12	10,700	Gravity
	S.W. Wickiup Avenue and S.W. Helmholtz Way	S.W. Regional Pump Station	15	7,100	Gravity
	S.W. Regional Pump Station	S.W. Quartz Avenue and S.W. 41st Street	8	2,600	Pressure
WRAP Collection System	Southeast corner of Tax Lot 1513180002101	North of Highway 126	12	2,250	Gravity
	North of Highway 126	South of W. Antler Avenue	15	2,100	Gravity
	South of W. Antler Avenue	WRAP Pump Station	18	3,200	Gravity
	WRAP Pump Station	S.W. 35th Street and N.W. Hemlock Avenue	8	5,200	Pressure

Western Region Sewer Expansion Selection of an Alternative

The advantages and disadvantages of each Western Regional Sewer Alternative was evaluated, presented to the City at Workshop Six, and a summary of each is provided on Figure 5-12. Under direction of the City, the recommended improvement is based on the Western Region Sewer Expansion Alternative 4 as shown on Figure 5-10.

The natural down gradient of the WRAP area is from south to north, so the most economical site to construct the WRAP Pump Station is at the drainage basin's low point located on the most northern boundary of the WRAP area. To accommodate development on the southern end of the WRAP area, where development is anticipated to occur first, either the WRAP Pump Station and the entire WRAP collector sewer, as shown on Figure 5-10, would need to be constructed or interim pump stations would need to be allowed for various phases of development. Any interim pump stations would discharge to the West Cascade Trunk on S.W. 35th Street. The West Cascade Trunk ultimately flows into the West 19th Street Interceptor, which is the location for the discharge of the future WRAP Pump Station. As development occurs, with each new interim pump station constructed all flow contributing to other upstream interim pump stations should be redirected, such that only one interim pump station is online

at any given time. Once a new interim pump station is constructed, all upstream interim pump stations should be decommissioned.

Collector sewers currently conveying wastewater to the existing Feather Ridge Pump Station are too low to be connected to the Obsidian Interceptor with gravity flow. Therefore, the Feather Ridge Pump Station should either be made a permanent pump station, or be connected to the WRAP collector by routing under S.W. Obsidian Avenue. It should be noted that due to the variable terrain through the WRAP and other western Redmond areas, careful attention to and planning should occur before any major development, to ensure all newly developed areas can be served, to the extent possible, by gravity sewers. Major earthwork may be needed in some areas to avoid excessively deep sewer lines or the need for additional pump stations. It may be ideal for the City to zone low-lying areas that cannot viably be served with gravity sewers as open space, to avoid the need for sewer lines in those areas. Otherwise, individual grinder pump stations may be needed.

3,000 0 3,000

SCALE IN FEET

NW COYNER AVE

NW PERSHALL WAY

NW CANAL BLVD

N HWY 97

97

NE KING WAY

NORTHWEST WAY

NW 10TH ST

NW HELMHOLTZ WAY

NW 35TH ST

NW 19TH ST

NW CANYON DR

NE NEGUS WAY

NW MAPLE AVE

NE 5TH ST

NE MAPLE AVE

NW 6TH ST

SB HWY 97

NE 9TH ST

NW HEMLOCK AVE

LAWSON CROSSING
PUMP STATION

W ANTLER AVE

E ANTLER AVE

MH0297

Black Butte Trunk

W HWY 126

SW 35TH ST

SW HIGHLAND AVE

Redmond

NB HWY 97

SW 33RD ST

SW 23RD ST

Canyon
Interceptor

MH0309

E HWY 126

SW OBSIDIAN AVE

SW 27TH ST

SW PUMICE AVE

SW QUARTZ AVE

SW 31ST ST

SW Odem
Medo Rd

MH21C004

MH21C003

SW AIRPORT WAY

SW 58TH ST

SW HELMHOLTZ WAY

YEW
PUMP
STATION

CENTRAL OREGON DR

S HWY 97

97

SW CANAL BLVD

LEGEND

- FLOODING MANHOLE
- FREEBOARD CRITERIA TRIGGERED
- PUMP STATION
- MODELED FORCEMAIN
- PIPELINE D/D GREATER THAN OR EQUAL TO 1
- MODELED GRAVITY MAIN
- PARCELS
- PLANNING SERVICE AREA

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CITY OF
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WASTEWATER COLLECTION SYSTEM MASTER PLAN

BUILD-OUT PLANNING SERVICE AREA DEFICIENCIES

FIGURE

5-2

3,000 0 3,000

SCALE IN FEET

NW COYNER AVE

NW PERSHALL WAY

NW CANAL BLVD

97

N HWY 97

NE KING WAY

NORTHWEST WAY

NW 10TH ST

NW CANYON DR

NW HELMHOLTZ WAY

NW 31ST ST

NW 19TH ST

NE NEGUS WAY

NE 5TH ST

NW MAPLE AVE

NE MAPLE AVE

NW 6TH ST

SB HWY 97

NE 9TH ST

NW HEMLOCK AVE

LAWSON CROSSING PUMP STATION

W ANTLER AVE

E ANTLER AVE

W HWY 126

SW 35TH ST

SW HIGHLAND AVE

Redmond

NB HWY 97

15"

15"

15" E HWY 126

SW 33RD ST

SW 23RD ST

21"

SW OBSIDIAN AVE

SW 27TH ST

SW PUMICE AVE

SW QUARTZ AVE

SW 31ST ST

12"

18"

SW AIRPORT WAY

SW HELMHOLTZ WAY

SW 58TH ST

10"

YEW PUMP STATION

CENTRAL OREGON DR

S HWY 97

18"

97

SW CANAL BLVD

LEGEND

- PUMP STATION
- UPSIZED FORCEMAIN
- BLACK BUTTE TRUNK
- SW ODEM MEDO RD
- CANYON INTERCEPTOR
- YEW PS
- MODELED GRAVITY MAIN
- PARCELS
- PLANNING SERVICE AREA

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CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

YEW ALTERNATIVE 1 IMPROVEMENTS

FIGURE
5-3

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3,000 0 3,000

SCALE IN FEET

NW COYNER AVE
NW PERSHALL WAY
NW CANAL BLVD
97
N HWY 97
NORTHWEST WAY
NE KING WAY
NW 10TH ST
NW CANYON DR
NW HELMHOLTZ WAY
NW 35TH ST
NW 19TH ST
NE 5TH ST
NE NEGUS WAY
NW MAPLE AVE
NE MAPLE AVE
NW 6TH ST
SB HWY 97
NE 9TH ST
NW HEMLOCK AVE
LAWSON CROSSING PUMP STATION
6"
W ANTLER AVE
E ANTLER AVE
24"
21"
18"
15"
15"
W HWY 126
SW 35TH ST
SW HIGHLAND AVE
Redmond
NB HWY 97
SW 33RD ST
SW 23RD ST
15" E HWY 126
SW OBSIDIAN AVE
SW 27TH ST
SW PUMICE AVE
SW QUARTZ AVE
SW 31ST ST
15"
SW AIRPORT WAY
SW HELMHOLTZ WAY
YEW PUMP STATION
15"
SW 58TH ST
CENTRAL OREGON DR
S HWY 97
97
SW CANAL BLVD

LEGEND

- PUMP STATION
- MODELED FORCEMAIN
- EAST SPRUCE INTERCEPTOR
- LINE K
- MODELED GRAVITY MAIN
- PARCELS
- PLANNING SERVICE AREA

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CITY OF
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WASTEWATER COLLECTION SYSTEM MASTER PLAN

YEW ALTERNATIVE 2 IMPROVEMENTS

FIGURE
5-4

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SCALE IN FEET

NW COYNER AVE

NW PERSHALL WAY

NW CANAL BLVD

N HWY 97

97

NE KING WAY

NORTHWEST WAY

NW 10TH ST

NW HELMHOLTZ WAY

NW 3RD ST

NW 19TH ST

NW CANYON DR

NE NEGUS WAY

NW MAPLE AVE

NE 5TH ST

NE MAPLE AVE

NW 6TH ST

SB HWY 97

NE 9TH ST

NW HEMLOCK AVE

LAWSON CROSSING PUMP STATION

W ANTLER AVE

E ANTLER AVE

W HWY 126

SW 35TH ST

SW HIGHLAND AVE

Redmond

NB HWY 97

12"

15"

15"

15" E HWY 126

SW 33RD ST

SW 23RD ST

SW OBSIDIAN AVE

SW 27TH ST

SW PUMICE AVE

SW QUARTZ AVE

SW 31ST ST

SW AIRPORT WAY

SW 58TH ST

SW HELMHOLTZ WAY

YEW PUMP STATION

12"

CENTRAL OREGON DR

18"

S HWY 97

97

SW CANAL BLVD

SW MCVEY AVE

LEGEND

- PUMP STATION
- UPSIZED FORCEMAIN
- BLACK BUTTE TRUNK
- YEW PS
- MODELED FORCEMAIN
- PARCELS
- PLANNING SERVICE AREA

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CITY OF
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WASTEWATER COLLECTION SYSTEM MASTER PLAN

YEW ALTERNATIVE 3 IMPROVEMENTS

FIGURE
5-5A

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SCALE IN FEET

NW COYNER AVE

NW PERSHALL WAY

NW CANAL BLVD

N HWY 97

97

NE KING WAY

NORTHWEST WAY

NW 10TH ST

NW CANYON DR

NE NEGUS WAY

NW HELMHOLTZ WAY

NW 35TH ST

NW 19TH ST

NW MAPLE AVE

NE 5TH ST

NE MAPLE AVE

NW 6TH ST

SB HWY 97

NE 9TH ST

NW HEMLOCK AVE

LAWSON CROSSING PUMP STATION

6"

W ANTLER AVE

E ANTLER AVE

24"

21"

18"

15"

15"

15"

W HWY 126

SW 35TH ST

SW HIGHLAND AVE

Redmond

NB HWY 97

SW 33RD ST

SW 23RD ST

15" E HWY 126

SW OBSIDIAN AVE

SW PUMICE AVE

SW 27TH ST

SW QUARTZ AVE

SW 31ST ST

15"

SW AIRPORT WAY

SW 58TH ST

SW HELMHOLTZ WAY

YEW PUMP STATION

15"

CENTRAL OREGON DR

S HWY 97

SW CANAL BLVD

97

LEGEND

- PUMP STATION
- MODELED FORCEMAIN
- EAST SPRUCE INTERCEPTOR
- BLACK BUTTE TRUNK
- MODELED GRAVITY MAIN
- PARCELS
- PLANNING SERVICE AREA

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CITY OF
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WASTEWATER COLLECTION SYSTEM MASTER PLAN

YEW ALTERNATIVE 4 IMPROVEMENTS
CITY SELECTED ALTERNATIVE

FIGURE

5-5B

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SCALE IN FEET

NW COYNER AVE

NW PERSHALL WAY

NW CANAL BLVD

N HWY 97

97

NE KING WAY

NORTHWEST WAY

NW CANYON DR

NW 10TH ST

NE NEGUS WAY

NW HELMHOLTZ WAY

NW 35TH ST

NW MAPLE AVE

NW 19TH ST

NW 6TH ST

NE 5TH ST

NE MAPLE AVE

NE 9TH ST

NW HEMLOCK AVE

NB HWY 97 SB HWY 97

W ANTLER AVE

E ANTLER AVE

W HWY 126

SW HIGHLAND AVE

Redmond

SW 35TH ST

SW 23RD ST

E HWY 126

SW OBSIDIAN AVE

SW 33RD ST

SW 31ST ST

SW 27TH ST

SW PUMICE AVE

SW QUARTZ AVE

SW 58TH ST

SW HELMHOLTZ WAY

SW AIRPORT WAY

CENTRAL OREGON DR

S HWY 97

97

SW CANAL BLVD

SW MCVEY AVE

LEGEND

- EXISTING PUMP STATION
- PLANNING SERVICE AREA
- NW REDMOND FUTURE SEWER SERVICE AREA
- WEST REDMOND AREA PLAN
- SW REDMOND FUTURE SEWER SERVICE AREA

EXISTING SEWER FORCE MAINS

- < 6 INCHES
- 6- 8 INCHES

EXISTING SEWER GRAVITY LINES

- 6-8 INCHES
- 10-18 INCHES
- 20-28 INCHES
- ≥ 30 INCHES

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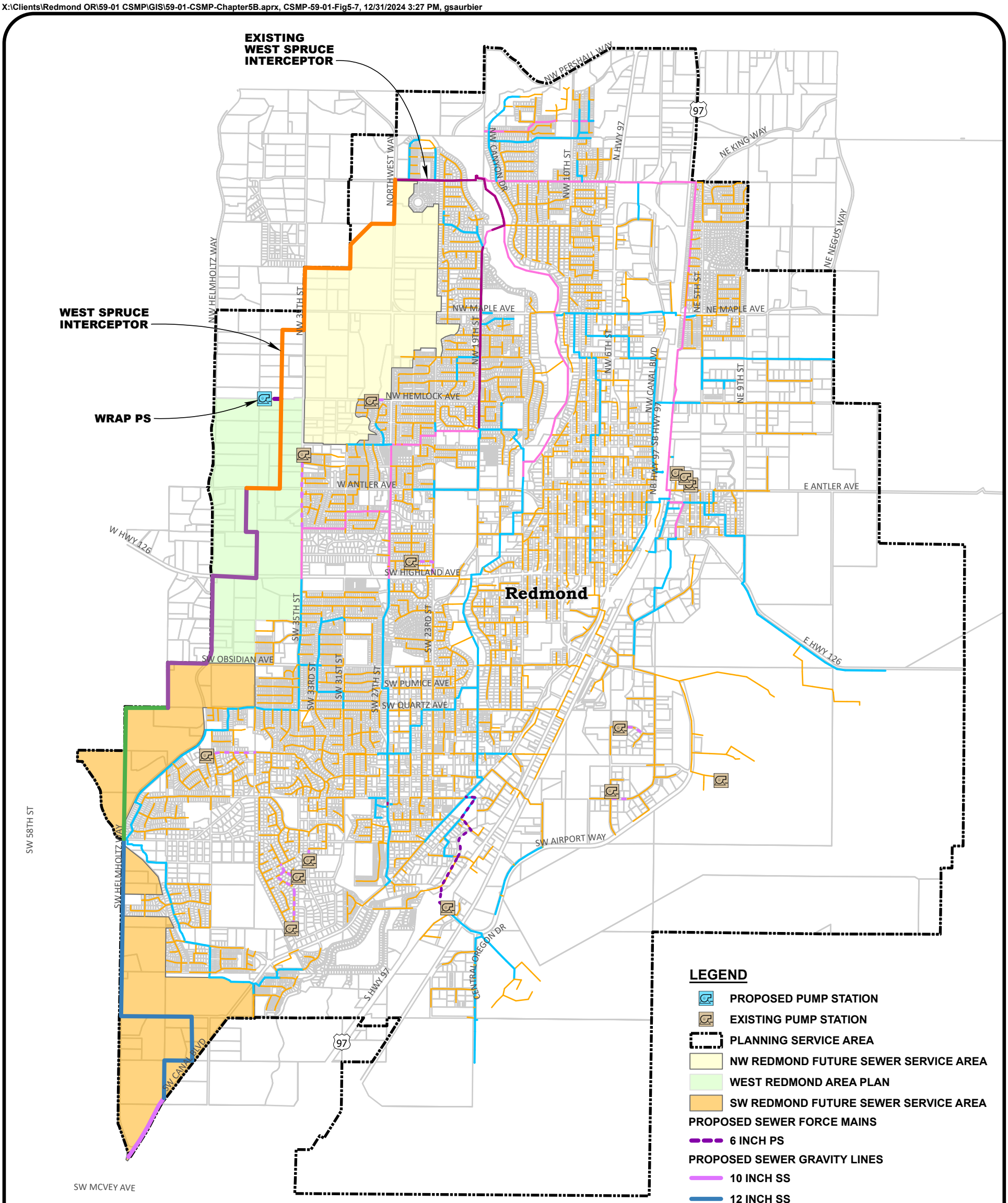
CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

WESTERN SEWER SERVICE EXPANSION AREAS

FIGURE

5-6

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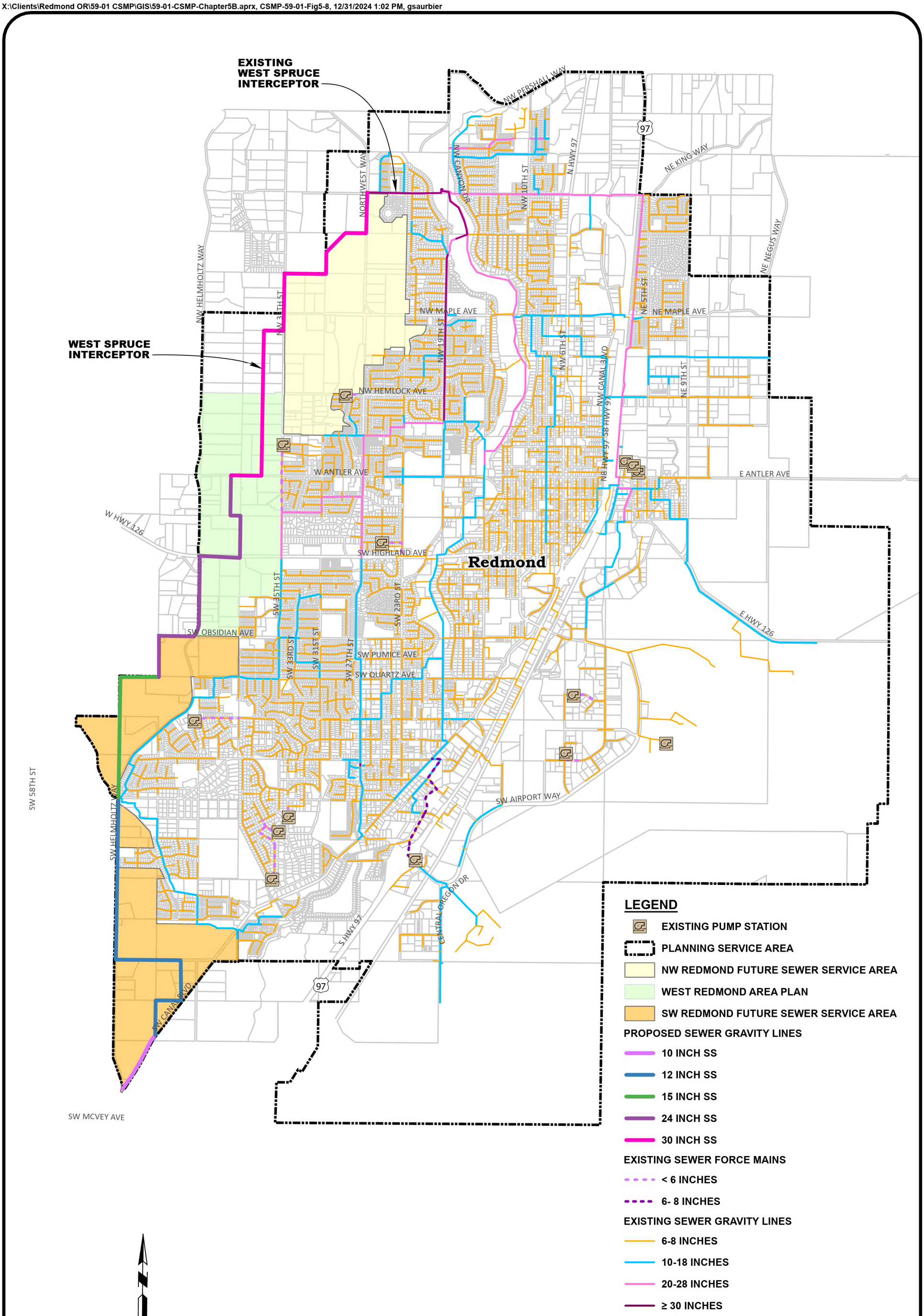
CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

WESTERN REGION SEWER EXPANSION ALTERNATIVE 1

FIGURE

5-7

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CITY OF
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WASTEWATER COLLECTION SYSTEM MASTER PLAN

WESTERN REGION SEWER EXPANSION ALTERNATIVE 2

FIGURE

5-8

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3,000 0 3,000

SCALE IN FEET

WEST SPRUCE INTERCEPTOR

NORTHWEST WAY INTERCEPTOR

NW COYNER AVE
NW PERSHALL WAY
NW CANAL BLVD
97
NE KING WAY
NORTHWEST WAY
NW CANYON DR
NW 10TH ST
N HWY 97
NE NEGUS WAY
NW HELMHOLTZ WAY
NW 35TH ST
NW MAPLE AVE
NW 19TH ST
NW 6TH ST
NE 5TH ST
NE MAPLE AVE
NW HEMLOCK AVE
NE 9TH ST
N&I HWY 97 SB HWY 97
W ANTLER AVE
E ANTLER AVE
W HWY 126
SW HIGHLAND AVE
Redmond
SW 35TH ST
SW 23RD ST
E HWY 126
SW OBSIDIAN AVE
SW 33RD ST
SW 31ST ST
SW 27TH ST
SW PUMICE AVE
SW QUARTZ AVE
SW 58TH ST
SW HELMHOLTZ WAY
SW AIRPORT WAY
CENTRAL OREGON DR
S HWY 97
SW CANAL BLVD

LEGEND

- EXISTING PUMP STATION
- PLANNING SERVICE AREA
- NW REDMOND FUTURE SEWER SERVICE AREA
- SW REDMOND FUTURE SEWER SERVICE AREA
- WEST REDMOND AREA PLAN

PROPOSED SEWER GRAVITY LINES

- 10 INCH SS
- 12 INCH SS
- 15 INCH SS
- 18 INCH SS
- 24 INCH SS

EXISTING SEWER FORCE MAINS

- < 6 INCHES
- 6- 8 INCHES

EXISTING SEWER GRAVITY LINES

- 6-8 INCHES
- 10-18 INCHES
- 20-28 INCHES
- 30-42 INCHES
- 48 INCH

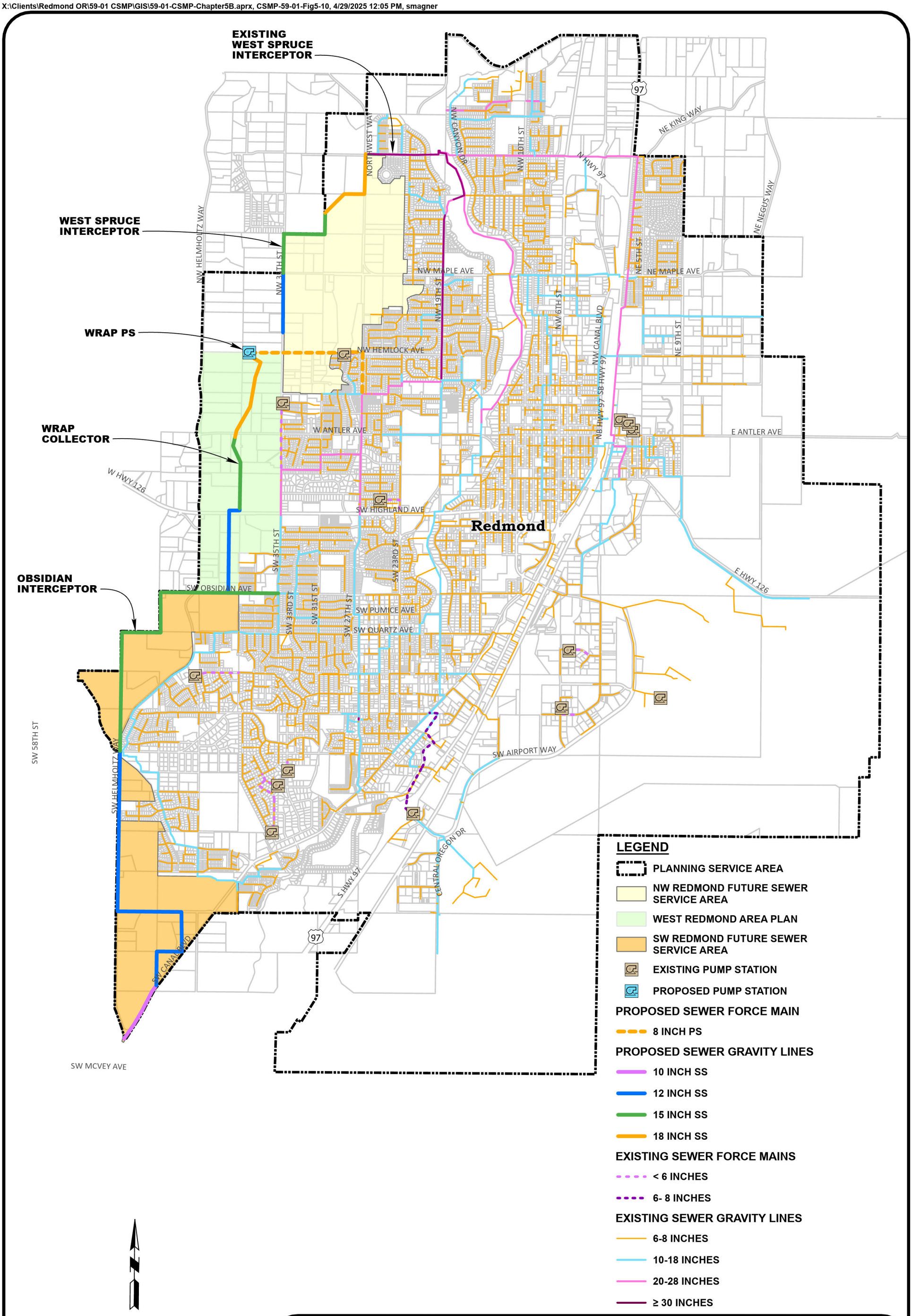
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CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

WESTERN REGION SEWER EXPANSION ALTERNATIVE 3

FIGURE
5-9

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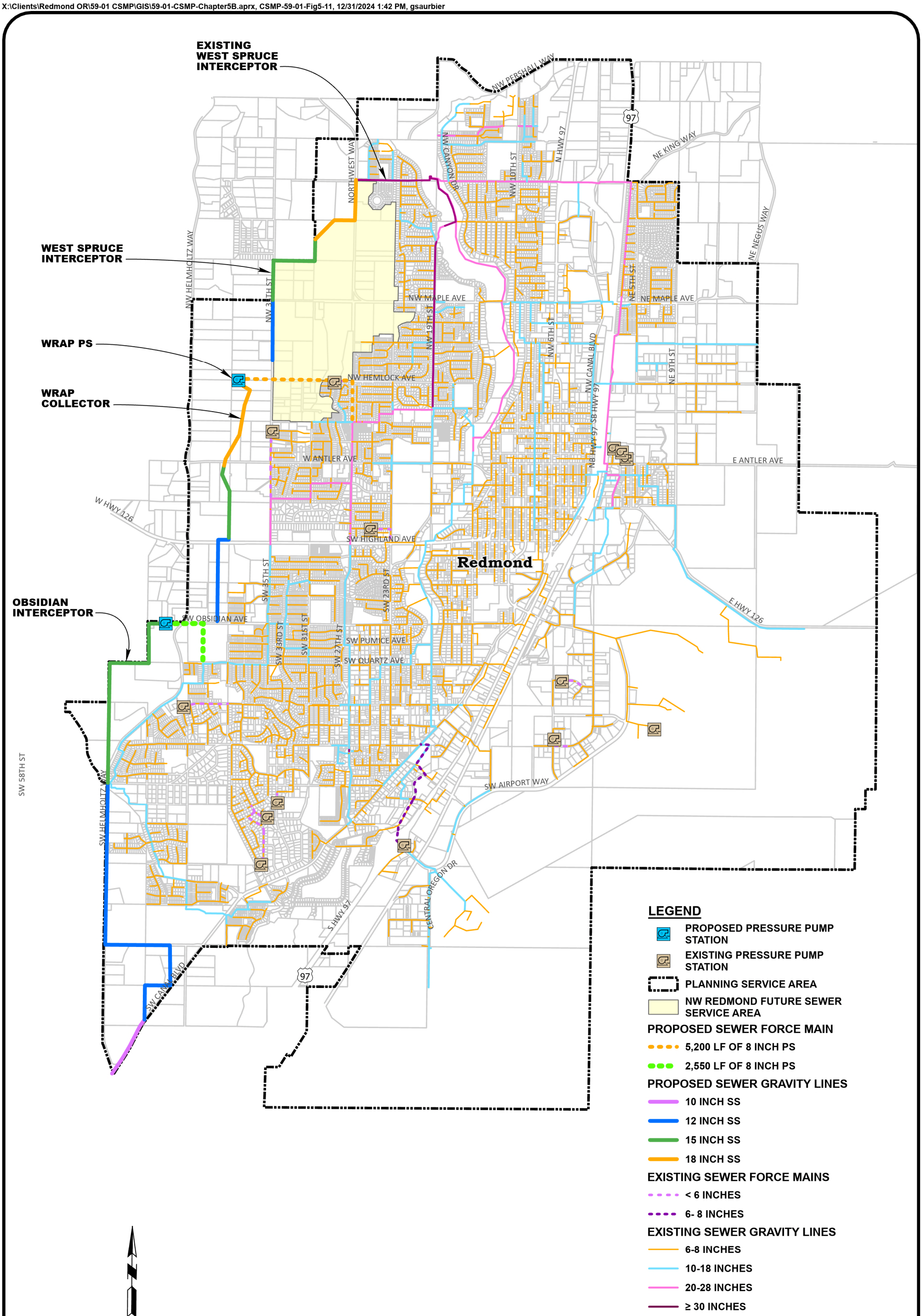
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CITY OF
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WASTEWATER COLLECTION SYSTEM MASTER PLAN

WESTERN REGION SEWER EXPANSION ALTERNATIVE 4 CITY SELECTED ALTERNATIVE

FIGURE
5-10

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CITY OF
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WASTEWATER COLLECTION SYSTEM MASTER PLAN

WESTERN REGION SEWER EXPANSION ALTERNATIVE 5

FIGURE
5-11

CITY OF REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN
WESTERN REGION SEWER EXPANSION ALTERNATIVE ADVANTAGES AND DISADVANTAGES SUMMARY

Alternative	Description		Considerations
1	Adopt the recommended alternative of the 2007 Wastewater Master Plan, consisting of approximately 37,400 linear feet of gravity sewer, 500 linear feet of pressure sewer, and one pump station.	Advantages	•Capacity - Preserves future capacity of the existing interceptor pipes due to the location of its final connection at the plant interceptor. •Long-term Maintenance - Most of the western region would be served by gravity, with only one small pump station required to serve the WRAP area. •Constructability - The majority of the sewer would be installed at standard depths.
		Disadvantages	•Timing of installation and development - It is anticipated that development in the near term will occur in the southwest area of Redmond. Therefore, much of the sewer would need to be constructed before any development could occur.
2	Revise the recommended alternative of the 2007 Wastewater Master Plan to eliminate the need for a pump station by lowering the sewer deep enough that most western region areas could be served by gravity alone.	Advantages	•Capacity - Preserves future capacity of the existing interceptor pipes due to the location of its final connection at the plant interceptor. •Long-term Maintenance - All western region areas would be served by gravity. No permanent pump stations would be required.
		Disadvantages	•Timing of installation and development - It is anticipated that development in the near term will occur in the southwest area of Redmond. Therefore, much of the sewer would need to be constructed before any development could occur. •Constructability/Cost - The sewer is very deep in places, resulting in higher construction costs and greater impacts to traffic during construction.
3	Construct an interceptor from the WRAP area to the future 48-inch interceptor on N.W. Northwest Way. The downstream portion of the recommended of the 2007 Wastewater Master Plan would be constructed with reduced pipe sizes, and would terminate near Maple and N.W. 35th Street.	Advantages	•Capacity - Preserves future capacity of the existing interceptor pipes due to the location of its final connection at the plant interceptor. •Long-term Maintenance - All western region areas would be served by gravity. No permanent pump stations would be required. •Service Area - This alternative would increase the sewer service. •Constructability/Cost - The alignment of the sewer would follow the natural topography without being substantially deep. Much of the alignment is currently in undeveloped areas or along county roads, which could facilitate ease of installation and relatively lower units costs of trenching, traffic control and surface restoration.
		Disadvantages	•Constructed Length - The pipe is outside City limits and would require substantial coordination with the County and private property owners for right-of-way coordination and easements. •Timing of installation and development - It is anticipated that development in the near term will occur in the southwest area of Redmond. Therefore,
4	Construct the upstream portion of the Obsidian Interceptor above S.W. Obsidian Avenue as described in the 2007 Wastewater Master Plan, connect that portion of interceptor to the Cascade Trunk at S.W. Obsidian and S.W. 35th Street, construct a regional pump station and forcemain to serve the WRAP development area, and construct the revised West Spruce as described in Alternative 3.	Advantages	•Timing of installation and development - This alternative has three separate connections to the existing system, allowing flexibility in the timing of the projects as development occurs.
		Disadvantages	•Capacity - This alternative utilizes existing capacity within the exiting sewer trunks and interceptors. •Long-term Maintenance - The larger WRAP pump station operation and maintenance (O&M) costs increase over the gravity sewer options. •Constructability/Cost - The Obsidian Interceptor is excessively deep and will have higher than normal construction costs.
5	Construct two regional pump stations, one to serve the WRAP development area and one to serve the future development areas south of S.W. Obsidian Avenue in the western portion of the City. Portions of the Obsidian Interceptor above S.W. Obsidian Avenue would be constructed as described in the 2007 Wastewater Master Plan and the portion of the West Spruce Interceptor northeast of N.W. 35th Street and N.W. Hemlock Avenue constructed as described in Alternative 4.	Advantages	•Timing of installation and development - This alternative has three separate connections to the existing system, allowing flexibility in the timing of the projects as development occurs. •Constructability/Cost - The pump station and forcemain have a lower initial capital cost than the gravity pipe on Obsidian.
		Disadvantages	•Capacity - This alternative utilizes existing capacity within the exiting sewer trunks and interceptors. •Long-Term Maintenance - The two large pump stations at WRAP and Obsidian will have higher long term O&M costs than the gravity option.

anderson perry

CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN
WESTERN REGION SEWER EXPANSION ALTERNATIVE ADVANTAGES AND DISADVANTAGES SUMMARY

FIGURE
5-12

Chapter 6 - Capital Improvement Plan

Introduction

As the City of Redmond develops, its existing wastewater collection system will continue to approach full capacity, which in turn, will lead to system deficiencies. This chapter outlines proposed infrastructure projects designed to accommodate future development while ensuring the City's wastewater collection system remains effective and reliable. This chapter serves as a guide for planning and funding these projects, providing a Capital Improvement Plan (CIP) summary and recommendations for updating the Sanitary System Development Charge and user rates.

Planning service areas were evaluated based on capacity analysis previously described in Chapter 5. The areas evaluated were as follows: existing service area, 20-year (2045), buildout, and buildout with additional flow from residential densification due to House Bill 2001 (HB2001) (flow projections only, this scenario was not modeled). The existing service area is described as the contributing acreage within the service area that includes parks and open space areas but no vacant lots. The 20-year service area is described similarly to the existing service area, but the vacant lots within the service area are included and multiplied by the coefficient respective to the 20-year growth projection. As described in Chapter 5, there are no modeled capacity deficiencies in the existing system. However, build-out will create deficiencies related to capacity. This chapter helps to explain where the capacity deficiencies are within the system, proposed improvements, and the costs associated with each of the recommended projects.

The CIP does not include projects or costs related to maintenance or repair. The proposed projects were categorized as being either in the Improvement Program or the Expansion Program. Improvement Program projects are proposed projects that will add capacity to the existing system to accommodate future growth. Expansion Program projects are proposed projects that will serve areas within the service area projected to be developed. Three categories help determine when development will occur: short-term (0 to 5 years), medium-term (5 to 10 years), and long-term (10 years and longer). All of these proposed projects are categorized as long-term projects, so they are anticipated to be implemented no earlier than 2035. Refer to Appendix H for additional project details.

Cost Estimate Assumptions

Cost estimates for the Improvement Program and Expansion Program proposed projects are based on previous bid tabulations, work experience in the field, projects previously completed by Anderson Perry & Associates, Inc., and engineering judgment. These costs are planning level estimates that will aid the City in preparing for the proposed projects. The final cost of each project is dependent on material and construction costs in the year of construction, final scope and schedule, and contingencies.

All costs are in 2024 dollars and were developed using a Class 5 budget estimate, as established by the American Association of Cost Estimators. This level of estimate is used for concept screening and assumes a 0 to 2 percent level of project definition. The expected accuracy range is -50 percent to +50 percent, meaning the actual cost should fall in the range of 50 percent below the estimate to 50 percent above the estimate. The high level cost estimates account for the uncertainties that lie within each project. The project cost estimates will be categorized as either a unit (i.e., linear feet) or lump sum

price. Pipe projects will total the sum of the individual unit price items. Pump stations will be estimated at a lump sum price.

The following additional cost markups were applied to project costs: 20 percent for engineering, including design, construction management, observation, and testing; 10 percent for scope contingency; 25 percent for construction contingency; and 10 percent for administrative and City costs.

It was assumed the inflation rate will remain at 3 percent per year. Within the electronic CIP tool, the project timing can be changed to reflect the year in which the City would like to construct the project. Additionally, the project timing of each individual project element can be changed to different years. The electronic CIP tool will be placed on a USB drive and a hard copy will be included as Appendix H.

Capital Improvement Plan Projects Based on Unit Cost

Pipe

Pipe material for all Improvement Program and Expansion Program projects is assumed to be polyvinyl chloride SDR 35 (ASTM 3034 or F679). Pipe material costs were based on a per linear foot price with an additional 15 percent added to account for contractor markup.

Trench Excavation and Backfill

Several factors were considered in estimating the cost of pipe trench excavation. Four depth ranges were defined: 5 to 10 feet, 10 to 15 feet, 15 to 20 feet, and greater than 20 feet. An average depth was calculated for each range to estimate the excavation and backfill volumes. Shoring, rather than benching, was assumed for all trench depths to stabilize the excavation.

The base width of the trench was set at 1 foot on either side of the pipe to accommodate equipment with side slopes of 1.5H:1V for excavation. The City's geological conditions, characterized by a heavy rock presence, significantly impact excavation costs. For new pipe installations, it was assumed that 75 percent of the trench excavation would require rock removal using a hydraulic hammer. For replacement of existing pipes, rock excavation was excluded from the cost estimate. These assumptions apply to both unimproved and improved areas.

Surface Restoration

Surface restoration requirements vary based on the project's location and the existing site conditions, unimproved versus improved areas. The extent of surface restoration required will be determined by the depth of the trench excavation. Deeper trenches may necessitate a broader restoration footprint to accommodate side slopes.

Unimproved Areas

Unimproved areas refer to locations that lack significant development or infrastructure. This includes natural landscapes such as open fields, agricultural lands, and other underdeveloped areas. Surface restoration is simplified, consisting primarily of topsoil replacement and seeding to promote vegetation growth and minimize environmental

impact. Restoration in these areas is less extensive compared to improved areas, as the primary goals are erosion control and matching the existing conditions.

Improved Areas

Improved areas are those that have been developed and include infrastructure such as roads, sidewalks, buildings, etc. These areas often feature asphalt, concrete, and curbs that require more labor-intensive and costly restoration compared to unimproved areas. Improved area restoration involves cutting, removing, and replacing the asphalt surface to match or exceed the pre-construction condition, ensuring the integrity and functionality of the roadway. In newly developed areas, surface restoration is typically excluded as an incidental cost to pipeline installation as these areas are subject to separate surface finishing regardless of pipeline presence.

Traffic Control

Traffic control is more heavily considered in improved areas where existing development must remain accessible to the public during construction. In improved areas, temporary lane closures, detours, signage, barriers, and flagging to direct and manage the flow of traffic may need to be considered. Traffic control in unimproved areas was not included in the cost estimate.

Capital Improvement Plan Projects Based on Lump Sum

Cost estimates based on lump sum quantities account for all materials, labor, and other indirect costs for project completion. Lump sum estimates will be applied to the pump stations proposed for the Improvement and Expansion Programs. These cost estimates are derived from previous estimates and engineering judgment, in addition to historical project completion.

Improvement Program

Pipelines

Black Butte Trunk Sanitary Sewer Main Replacement (P-01)

This project will replace the Black Butte Trunk sewer main to serve anticipated growth in the area. The existing pipeline will be upgraded from a 12-inch to a 15-inch diameter main to increase capacity and ensure reliable wastewater conveyance. The new sewer main will be designed to accommodate future development while minimizing the risk of overflows and system backups.

Pump Stations

Yew Avenue Pump Station - Pump Upgrade (LS-01)

This project will increase the pumping capacity of the Yew Avenue Pump Station to meet the City's capacity obligations in Amendment No. 1 to the Annexation Agreement with the Oregon Department of State Lands. The project includes installing new 14 horsepower pumps at the station without having to modify the existing station or forcemain.

Yew Avenue Pump Station Replacement (LS-02)

This project will replace the current pump station to increase the firm capacity to 2.1 million gallons per day to handle future buildout. The project maximizes the capacity of the station without requiring any upstream or downstream pipe improvements. This upgrade includes an entirely new station (wetwell, pumps, and control panel).

Expansion Program

Pipelines

East Spruce Interceptor (P-02)

The East Spruce Interceptor project will handle increased flows from future growth in the southeast part of the service area. The new interceptor will accommodate flows diverted from the Yew Avenue Pump Station as part of a broader system improvement effort. By constructing the East Spruce Interceptor, capacity projects in the existing system downstream of Yew Avenue Pump Station are avoided. The construction of the East Spruce Interceptor is a critical step to ensuring the wastewater collection system can meet the demands of a growing community while maintaining reliable service.

West Spruce Interceptor (P-05)

The West Spruce Interceptor project will convey flows from the northwest area of the service area and connect to the existing West Spruce Interceptor. The alignment aims to maximum the service area without resulting in an excessively deep sewer (greater than 25 feet deep). Generally, the West Spruce Interceptor will only provide service to those areas located southeast of the pipe alignment. As the natural topography along the West Spruce Interceptor is to the northwest, the majority of those areas northwest of the alignment are too low in elevation to be served by the West Spruce Interceptor. Individual grinder pump stations or a regional pump station would be required in this area if the service area were expanded.

West Redmond Area Plan Collector (P-04)

The West Redmond Area Plan (WRAP) Collector will convey flows from the Feather Ridge development (under construction when this Wastewater Collection System Master Plan was developed) and the WRAP area to the proposed WRAP Pump Station. The WRAP Collector alignment will follow a low-lying canyon through the area. While the alignment will be close to the center of the WRAP area, with respect to east to west, the alignment deviates from the center of the WRAP to remain within the natural low point of the area and avoid excessively deep sewer lines. For the proposed collector to be in the center of the WRAP area, excessive earthwork and/or excessively deep sewer lines would be needed, which would be cost prohibitive.

Obsidian Interceptor (P-03)

The Obsidian Interceptor will convey flows from the southeast area of the service area to the existing Cascade Trunk at the intersection of S.W. Obsidian Avenue and S.W. 35th Street. The

proposed interceptor will provide gravity sewer to most areas within the southeast service area, except for the new Feather Ridge development.

Just upstream of S.W. Obsidian Avenue, the collector sewer follows the UGB. Along S.W. Obsidian Avenue, the interceptor will be constructed within the road embankment and in some areas higher than the adjacent grade beyond the road embankment. This is necessary to connect to the existing system due to the invert elevation of the existing manhole on the Cascade Trunk. It should be noted that the Obsidian Interceptor along S.W. Obsidian Avenue will be shallow in places and may require either controlled density fill or the raising of S.W. Obsidian Avenue embankment where the minimum pipe cover cannot be met under the existing grades. There may also be conflicts with existing culverts that must be addressed prior to design and implementation of the interceptor sewer.

Pump Stations

West Redmond Area Plan Pump Station (LS-03)

The WRAP Pump Station will convey flows from the lowest point of the WRAP area to the existing 19th Street Interceptor at the intersection of N.W. 27th Street and N.W. Elm Avenue. The needed firm capacity of the pump station was determined by using the contributing drainage area of approximately 475 acres (including the new Feather Ridge development) and the flow factor for Medium Density Residential of 790 gallons per acre per day. Finally, based on City standards for flows less than 1 million gallons per day a peak hourly flow factor of 3.0 was used. With this criteria, the pump station firm capacity of approximately 800 gallons per minute is determined. To convey the estimated flow, an 8-inch forcemain will be needed. The firm capacity should be re-evaluated once a more comprehensive regional master plan for the area is developed per the proposed land use type and associated area.

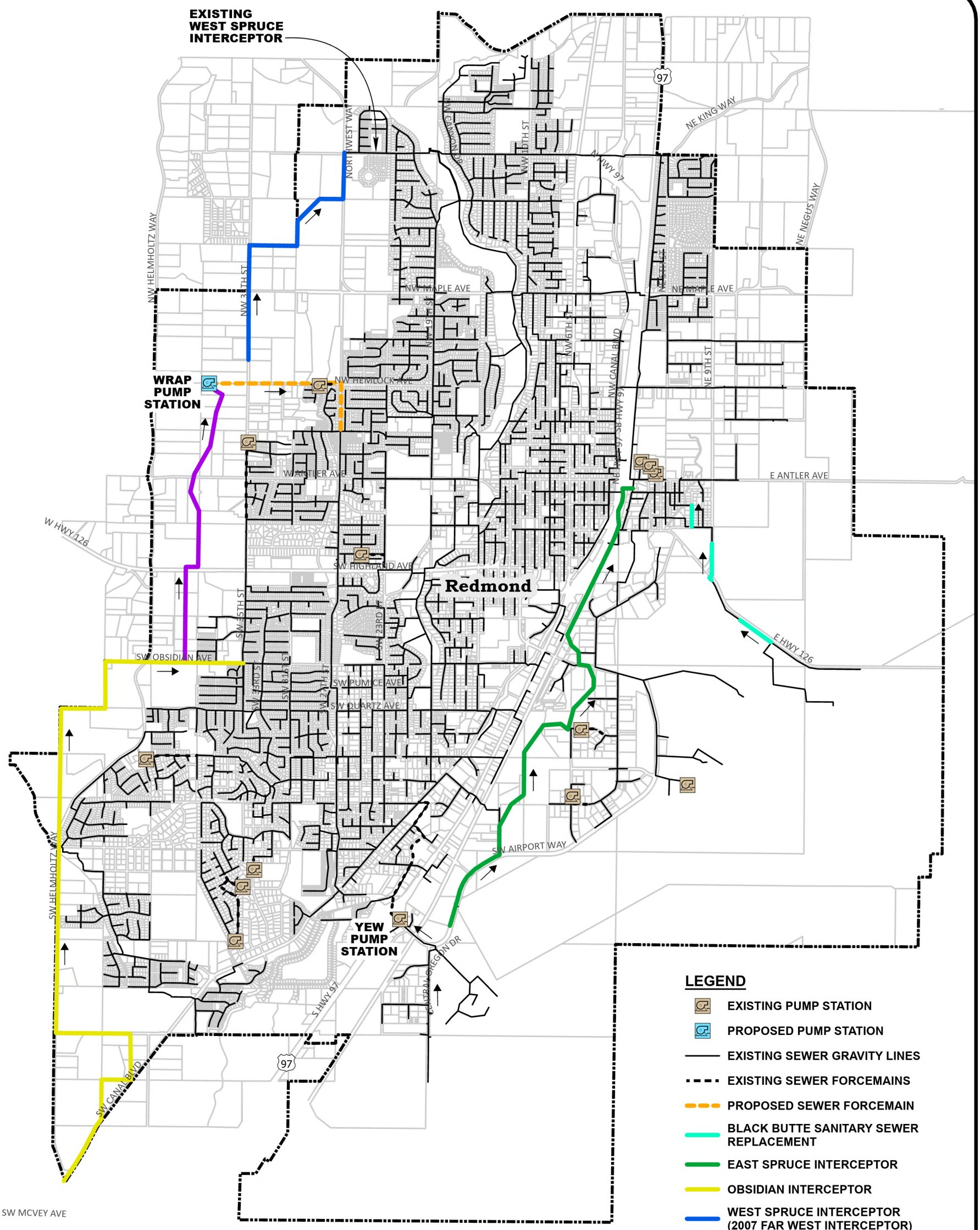
Summary

Table 6-1 describes the total project costs for the Improvement and Expansion Programs over the short-, medium-, and long-term durations, and Figure 6-1 shows the project locations. As shown in the CIP summary on Table 6-1, the total cost for all the projects is approximately $66 million. This includes approximately $4.5 million for the Improvement Program to upgrade existing pipes to larger diameters, and to increase pump station capacity. This also includes approximately $61.5 million for the Expansion Program to extend sewer service into areas of expected growth. Detailed cost estimates for each project can be found in the electronic CIP spreadsheet.

TABLE 6-1
CAPITAL IMPROVEMENT PLAN SUMMARY

	Capital Improvement Phasing			
	Short-Term (2025 to 2030)	**Medium-Term (2031 to 2035)**	**Long-Term (2035 and Beyond)**	**Total Cost**
Improvement Program	$2,130,000	$2,410,000	N/A	$4,540,000
Expansion Program	N/A	$42,750,000	$18,920,000	$61,670,000
All Programs Total Cost	$2,130,000	$45,160,000	$18,920,000	$66,210,000

N/A = Not Applicable



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anderson perry

CITY OF
REDMOND, OREGON
WASTEWATER COLLECTION SYSTEM MASTER PLAN

CAPITAL IMPROVEMENT PLAN

FIGURE
6-1

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Appendix G - Technical Memorandum 2 - West Cascade Trunk Development Review Sewer System Capacity Analysis

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APPENDIX A
City of Redmond, Oregon 2023 Sanitary Sewer Flow Study

City of Redmond, OR 2023 Sanitary Sewer Flow Study

Final Report Submitted to **City of Redmond**
August 17, 2023



ADS ENVIRONMENTAL SERVICES

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Tukwila, WA 98188

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City of Redmond, OR 2023 Sanitary Sewer Flow Study

Prepared For:

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3100 NW 19th Street Redmond, Oregon 97756

SUBJECT: City of Redmond, OR 2023 Sanitary Sewer Flow Study

Dear Mr. Kirchner,

ADS is pleased to submit the report for the project referenced above completed on behalf of the City of Redmond. The metering was conducted at seven (7) locations. The study was conducted during the period of Thursday, 18 May 2023 to Monday, 24 July 2023.

The report contains depth, velocity, and quantity hydrographs as well as daily long tables for the metering period. An Excel file containing depth, quantity, and velocity entities for the monitoring location in 5-minute format is also provided.

In addition, we would be happy to further explain any details about the report that may seem unclear. Should you have any questions or comments, you may contact the Project Manager, Sean Winder at 206.423.3453.

It has been our pleasure to be of service to you in the performance of this project. Thank you for choosing ADS products and services to meet your flow monitoring needs.

Sincerely,
ADS ENVIRONMENTAL SERVICES

Justin Hatch
Data Analyst

Scope and Methodology

Introduction

The City of Redmond entered into an agreement with ADS Environmental Services to conduct flow monitoring at (7) seven locations in the City of Redmond Sanitary Collection System. The study was scheduled for a period of (68) sixty-eight days. Once in place, the flow monitoring equipment was used to measure depth, velocity, and to quantify flows. Data obtained from the study will be used to calibrate hydraulic model and evaluate collections system performance.

Project Scope

The scope of this study involved using a flow monitor to quantify wastewater flow at the designated locations for the 68-day time period. Specifically, the study included the following key components.

- Investigate the proposed flow-monitoring sites for adequate hydraulic conditions
- Flow monitor installations
- Flow monitor confirmations and data collections
- Flow data analysis

Equipment installation was completed on May 17, 2023. The monitoring began on May 18, 2023 and was completed on July 24, 2023. Upon completion of the study, equipment was removed from the system.

Flow Monitoring Equipment



The ***ADS Triton+*** monitor was selected for this project. This flow monitor is an area velocity flow monitor that uses both the Continuity and Manning's equations to measure flow.

The ADS Triton+ monitor consists of data acquisition sensors and a battery-powered microcomputer. The microcomputer includes a processor unit, data storage, and an on-board clock to control and synchronize the sensor recordings. The monitor was programmed to acquire and store depth of flow and velocity readings at 5-minute intervals.

The Triton+ monitor features cross-checking using multiple technologies in each sensor for continuous running of comparisons and tolerances. The Triton+ monitor can support two (2) sets of sensors. The sensor option used for this project was:

The Peak Combo Sensor installed at the bottom of the pipe includes three types of data acquisition technologies.

The ***up looking ultrasonic depth*** uses sound waves from two independent transceivers to measure the distance from the sensor upward toward the flow surface; applying the speed of sound in the water and the temperature measured by

sensor to calculate depth.

The ***pressure depth*** is calculated by using a piezo-resistive crystal to determine the difference between hydrostatic and atmospheric pressure. The pressure sensor is temperature compensated and vented to the atmosphere through a desiccant filled breather tube.

To obtain ***peak velocity*****,** the sensor sends an ultrasonic signal at an angle upward through the widest cross-section of the oncoming flow. The signal is reflected by suspended particles, air bubbles, or organic matter with a frequency shift proportional to the velocity of the reflecting objects. The reflected signal is received by the sensor and processed using digital spectrum analysis to determine the peak flow velocity.

Installation

Installation of flow monitoring equipment typically proceeds in four steps. First, the site is investigated for safety and to determine physical and hydraulic suitability for the flow monitoring equipment. Second, the equipment is physically installed at the selected location. Third, the monitor is tested to assure proper operation of the velocity and depth of flow sensors and verify that the monitor clock is operational and synchronized to the master computer clock. Fourth, the depth and velocity sensors are confirmed and line confirmations are performed.

In pipes up to 42 inches in diameter, the sensors were mounted on expandable stainless steel rings, inserted at least a foot upstream into influent pipes and tightened against the inside walls of the pipes. Influent pipe installations reduce the influences of turbulence and backwater often caused by changes in channel geometry in manholes.





Data Collection, Confirmation, and Quality Assurance

Data collection was done remotely via wireless connect on a weekly basis via ADS Field Representatives. During the monitoring period, field crews visit each monitoring location to verify proper monitor operation and document field conditions. The following quality assurance steps are taken to assure the integrity of the collected data:

Measure power supplies: monitors were powered by dry cell battery packs. Voltages were recorded and battery packs replaced, as necessary. Separate batteries provided back-up power to memory allowing primary batteries to be replaced without loss of data.

Clock synchronization: Field crews synchronized monitor clocks to master clocks.

Confirm depth and velocity readings: Field crews descended into meter manholes to manually measure depths and velocities and compare them meter readings to confirm that they agreed. They also measured silt levels, if any, in the inverts of the pipes. Silt areas were subtracted from flow areas to compute true areas of flow.

Confirm average velocities through cross-sectional velocity profiles: Since ADS velocity sensors measure peak velocity, field crews collected cross-sectional velocity profiles in order to develop a relationship between peak and average velocity in lines that meet the hydraulic criteria.

Upload and Review Data: Data collected from the monitors were uploaded and reviewed by a Data Analyst for completeness, outliers and deviations in the flow patterns, which indicate system anomalies or equipment failure.

Flow Quantification Methods

There are two main equations used to measure open channel flow: the ***Continuity Equation*** and the ***Manning Equation.*** The Continuity Equation, which is considered the most accurate, can be used if both depth of flow and velocity are available. In cases where velocity measurements are not available or not practical to obtain, the Manning Equation can be used to estimate velocity from the depth data based on certain physical characteristics of the pipe (i.e. the slope and roughness of the pipe being measured). However, the Manning equation assumes uniform, steady flow hydraulic conditions with non-varying roughness, which are typically invalid assumptions in most sanitary sewers. The Continuity Equation was used exclusively for this study.

Continuity Equation

The Continuity Equation states that the flow quantity (Q) is equal to the wetted area (A) multiplied by the average velocity (V) of the flow.

Q = A * V

This equation is applicable in a variety of conditions including backwater, surcharge, and reverse flow.

Data Analysis and Presentation

Data Analysis

A flow monitor is typically programmed to collect data at 5-minute intervals throughout the monitoring period. The monitor stores raw data consisting of (1) the ultrasonic depth, (2) the peak velocity and (3) the pressure depth. The data is imported into ADS's proprietary software and is examined by a data analyst to verify its integrity. The data analyst also reviews the daily field reports and site visit records to identify conditions that would affect the collected data.

Velocity profiles and the line confirmation data developed by the field personnel are reviewed by the data analyst to identify inconsistencies and verify data integrity. Velocity profiles are reviewed and an average to peak velocity ratio is calculated for the site. This ratio is used in converting the peak velocity measured by the sensor to the average velocity used in the Continuity equation. The data analyst selects which depth sensor entity will be used to calculate the final depth information. Silt and/or debris are often present in sewer lines. When present, silt levels are measured at each site visit. They are reviewed by the data analyst and representative silt levels established. Silt reduces the cross sectional area of the flow where as debris causes depth to become deeper and slower. Calculated flow should remain consistent in both hydraulic conditions. Debris may result in reduced line capacity.

Occasionally the velocity sensor's performance may be compromised resulting in invalid readings sporadically during the monitoring period. This is generally caused by excessive debris (silt) blocking the sensor's crystals, shallow flows (~< 1") that may drop below the top of the sensor or very clear flows lacking the particles needed to measure rate. In order to use the Continuity equation to quantify the flow during these periods, a Data Analyst and/or Engineer will use the site's historical pipe curve (depth vs. velocity) data along with valid field confirmations to reconstitute and replace the false velocity recordings with expected velocity readings for a given historical depth along the curve.

Selections for the above parameters can be constant or can change during the monitoring period. While the data analysis process is described in a linear manner, it often requires an iterative approach to accurately complete.

Data Presentation

This type of flow monitoring project generates a large volume of data. To facilitate review of the data, results have been provided in graphical and tabular formats. The flow data is presented graphically in the form of scattergraphs and hydrographs. Hydrographs are based on one hour averaging. Tables are provided in daily average format. These tables show the flow rate for each day, along with the daily minimum and maximums, the times they were observed, the total daily flow, and total flow for the month (or monitoring period). The following explanation of terms may aid in interpretation of the tables and hydrographs.

DFINAL - Final calculated depth measurement (in inches)

QFINAL - Final calculated flow rate (in MGD)

VFINAL - Final calculated flow velocity (in feet per second)

REPORT TOTAL - Total volume of flow recorded for the indicated time period (in MG)

RED_MH0087

Site Commentary

SITE INFORMATION

Pipe	Circular 17.5 in H x 17.5 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study. Backwater conditions were not observed.

This site was positioned upstream of site RED_MH04B057. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Thursday, 18 May 2023 to Monday, 24 July 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	**DFINAL (in)**	**VFINAL (ft/s)**	**QFINAL (MGD - Total MG)**
Average	2.84	1.56	0.186
Minimum	1.58	0.72	0.039
Maximum	3.96	2.13	0.391
Min Time	06/12/2023 1:00:00 AM	07/01/2023 4:00:00 AM	06/01/2023 3:00:00 AM
Max Time	07/24/2023 9:00:00 AM	07/24/2023 9:00:00 AM	07/24/2023 9:00:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the one hour average.

DATA UPTIME

Data uptime observed during **Thursday, 18 May 2023 to Monday, 24 July 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

Redmond.TFM.OR23		Site Name
Flow Monitoring Site Report	ADS ENVIRONMENTAL SERVICES®	RED_MH0087

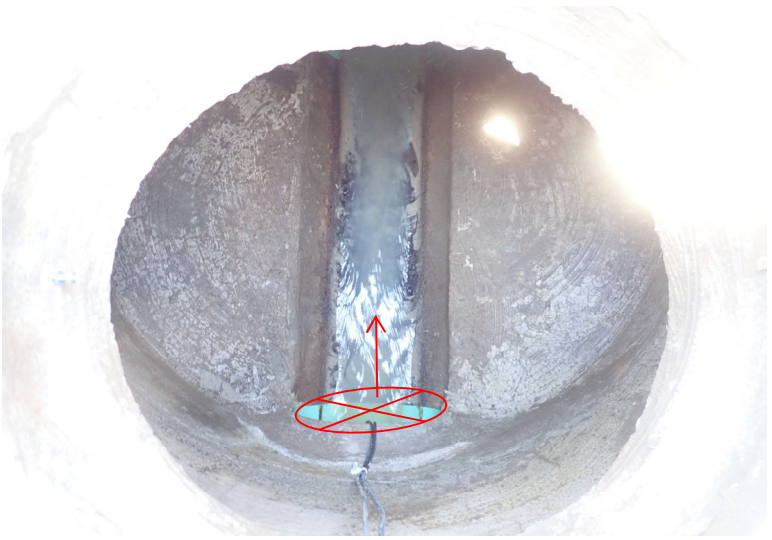
Site Address /Location:	1756 27th Pl, Redmond, OR			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	cone around m/h in front of house	Latitude:	44.2592233	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.1992943	17.50 X 17.50	Circular



Manhole #	System Characteristics
West interceptor 0087	Residential
Access	Traffic
Drive	None







ADS Project Name:	Redmond.TFM.OR23
ADS Project Number:	22927.11.325

Installation Information

Installation Date:	Installation Type:
Tuesday, May 16, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4), Smart Depth (CS5)	0 - 15 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
9:28:00 AM	17.50 X 17.50
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
2.88	N/A
Physical Offse CS5 (in)	Measurement Confidence (in)
1.38	0.38"
Peak Velocity (fps)	Velocity Sensor Offset (in)
2.08	0
Silt (in)	Silt Type
0	None

Hydraulic Comments:
Low depth, slow/moderate velocity, small waves

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
9.9'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

Hydrograph Report

RED_MH0087

Flow Monitor

RED_MH0087

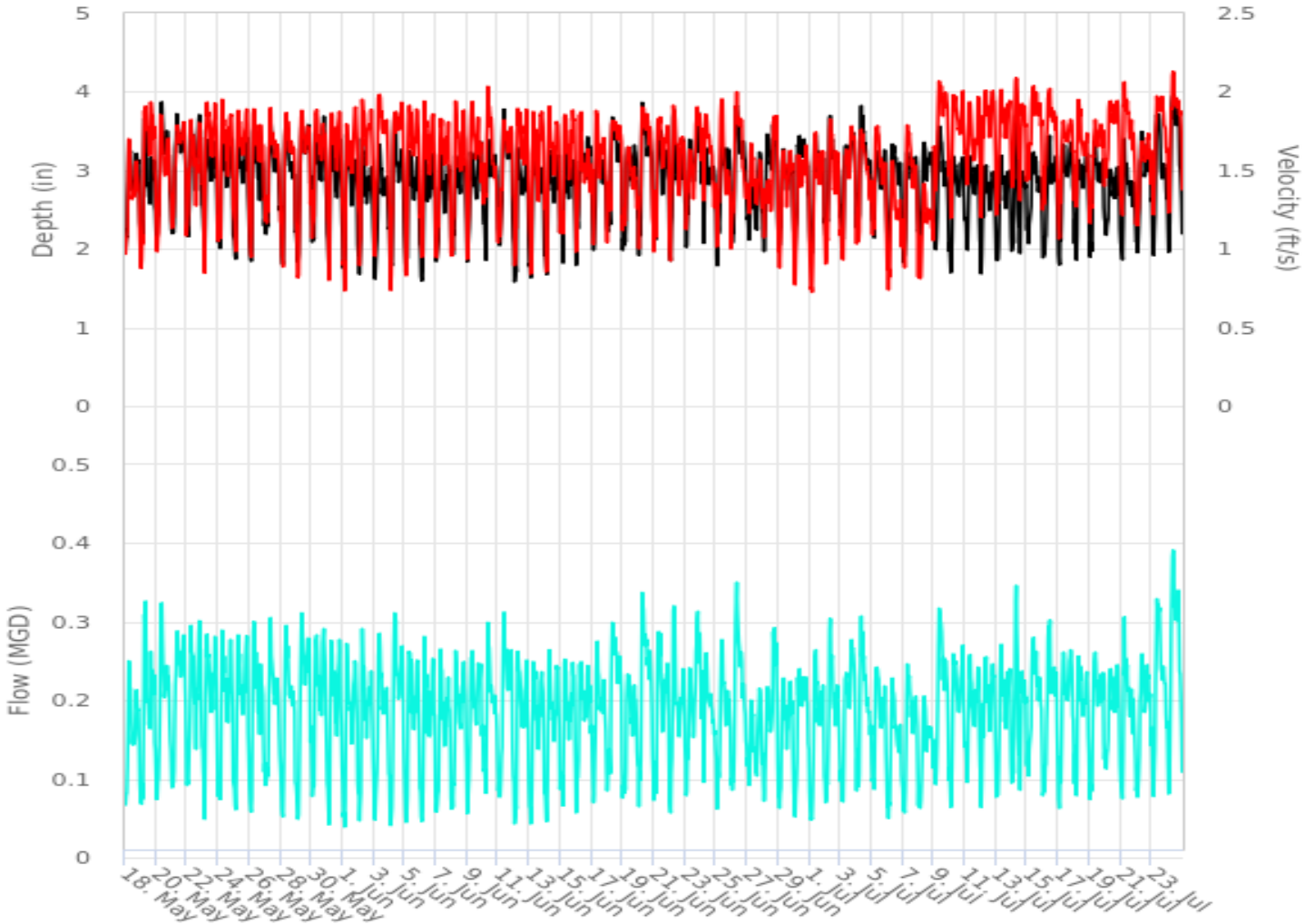
Pipe Height
17.50
in

Report Period

05/18/2023
To
07/24/2023

Legend

DFINAL
QFINAL
VFINAL



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Scattergraph Report

RED_MH0087

Flow Monitor

RED_MH0087

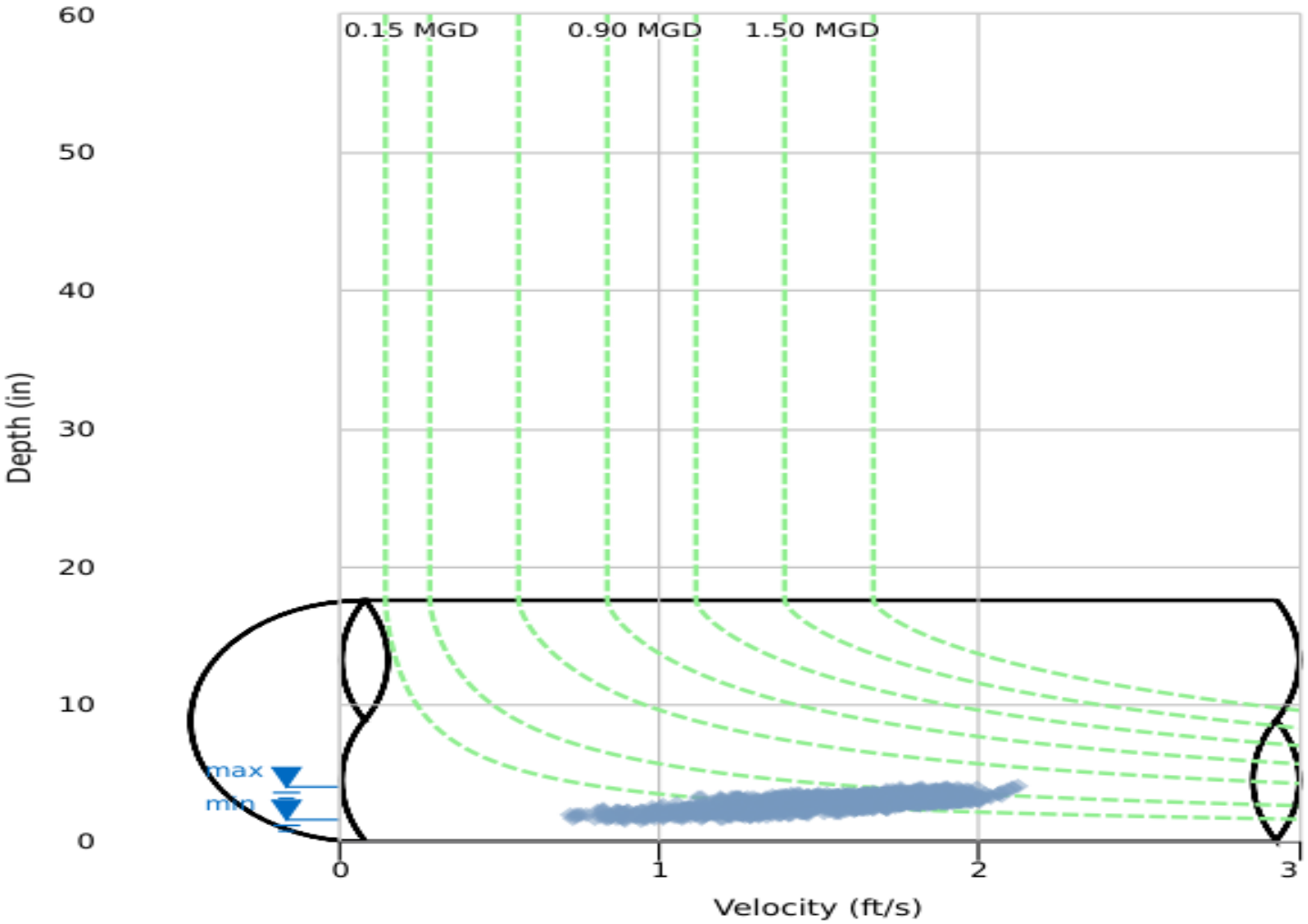
Pipe Height
17.50
in

Report Period

05/18/2023
To
07/24/2023

Legend

- DFINAL - VFINAL
- Iso-Q™
- Min-Max Depth



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Daily Tabular Report

05/18/2023 00:00 - 07/24/2023 23:59
RED_MH0087Pipe: Elliptical (17.5 in H x 17.5 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)					
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total
05/18/2023	01:45	1.90	09:30	3.82	2.82	00:30	0.86	06:50	1.86	1.34	01:45	0.057	09:30	0.316	0.158	0.158
05/19/2023	02:00	1.92	08:05	4.28	2.81	01:55	0.82	16:05	2.18	1.58	02:00	0.053	08:10	0.422	0.188	0.188
05/20/2023	01:35	1.96	08:10	4.70	3.06	01:55	0.81	08:10	2.28	1.47	01:55	0.058	08:10	0.532	0.195	0.195
05/21/2023	00:40	2.02	20:25	3.91	3.09	23:50	0.93	17:55	2.04	1.56	00:40	0.066	20:25	0.362	0.210	0.210
05/22/2023	02:20	2.03	18:30	4.07	3.08	00:50	0.81	21:50	2.10	1.55	00:50	0.061	18:30	0.378	0.205	0.205
05/23/2023	03:20	1.62	19:20	3.82	2.87	03:20	0.64	19:20	2.12	1.62	03:20	0.032	19:20	0.369	0.197	0.197
05/24/2023	03:20	1.79	19:20	3.90	2.87	00:05	0.81	06:35	2.16	1.59	03:20	0.048	06:35	0.377	0.193	0.193
05/25/2023	03:00	1.78	09:10	4.00	2.88	03:25	0.90	09:15	2.13	1.59	02:50	0.054	09:10	0.394	0.196	0.196
05/26/2023	03:15	1.80	07:35	3.83	2.82	01:30	0.80	10:15	2.12	1.54	01:30	0.047	10:15	0.363	0.184	0.184
05/27/2023	03:20	2.01	08:40	4.04	2.93	03:20	1.00	08:35	2.16	1.55	03:20	0.069	08:35	0.400	0.192	0.192
05/28/2023	03:55	1.76	10:05	3.99	2.85	04:30	0.79	13:00	2.04	1.50	04:30	0.046	10:00	0.375	0.183	0.183
05/29/2023	03:10	1.72	09:30	4.23	3.03	03:25	0.70	09:25	2.17	1.51	03:15	0.044	09:30	0.425	0.203	0.203
05/30/2023	01:55	1.96	18:30	4.03	2.99	02:00	0.95	06:25	2.11	1.59	02:00	0.065	06:25	0.382	0.204	0.204
05/31/2023	03:25	1.58	20:35	3.91	2.81	03:20	0.68	07:45	2.18	1.57	03:20	0.033	20:30	0.378	0.187	0.187
06/01/2023	03:30	1.63	06:45	3.74	2.73	02:55	0.66	18:55	2.12	1.52	03:30	0.034	06:50	0.340	0.174	0.174
06/02/2023	02:35	1.60	06:30	3.82	2.67	02:40	0.75	06:25	2.24	1.61	02:40	0.038	06:25	0.385	0.177	0.177
06/03/2023	02:20	1.55	09:25	3.82	2.60	02:05	0.85	09:25	2.18	1.64	02:10	0.040	09:25	0.379	0.175	0.175
06/04/2023	04:15	1.68	08:25	4.20	2.81	03:00	0.63	11:50	2.14	1.58	03:00	0.034	08:25	0.412	0.192	0.192
06/05/2023	02:25	1.69	06:25	3.70	2.68	02:00	0.70	06:25	2.13	1.57	02:00	0.039	06:25	0.355	0.177	0.177
06/06/2023	03:15	1.54	06:40	3.59	2.63	03:15	0.88	06:05	2.13	1.56	03:15	0.041	20:35	0.336	0.170	0.170
06/07/2023	01:05	1.74	20:55	3.72	2.67	01:00	0.77	09:40	2.05	1.50	01:00	0.043	20:55	0.329	0.165	0.165
06/08/2023	02:50	1.80	17:00	3.56	2.73	00:15	0.78	06:00	2.10	1.55	00:15	0.051	06:00	0.330	0.175	0.175
06/09/2023	00:35	1.74	20:10	3.74	2.84	00:35	0.86	07:55	2.11	1.58	00:35	0.048	06:10	0.346	0.189	0.189
06/10/2023	05:25	1.76	09:25	3.73	2.84	23:05	1.05	08:10	2.14	1.57	05:20	0.065	08:10	0.357	0.184	0.184
06/11/2023	23:50	1.85	12:20	3.92	2.96	00:15	0.93	17:40	2.03	1.54	02:20	0.067	12:20	0.362	0.197	0.197
06/12/2023	01:40	1.53	07:35	3.60	2.64	02:20	0.77	10:35	2.12	1.57	02:20	0.036	06:40	0.323	0.173	0.173
06/13/2023	03:30	1.55	08:05	3.74	2.64	02:20	0.66	09:20	2.19	1.52	02:20	0.031	09:20	0.354	0.167	0.167
06/14/2023	03:20	1.61	07:35	3.74	2.68	03:25	0.81	07:30	2.07	1.53	03:25	0.041	07:35	0.349	0.170	0.170
06/15/2023	04:35	1.67	05:55	3.53	2.74	04:25	0.86	19:15	2.08	1.58	04:25	0.047	05:55	0.324	0.177	0.177
06/16/2023	00:45	1.69	06:35	3.77	2.92	00:25	0.86	06:35	2.22	1.48	00:25	0.049	06:35	0.380	0.182	0.182
06/17/2023	03:20	1.90	09:05	3.82	2.82	03:25	0.88	08:05	2.08	1.54	03:25	0.056	09:05	0.359	0.180	0.180
06/18/2023	04:55	2.07	08:55	4.05	3.05	00:15	0.97	09:00	2.00	1.61	00:40	0.077	09:00	0.370	0.212	0.212
06/19/2023	02:40	1.84	08:25	3.70	2.84	05:00	0.97	10:10	1.93	1.41	02:40	0.062	08:25	0.314	0.167	0.167
06/20/2023	01:30	1.77	06:55	4.06	3.10	01:35	0.87	06:30	2.10	1.61	01:35	0.051	06:30	0.379	0.218	0.218
06/21/2023	03:55	1.87	10:25	3.92	2.92	00:35	0.83	08:00	2.05	1.59	03:55	0.056	10:30	0.354	0.197	0.197
06/22/2023	02:35	1.72	07:45	4.09	2.90	02:35	0.72	19:55	2.10	1.55	02:35	0.040	07:45	0.399	0.191	0.191
06/23/2023	04:05	1.89	18:55	3.98	3.02	04:10	0.91	19:00	2.10	1.55	04:10	0.058	19:00	0.374	0.201	0.201
06/24/2023	05:05	1.79	09:35	3.71	2.91	05:00	1.06	08:50	2.14	1.61	05:05	0.062	08:50	0.345	0.193	0.193
06/25/2023	02:50	1.59	13:25	3.72	2.84	23:50	0.85	07:55	2.13	1.46	02:50	0.046	08:55	0.349	0.174	0.174
06/26/2023	01:45	1.97	08:05	4.37	3.10	00:00	0.82	08:10	2.11	1.59	00:05	0.062	08:05	0.440	0.215	0.215
06/27/2023	02:55	1.85	16:45	3.60	2.65	02:30	0.93	16:45	1.96	1.42	02:40	0.059	16:45	0.314	0.151	0.151
06/28/2023	02:25	1.87	07:15	4.00	3.01	02:05	0.91	21:10	2.00	1.45	02:05	0.060	07:15	0.322	0.186	0.186
06/29/2023	00:05	1.83	08:15	3.69	2.81	00:05	0.68	19:50	1.85	1.37	00:05	0.041	08:15	0.303	0.161	0.161
06/30/2023	03:00	1.78	09:45	3.85	2.95	02:40	0.58	09:45	1.82	1.37	02:40	0.035	09:45	0.320	0.174	0.174
07/01/2023	04:40	1.85	21:10	3.78	2.79	04:20	0.59	09:25	1.95	1.35	04:20	0.037	09:25	0.334	0.162	0.162
07/02/2023	02:05	2.00	11:00	3.97	2.98	02:10	0.75	11:00	2.06	1.42	02:05	0.051	11:00	0.379	0.182	0.182
07/03/2023	04:00	1.84	11:55	3.95	3.03	04:05	0.74	17:40	2.07	1.47	04:00	0.045	17:40	0.374	0.194	0.194
07/04/2023	05:25	2.05	08:10	4.09	3.07	05:25	0.88	09:00	1.87	1.45	05:25	0.062	08:10	0.348	0.192	0.192
07/05/2023	03:50	1.87	17:40	3.85	2.86	02:15	0.91	11:45	2.00	1.46	03:50	0.057	17:40	0.337	0.175	0.175
07/06/2023	02:00	1.88	08:45	3.89	2.82	02:30	0.73	08:50	1.85	1.19	02:00	0.047	08:50	0.330	0.141	0.141
07/07/2023	01:25	1.71	17:20	3.66	2.77	03:45	0.79	06:40	2.01	1.43	01:25	0.051	06:40	0.311	0.166	0.166
07/08/2023	01:05	1.86	08:45	3.70	2.91	04:05	0.71	08:45	1.64	1.15	01:05	0.047	08:45	0.274	0.141	0.141
07/09/2023	23:55	1.80	10:20	3.89	2.83	03:30	1.23	21:55	2.21	1.82	23:50	0.076	08:30	0.353	0.214	0.214
07/10/2023	01:55	1.62	21:00	3.82	2.70	02:55	1.04	08:00	2.17	1.75	02:55	0.055	21:05	0.372	0.193	0.193
07/11/2023	04:55	1.74	07:05	3.53	2.69	04:55	1.21	07:05	2.24	1.69	04:55	0.067	07:05	0.350	0.183	0.183
07/12/2023	01:55	1.63	08:05	3.24	2.64	01:50	1.05	19:00	2.17	1.80	01:50	0.053	19:00	0.296	0.191	0.191
07/13/2023	04:10	1.59	08:50	3.37	2.61	00:45	1.08	07:30	2.16	1.73	04:10	0.055	07:30	0.308	0.183	0.183
07/14/2023	03:20	1.74	07:35	3.88	2.67	01:00	1.14	20:40	2.18	1.74	03:25	0.068	07:35	0.375	0.190	0.190
07/15/2023	01:00	1.95	14:50	3.67	2.75	00:40	1.34	08:25	2.21	1.80	00:45	0.093	08:25	0.357	0.201	0.201
07/16/2023	02:45	1.68	10:20	3.78	2.73	23:55	1.12	14:50	2.19	1.70	00:50	0.065	10:20	0.339	0.193	0.193
07/17/2023	02:15	1.70	08:45	3.84	2.85	02:05	0.95	08:45	2.00	1.62	02:05	0.051	08:45	0.351	0.194	0.194
07/18/2023	04:30	1.74	19:15	3.92	2.79	05:10	1.13	09:55	2.13	1.62	04:25	0.066	19:15	0.381	0.185	0.185
07/19/2023	01:30	1.76	07:45	3.79	2.80	01:35	1.04	18:40	2.03	1.60	01:30	0.059	06:55	0.326	0.186	0.186
07/20/2023	23:25	2.07	09:05	3.56	2.69	23:20	1.35	07:00	2.22	1.77	23:25	0.097	09:05	0.349	0.191	0.191
07/21/2023	03:10	1.67	06:05	3.85	2.66	02:55	1.06	06:10	2.23	1.69	02:55	0.056	06:05	0.384	0.182	0.182
07/22/2023	02:15	1.74	08:30	4.07	2.89	02:30	0.95	17:15	1.97	1.52	02:30	0.056	08:30	0.358	0.185	0.185
07/23/2023	03:20	1.84	08:40	4.22	2.97	02:30	1.10	18:25	2.20	1.74	02:30	0.069	08:40	0.402	0.220	0.220
07/24/2023	02:25	1.94	07:20	4.39	3.19	02:25	1.12	08:10	2.27	1.78	02:25	0.074	16:45	0.450	0.253	0.253

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	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			12.657
Average	2.84	1.56	0.186

RED_MH0163

Site Commentary

SITE INFORMATION

Pipe	Circular (18 in H x 18 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study. Backwater conditions were not observed.

This site was positioned upstream of site RED_MH04C002. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Thursday, 18 May 2023 to Monday, 24 July 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	**DFINAL (in)**	**VFINAL (ft/s)**	**QFINAL (MGD - Total MG)**
Average	3.00	9.38	1.196
Minimum	2.16	6.90	0.543
Maximum	3.68	10.88	1.823
Min Time	07/11/2023 2:00:00 AM	07/13/2023 3:00:00 AM	07/13/2023 3:00:00 AM
Max Time	06/16/2023 10:00:00 AM	07/23/2023 12:00:00 PM	06/16/2023 10:00:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the one hour average.

DATA UPTIME

Data uptime observed during **Thursday, 18 May 2023 to Monday, 24 July 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	99.954
VFINAL (ft/s)	99.954
QFINAL (MGD - Total MG)	99.954

Redmond.TFM.OR23

Flow Monitoring Site Report

Site Name

RED_MH0163

Site Address /Location:	SW 15th St @, SW Black Butte Blvd, Redmond, OR			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	cone around area	Latitude:	44.2765001	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.1841154	18 X 18	Circular



Manhole #	System Characteristics
A interceptor 0163	Residential
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Tuesday, May 16, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4), Smart Depth (CS5)	0 - 15 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
10:57:00 AM	18 X 18
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
2.75	N/A
Physical Offse CS5 (in)	Measurement Confidence (in)
1.38	0.38"
Peak Velocity (fps)	Velocity Sensor Offset (in)
12	
Silt (in)	Silt Type
0	None

Hydraulic Comments:

Low depth, fast velocity, choppy flow

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
11.6'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

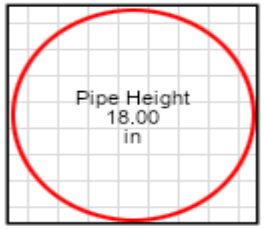
ADS Project Name:	Redmond.TFM.OR23
ADS Project Number:	22927.11.325

Hydrograph Report

RED_MH0163

Flow Monitor

RED_MH0163



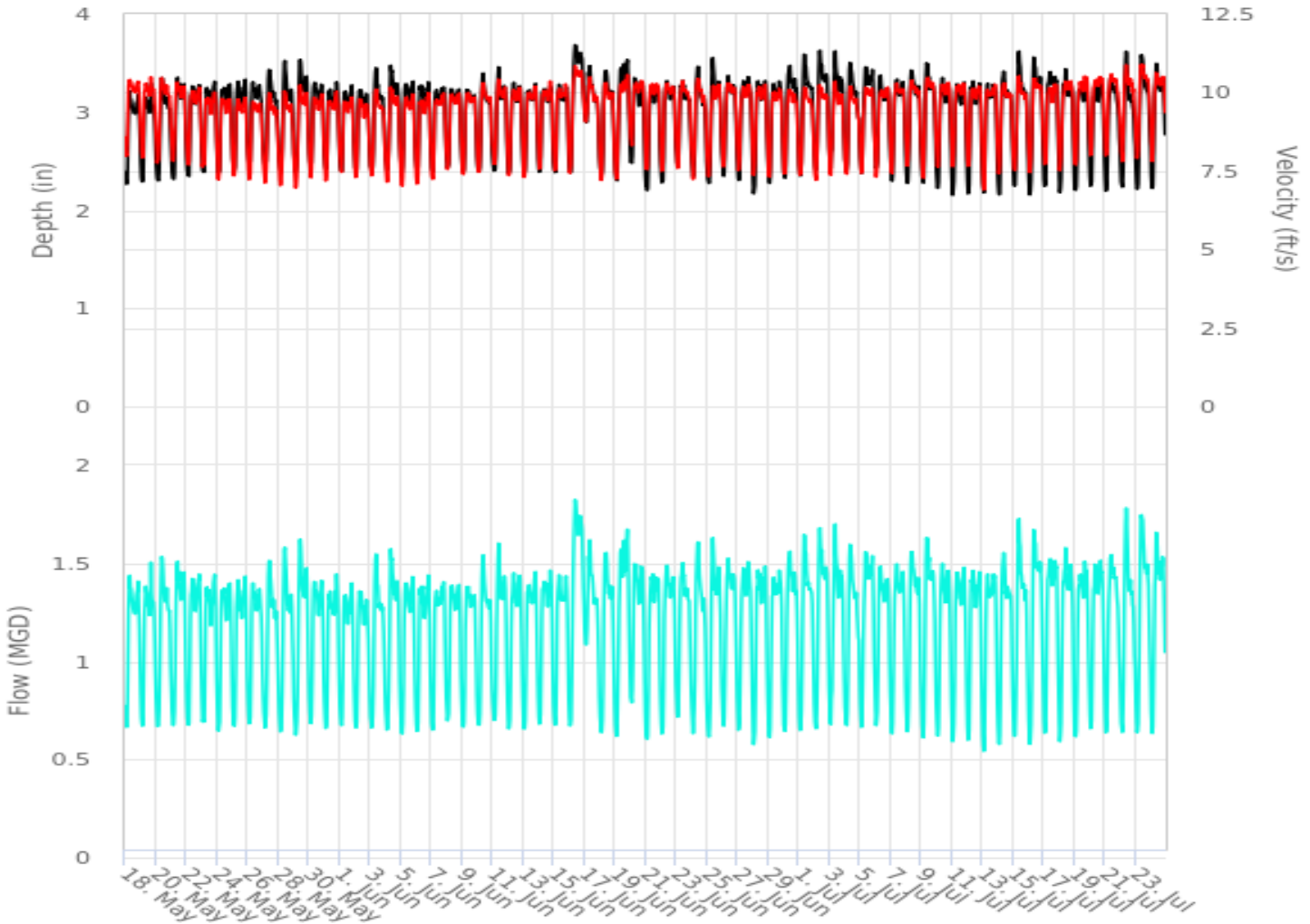
Report Period

05/18/2023
To
07/24/2023

Legend

DFINAL
QFINAL
VFINAL





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Scattergraph Report

RED_MH0163

Flow Monitor

RED_MH0163

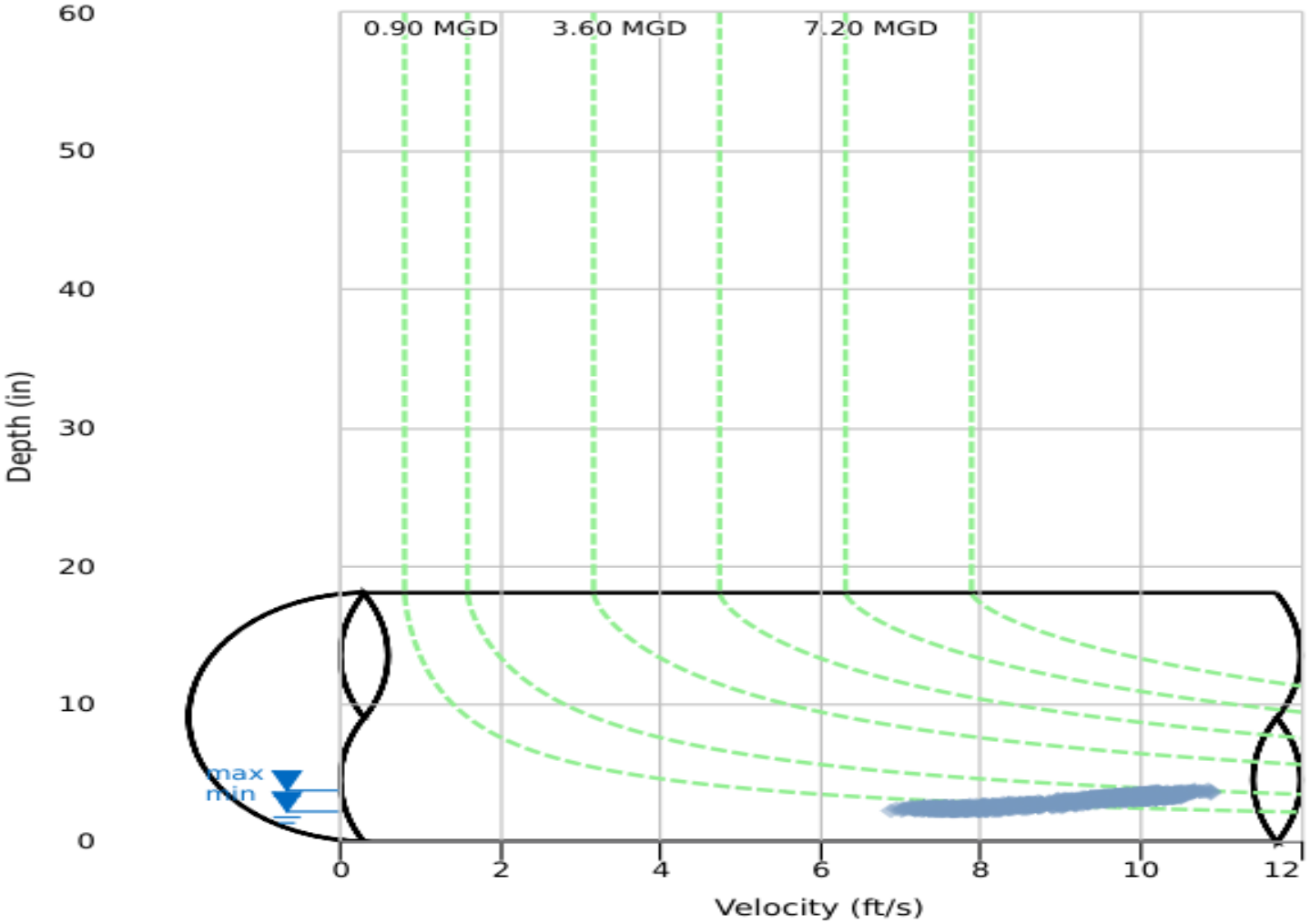
Pipe Height
18.00
in

Report Period

05/18/2023
To
07/24/2023

Legend

- DFINAL - VFINAL
- Iso-Q™
- Min-Max Depth



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Daily Tabular Report

05/18/2023 00:00 - 07/24/2023 23:59
RED_MH0163Pipe: Elliptical (18 in H x 18 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)					
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total
05/18/2023	02:40	2.25	21:45	3.26	2.89	03:30	7.71	06:55	10.59	9.74	03:30	0.640	21:45	1.480	1.173	1.173
05/19/2023	03:55	2.27	17:05	3.43	2.88	04:05	7.67	17:00	10.91	9.62	04:05	0.642	17:05	1.650	1.155	1.155
05/20/2023	04:15	2.29	10:55	3.42	2.89	05:00	7.40	11:10	10.72	9.51	05:00	0.632	11:10	1.611	1.153	1.153
05/21/2023	05:15	2.29	11:05	3.40	2.95	05:10	7.64	10:30	10.61	9.49	05:10	0.654	11:05	1.545	1.181	1.181
05/22/2023	04:50	2.33	12:35	3.33	2.97	04:55	7.43	21:25	10.37	9.36	04:50	0.649	12:35	1.494	1.175	1.175
05/23/2023	04:30	2.36	22:00	3.38	2.98	02:25	7.33	20:15	10.42	9.23	02:25	0.661	20:15	1.515	1.165	1.165
05/24/2023	03:40	2.36	21:00	3.36	2.98	03:30	7.06	20:35	10.16	9.10	03:30	0.630	21:00	1.477	1.151	1.151
05/25/2023	04:05	2.39	10:35	3.45	3.01	04:10	7.09	10:55	10.29	9.07	04:05	0.638	10:55	1.564	1.159	1.159
05/26/2023	03:40	2.45	11:05	3.38	3.01	04:00	6.84	09:55	9.99	8.98	04:00	0.638	11:05	1.474	1.150	1.150
05/27/2023	04:40	2.41	10:30	3.48	3.00	04:30	6.87	11:35	10.18	8.92	04:40	0.637	11:15	1.565	1.137	1.137
05/28/2023	04:50	2.37	10:55	3.76	3.00	05:50	6.80	10:55	10.73	8.95	05:50	0.608	10:55	1.861	1.145	1.145
05/29/2023	04:50	2.33	12:10	3.60	3.04	04:15	6.80	11:50	10.46	9.05	04:50	0.593	12:05	1.689	1.185	1.185
05/30/2023	04:50	2.44	10:05	3.37	3.01	04:40	7.12	20:40	10.13	9.14	04:40	0.663	20:30	1.462	1.168	1.168
05/31/2023	03:55	2.40	21:15	3.37	2.98	03:40	7.07	20:15	10.25	9.11	03:55	0.642	20:15	1.497	1.147	1.147
06/01/2023	04:50	2.38	20:20	3.31	2.94	04:10	7.23	20:35	10.08	9.09	04:10	0.654	20:35	1.440	1.120	1.120
06/02/2023	04:10	2.37	10:40	3.28	2.95	03:30	7.09	11:30	10.04	9.04	03:50	0.637	08:30	1.402	1.121	1.121
06/03/2023	04:20	2.36	11:05	3.49	2.98	03:10	7.04	09:30	10.33	9.07	03:10	0.628	11:05	1.584	1.145	1.145
06/04/2023	03:40	2.37	09:30	3.56	3.01	04:35	6.90	11:30	10.39	9.07	03:35	0.623	09:30	1.659	1.167	1.167
06/05/2023	03:10	2.36	20:45	3.37	3.00	03:10	6.83	10:35	10.12	9.05	03:10	0.605	09:35	1.468	1.156	1.156
06/06/2023	02:25	2.37	20:45	3.39	2.99	03:35	6.88	20:50	10.17	9.07	02:25	0.620	20:45	1.499	1.153	1.153
06/07/2023	03:45	2.37	19:45	3.30	2.99	03:45	6.95	19:45	10.13	9.16	03:45	0.617	19:45	1.455	1.160	1.160
06/08/2023	03:05	2.41	09:50	3.31	2.98	02:20	7.27	10:15	10.33	9.27	02:20	0.665	10:15	1.488	1.168	1.168
06/09/2023	03:20	2.37	10:55	3.29	2.96	03:25	7.17	09:30	10.24	9.23	03:25	0.640	09:30	1.450	1.150	1.150
06/10/2023	03:35	2.38	09:00	3.44	2.95	03:45	7.19	11:10	10.50	9.27	03:45	0.646	10:45	1.576	1.156	1.156
06/11/2023	05:10	2.38	10:05	3.54	2.98	03:55	7.34	10:25	10.57	9.38	05:10	0.661	10:10	1.667	1.187	1.187
06/12/2023	02:50	2.35	10:25	3.39	2.97	02:30	6.91	19:40	10.54	9.31	02:30	0.615	10:25	1.533	1.170	1.170
06/13/2023	03:10	2.37	20:35	3.39	2.97	02:10	7.06	19:20	10.51	9.33	03:40	0.631	20:30	1.537	1.172	1.172
06/14/2023	02:55	2.38	19:50	3.33	2.98	02:05	7.27	19:25	10.64	9.43	02:05	0.652	19:50	1.540	1.191	1.191
06/15/2023	03:35	2.37	09:40	3.35	2.97	02:25	7.17	20:45	10.55	9.41	02:25	0.648	09:45	1.526	1.184	1.184
06/16/2023	03:10	2.36	10:30	3.73	3.25	03:05	7.02	10:45	11.06	9.83	03:05	0.628	10:25	1.889	1.420	1.420
06/17/2023	23:50	2.73	07:30	3.55	3.14	23:30	8.67	08:55	10.91	9.77	23:50	0.953	08:55	1.675	1.311	1.311
06/18/2023	03:20	2.34	09:35	3.52	2.98	04:50	6.96	11:20	10.58	9.26	04:50	0.610	09:35	1.634	1.175	1.175
06/19/2023	04:25	2.26	15:05	3.74	3.08	03:55	7.01	21:05	11.00	9.47	03:00	0.591	15:05	1.872	1.265	1.265
06/20/2023	03:10	2.45	07:35	3.40	3.02	02:05	8.12	18:25	10.95	9.74	03:05	0.762	18:25	1.594	1.244	1.244
06/21/2023	03:40	2.15	18:50	3.33	2.92	01:35	7.18	18:05	10.59	9.47	03:35	0.564	18:50	1.524	1.170	1.170
06/22/2023	02:40	2.23	09:50	3.45	2.98	02:45	7.29	18:00	10.72	9.50	02:40	0.596	09:50	1.630	1.202	1.202
06/23/2023	03:30	2.41	13:45	3.42	3.00	03:10	7.39	11:10	10.74	9.48	03:40	0.683	10:20	1.581	1.206	1.206
06/24/2023	03:15	2.31	11:10	3.58	2.97	03:10	7.01	11:35	11.02	9.37	03:10	0.604	11:10	1.718	1.183	1.183
06/25/2023	04:20	2.26	10:30	3.63	2.98	04:30	7.00	10:50	10.74	9.29	04:30	0.591	10:30	1.702	1.182	1.182
06/26/2023	03:15	2.32	10:10	3.42	3.00	03:05	7.25	13:25	10.64	9.50	03:05	0.630	10:15	1.599	1.213	1.213
06/27/2023	03:05	2.24	18:05	3.43	2.99	02:45	7.30	17:55	10.68	9.47	03:05	0.610	17:55	1.603	1.205	1.205
06/28/2023	02:30	2.13	20:50	3.42	2.97	03:05	7.05	19:00	10.67	9.41	03:05	0.542	09:30	1.565	1.187	1.187
06/29/2023	03:35	2.24	18:10	3.43	2.99	02:20	6.99	18:10	10.55	9.30	03:35	0.595	18:10	1.601	1.184	1.184
06/30/2023	03:25	2.27	11:15	3.67	3.07	03:20	6.99	11:15	10.51	9.28	03:20	0.586	11:15	1.757	1.226	1.226
07/01/2023	03:05	2.30	09:45	3.67	3.08	03:05	7.16	09:40	10.34	9.19	03:05	0.609	09:40	1.718	1.220	1.220
07/02/2023	03:45	2.32	10:05	3.78	3.11	03:45	6.83	09:55	10.60	9.26	03:45	0.590	10:05	1.807	1.254	1.254
07/03/2023	03:20	2.38	10:25	3.69	3.10	03:05	7.06	09:20	10.58	9.30	03:05	0.645	10:25	1.757	1.247	1.247
07/04/2023	04:10	2.35	09:05	3.62	3.03	04:20	7.12	09:00	10.78	9.19	04:10	0.630	09:00	1.746	1.189	1.189
07/05/2023	03:15	2.29	09:50	3.55	3.09	04:20	7.09	18:40	10.42	9.37	03:15	0.610	09:50	1.658	1.250	1.250
07/06/2023	02:35	2.33	09:10	3.47	3.03	02:40	6.84	12:05	10.56	9.41	02:40	0.610	12:05	1.575	1.216	1.216
07/07/2023	03:35	2.20	11:10	3.47	3.00	03:25	7.22	14:15	10.69	9.49	03:35	0.588	11:10	1.606	1.210	1.210
07/08/2023	04:45	2.21	08:45	3.51	3.00	03:25	7.46	10:40	10.71	9.50	03:25	0.602	10:40	1.639	1.214	1.214
07/09/2023	04:50	2.20	09:25	3.58	3.01	04:25	7.11	10:10	10.85	9.48	04:45	0.583	11:00	1.693	1.226	1.226
07/10/2023	03:15	2.17	16:50	3.45	2.96	03:25	7.22	21:15	10.74	9.53	03:25	0.567	16:50	1.588	1.195	1.195
07/11/2023	02:15	2.11	19:45	3.40	2.96	03:20	7.39	20:10	10.75	9.53	02:15	0.559	20:10	1.569	1.193	1.193
07/12/2023	02:40	2.10	10:55	3.37	2.96	02:35	7.33	10:45	10.53	9.45	02:35	0.553	10:45	1.543	1.185	1.185
07/13/2023	03:20	2.14	09:55	3.38	2.96	03:05	6.69	21:05	10.67	9.34	03:00	0.513	21:05	1.520	1.175	1.175
07/14/2023	03:25	2.12	09:25	3.48	2.97	03:20	7.12	09:25	10.73	9.42	03:20	0.541	09:25	1.661	1.191	1.191
07/15/2023	04:15	2.18	10:35	3.71	3.02	04:05	7.11	10:40	11.00	9.39	04:15	0.563	10:50	1.826	1.218	1.218
07/16/2023	03:20	2.12	09:40	3.65	3.02	03:35	7.00	11:20	11.04	9.48	03:35	0.541	09:40	1.781	1.235	1.235
07/17/2023	02:40	2.19	11:15	3.49	3.04	03:05	7.40	13:00	10.68	9.51	03:05	0.586	13:00	1.601	1.242	1.242
07/18/2023	02:50	2.12	11:35	3.51	3.00	02:40	7.24	19:40	10.75	9.56	02:50	0.560	11:20	1.659	1.224	1.224
07/19/2023	02:35	2.15	18:15	3.39	2.95	03:00	7.27	17:10	10.86	9.63	03:00	0.572	17:10	1.611	1.202	1.202
07/20/2023	03:00	2.20	09:45	3.48	2.97	03:55	7.61	12:15	10.81	9.78	02:45	0.611	18:20	1.623	1.228	1.228
07/21/2023	02:45	2.15	11:40	3.43	2.95	02:50	7.57	12:00	10.90	9.75	02:45	0.587	09:15	1.611	1.218	1.218
07/22/2023	04:20	2.21	11:05	3.77	2.96	04:25	7.49	10:20	11.10	9.75	04:25	0.603	11:05	1.878	1.229	1.229
07/23/2023	04:15	2.17	09:35	3.72	3.02	04:15	7.51	09:40	11.21	9.84	04:15	0.589	09:35	1.875	1.278	1.278
07/24/2023	03:30	2.17	09:30	3.62	3.02	03:35	7.49	09:20	10.93	9.79	03:35	0.592	09:30	1.777	1.266	1.265

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	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			81.321
Average	3.00	9.38	1.196

RED_MH03B042

Site Commentary

SITE INFORMATION

Pipe	Elliptical (23.25 in H x 24.13 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were experienced during the study. Backwater conditions were observed from **15 June to 26 June, 18 July to 20 July, and 22 July to 23 July.**

Average flow depth, velocity, and quantity data observed during **Thursday, 18 May 2023 to Monday, 24 July 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	**DFINAL (in)**	**VFINAL (ft/s)**	**QFINAL (MGD - Total MG)**
Average	3.84	1.94	0.421
Minimum	2.35	0.53	0.098
Maximum	5.77	3.88	0.911
Min Time	06/15/2023 2:00:00 AM	06/18/2023 4:00:00 AM	07/05/2023 3:00:00 AM
Max Time	06/15/2023 9:00:00 PM	05/19/2023 5:00:00 PM	05/19/2023 5:00:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the one hour average.

DATA UPTIME

Data uptime observed during **Thursday, 18 May 2023 to Monday, 24 July 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

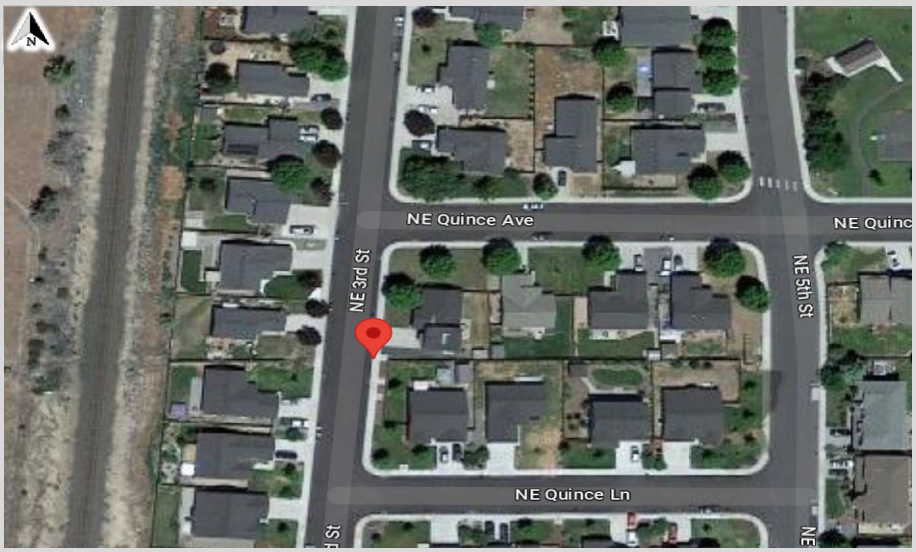
Redmond.TFM.OR23

Flow Monitoring Site Report

Site Name

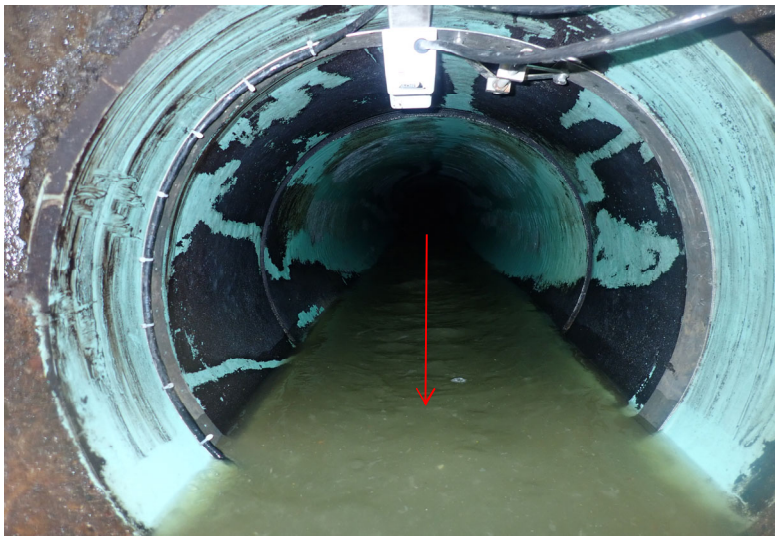
RED_MH03B042

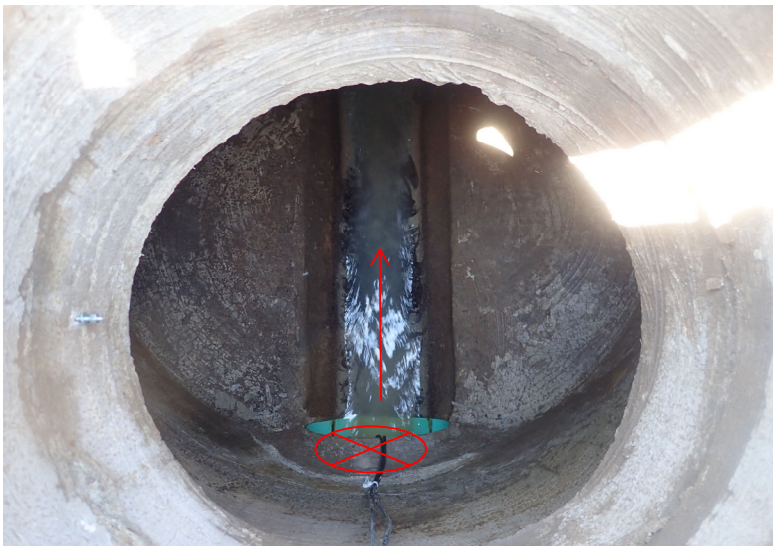
Site Address /Location:	2410 NE 3rd St, Redmond,OR			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Cone around M/H	Latitude:	44.2982581	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.1649724	23.25 X 24.13	Elliptical



Manhole #	System Characteristics
East 03B042	Residential
Access	Traffic
Drive	Light







Installation Information

Installation Date:	Installation Type:
Tuesday, May 16, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4), Smart Depth (CS5)	0 - 15 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
11:27:00 AM	23.25 X 24.13
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
4.50	N/A
Physical Offse CS5 (in)	Measurement Confidence (in)
1.38	0.38"
Peak Velocity (fps)	Velocity Sensor Offset (in)
2.9	0
Silt (in)	Silt Type
0	None

Hydraulic Comments:

Good depth, moderate velocity, small waves

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
9.5'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Redmond.TFM.OR23
ADS Project Number:	22927.11.325

Hydrograph Report

RED_MH03B042

Flow Monitor

RED_MH03B042

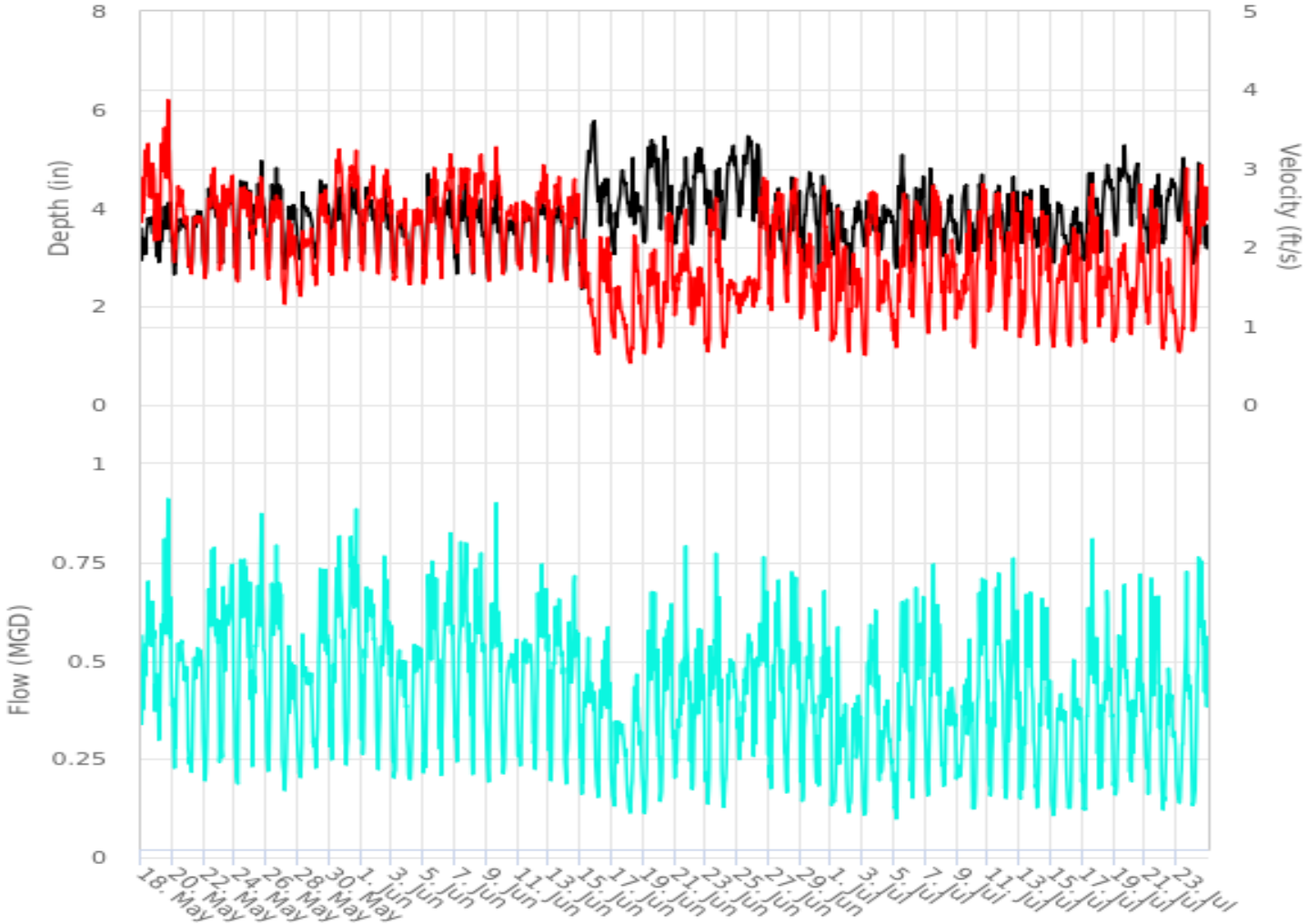
Pipe Height
23.25
in

Report Period

05/18/2023
To
07/24/2023

Legend

DFINAL
QFINAL
VFINAL



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Scattergraph Report

RED_MH03B042

Flow Monitor

RED_MH03B042

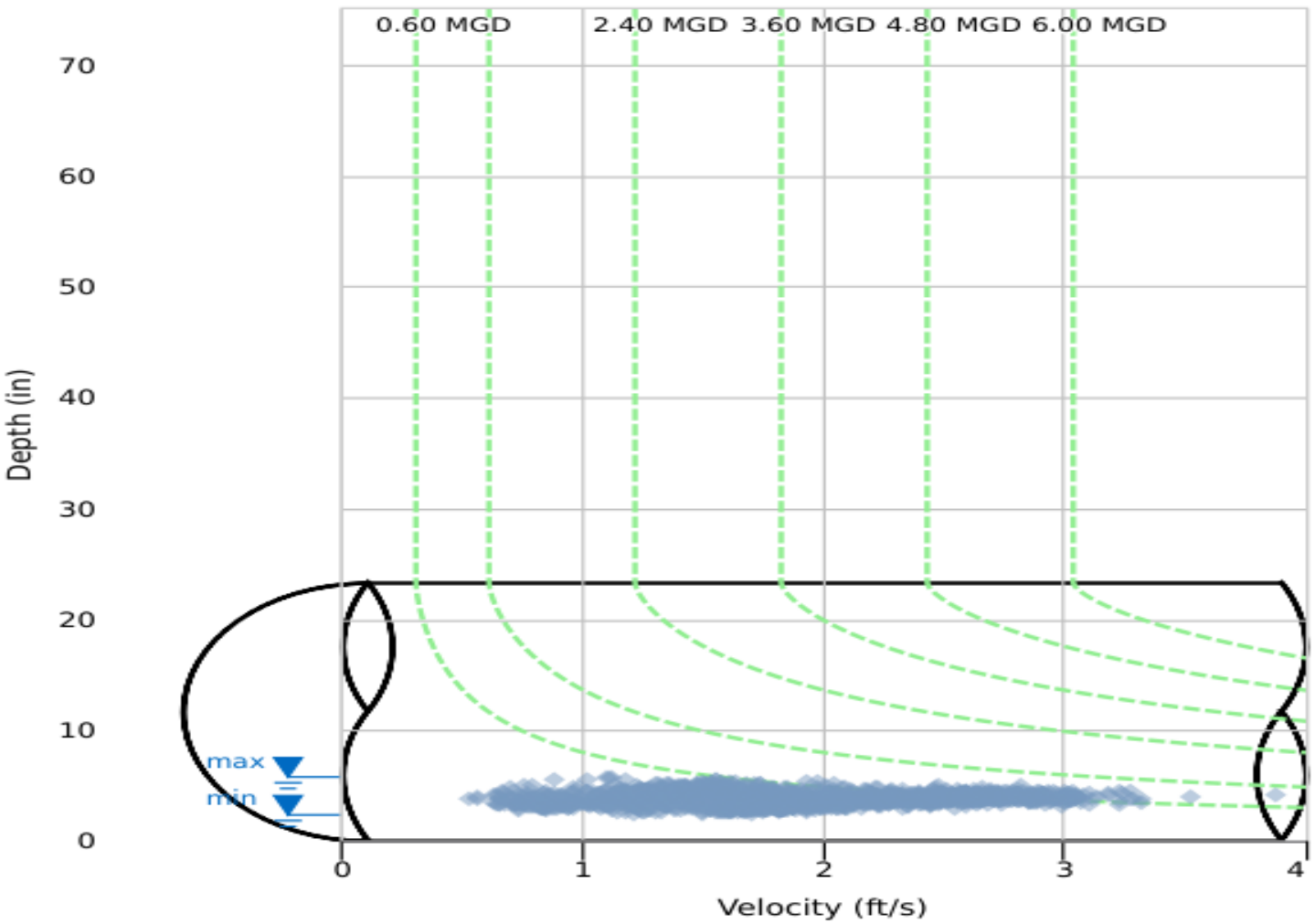
Pipe Height
23.25
in

Report Period

05/18/2023
To
07/24/2023

Legend

- DFINAL - VFINAL
- Iso-Q™
- Min-Max Depth



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Daily Tabular Report

05/18/2023 00:00 - 07/24/2023 23:59

RED_MH03B042Pipe: Elliptical (23.25 in H x 24.13 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)					
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total
05/18/2023	01:45	2.82	11:20	4.01	3.49	21:30	1.95	06:15	3.60	2.77	01:55	0.308	11:15	0.816	0.519	0.519
05/19/2023	03:40	2.76	15:45	4.43	3.54	03:10	2.00	17:10	4.49	2.87	03:45	0.290	17:25	1.013	0.557	0.557
05/20/2023	03:45	2.58	00:50	4.21	3.46	03:50	1.69	09:10	3.09	2.37	03:45	0.205	12:55	0.635	0.443	0.443
05/21/2023	05:25	2.61	14:15	4.07	3.45	05:20	1.47	15:50	2.79	2.15	05:20	0.180	14:45	0.581	0.406	0.406
05/22/2023	02:25	2.50	07:05	4.88	3.78	02:10	1.49	13:25	3.16	2.40	02:25	0.175	13:35	0.938	0.524	0.524
05/23/2023	00:15	2.76	06:55	4.74	3.78	04:05	1.48	20:15	3.12	2.38	00:10	0.201	06:50	0.833	0.516	0.516
05/24/2023	04:35	2.50	14:45	4.99	3.84	04:15	1.36	14:45	3.23	2.36	04:15	0.158	14:45	1.004	0.529	0.529
05/25/2023	02:40	2.62	16:10	5.55	3.96	02:30	1.55	15:50	3.31	2.37	02:30	0.194	16:05	1.158	0.541	0.541
05/26/2023	02:10	2.72	15:35	5.35	3.93	01:55	1.38	08:30	3.05	2.32	01:55	0.182	15:35	0.959	0.532	0.532
05/27/2023	04:15	2.72	17:10	4.23	3.53	04:40	1.18	13:45	2.55	1.83	04:40	0.158	13:45	0.600	0.357	0.357
05/28/2023	02:55	2.80	07:25	4.58	3.67	04:05	1.23	07:20	2.40	1.88	04:05	0.173	07:25	0.655	0.387	0.387
05/29/2023	03:15	2.85	10:05	4.92	3.83	03:25	1.36	10:00	3.17	2.23	03:15	0.189	09:55	0.940	0.492	0.492
05/30/2023	03:15	2.79	16:00	4.87	3.77	04:30	1.45	15:50	3.83	2.50	03:10	0.217	15:50	1.146	0.538	0.538
05/31/2023	02:25	2.74	09:45	5.03	3.82	02:10	1.64	17:45	3.48	2.61	02:10	0.216	09:45	1.020	0.574	0.574
06/01/2023	23:10	2.69	09:20	4.73	3.79	03:10	1.57	19:40	3.18	2.48	03:10	0.245	09:15	0.854	0.530	0.530
06/02/2023	03:05	2.71	12:05	4.96	3.65	03:00	1.56	19:45	3.46	2.45	03:00	0.203	12:00	1.028	0.500	0.500
06/03/2023	03:15	2.61	09:10	3.94	3.39	03:25	1.42	19:45	2.68	2.15	03:25	0.174	08:55	0.557	0.392	0.392
06/04/2023	03:40	2.59	21:00	4.04	3.45	03:40	1.32	16:00	2.71	2.15	03:40	0.159	21:05	0.585	0.406	0.406
06/05/2023	00:30	2.75	07:45	5.09	3.76	00:50	1.46	13:35	3.21	2.40	00:30	0.199	13:30	0.929	0.515	0.515
06/06/2023	03:25	2.66	17:25	4.76	3.68	03:25	1.46	17:10	3.33	2.57	03:25	0.183	17:20	0.963	0.532	0.532
06/07/2023	03:20	2.52	09:25	4.72	3.65	04:00	1.73	20:35	3.42	2.62	03:20	0.227	09:20	0.923	0.535	0.535
06/08/2023	03:25	2.51	16:00	4.93	3.58	02:50	1.45	16:00	3.46	2.61	02:50	0.176	16:00	1.060	0.518	0.518
06/09/2023	03:45	2.44	15:25	5.16	3.50	04:45	1.48	15:25	3.69	2.51	03:45	0.169	15:25	1.205	0.491	0.491
06/10/2023	03:25	2.54	22:35	4.17	3.39	02:25	1.65	13:05	2.95	2.26	02:15	0.199	22:40	0.654	0.412	0.412
06/11/2023	04:20	2.72	18:40	3.98	3.50	03:30	1.58	09:40	2.87	2.27	04:00	0.212	09:40	0.628	0.433	0.433
06/12/2023	03:45	2.74	13:20	4.89	3.70	03:35	1.57	19:10	3.17	2.45	03:15	0.206	19:00	0.883	0.513	0.513
06/13/2023	03:40	2.54	15:55	4.81	3.58	02:25	1.41	15:45	3.19	2.41	02:35	0.180	15:55	0.906	0.479	0.479
06/14/2023	02:40	2.43	14:55	5.12	3.52	02:20	1.40	14:50	3.31	2.29	02:30	0.157	14:55	1.050	0.450	0.450
06/15/2023	02:45	2.16	21:55	5.97	4.47	22:45	0.70	00:40	2.63	1.47	02:35	0.126	12:45	0.823	0.377	0.377
06/16/2023	07:15	3.38	05:20	5.58	4.18	01:50	0.52	19:00	2.90	1.49	03:30	0.118	18:40	0.722	0.360	0.360
06/17/2023	04:30	3.03	16:10	4.82	4.03	04:30	0.66	05:30	2.08	1.13	04:30	0.101	05:30	0.528	0.264	0.264
06/18/2023	23:55	3.50	09:10	5.25	4.01	00:45	0.48	14:05	2.66	1.21	04:45	0.105	14:00	0.793	0.273	0.273
06/19/2023	03:05	3.21	17:45	5.70	4.54	02:15	0.58	13:05	2.55	1.35	02:15	0.101	13:05	0.933	0.391	0.391
06/20/2023	23:45	3.14	08:50	6.04	4.30	02:20	0.60	13:15	3.03	1.54	02:20	0.113	19:20	0.862	0.390	0.390
06/21/2023	01:35	3.18	17:30	5.42	4.12	00:05	0.97	17:30	2.86	1.72	01:05	0.177	17:30	1.000	0.420	0.420
06/22/2023	03:10	3.18	08:50	5.63	4.54	22:55	0.75	08:55	2.08	1.36	02:50	0.154	08:55	0.768	0.383	0.383
06/23/2023	07:30	3.25	15:30	5.20	4.09	03:35	0.61	06:05	2.89	1.79	03:35	0.118	15:25	0.942	0.420	0.420
06/24/2023	04:00	3.28	18:00	5.35	4.52	09:50	0.67	13:15	1.91	1.26	03:00	0.117	16:10	0.627	0.357	0.357
06/25/2023	03:55	3.66	16:00	5.55	4.74	09:30	0.65	20:50	1.98	1.42	03:50	0.175	18:20	0.703	0.419	0.419
06/26/2023	23:50	2.87	02:35	5.50	4.18	01:40	0.91	16:30	3.30	2.01	01:40	0.188	16:30	0.944	0.478	0.478
06/27/2023	03:35	2.87	15:05	4.47	3.66	05:20	0.99	20:30	3.36	2.15	01:10	0.158	14:55	0.753	0.442	0.442
06/28/2023	02:55	2.56	11:00	5.02	3.71	02:35	1.07	17:50	3.35	2.13	02:40	0.134	11:10	0.951	0.452	0.452
06/29/2023	04:00	2.41	14:45	5.04	3.96	00:55	0.94	02:25	2.83	1.63	04:00	0.120	14:45	0.813	0.377	0.377
06/30/2023	04:00	2.32	19:55	4.78	3.96	02:20	0.79	13:25	3.17	1.75	02:20	0.152	13:25	0.868	0.400	0.400
07/01/2023	04:30	2.98	09:50	4.67	3.52	03:50	0.68	10:10	2.93	1.48	03:50	0.107	09:55	0.758	0.286	0.286
07/02/2023	05:05	2.35	18:00	4.31	3.51	03:40	0.64	09:30	2.28	1.37	03:40	0.103	12:40	0.535	0.265	0.265
07/03/2023	02:20	3.15	19:40	4.58	3.68	03:55	0.52	11:55	3.16	1.92	03:55	0.087	11:55	0.800	0.398	0.398
07/04/2023	02:30	3.10	03:00	4.25	3.72	23:20	0.76	10:15	2.40	1.38	01:00	0.132	02:50	0.585	0.284	0.284
07/05/2023	03:50	2.73	12:05	5.40	3.89	04:00	0.62	19:00	3.09	1.69	03:45	0.082	12:00	0.849	0.392	0.392
07/06/2023	04:20	2.72	20:05	4.93	3.86	05:40	0.95	09:20	2.96	1.93	02:25	0.141	09:20	0.843	0.433	0.433
07/07/2023	02:05	2.82	07:35	4.89	3.90	03:40	0.76	11:55	3.33	1.93	02:05	0.121	20:45	0.946	0.432	0.432
07/08/2023	02:15	2.91	15:10	4.52	3.62	03:55	0.81	15:40	2.57	1.62	03:55	0.151	15:40	0.517	0.321	0.321
07/09/2023	03:15	3.05	13:05	4.52	3.71	23:55	0.84	18:55	3.13	1.58	23:55	0.143	18:55	0.746	0.326	0.326
07/10/2023	05:05	2.92	14:40	5.17	3.87	02:20	0.65	14:45	3.52	1.93	02:30	0.107	14:45	1.058	0.441	0.441
07/11/2023	03:45	2.56	15:45	5.04	3.76	00:40	0.87	15:35	3.12	1.96	00:40	0.128	15:35	0.929	0.426	0.426
07/12/2023	01:15	3.03	14:05	5.09	3.86	03:45	0.87	14:00	3.05	1.81	03:50	0.139	14:05	0.956	0.408	0.408
07/13/2023	00:45	3.15	10:40	4.84	3.87	00:50	0.62	16:10	3.18	1.69	00:50	0.100	16:10	0.928	0.377	0.377
07/14/2023	04:40	2.97	17:05	4.96	3.78	02:15	0.67	10:25	2.97	1.73	02:40	0.107	10:25	0.901	0.377	0.377
07/15/2023	04:40	2.76	10:15	4.19	3.51	03:20	0.67	21:20	2.32	1.44	04:35	0.092	15:35	0.461	0.280	0.280
07/16/2023	03:50	2.82	09:55	4.42	3.55	04:55	0.56	10:15	2.86	1.54	04:55	0.092	09:50	0.710	0.301	0.301
07/17/2023	04:45	2.68	09:50	5.14	3.82	04:30	0.61	15:05	3.36	1.83	04:30	0.083	15:20	1.021	0.411	0.411
07/18/2023	04:25	2.98	13:45	5.51	4.20	23:55	0.70	13:40	2.87	1.50	02:10	0.138	13:40	1.015	0.378	0.378
07/19/2023	02:55	3.40	16:15	5.65	4.43	00:05	0.68	07:30	2.52	1.48	03:05	0.138	07:30	0.850	0.406	0.406
07/20/2023	23:40	3.54	12:45	5.24	4.17	00:25	0.77	16:25	3.35	1.61	03:55	0.155	16:25	0.918	0.385	0.385
07/21/2023	04:50	3.00	20:10	5.15	3.92	05:00	0.87	09:15	3.28	1.84	05:00	0.132	20:10	0.989	0.418	0.418
07/22/2023	03:05	3.26	16:45	4.68	4.07	00:55	0.64	11:30	2.19	1.22	03:05	0.113	11:30	0.581	0.293	0.293
07/23/2023	23:55	3.01	10:15	5.06	3.92	05:35	0.62	15:20	3.43	1.59	04:20	0.121	15:20	0.905	0.338	0.338
07/24/2023	02:10	2.79	09:45	5.45	3.72	02:00	0.76	20:35	3.49	2.07	02:00	0.105	09:35	1.048	0.444	0.443

05/18/2023 00:00 - 07/24/2023 23:59

	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			28.642
Average	3.84	1.94	0.421

RED_MH04B057

Site Commentary

SITE INFORMATION

Pipe	Elliptical (30.5 in H x 29 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study. Backwater conditions were not observed.

This site was positioned downstream of sites RED_MH0087 and RED_MH17C073. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Thursday, 18 May 2023 to Monday, 24 July 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	**DFINAL (in)**	**VFINAL (ft/s)**	**QFINAL (MGD - Total MG)**
Average	5.21	2.36	0.870
Minimum	3.00	1.35	0.273
Maximum	6.70	2.90	1.398
Min Time	05/28/2023 4:00:00 AM	06/24/2023 4:00:00 AM	06/12/2023 3:00:00 AM
Max Time	06/11/2023 10:00:00 AM	07/16/2023 10:00:00 AM	06/11/2023 10:00:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the one hour average.

DATA UPTIME

Data uptime observed during **Thursday, 18 May 2023 to Monday, 24 July 2023** is provided in the following table. Downtime was experienced from **28 June, 2023 to 6 July, 2023** due to equipment failure.

Percent Uptime	
DFINAL (in)	89.001
VFINAL (ft/s)	89.001
QFINAL (MGD - Total MG)	89.001

RED_MH04B057

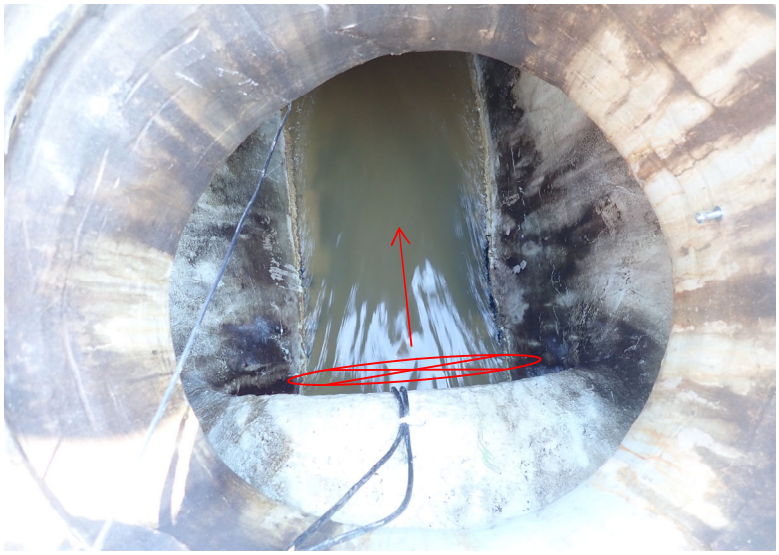
Site Address /Location:	nearest 2447 NW Canyon Dr behind on trail, Redmond, OR			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	On Dry Canyon Trail	Latitude:	44.298653	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.186637	30.50 X 29.00	Elliptical



Manhole #	System Characteristics
W side sewer interceptor 04B057	Residential
Access	Traffic
Drive	None







ADS Project Name:	Redmond.TFM.OR23
ADS Project Number:	22927.11.325

Installation Information

Installation Date:	Installation Type:
Tuesday, May 16, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4), Smart Depth (CS5)	0 - 15 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
11:27:00 AM	30.50 X 29.00
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
4.50	N/A
Physical Offse CS5 (in)	Measurement Confidence (in)
1.38	0.38"
Peak Velocity (fps)	Velocity Sensor Offset (in)
2.9	0
Silt (in)	Silt Type
0	None

Hydraulic Comments:

Good depth, moderate velocity, small waves

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
4'4	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

Hydrograph Report

RED_MH04B057

Flow Monitor

RED_MH04B057

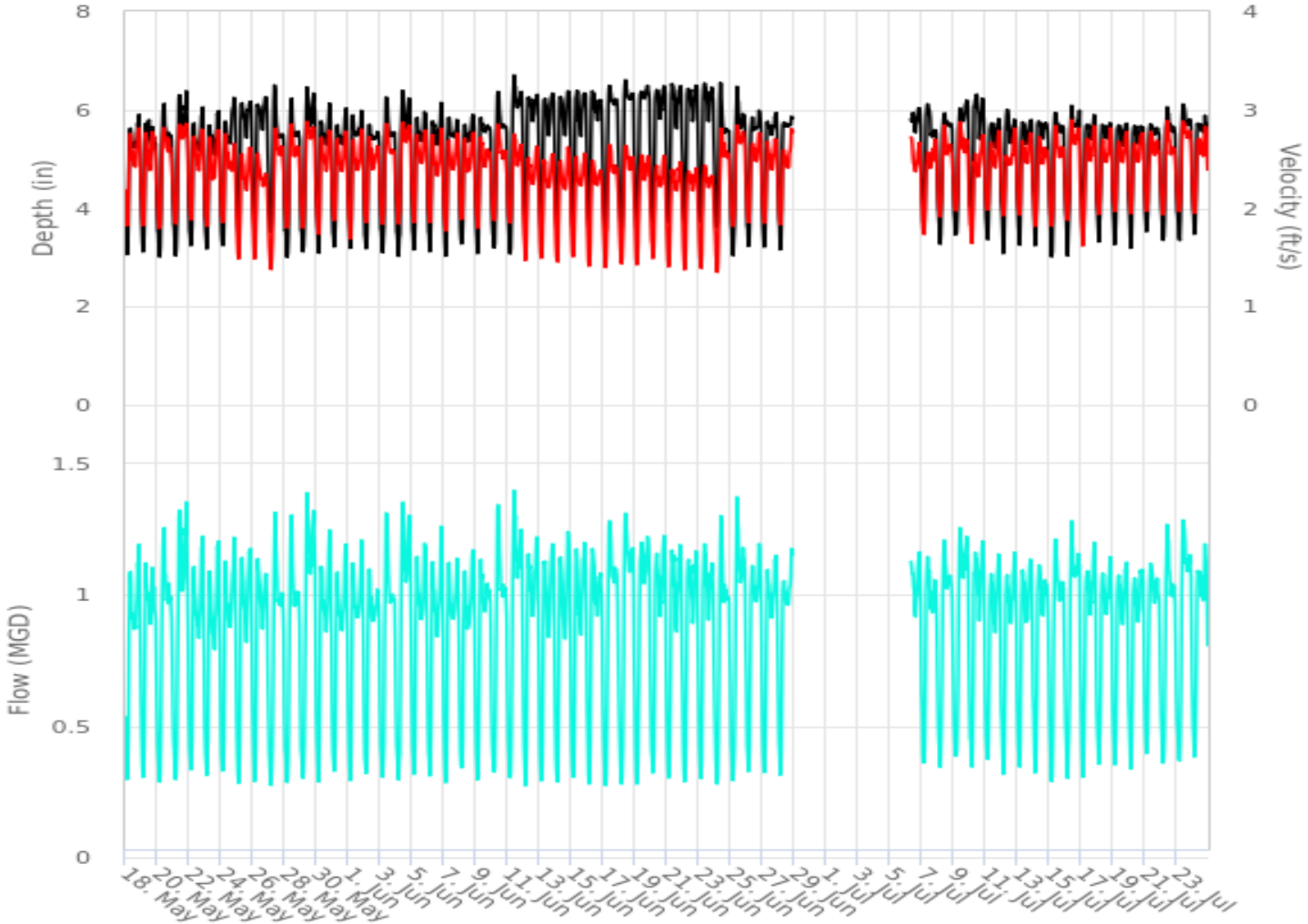
Pipe Height
30.50
in

Report Period

05/18/2023
To
07/24/2023

Legend

DFINAL
QFINAL
VFINAL



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Scattergraph Report

RED_MH04B057

Flow Monitor

RED_MH04B057

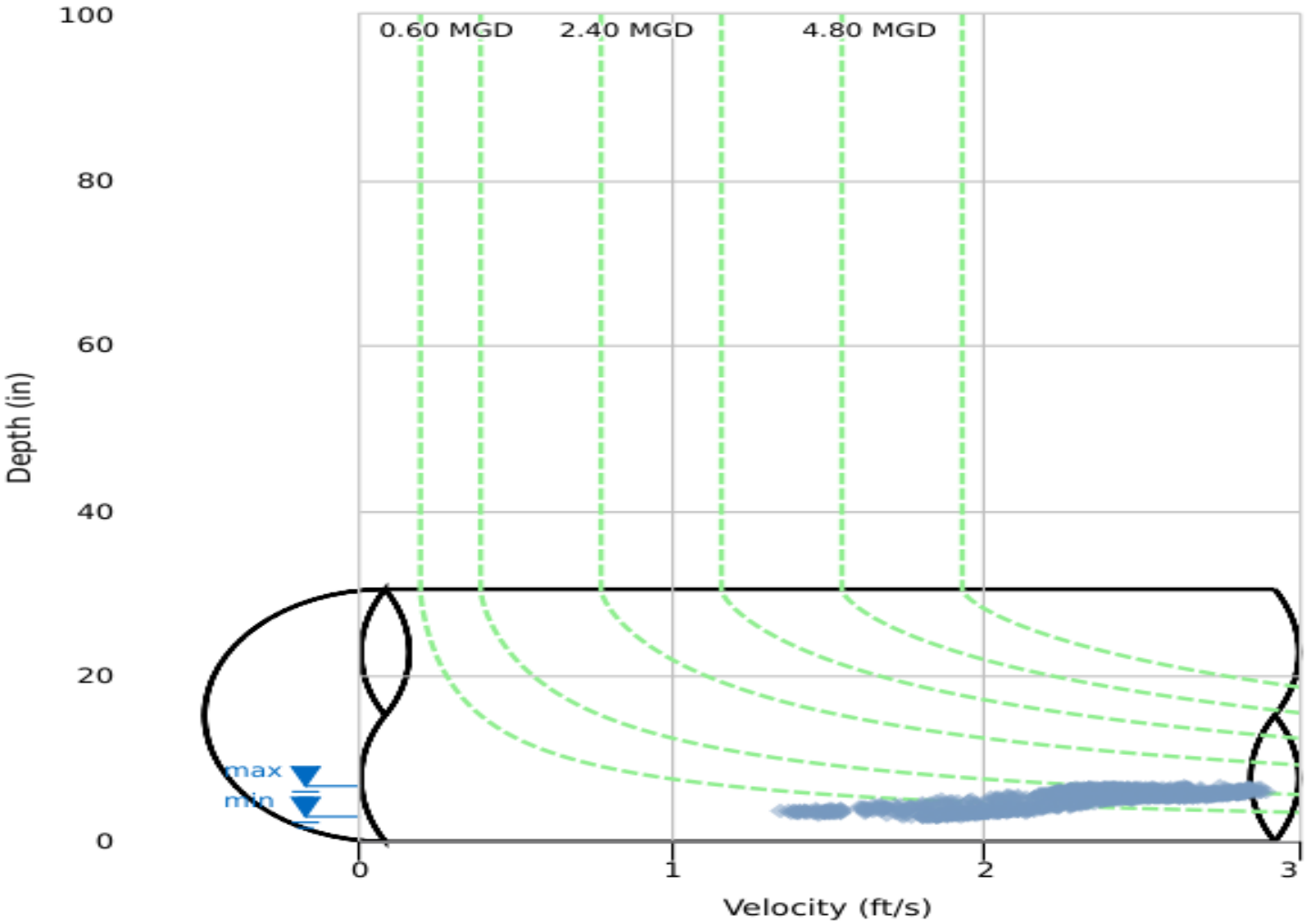
Pipe Height
30.50
in

Report Period

05/18/2023
To
07/24/2023

Legend

- DFINAL - VFINAL
- Iso-Q™
- Min-Max Depth



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Daily Tabular Report

05/18/2023 00:00 - 07/24/2023 23:59
RED_MH04B057Pipe: Elliptical (30.5 in H x 29 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)					
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total
05/18/2023	03:50	3.03	21:35	6.15	4.94	03:30	1.75	21:35	2.89	2.44	03:30	0.282	21:35	1.300	0.831	0.831
05/19/2023	04:10	3.01	07:30	6.10	4.94	04:05	1.73	17:20	2.88	2.43	04:05	0.276	07:30	1.254	0.825	0.825
05/20/2023	03:55	2.98	11:00	6.59	4.93	03:35	1.72	10:55	2.93	2.42	05:00	0.280	10:55	1.446	0.833	0.833
05/21/2023	04:55	3.03	20:10	6.72	5.11	04:10	1.81	09:45	2.97	2.51	04:10	0.291	20:10	1.484	0.916	0.916
05/22/2023	03:55	3.19	19:45	6.29	4.99	03:55	1.77	19:40	2.89	2.45	03:55	0.308	19:45	1.338	0.844	0.844
05/23/2023	03:45	3.08	21:10	6.25	4.98	03:40	1.76	19:20	2.88	2.40	03:40	0.289	21:10	1.315	0.825	0.825
05/24/2023	04:10	3.06	20:45	6.33	5.13	04:00	1.80	06:55	2.84	2.37	04:10	0.297	20:40	1.260	0.851	0.851
05/25/2023	04:10	3.27	21:30	6.28	5.37	03:50	1.44	21:30	2.70	2.21	04:00	0.274	21:30	1.250	0.858	0.858
05/26/2023	04:25	3.42	19:10	6.34	5.42	04:20	1.40	07:40	2.67	2.16	04:20	0.269	07:40	1.214	0.843	0.843
05/27/2023	04:45	3.44	09:55	6.54	5.15	05:05	1.31	10:45	2.91	2.26	05:05	0.256	10:50	1.408	0.830	0.830
05/28/2023	04:25	2.96	11:20	6.53	4.96	04:05	1.71	11:25	2.96	2.41	04:45	0.277	11:25	1.448	0.837	0.837
05/29/2023	04:55	3.01	10:50	7.02	5.22	04:25	1.74	10:40	3.00	2.49	04:55	0.281	10:50	1.614	0.936	0.936
05/30/2023	03:50	2.97	20:55	6.52	5.10	04:35	1.67	20:50	2.95	2.40	03:55	0.264	20:55	1.425	0.861	0.861
05/31/2023	03:35	3.13	21:10	6.18	5.04	02:55	1.79	21:05	2.86	2.40	03:35	0.307	21:05	1.288	0.842	0.842
06/01/2023	04:20	3.17	20:50	6.07	5.11	03:10	1.65	21:20	2.87	2.37	03:10	0.284	20:45	1.249	0.850	0.850
06/02/2023	03:15	3.06	08:55	5.87	4.96	04:05	1.77	07:50	2.82	2.40	03:15	0.294	08:50	1.178	0.820	0.820
06/03/2023	04:30	2.98	09:45	6.57	5.02	04:20	1.69	09:20	2.93	2.43	04:20	0.275	09:40	1.432	0.857	0.857
06/04/2023	05:00	2.97	11:20	6.58	5.13	03:40	1.76	11:15	2.94	2.50	05:00	0.281	11:15	1.451	0.916	0.916
06/05/2023	03:50	3.04	19:35	6.22	5.06	03:05	1.78	19:30	2.90	2.46	03:45	0.297	19:30	1.316	0.867	0.867
06/06/2023	03:30	3.03	20:45	6.33	5.10	03:30	1.80	20:50	2.91	2.39	03:30	0.289	20:50	1.352	0.853	0.853
06/07/2023	03:15	2.99	08:55	5.96	5.05	03:35	1.70	20:05	2.83	2.38	03:35	0.270	20:15	1.188	0.838	0.838
06/08/2023	03:45	3.18	19:45	6.03	5.06	04:15	1.82	21:55	2.86	2.41	03:40	0.324	19:45	1.245	0.846	0.846
06/09/2023	03:45	2.98	08:15	5.97	5.08	03:40	1.69	08:00	2.82	2.39	03:45	0.267	08:15	1.202	0.846	0.846
06/10/2023	05:10	3.13	10:50	6.74	5.14	05:35	1.79	10:40	2.95	2.42	04:35	0.312	10:50	1.501	0.881	0.881
06/11/2023	04:30	3.00	10:25	6.91	5.41	04:20	1.76	10:20	2.85	2.37	04:25	0.285	10:20	1.500	0.931	0.931
06/12/2023	03:45	3.27	21:05	6.43	5.52	03:55	1.41	20:55	2.71	2.21	03:55	0.253	21:10	1.288	0.892	0.892
06/13/2023	04:40	3.44	19:55	6.51	5.45	03:40	1.42	19:50	2.77	2.18	03:40	0.277	19:50	1.343	0.863	0.863
06/14/2023	04:15	3.44	19:50	6.53	5.48	04:20	1.35	19:40	2.75	2.18	04:20	0.263	19:40	1.324	0.869	0.869
06/15/2023	03:05	3.48	20:35	6.43	5.52	03:00	1.44	20:35	2.71	2.18	03:05	0.285	20:35	1.299	0.876	0.876
06/16/2023	03:50	3.45	08:00	6.70	5.55	03:05	1.38	09:10	2.64	2.14	03:50	0.269	08:00	1.283	0.865	0.865
06/17/2023	05:05	3.41	10:50	6.59	5.49	04:20	1.33	10:35	2.71	2.19	04:20	0.262	10:45	1.330	0.882	0.882
06/18/2023	04:35	3.40	10:10	6.84	5.53	04:30	1.40	10:05	2.72	2.22	04:30	0.268	10:05	1.401	0.906	0.906
06/19/2023	03:55	3.46	19:35	6.53	5.61	02:50	1.36	10:10	2.64	2.19	03:05	0.270	19:35	1.280	0.906	0.906
06/20/2023	03:30	3.62	20:10	6.51	5.62	04:20	1.37	20:00	2.67	2.15	04:20	0.290	20:00	1.291	0.888	0.888
06/21/2023	04:20	3.64	08:30	6.54	5.64	03:40	1.36	20:45	2.60	2.11	03:20	0.292	20:45	1.268	0.876	0.876
06/22/2023	04:15	3.60	20:20	6.52	5.64	03:45	1.28	20:00	2.53	2.10	03:45	0.267	20:00	1.221	0.872	0.872
06/23/2023	04:30	3.62	09:00	6.64	5.66	03:20	1.32	09:00	2.56	2.09	04:25	0.283	09:00	1.281	0.873	0.873
06/24/2023	04:40	3.59	09:15	6.59	5.24	04:30	1.29	11:00	2.92	2.25	04:30	0.270	11:00	1.404	0.844	0.844
06/25/2023	04:40	2.95	10:10	6.69	5.12	04:30	1.72	11:00	2.92	2.46	04:30	0.275	10:10	1.476	0.895	0.895
06/26/2023	03:55	3.08	19:50	6.28	5.15	04:05	1.76	19:40	2.88	2.42	04:05	0.303	19:45	1.300	0.876	0.876
06/27/2023	03:35	3.11	21:35	6.02	5.12	02:55	1.77	21:30	2.87	2.39	03:30	0.297	21:30	1.246	0.856	0.856
06/28/2023	03:45	3.03	19:55	5.93	5.06	03:40	1.75	20:10	2.85	2.35	03:40	0.283	20:10	1.198	0.829	0.703
06/29/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06/30/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07/01/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07/02/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07/03/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07/04/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07/05/2023	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07/06/2023	23:55	5.08	19:10	6.07	5.82	15:15	2.27	09:15	2.86	2.53	23:55	0.785	21:00	1.204	1.050	0.693
07/07/2023	04:00	3.52	09:50	6.15	5.24	04:00	1.68	20:15	2.81	2.35	04:00	0.335	09:50	1.207	0.866	0.866
07/08/2023	04:50	3.13	11:00	6.02	5.10	04:25	1.85	11:00	2.93	2.45	04:50	0.315	11:00	1.275	0.872	0.872
07/09/2023	03:40	3.36	09:50	6.27	5.23	04:00	1.86	10:05	2.95	2.47	03:40	0.349	09:50	1.339	0.916	0.916
07/10/2023	03:50	3.53	12:05	6.46	5.41	04:55	1.61	21:15	2.86	2.31	03:45	0.328	21:00	1.271	0.898	0.898
07/11/2023	04:05	3.08	20:25	5.87	5.07	04:05	1.88	22:00	2.84	2.43	04:05	0.310	20:15	1.183	0.855	0.855
07/12/2023	03:45	2.99	09:35	6.06	5.10	04:35	1.88	20:20	2.86	2.41	03:45	0.301	20:40	1.196	0.857	0.857
07/13/2023	04:20	3.10	19:50	5.94	5.10	04:05	1.76	19:50	2.88	2.44	04:05	0.312	19:50	1.229	0.863	0.863
07/14/2023	03:45	3.14	07:45	5.88	5.13	03:00	1.73	09:50	2.85	2.40	03:45	0.302	09:55	1.190	0.858	0.858
07/15/2023	04:55	2.97	09:50	6.32	5.05	04:05	1.77	09:50	3.03	2.43	05:00	0.281	09:50	1.416	0.858	0.858
07/16/2023	04:45	2.95	10:35	6.33	5.08	04:45	1.78	10:30	2.94	2.50	04:45	0.276	10:35	1.374	0.891	0.891
07/17/2023	03:40	3.26	20:00	6.02	5.15	04:05	1.54	19:50	2.92	2.42	04:05	0.283	20:05	1.268	0.874	0.874
07/18/2023	04:00	3.14	20:45	5.90	5.08	02:50	1.86	20:35	2.90	2.45	03:55	0.326	20:45	1.222	0.861	0.861
07/19/2023	03:40	3.16	21:35	5.80	5.04	03:05	1.92	21:35	2.88	2.45	03:40	0.332	21:35	1.190	0.854	0.854
07/20/2023	04:15	2.99	18:10	5.76	5.04	03:50	1.84	19:55	2.87	2.46	04:20	0.297	19:55	1.157	0.856	0.856
07/21/2023	03:45	3.39	09:35	5.79	5.11	03:50	1.87	09:30	2.87	2.47	03:50	0.356	09:30	1.178	0.874	0.874
07/22/2023	04:30	3.20	10:20	6.27	5.08	05:45	1.84	10:20	2.96	2.47	04:35	0.338	10:20	1.366	0.874	0.874
07/23/2023	04:55	3.28	09:55	6.60	5.14	03:30	1.85	09:55	2.96	2.53	04:50	0.349	09:55	1.473	0.916	0.916
07/24/2023	03:50	3.32	19:15	6.15	5.14	03:45	1.82	19:15	2.98	2.49	03:45	0.336	19:15	1.339	0.893	0.892

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	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			52.606
Average	5.21	2.36	0.869

RED_MH04C002

Site Commentary

SITE INFORMATION

Pipe	Elliptical (23.25 in H x 23.75 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study. Backwater conditions were not observed.

This site was positioned downstream of site RED_MH0163. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Thursday, 18 May 2023 to Monday, 24 July 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	**DFINAL (in)**	**VFINAL (ft/s)**	**QFINAL (MGD - Total MG)**
Average	7.51	2.11	1.192
Minimum	4.77	1.35	0.411
Maximum	9.95	2.59	2.065
Min Time	05/29/2023 4:00:00 AM	06/16/2023 3:00:00 AM	05/29/2023 4:00:00 AM
Max Time	05/19/2023 4:00:00 PM	05/19/2023 4:00:00 PM	05/19/2023 4:00:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the one hour average.

DATA UPTIME

Data uptime observed during **Thursday, 18 May 2023 to Monday, 24 July 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

Redmond.TFM.OR23

Flow Monitoring Site Report

Site Name

RED_MH04C002

Site Address /Location:	2241 NW Canyon Dr, Redmond OR (behind House)		
Site Access Details:	E of trail	Latitude:	44.2970549
		Longitude:	-121.1862132

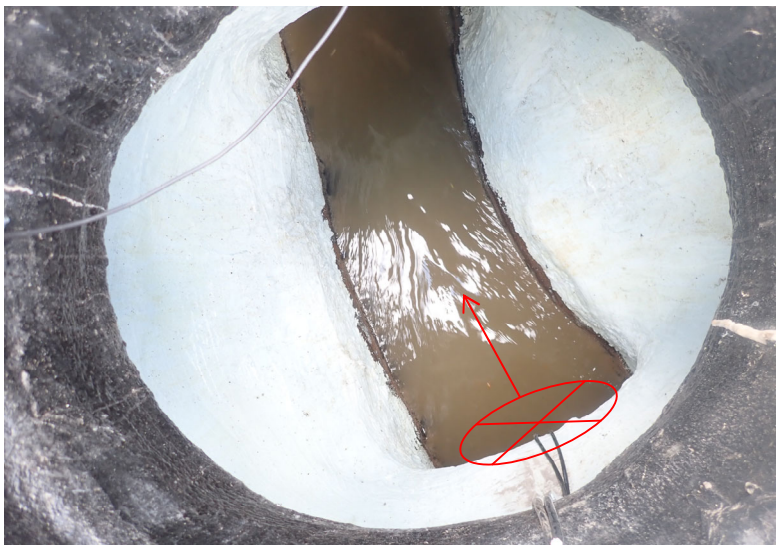
Monitor Series	Location Type
TRITON+	Temporary
Pipe Size (H x W)	Pipe Shape
23.25 X 23.75	Elliptical



Manhole #	System Characteristics
A interceptor 04C002	Residential
Access	Traffic
Drive	None







Installation Information

Installation Date:	Installation Type:
Tuesday, May 16, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4), Smart Depth (CS5)	0 - 15 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
1.22 PM	23.25 X 23.75
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
9.25	N/A
Physical Offse CS5 (in)	Measurement Confidence (in)
1.38	0.38"
Peak Velocity (fps)	Velocity Sensor Offset (in)
1.81	0
Silt (in)	Silt Type
0	None

Hydraulic Comments:

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
4.6'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

ADS Project Name:	Redmond.TFM.OR23
ADS Project Number:	22927.11.325

Hydrograph Report

RED_MH04C002

Flow Monitor

RED_MH04C002

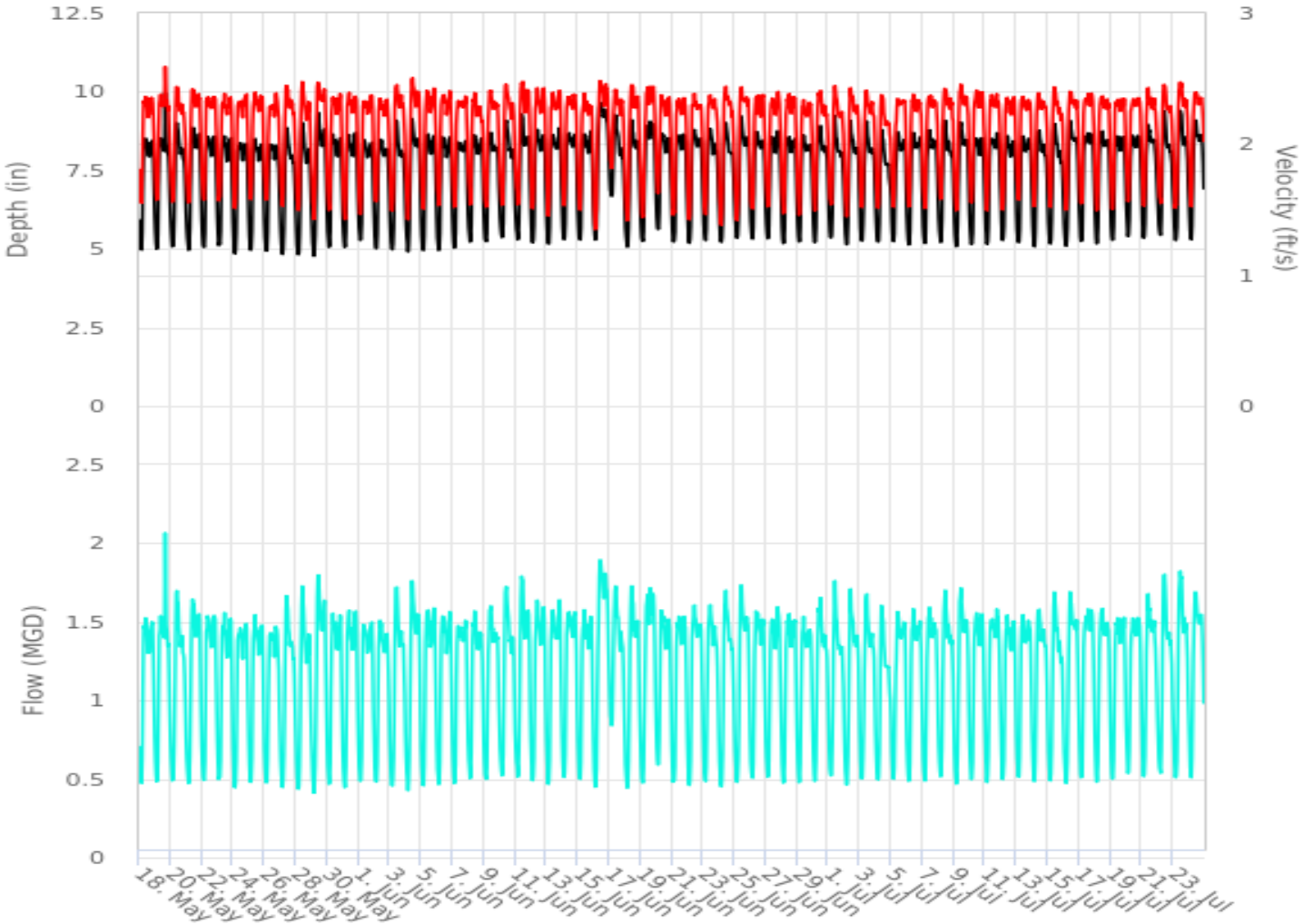
Pipe Height
23.25
in

Report Period

05/18/2023
To
07/24/2023

Legend

DFINAL
QFINAL
VFINAL



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Scattergraph Report

RED_MH04C002

Flow Monitor

RED_MH04C002

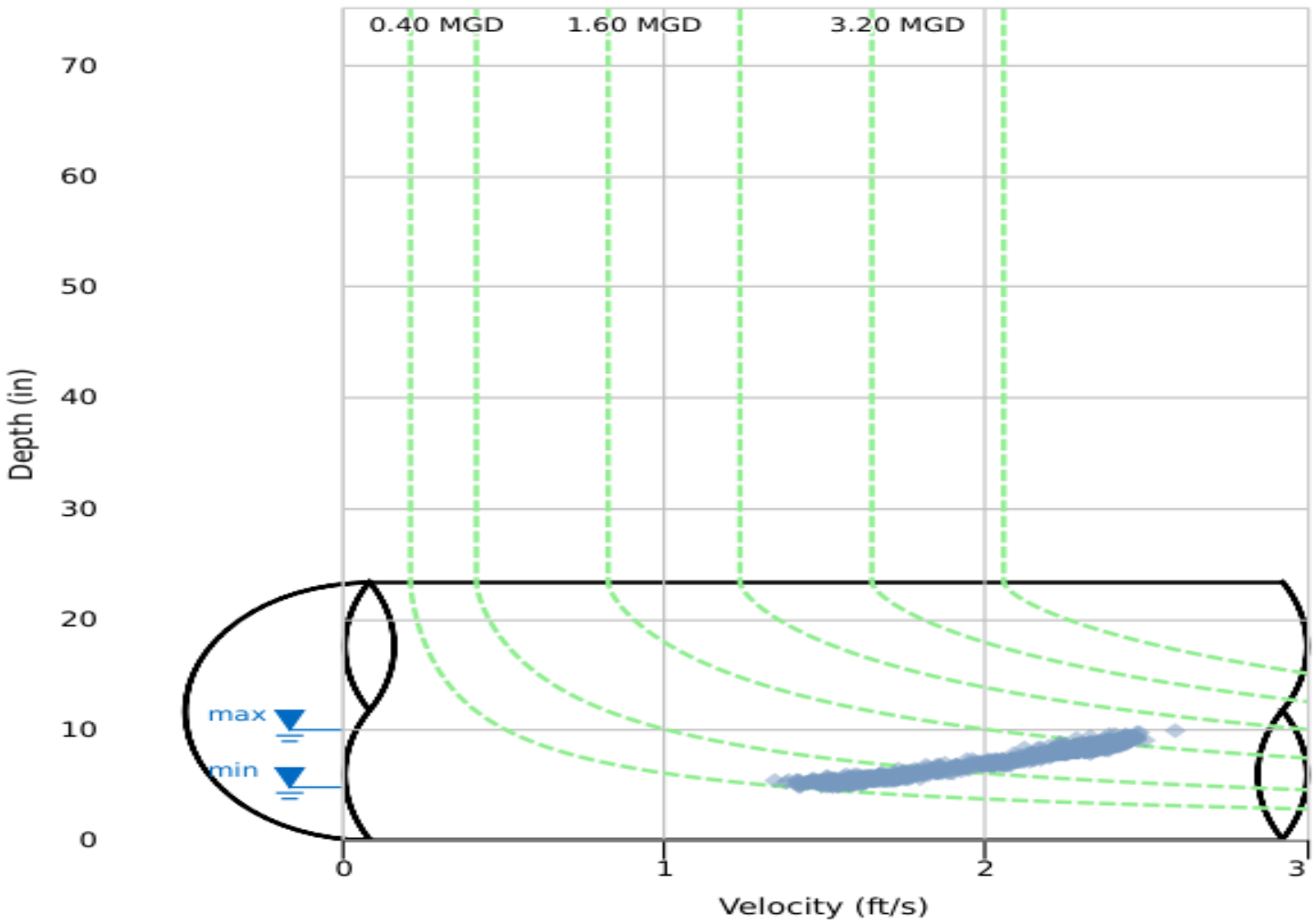
Pipe Height
23.25
in

Report Period

05/18/2023
To
07/24/2023

Legend

- DFINAL - VFINAL
- Iso-Q™
- Min-Max Depth



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Daily Tabular Report

05/18/2023 00:00 - 07/24/2023 23:59
RED_MH04C002Pipe: Elliptical (23.25 in H x 23.75 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)					
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total
05/18/2023	04:20	4.85	10:30	8.64	7.40	04:10	1.45	17:55	2.55	2.12	04:10	0.428	21:10	1.641	1.169	1.169
05/19/2023	03:55	4.87	16:35	10.69	7.50	04:35	1.50	16:30	2.71	2.14	03:40	0.454	16:30	2.340	1.211	1.211
05/20/2023	03:15	4.96	10:00	9.08	7.34	03:25	1.49	12:40	2.54	2.10	03:15	0.455	09:50	1.743	1.152	1.152
05/21/2023	04:50	4.89	11:35	8.98	7.43	05:10	1.48	10:35	2.51	2.11	04:50	0.457	10:35	1.738	1.182	1.182
05/22/2023	03:30	5.00	09:40	8.79	7.47	04:35	1.49	18:45	2.48	2.13	04:35	0.469	09:40	1.629	1.194	1.194
05/23/2023	02:45	5.04	19:55	8.79	7.45	02:45	1.49	19:50	2.49	2.12	02:45	0.462	19:50	1.661	1.181	1.181
05/24/2023	03:30	4.74	12:15	8.50	7.31	02:35	1.44	21:15	2.50	2.11	03:30	0.418	11:40	1.568	1.150	1.150
05/25/2023	04:00	4.89	10:30	8.72	7.35	02:55	1.46	10:35	2.48	2.14	03:20	0.451	10:35	1.654	1.168	1.168
05/26/2023	03:55	4.86	17:25	8.44	7.29	03:50	1.51	10:00	2.48	2.11	03:50	0.447	17:20	1.551	1.140	1.140
05/27/2023	04:30	4.73	10:45	8.95	7.19	04:40	1.40	09:55	2.55	2.11	04:40	0.407	11:15	1.720	1.128	1.128
05/28/2023	04:40	4.72	10:35	9.27	7.20	04:40	1.43	10:30	2.58	2.08	04:40	0.404	10:30	1.868	1.116	1.116
05/29/2023	04:30	4.68	11:35	9.42	7.47	04:10	1.36	10:25	2.55	2.12	04:40	0.387	11:35	1.858	1.205	1.205
05/30/2023	03:35	5.00	09:45	8.76	7.49	04:20	1.42	21:25	2.52	2.10	03:50	0.440	21:25	1.630	1.185	1.185
05/31/2023	03:45	4.99	20:30	8.78	7.46	04:15	1.33	19:45	2.54	2.09	04:15	0.413	19:45	1.684	1.176	1.176
06/01/2023	03:55	5.17	08:30	8.60	7.45	02:25	1.37	18:50	2.53	2.10	03:55	0.446	21:10	1.607	1.169	1.169
06/02/2023	03:30	4.91	09:30	8.61	7.33	03:15	1.48	08:55	2.47	2.11	03:35	0.453	09:40	1.589	1.149	1.149
06/03/2023	04:05	4.85	11:00	9.24	7.33	03:55	1.41	09:45	2.55	2.10	03:55	0.419	10:35	1.801	1.157	1.157
06/04/2023	04:20	4.83	10:10	9.21	7.44	04:35	1.33	11:50	2.59	2.12	04:35	0.391	11:50	1.823	1.193	1.193
06/05/2023	04:15	4.85	19:05	8.72	7.44	04:15	1.37	17:45	2.50	2.13	04:15	0.403	20:30	1.638	1.191	1.191
06/06/2023	03:25	4.87	21:20	8.73	7.45	03:15	1.43	20:45	2.56	2.14	03:15	0.429	20:45	1.692	1.193	1.193
06/07/2023	03:35	4.91	21:10	8.67	7.43	03:55	1.45	20:50	2.48	2.12	03:30	0.443	21:10	1.608	1.176	1.176
06/08/2023	03:10	5.17	10:40	8.74	7.50	03:40	1.49	11:20	2.48	2.10	03:10	0.480	10:35	1.630	1.176	1.176
06/09/2023	04:15	5.12	11:25	8.77	7.47	04:05	1.43	09:25	2.57	2.11	04:05	0.464	11:20	1.674	1.185	1.185
06/10/2023	04:35	5.31	10:40	9.22	7.53	04:30	1.45	11:35	2.53	2.11	04:30	0.489	11:35	1.795	1.195	1.195
06/11/2023	04:55	5.18	10:45	9.39	7.61	04:25	1.43	12:00	2.59	2.15	04:25	0.482	12:00	1.896	1.238	1.238
06/12/2023	03:25	5.10	11:05	8.97	7.59	04:30	1.46	10:40	2.55	2.13	03:30	0.471	10:40	1.719	1.223	1.223
06/13/2023	03:00	5.05	21:10	9.04	7.57	04:30	1.35	21:45	2.53	2.12	04:30	0.434	20:05	1.732	1.211	1.211
06/14/2023	02:55	5.20	11:20	9.00	7.64	03:55	1.42	18:10	2.51	2.13	03:55	0.465	11:20	1.703	1.229	1.229
06/15/2023	04:15	5.18	20:45	8.80	7.61	04:40	1.43	10:05	2.49	2.09	03:20	0.468	10:05	1.657	1.199	1.199
06/16/2023	03:45	5.22	11:35	9.74	8.21	03:50	1.31	11:20	2.60	2.13	03:50	0.427	11:20	1.980	1.379	1.379
06/17/2023	04:45	6.57	10:00	9.37	7.95	05:15	1.74	09:50	2.48	2.19	04:30	0.805	09:55	1.823	1.303	1.303
06/18/2023	04:55	5.01	10:10	9.24	7.45	02:50	1.33	11:20	2.55	2.08	04:20	0.428	11:20	1.810	1.175	1.175
06/19/2023	04:40	5.16	15:35	9.33	7.73	03:50	1.36	11:15	2.56	2.12	04:45	0.443	15:35	1.828	1.253	1.253
06/20/2023	03:55	5.55	08:05	9.03	7.67	03:40	1.54	18:30	2.49	2.14	03:40	0.557	08:05	1.714	1.226	1.226
06/21/2023	02:40	5.17	18:40	8.75	7.54	04:30	1.42	19:35	2.48	2.08	02:35	0.463	19:35	1.642	1.185	1.185
06/22/2023	03:40	5.14	10:40	8.85	7.60	03:45	1.36	10:45	2.47	2.09	03:45	0.439	11:40	1.669	1.202	1.202
06/23/2023	04:20	5.18	11:55	8.85	7.53	04:30	1.38	11:25	2.47	2.09	04:30	0.452	11:25	1.678	1.184	1.184
06/24/2023	04:15	5.19	11:40	9.06	7.45	02:55	1.35	11:40	2.54	2.07	04:45	0.440	11:40	1.786	1.161	1.161
06/25/2023	04:45	5.26	10:45	9.27	7.60	04:55	1.36	10:05	2.54	2.08	04:55	0.456	10:05	1.812	1.200	1.200
06/26/2023	04:00	5.18	10:45	8.78	7.57	03:55	1.36	12:55	2.51	2.09	03:55	0.438	12:55	1.671	1.194	1.194
06/27/2023	03:50	5.24	18:20	8.94	7.57	03:50	1.47	20:35	2.52	2.11	03:50	0.481	18:15	1.666	1.200	1.200
06/28/2023	04:05	5.00	09:50	8.69	7.51	02:30	1.35	20:45	2.49	2.10	04:10	0.441	12:30	1.628	1.187	1.187
06/29/2023	04:25	5.14	10:25	8.72	7.48	03:25	1.41	19:25	2.45	2.07	03:25	0.457	10:25	1.612	1.160	1.160
06/30/2023	03:50	5.14	12:00	9.21	7.53	04:05	1.42	09:50	2.55	2.10	03:40	0.465	09:55	1.759	1.189	1.189
07/01/2023	03:30	5.32	10:15	9.30	7.46	04:25	1.48	11:05	2.53	2.08	03:25	0.500	11:05	1.835	1.165	1.165
07/02/2023	04:45	4.97	10:40	9.34	7.42	04:25	1.38	14:05	2.49	2.07	04:40	0.428	10:35	1.801	1.153	1.153
07/03/2023	03:35	5.18	11:10	9.29	7.48	04:10	1.46	10:55	2.52	2.10	03:40	0.477	10:55	1.809	1.177	1.177
07/04/2023	04:15	5.16	09:40	9.00	7.19	04:05	1.45	11:55	2.48	2.04	04:10	0.472	09:40	1.717	1.080	1.080
07/05/2023	03:55	5.18	10:40	8.84	7.49	04:50	1.37	21:25	2.47	2.11	04:50	0.444	10:35	1.635	1.181	1.181
07/06/2023	03:25	4.98	10:25	8.93	7.50	03:30	1.45	10:20	2.55	2.11	03:30	0.444	10:20	1.728	1.186	1.186
07/07/2023	04:10	5.13	11:50	8.88	7.54	04:30	1.43	13:30	2.51	2.12	04:30	0.458	11:45	1.625	1.202	1.202
07/08/2023	04:25	5.12	11:20	9.19	7.49	04:40	1.50	11:15	2.57	2.14	04:25	0.489	11:15	1.836	1.199	1.199
07/09/2023	04:30	4.98	11:55	9.11	7.51	04:35	1.42	11:55	2.56	2.12	04:35	0.438	11:55	1.807	1.203	1.203
07/10/2023	04:00	5.06	11:20	8.67	7.47	03:55	1.47	10:00	2.55	2.14	03:55	0.462	10:00	1.687	1.198	1.198
07/11/2023	03:45	5.10	19:20	8.79	7.55	03:15	1.37	08:50	2.53	2.13	03:15	0.440	18:10	1.665	1.208	1.208
07/12/2023	03:20	5.15	11:25	8.75	7.49	03:55	1.42	11:35	2.55	2.12	03:55	0.469	11:35	1.704	1.184	1.184
07/13/2023	03:45	5.13	10:30	8.74	7.48	04:05	1.50	10:25	2.54	2.13	04:05	0.486	10:25	1.687	1.191	1.191
07/14/2023	04:05	4.98	11:10	8.84	7.46	04:35	1.44	10:30	2.52	2.13	04:05	0.442	10:55	1.649	1.185	1.185
07/15/2023	05:05	4.97	10:20	9.12	7.38	04:05	1.44	10:05	2.54	2.10	05:05	0.444	10:15	1.777	1.157	1.157
07/16/2023	04:20	4.95	10:10	9.21	7.49	05:10	1.38	11:05	2.50	2.10	04:30	0.440	10:55	1.753	1.188	1.188
07/17/2023	03:35	5.18	14:30	8.82	7.61	03:55	1.40	14:40	2.47	2.13	03:55	0.453	14:40	1.655	1.224	1.224
07/18/2023	03:35	5.09	10:00	8.91	7.57	03:40	1.38	10:05	2.46	2.11	03:40	0.436	10:05	1.678	1.203	1.203
07/19/2023	03:55	5.16	19:00	8.74	7.56	03:45	1.41	21:10	2.45	2.11	03:45	0.461	21:10	1.625	1.201	1.201
07/20/2023	03:50	5.31	10:50	8.78	7.63	04:00	1.47	17:40	2.44	2.13	03:45	0.498	10:50	1.637	1.220	1.220
07/21/2023	02:50	5.27	09:40	9.26	7.63	02:50	1.44	09:35	2.52	2.12	02:50	0.477	09:35	1.810	1.219	1.219
07/22/2023	05:10	5.33	11:20	9.46	7.61	05:05	1.46	09:25	2.55	2.11	05:05	0.492	09:45	1.868	1.214	1.214
07/23/2023	05:10	5.17	11:05	9.50	7.66	03:50	1.42	13:05	2.55	2.12	03:50	0.468	13:05	1.887	1.239	1.239
07/24/2023	04:20	5.15	10:55	9.20	7.71	04:15	1.40	12:35	2.49	2.14	04:15	0.451	11:15	1.750	1.250	1.249

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	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			81.067
Average	7.51	2.11	1.192

RED_MH04C042

Site Commentary

SITE INFORMATION

Pipe	Elliptical (8.13 in H x 7.88 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study. Backwater conditions were not observed.

Average flow depth, velocity, and quantity data observed during **Thursday, 18 May 2023 to Monday, 24 July 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	**DFINAL (in)**	**VFINAL (ft/s)**	**QFINAL (MGD - Total MG)**
Average	1.64	4.97	0.165
Minimum	1.37	2.28	0.063
Maximum	2.02	6.19	0.262
Min Time	07/22/2023 2:00:00 AM	06/16/2023 3:00:00 AM	07/22/2023 2:00:00 AM
Max Time	05/29/2023 10:00:00 AM	05/21/2023 8:00:00 AM	05/29/2023 9:00:00 AM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the one hour average.

DATA UPTIME

Data uptime observed during **Thursday, 18 May 2023 to Monday, 24 July 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	99.985
VFINAL (ft/s)	99.985
QFINAL (MGD - Total MG)	99.985

Redmond.TFM.OR23		Site Name
Flow Monitoring Site Report	ADS ENVIRONMENTAL SERVICES®	RED_MH04C042

Site Address /Location:	2407 NW Canyon Dr, Redmond, Or (behind House)			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	near trail behind houses	Latitude:	44.298211	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.185655	8.13 X 7.88	Elliptical



Manhole #	System Characteristics
D Basin 04C042	Residential
Access	Traffic
Drive	None







ADS Project Name:	Redmond.TFM.OR23
ADS Project Number:	22927.11.325

Installation Information

Installation Date:	Installation Type:
Wednesday, May 17, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4), Smart Depth (CS5)	0 - 15 psi

Installation Confirmation:

Confirmation Time:	Pipe Size (HxW)
1:22:00 PM	8.13 X 7.88
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
2.00	N/A
Physical Offse CS5 (in)	Measurement Confidence (in)
1.38	0.38"
Peak Velocity (fps)	Velocity Sensor Offset (in)
5.85	0
Silt (in)	Silt Type
0	None

Hydraulic Comments:
Low depth, fast velocity, choppy flow

Manhole / Pipe Information:

Manhole Depth (Approx. FT):	Manhole Configuration
4'6	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
Concrete	Good

Communication Information:

Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole

Additional Site Info. / Comments:

Hydrograph Report

RED_MH04C042

Flow Monitor

RED_MH04C042

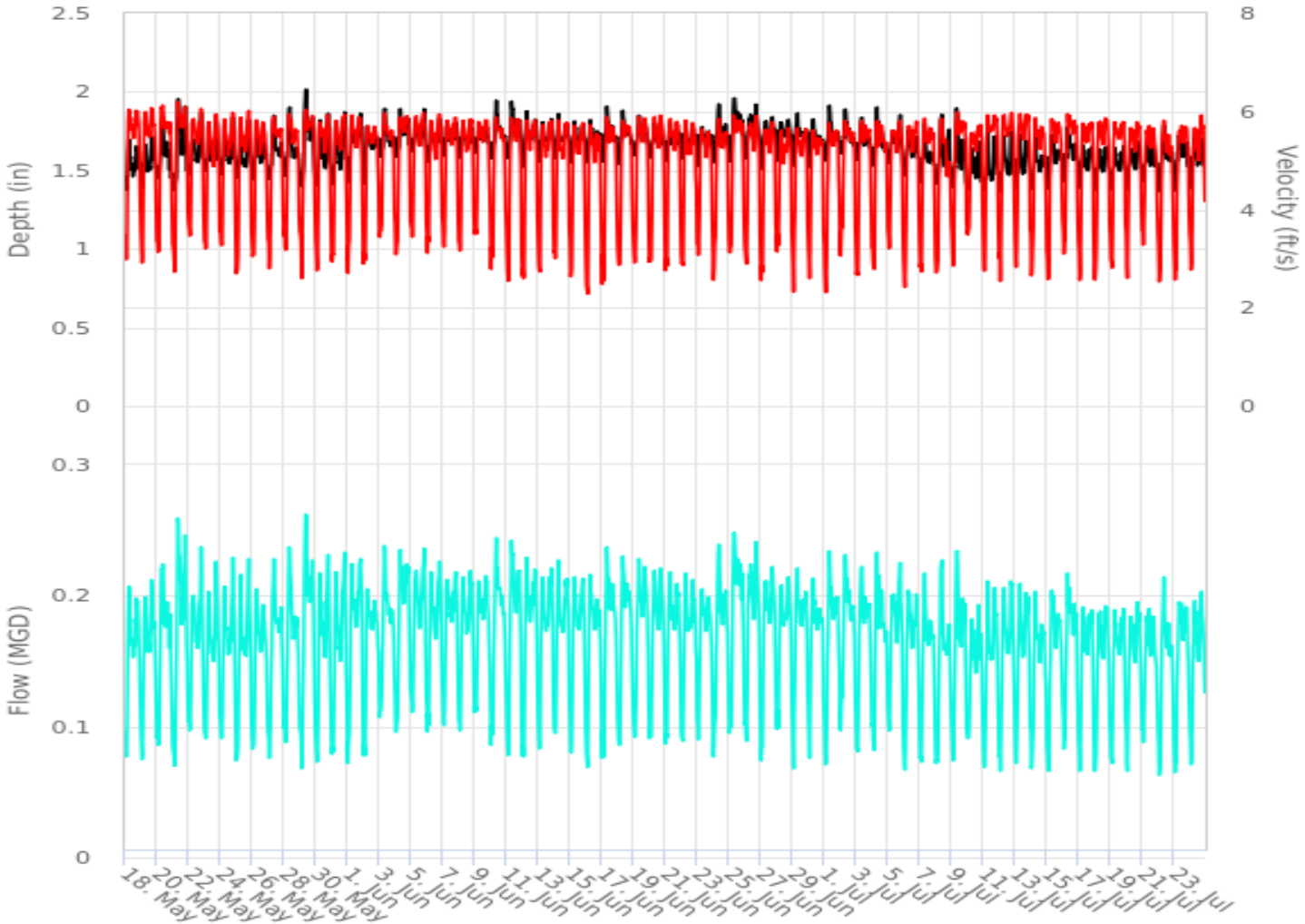
Pipe Height
8.13
in

Report Period

05/18/2023
To
07/24/2023

Legend

DFINAL
QFINAL
VFINAL



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Scattergraph Report

RED_MH04C042

Flow Monitor

RED_MH04C042

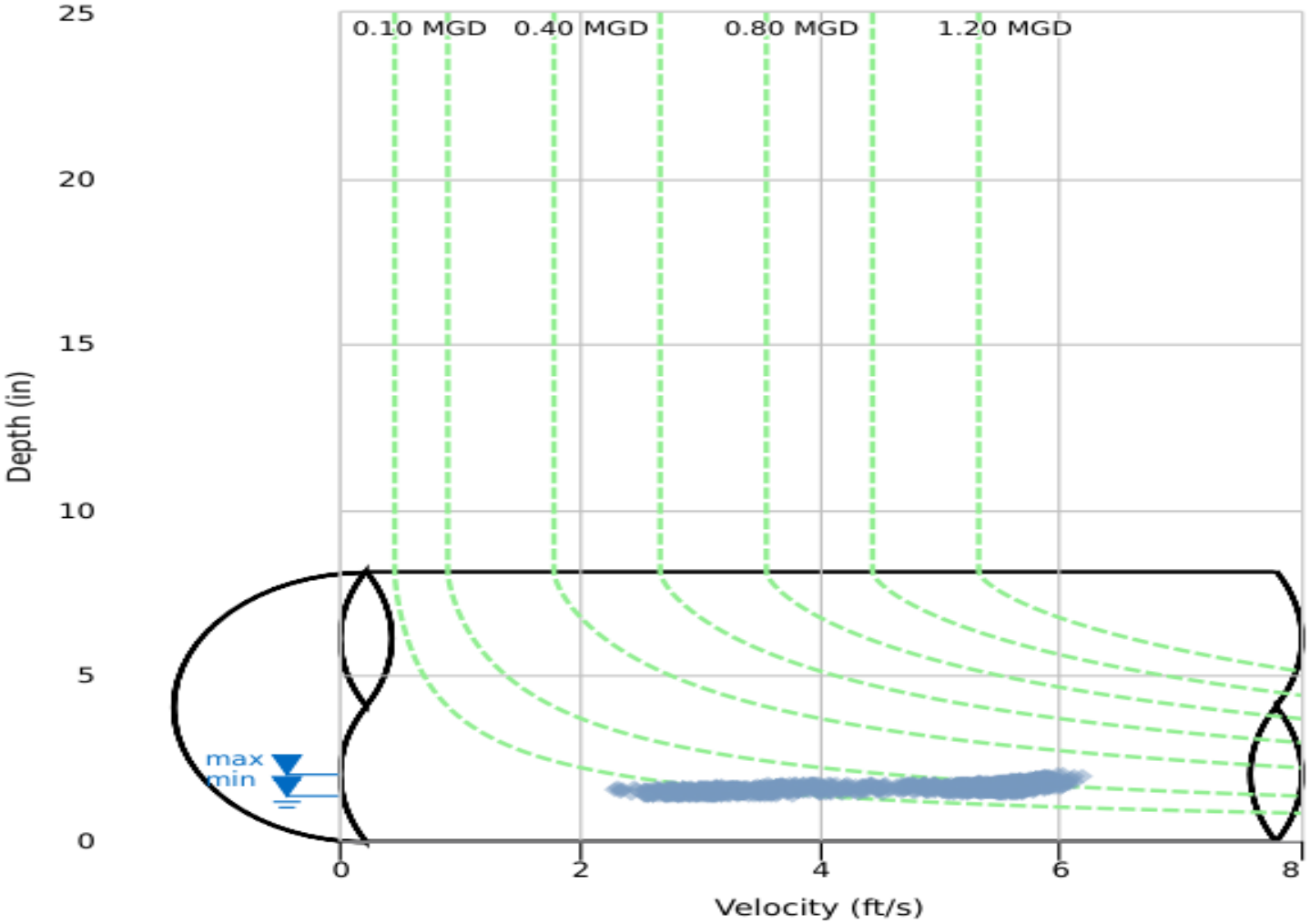
Pipe Height
8.13
in

Report Period

05/18/2023
To
07/24/2023

Legend

- DFINAL - VFINAL
- Iso-Q™
- Min-Max Depth



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Daily Tabular Report

05/18/2023 00:00 - 07/24/2023 23:59
RED_MH04C042Pipe: Elliptical (8.13 in H x 7.88 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)					
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total
05/18/2023	03:15	1.35	06:00	1.79	1.54	03:20	2.67	06:00	6.29	5.21	03:20	0.066	06:00	0.232	0.157	0.157
05/19/2023	02:10	1.35	18:40	2.05	1.55	01:20	2.66	18:40	6.97	5.18	01:20	0.068	18:40	0.312	0.158	0.158
05/20/2023	04:10	1.38	07:45	1.90	1.59	04:00	2.63	07:45	6.49	5.14	04:00	0.068	07:45	0.261	0.163	0.163
05/21/2023	01:35	1.35	08:40	2.07	1.64	04:05	2.48	08:40	6.47	5.13	04:05	0.062	08:40	0.293	0.173	0.173
05/22/2023	02:50	1.43	20:00	1.94	1.62	02:45	3.11	19:05	6.21	5.15	02:45	0.086	20:00	0.250	0.166	0.166
05/23/2023	01:35	1.46	18:30	1.99	1.60	02:40	2.84	18:30	6.30	4.99	02:40	0.081	18:30	0.270	0.159	0.159
05/24/2023	02:35	1.43	06:45	1.96	1.61	02:40	2.88	19:15	6.17	5.04	02:35	0.077	19:15	0.258	0.161	0.161
05/25/2023	00:05	1.42	18:00	1.96	1.59	03:15	2.32	19:05	6.26	4.95	03:15	0.063	19:05	0.259	0.157	0.157
05/26/2023	01:30	1.40	06:00	2.00	1.59	01:35	2.51	06:00	6.17	4.96	01:35	0.067	06:00	0.267	0.157	0.157
05/27/2023	04:10	1.39	10:05	1.97	1.61	02:40	2.52	10:05	6.12	4.97	02:40	0.068	10:05	0.258	0.160	0.160
05/28/2023	03:15	1.39	08:15	2.03	1.63	00:55	2.53	09:45	6.09	5.01	00:55	0.066	08:15	0.266	0.164	0.164
05/29/2023	03:50	1.36	08:00	2.15	1.68	03:35	2.41	09:40	6.39	5.07	03:50	0.061	08:00	0.292	0.177	0.177
05/30/2023	04:25	1.35	19:10	1.99	1.61	02:50	2.39	18:45	6.17	4.99	03:25	0.063	19:10	0.256	0.163	0.163
05/31/2023	03:30	1.37	07:15	1.96	1.62	02:35	2.51	20:30	6.19	5.02	02:35	0.066	07:15	0.257	0.163	0.163
06/01/2023	01:00	1.39	07:30	2.00	1.68	01:35	2.46	07:30	6.24	5.06	01:25	0.066	07:30	0.270	0.174	0.174
06/02/2023	03:05	1.37	05:45	1.83	1.64	03:05	2.48	17:20	5.94	4.99	03:05	0.062	06:10	0.220	0.165	0.165
06/03/2023	01:55	1.50	08:50	1.98	1.70	01:35	3.15	08:10	6.08	5.07	01:35	0.098	08:50	0.257	0.174	0.174
06/04/2023	02:35	1.54	08:45	1.98	1.73	02:35	2.63	08:50	6.12	5.07	02:35	0.078	08:50	0.259	0.181	0.181
06/05/2023	03:30	1.56	20:35	1.96	1.72	02:50	3.34	08:25	6.14	5.19	03:30	0.103	20:05	0.253	0.182	0.182
06/06/2023	03:10	1.50	18:55	1.90	1.70	01:40	2.82	19:55	6.12	5.05	01:40	0.087	18:55	0.244	0.175	0.175
06/07/2023	02:20	1.54	19:05	1.91	1.71	01:20	2.93	10:05	6.16	5.13	01:25	0.088	19:05	0.246	0.179	0.179
06/08/2023	02:15	1.51	07:00	1.90	1.70	01:35	2.80	17:15	6.06	5.03	01:35	0.085	07:00	0.242	0.173	0.173
06/09/2023	00:45	1.53	17:35	1.87	1.70	00:20	3.18	18:15	6.04	5.14	00:45	0.096	17:35	0.234	0.178	0.178
06/10/2023	04:50	1.52	09:35	2.01	1.73	01:20	2.51	11:05	6.08	4.94	03:35	0.077	09:35	0.259	0.175	0.175
06/11/2023	03:05	1.49	08:30	2.07	1.74	03:35	2.37	18:05	6.09	4.91	03:05	0.068	08:30	0.269	0.177	0.177
06/12/2023	00:50	1.48	07:15	1.97	1.72	03:20	2.28	19:00	6.03	4.94	03:20	0.067	07:15	0.252	0.174	0.174
06/13/2023	02:00	1.46	20:55	1.94	1.71	01:30	2.47	18:10	5.98	4.93	02:05	0.073	20:55	0.246	0.173	0.173
06/14/2023	01:10	1.48	07:40	1.93	1.71	02:25	2.63	07:35	6.07	4.93	01:10	0.081	07:35	0.244	0.172	0.172
06/15/2023	02:25	1.46	20:25	1.90	1.70	03:00	2.32	19:10	6.05	4.87	03:25	0.065	20:25	0.240	0.169	0.169
06/16/2023	03:50	1.53	07:25	1.85	1.70	02:30	2.16	11:30	5.88	4.75	02:30	0.064	09:05	0.223	0.165	0.165
06/17/2023	03:55	1.46	08:20	1.96	1.71	03:30	2.19	08:15	6.06	4.84	03:55	0.064	08:15	0.250	0.170	0.170
06/18/2023	03:45	1.48	08:30	1.94	1.71	04:55	2.26	16:00	6.11	4.85	04:55	0.067	08:35	0.247	0.170	0.170
06/19/2023	01:25	1.51	09:50	2.02	1.72	01:35	2.40	09:50	6.35	4.98	01:35	0.075	09:50	0.278	0.175	0.175
06/20/2023	02:55	1.52	17:15	1.93	1.70	02:35	2.46	18:00	6.14	4.99	02:30	0.075	17:15	0.249	0.172	0.172
06/21/2023	00:55	1.49	08:05	1.87	1.69	02:55	2.25	18:15	6.04	4.99	01:20	0.067	08:05	0.235	0.170	0.170
06/22/2023	01:55	1.50	07:10	1.89	1.69	01:05	2.45	07:05	6.08	4.92	01:00	0.074	07:10	0.237	0.169	0.169
06/23/2023	02:20	1.47	08:05	1.84	1.69	02:55	2.48	18:40	5.83	4.90	02:35	0.075	07:55	0.222	0.168	0.168
06/24/2023	00:35	1.48	09:25	1.98	1.72	02:15	2.30	09:45	6.05	4.89	01:25	0.069	09:25	0.253	0.173	0.173
06/25/2023	03:35	1.47	08:40	2.09	1.77	00:55	2.62	13:45	6.41	5.02	00:55	0.076	08:40	0.276	0.186	0.186
06/26/2023	03:25	1.52	11:10	2.02	1.74	02:50	2.37	17:35	6.17	4.97	03:25	0.073	11:10	0.269	0.179	0.179
06/27/2023	01:35	1.46	18:55	1.95	1.73	02:40	2.15	18:40	6.16	4.85	01:40	0.060	18:40	0.251	0.172	0.172
06/28/2023	01:15	1.48	08:55	1.88	1.73	01:20	2.55	19:30	5.88	4.87	01:20	0.073	17:40	0.232	0.172	0.172
06/29/2023	01:55	1.48	08:25	1.96	1.72	02:40	2.22	17:45	5.92	4.83	02:40	0.063	08:25	0.244	0.170	0.170
06/30/2023	02:30	1.47	08:30	1.91	1.70	02:40	2.44	07:10	5.84	4.84	02:15	0.071	07:10	0.232	0.167	0.167
07/01/2023	02:25	1.48	09:00	1.97	1.72	02:15	2.19	08:35	6.02	4.76	02:30	0.066	09:10	0.245	0.168	0.168
07/02/2023	00:30	1.56	08:35	1.98	1.72	01:50	2.55	10:50	6.13	4.99	01:50	0.081	07:45	0.255	0.175	0.175
07/03/2023	02:40	1.48	09:45	1.95	1.68	02:50	2.24	09:45	6.18	4.93	03:00	0.065	09:45	0.257	0.168	0.168
07/04/2023	04:45	1.47	08:15	1.98	1.67	03:30	2.40	08:05	6.10	4.89	03:30	0.071	08:15	0.247	0.166	0.166
07/05/2023	23:40	1.48	19:00	1.98	1.67	02:40	2.77	19:45	6.06	4.99	02:40	0.082	19:00	0.254	0.169	0.169
07/06/2023	01:30	1.40	07:50	1.92	1.62	02:25	2.25	20:30	5.95	4.92	02:25	0.060	07:50	0.239	0.159	0.159
07/07/2023	01:55	1.37	08:30	1.95	1.57	02:10	2.39	08:30	6.20	4.93	01:55	0.064	08:30	0.258	0.153	0.153
07/08/2023	04:20	1.39	10:20	1.93	1.60	02:00	2.30	10:40	6.16	4.69	04:20	0.064	10:30	0.248	0.150	0.150
07/09/2023	03:00	1.37	08:15	1.97	1.58	03:30	2.58	17:50	6.30	5.05	03:30	0.066	17:50	0.255	0.160	0.160
07/10/2023	01:15	1.34	07:45	1.81	1.50	01:05	2.85	20:40	6.01	5.06	01:05	0.073	07:45	0.221	0.146	0.146
07/11/2023	02:25	1.34	07:45	1.88	1.52	02:45	2.14	07:45	6.16	5.07	02:45	0.054	07:45	0.244	0.151	0.151
07/12/2023	01:50	1.34	18:35	1.88	1.55	02:45	2.37	07:40	6.15	5.12	02:30	0.060	18:35	0.239	0.157	0.157
07/13/2023	01:30	1.34	08:20	1.82	1.55	02:45	2.44	08:05	6.19	5.09	02:45	0.062	08:20	0.231	0.155	0.155
07/14/2023	01:45	1.35	07:40	1.79	1.54	02:55	2.37	07:05	5.99	4.94	01:25	0.060	07:35	0.218	0.149	0.149
07/15/2023	03:55	1.36	08:35	1.81	1.58	04:05	2.30	08:55	6.11	4.95	03:30	0.059	08:35	0.228	0.155	0.155
07/16/2023	04:15	1.39	10:20	1.82	1.60	02:35	2.67	10:25	6.15	5.04	04:15	0.070	10:20	0.233	0.161	0.161
07/17/2023	03:40	1.35	12:20	1.74	1.55	02:50	2.22	17:10	5.99	4.96	02:50	0.057	12:20	0.210	0.151	0.151
07/18/2023	02:50	1.35	07:45	1.76	1.53	01:30	2.27	17:20	6.11	4.96	01:30	0.058	16:20	0.217	0.148	0.148
07/19/2023	01:40	1.35	20:30	1.73	1.53	02:55	2.32	19:35	5.96	4.99	02:50	0.060	20:30	0.209	0.149	0.149
07/20/2023	02:35	1.35	16:55	1.90	1.55	02:10	2.34	16:55	6.23	4.98	02:10	0.058	16:55	0.250	0.152	0.152
07/21/2023	02:50	1.41	17:55	1.85	1.56	02:20	2.99	17:55	6.09	4.97	02:20	0.081	17:55	0.235	0.151	0.151
07/22/2023	03:15	1.34	09:10	1.90	1.57	03:50	2.23	09:10	6.01	4.72	03:50	0.056	09:10	0.242	0.147	0.147
07/23/2023	02:45	1.36	08:45	1.82	1.58	02:35	2.28	12:20	5.96	4.82	02:35	0.056	12:20	0.217	0.152	0.152
07/24/2023	02:40	1.36	08:20	1.87	1.57	02:55	2.28	18:20	6.18	4.94	02:55	0.056	08:20	0.228	0.153	0.153

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	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			11.223
Average	1.64	4.97	0.165

RED_MH17C073

Site Commentary

SITE INFORMATION

Pipe	Circular (14.5 in H x 14.5 in W)
Silt	0.00 (in)

OBSERVATIONS

Surcharge conditions were not experienced. Review of the scattergraph shows that free-flow conditions were maintained throughout the study. Backwater conditions were not observed.

This site was positioned upstream of site RED_MH04B057. A review of flow balancing indicated no problems.

Average flow depth, velocity, and quantity data observed during **Thursday, 18 May 2023 to Monday, 24 July 2023**, along with observed minimum and maximum data, are provided in the following table.

Observed Flow Conditions			
Item	**DFINAL (in)**	**VFINAL (ft/s)**	**QFINAL (MGD - Total MG)**
Average	3.86	1.68	0.281
Minimum	1.86	0.89	0.060
Maximum	5.32	2.16	0.491
Min Time	06/14/2023 2:00:00 AM	06/13/2023 2:00:00 AM	06/24/2023 3:00:00 AM
Max Time	05/30/2023 8:00:00 PM	06/18/2023 10:00:00 AM	05/30/2023 8:00:00 PM

Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Values in the Observed Flow Conditions and data on the graphical reports are based on the one hour average.

DATA UPTIME

Data uptime observed during **Thursday, 18 May 2023 to Monday, 24 July 2023** is provided in the following table:

Percent Uptime	
DFINAL (in)	100
VFINAL (ft/s)	100
QFINAL (MGD - Total MG)	100

Redmond.TFM.OR23		Site Name
Flow Monitoring Site Report	ADS ENVIRONMENTAL SERVICES®	RED_MH17C073

Site Address /Location:	SW indian Ave and SW 35th St., Redmond, OR			Monitor Series	Location Type
				TRITON+	Temporary
Site Access Details:	Middle of road traffic set up	Latitude:	44.2680675	Pipe Size (H x W)	Pipe Shape
		Longitude:	-121.2093556	14.50 X 14.50	Circular



Manhole #	System Characteristics
Far west Inerceptor 17C073	Residential
Access	Traffic
Drive	Medium







ADS Project Name:	Redmond.TFM.OR23
ADS Project Number:	22927.11.325

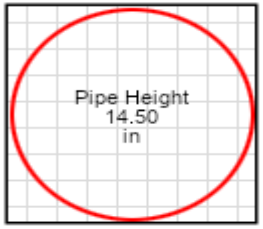
Installation Information	
Installation Date:	Installation Type:
Tuesday, May 16, 2023	Doppler Standard Ring and Crank
Monitoring Location (Sensors):	Monitor Location:
Upstream 0-5 FT	Manhole
Sensors / Devices:	Pressure Sensor Range (psi)
Peak Combo (CS4), Smart Depth (CS5)	0 - 15 psi
Installation Confirmation:	
Confirmation Time:	Pipe Size (HxW)
7:33:00 AM	14.50 X 14.50
Depth of Flow (Wet DOF) (in)	Range (Air DOF) (in)
4.75	N/A
Physical Offse CS5 (in)	Measurement Confidence (in)
1.38	0.38"
Peak Velocity (fps)	Velocity Sensor Offset (in)
3.08	0
Silt (in)	Silt Type
0	None
Hydraulic Comments:	
Good depth, moderate velocity, small waves	
Manhole / Pipe Information:	
Manhole Depth (Approx. FT):	Manhole Configuration
16.5'	Single
Manhole Material:	Manhole Condition:
Concrete	Good
Manhole Opening Diameter (in)	Manhole Diameter (Approx.):
26"	54"
Manhole Cover	Manhole Frame
Unbolted	Normal
Active Drop Connections	Air Quality:
No	Normal
Pipe Material	Pipe Condition:
PVC	Good
Communication Information:	
Communication Type	Antenna Location
Wireless	Manhole Pick / Vent Hole
Additional Site Info. / Comments:	

Hydrograph Report

RED_MH17C073

Flow Monitor

RED_MH17C073

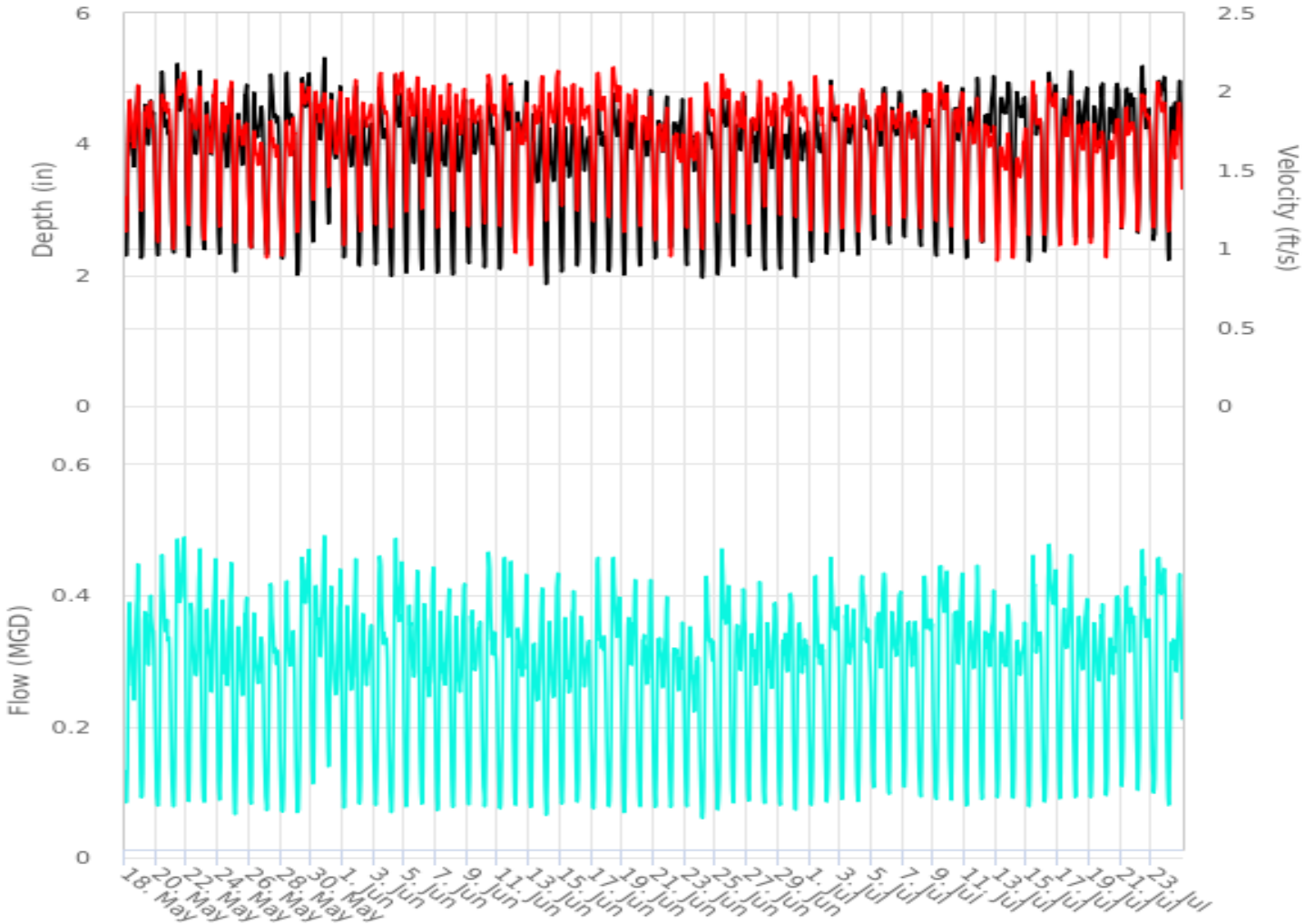


Report Period

05/18/2023
To
07/24/2023

Legend

DFINAL
QFINAL
VFINAL



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Scattergraph Report

RED_MH17C073

Flow Monitor

RED_MH17C073

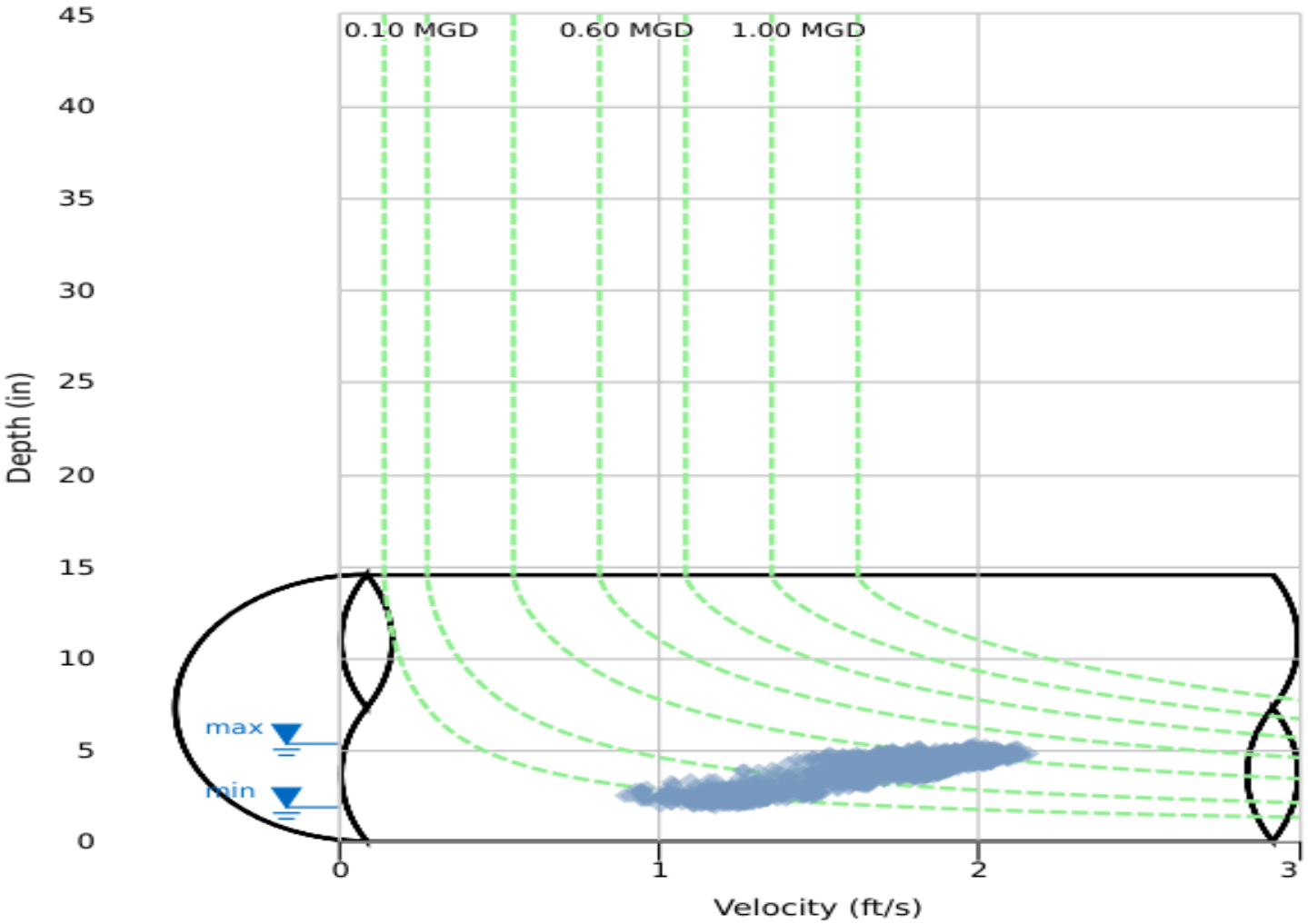
Pipe Height
14.50
in

Report Period

05/18/2023
To
07/24/2023

Legend

- DFINAL - VFINAL
- Iso-Q™
- Min-Max Depth



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Daily Tabular Report

05/18/2023 00:00 - 07/24/2023 23:59
RED_MH17C073Pipe: Elliptical (14.5 in H x 14.5 in W), Silt0.00 in

	DFINAL (in)					VFINAL (ft/s)					QFINAL (MGD - Total MG)					
Date	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total
05/18/2023	02:15	2.27	20:30	4.98	3.81	02:10	1.08	20:15	2.09	1.69	02:30	0.081	20:15	0.469	0.277	0.277
05/19/2023	01:55	2.14	15:55	4.90	3.86	01:45	1.15	15:45	2.06	1.70	01:50	0.079	15:50	0.450	0.282	0.282
05/20/2023	03:35	2.24	09:40	5.24	3.89	04:25	0.96	09:50	2.06	1.68	04:25	0.071	09:50	0.494	0.288	0.288
05/21/2023	04:10	2.26	09:15	5.36	4.08	04:05	0.91	18:50	2.18	1.75	04:05	0.068	09:15	0.519	0.326	0.326
05/22/2023	03:10	2.22	20:40	5.20	3.86	03:10	1.12	19:40	2.11	1.71	03:10	0.080	20:25	0.492	0.286	0.286
05/23/2023	01:55	2.30	20:20	5.09	3.93	03:00	0.95	20:20	2.14	1.65	03:00	0.072	20:20	0.497	0.284	0.284
05/24/2023	02:45	2.29	20:30	5.04	3.80	01:45	1.08	20:20	2.15	1.73	02:20	0.083	20:20	0.488	0.282	0.282
05/25/2023	02:05	1.97	20:25	5.03	3.83	02:25	0.99	20:10	1.89	1.60	02:05	0.060	20:10	0.425	0.264	0.264
05/26/2023	02:55	2.37	06:55	4.89	3.93	03:25	0.95	07:45	1.82	1.49	03:25	0.076	07:00	0.398	0.253	0.253
05/27/2023	03:55	2.22	09:10	5.14	3.95	03:00	0.89	09:00	1.90	1.49	03:55	0.066	09:00	0.439	0.259	0.259
05/28/2023	03:40	2.21	10:05	5.21	3.86	02:20	0.93	20:10	1.92	1.51	03:05	0.067	10:10	0.454	0.256	0.256
05/29/2023	02:55	1.93	09:40	5.24	3.99	03:15	1.03	09:50	2.12	1.74	02:30	0.062	09:45	0.500	0.314	0.314
05/30/2023	02:40	2.46	20:30	5.49	4.12	02:50	1.24	20:40	2.07	1.80	02:50	0.104	20:35	0.527	0.325	0.325
05/31/2023	02:30	2.69	20:50	5.06	3.96	02:40	1.31	20:45	2.15	1.72	02:40	0.125	20:45	0.488	0.289	0.289
06/01/2023	02:45	2.15	20:10	5.03	3.78	02:45	0.97	20:05	2.15	1.70	02:45	0.066	20:05	0.490	0.276	0.276
06/02/2023	01:55	2.11	07:15	4.57	3.69	04:00	1.02	07:10	2.03	1.71	01:50	0.076	07:10	0.404	0.266	0.266
06/03/2023	03:45	2.07	09:55	5.04	3.76	03:40	1.07	09:00	2.21	1.75	03:40	0.070	09:55	0.498	0.285	0.285
06/04/2023	04:00	1.88	10:05	5.27	3.82	03:55	1.07	18:55	2.21	1.80	03:55	0.061	10:10	0.529	0.306	0.306
06/05/2023	03:25	1.89	19:50	4.85	3.70	03:10	1.15	19:45	2.16	1.80	03:25	0.067	19:45	0.466	0.284	0.284
06/06/2023	02:40	1.97	20:30	4.96	3.68	02:30	1.19	20:00	2.12	1.77	02:40	0.073	20:30	0.465	0.275	0.275
06/07/2023	02:40	1.94	20:40	4.64	3.64	02:35	1.07	19:20	2.13	1.75	02:35	0.064	20:40	0.426	0.269	0.269
06/08/2023	03:10	1.94	20:40	4.82	3.61	03:10	1.19	20:40	2.10	1.75	03:10	0.070	20:40	0.454	0.266	0.266
06/09/2023	03:35	2.09	07:00	4.54	3.70	03:25	1.06	06:15	2.02	1.71	03:25	0.071	06:15	0.398	0.269	0.269
06/10/2023	03:20	2.04	09:45	5.05	3.76	03:25	1.13	09:30	2.17	1.76	03:25	0.072	09:45	0.489	0.285	0.285
06/11/2023	03:40	2.01	20:30	5.04	3.89	03:40	1.08	10:55	2.19	1.75	03:40	0.067	10:55	0.501	0.302	0.302
06/12/2023	03:15	2.32	19:30	5.10	3.96	03:15	0.90	19:50	1.99	1.60	03:15	0.069	19:30	0.458	0.277	0.277
06/13/2023	03:20	2.37	20:20	4.64	3.63	03:00	0.83	19:30	2.14	1.67	03:00	0.067	20:20	0.429	0.255	0.255
06/14/2023	02:30	1.79	19:50	4.77	3.54	02:25	1.12	18:40	2.21	1.79	02:25	0.059	19:50	0.467	0.266	0.266
06/15/2023	02:35	1.99	20:15	4.69	3.57	02:30	1.21	08:00	2.16	1.80	02:30	0.076	20:15	0.442	0.268	0.268
06/16/2023	02:40	2.08	07:55	4.39	3.54	03:20	1.19	08:00	2.10	1.76	02:40	0.080	08:00	0.393	0.258	0.258
06/17/2023	03:20	1.94	10:30	4.92	3.65	03:15	1.09	10:35	2.19	1.77	03:15	0.065	10:30	0.477	0.277	0.277
06/18/2023	03:40	1.94	08:35	5.03	3.72	04:10	1.15	10:15	2.26	1.81	04:10	0.068	08:35	0.514	0.292	0.292
06/19/2023	02:35	1.93	19:55	4.83	3.70	02:15	1.05	19:55	2.08	1.72	02:10	0.064	19:55	0.450	0.273	0.273
06/20/2023	03:10	2.09	20:45	4.94	3.75	03:10	1.07	18:10	2.03	1.67	03:10	0.071	20:40	0.449	0.267	0.267
06/21/2023	02:30	2.19	19:55	4.81	3.82	02:25	0.99	20:30	1.97	1.59	02:25	0.072	20:30	0.417	0.261	0.261
06/22/2023	02:30	2.34	20:50	4.84	3.87	02:25	0.89	10:40	1.83	1.53	02:25	0.070	20:05	0.385	0.253	0.253
06/23/2023	03:50	2.12	08:00	4.47	3.59	03:25	1.07	09:35	2.05	1.59	03:50	0.073	07:45	0.377	0.238	0.238
06/24/2023	03:50	1.84	09:30	4.85	3.60	03:50	0.94	09:30	2.13	1.68	03:50	0.052	09:30	0.464	0.261	0.261
06/25/2023	03:50	1.95	09:05	5.02	3.77	03:45	1.11	09:10	2.18	1.78	03:45	0.067	09:10	0.491	0.295	0.295
06/26/2023	03:10	2.01	19:50	4.88	3.77	03:10	1.13	18:40	2.07	1.73	03:10	0.070	19:30	0.439	0.277	0.277
06/27/2023	03:50	2.22	19:25	4.80	3.72	03:50	1.12	19:25	2.13	1.72	03:50	0.080	19:25	0.456	0.272	0.272
06/28/2023	03:20	1.97	19:00	4.65	3.63	03:10	1.21	18:30	2.10	1.77	03:10	0.073	18:30	0.427	0.269	0.269
06/29/2023	03:15	1.98	21:20	4.61	3.66	03:15	1.16	21:05	2.11	1.78	03:15	0.070	21:20	0.418	0.275	0.275
06/30/2023	03:30	1.82	21:05	4.34	3.62	03:30	1.12	09:05	2.09	1.74	03:30	0.060	09:05	0.386	0.264	0.264
07/01/2023	03:45	1.97	10:05	4.90	3.68	03:20	1.02	09:05	2.18	1.73	03:40	0.073	10:05	0.476	0.271	0.271
07/02/2023	03:40	2.29	09:20	5.14	3.91	02:50	1.04	09:40	2.09	1.69	03:25	0.082	09:20	0.484	0.289	0.289
07/03/2023	03:05	2.25	20:20	4.71	3.85	03:10	1.03	11:05	2.01	1.68	03:00	0.077	20:20	0.416	0.277	0.277
07/04/2023	03:10	2.29	09:40	4.90	3.91	04:00	1.01	10:30	2.07	1.68	04:00	0.080	09:40	0.453	0.287	0.287
07/05/2023	03:40	2.48	19:50	4.92	4.01	03:25	1.16	20:55	2.04	1.73	03:25	0.099	19:50	0.453	0.300	0.300
07/06/2023	03:05	2.37	20:40	4.89	4.00	03:10	1.07	21:20	2.04	1.69	03:05	0.085	21:20	0.442	0.293	0.293
07/07/2023	03:35	2.47	19:35	4.68	3.95	03:00	1.14	10:00	1.97	1.67	03:30	0.099	10:00	0.403	0.282	0.282
07/08/2023	04:00	2.37	11:20	4.88	3.92	03:55	1.08	15:45	2.07	1.71	04:25	0.088	09:15	0.448	0.292	0.292
07/09/2023	04:05	2.17	09:25	5.01	4.00	04:05	1.10	09:30	2.13	1.75	04:05	0.076	09:30	0.477	0.312	0.312
07/10/2023	03:15	2.28	19:40	4.90	3.97	03:15	1.07	20:40	2.06	1.71	03:15	0.080	20:55	0.448	0.294	0.294
07/11/2023	03:10	2.15	19:45	5.19	3.98	02:45	1.03	19:45	2.06	1.64	02:45	0.071	19:45	0.491	0.285	0.285
07/12/2023	03:40	2.38	20:55	5.16	4.08	02:35	0.98	09:55	1.87	1.57	02:35	0.079	20:55	0.433	0.281	0.281
07/13/2023	02:35	2.64	19:00	5.10	4.25	02:25	0.85	19:00	1.83	1.46	02:35	0.084	19:00	0.426	0.275	0.275
07/14/2023	02:10	2.62	21:10	4.94	4.14	03:20	0.87	18:00	1.77	1.44	03:20	0.082	21:10	0.393	0.262	0.262
07/15/2023	03:25	2.17	09:40	5.19	3.91	03:15	1.05	09:50	2.12	1.70	03:25	0.073	09:40	0.502	0.290	0.290
07/16/2023	03:20	2.34	10:45	5.24	4.10	03:25	1.02	10:40	2.11	1.71	03:25	0.080	10:40	0.510	0.316	0.316
07/17/2023	03:00	2.50	19:35	5.27	4.14	02:55	0.94	19:50	2.07	1.63	02:55	0.081	19:50	0.503	0.299	0.299
07/18/2023	02:30	2.52	20:35	4.99	4.08	02:30	0.98	20:35	1.88	1.58	02:30	0.084	20:35	0.426	0.282	0.282
07/19/2023	03:00	2.52	18:50	5.00	4.05	03:00	1.00	08:10	1.86	1.55	03:00	0.086	20:55	0.405	0.273	0.273
07/20/2023	03:30	2.59	20:00	5.06	4.15	02:15	0.89	21:05	1.93	1.54	02:15	0.089	21:05	0.437	0.283	0.283
07/21/2023	02:10	2.55	10:05	5.03	4.24	02:35	1.06	10:05	1.94	1.65	02:10	0.105	10:05	0.443	0.309	0.309
07/22/2023	03:50	2.48	10:05	5.26	4.14	03:35	1.08	09:45	2.07	1.69	03:45	0.092	09:10	0.491	0.307	0.307
07/23/2023	04:00	2.43	20:50	5.21	4.15	04:00	1.05	10:30	2.13	1.72	04:00	0.086	11:40	0.482	0.321	0.321
07/24/2023	02:10	2.18	19:15	5.12	4.03	03:00	1.06	18:00	1.98	1.60	02:05	0.076	19:15	0.461	0.282	0.282

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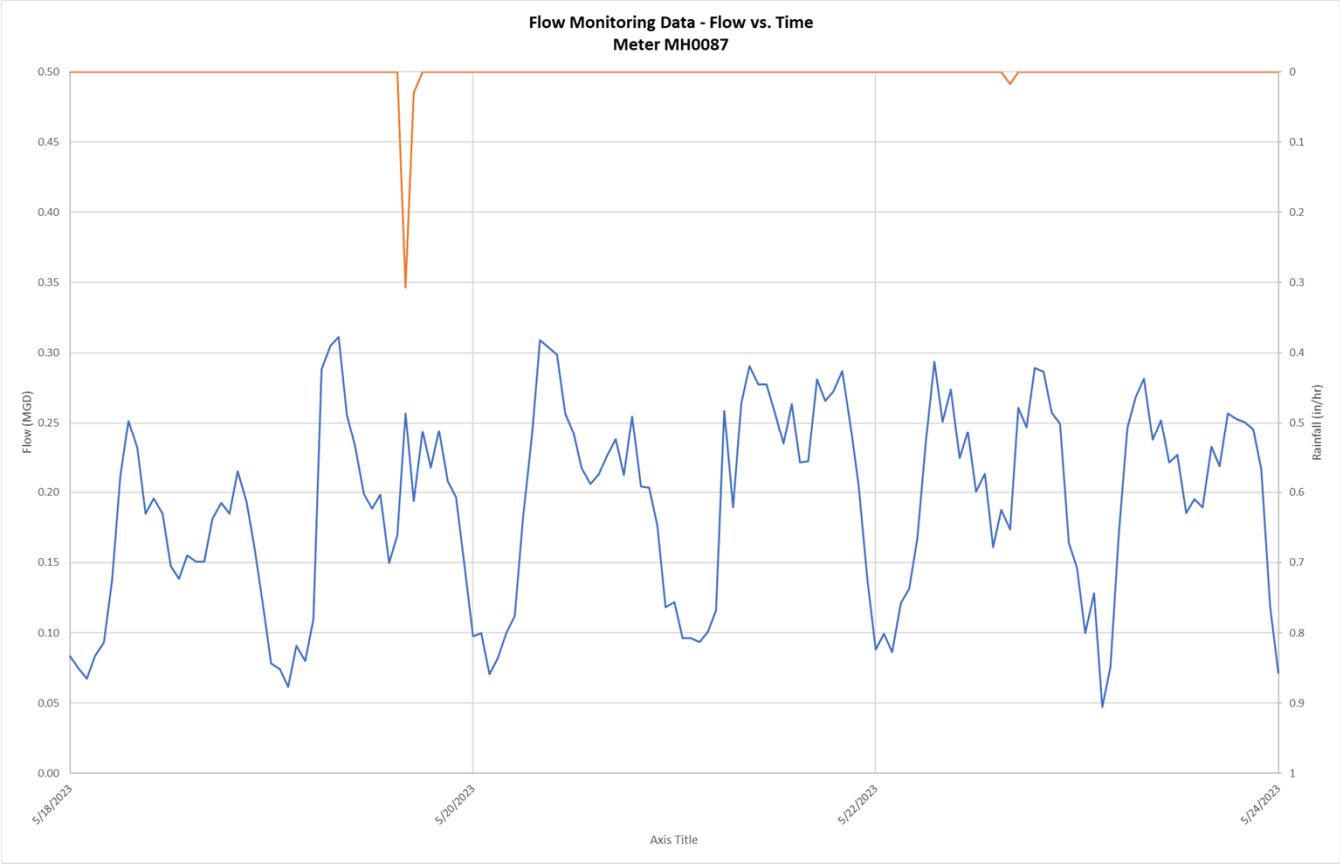
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	DFINAL (in)	VFINAL (ft/s)	QFINAL (MGD - Total MG)
Total			19.127
Average	3.86	1.68	0.281

APPENDIX B
Carollo Evaluation of Flow Monitoring Data

Meter MH0087

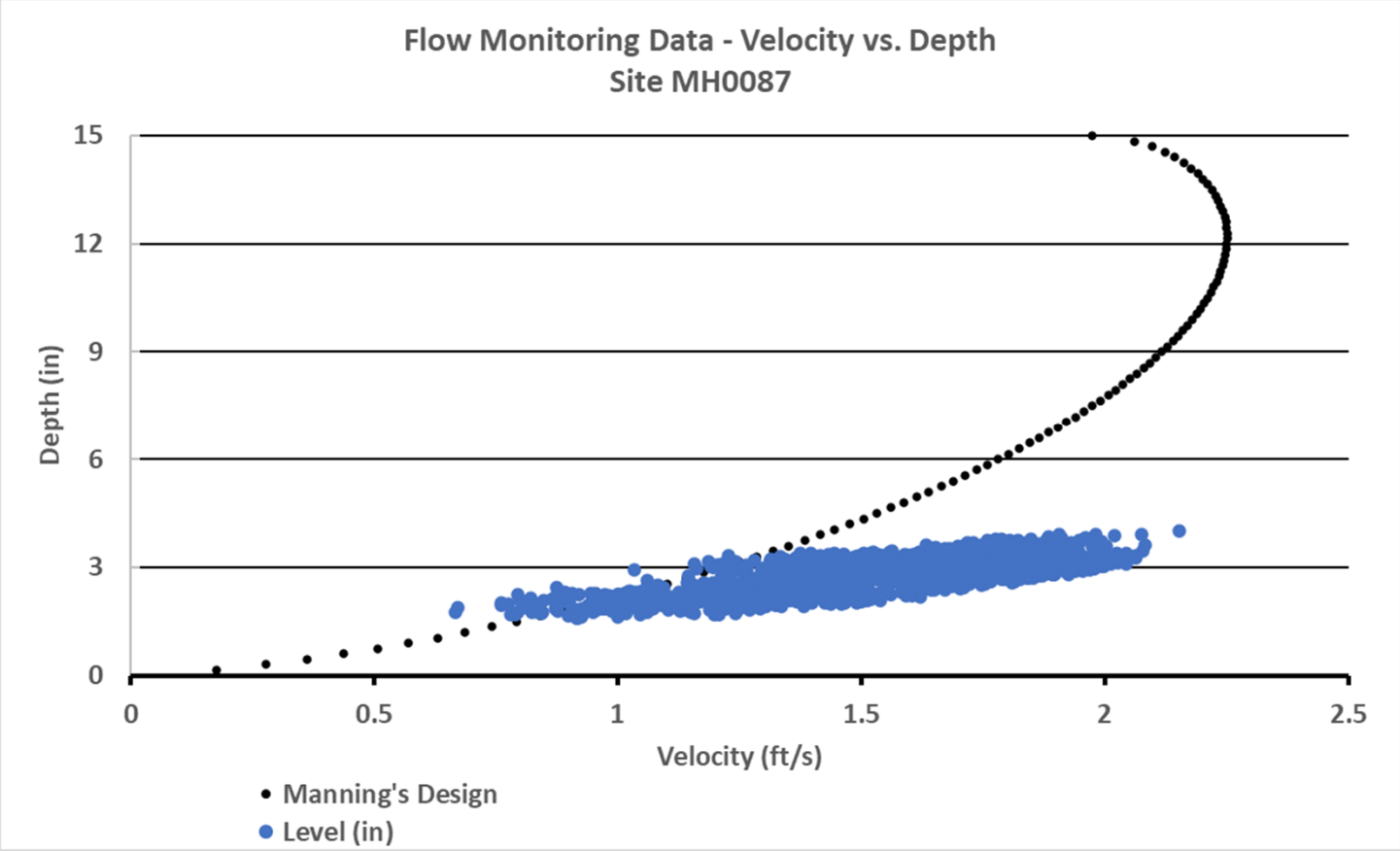
Flow vs. Rainfall



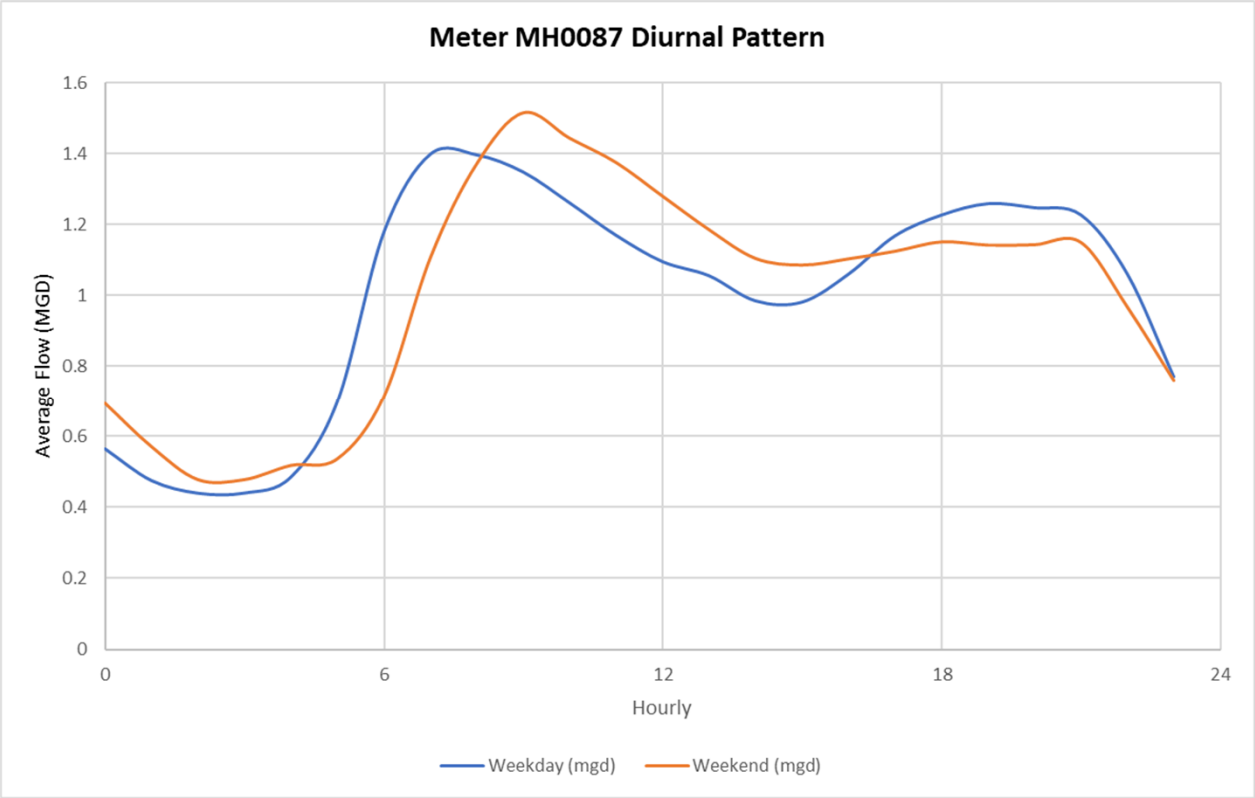
Flow (MGD)

Rainfall (in/hr)

Meter MH0087
Scattergraph

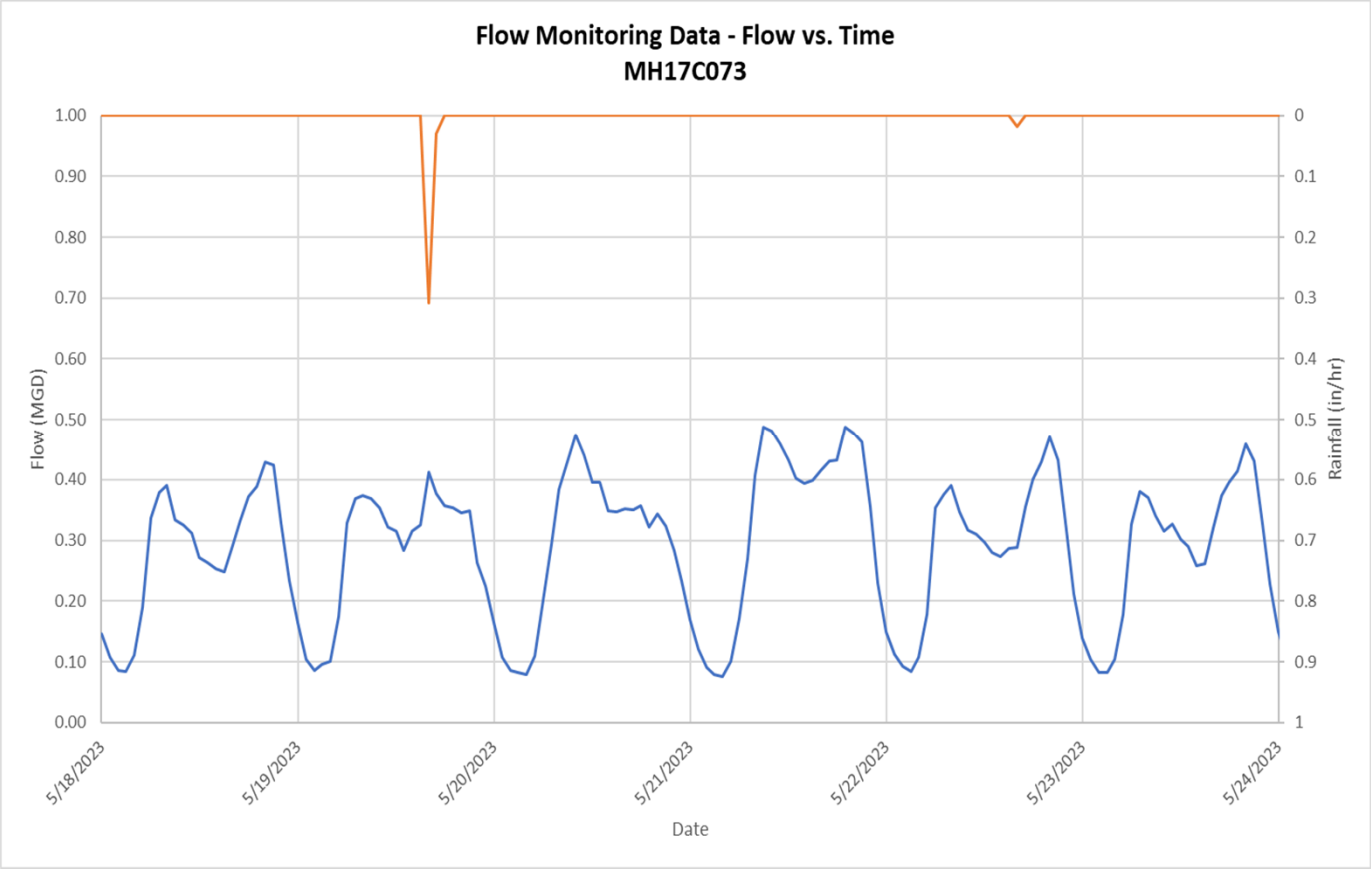


Meter MH0087
Diurnal Pattern



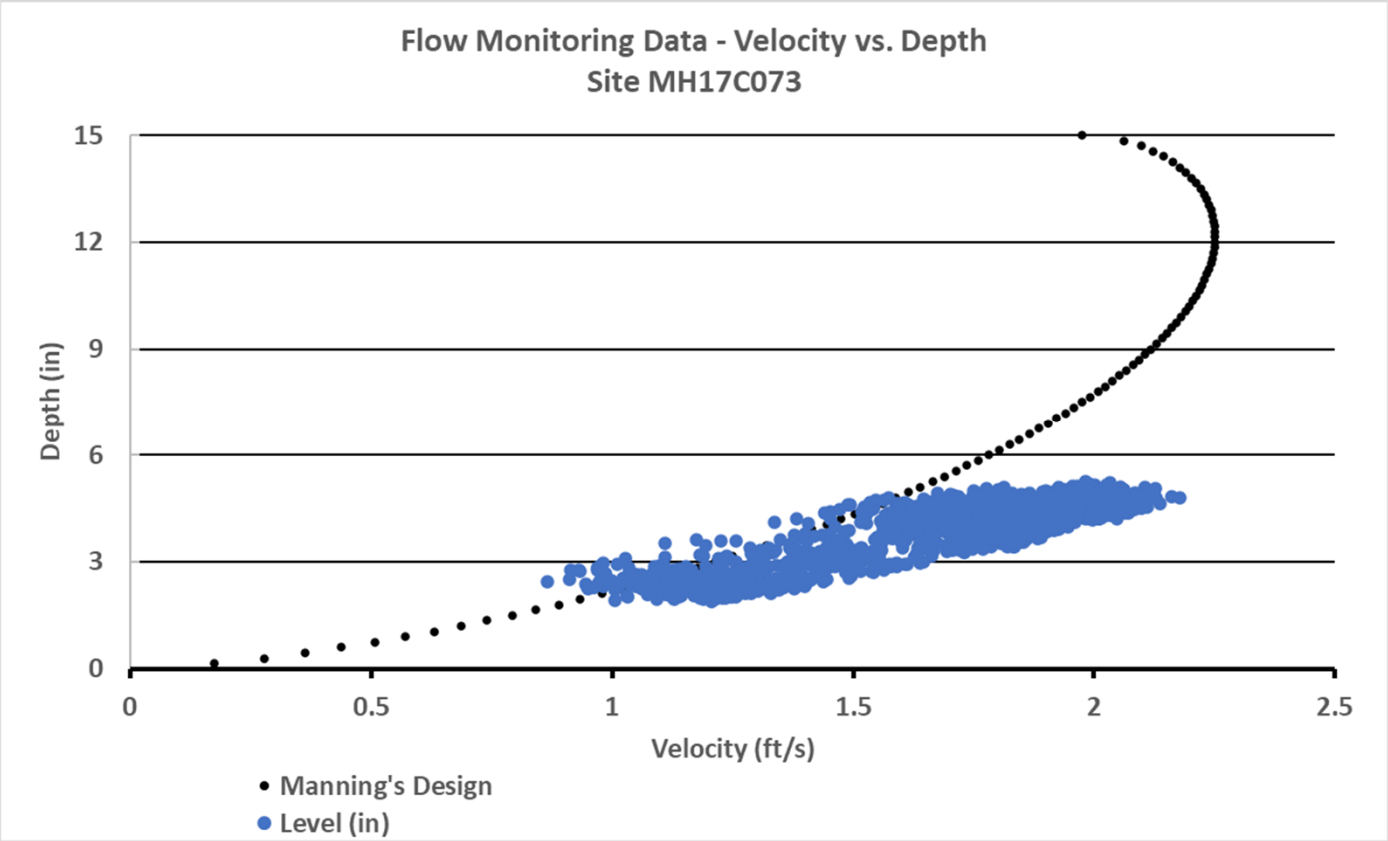
Meter MH17C073

Flow vs. Rainfall

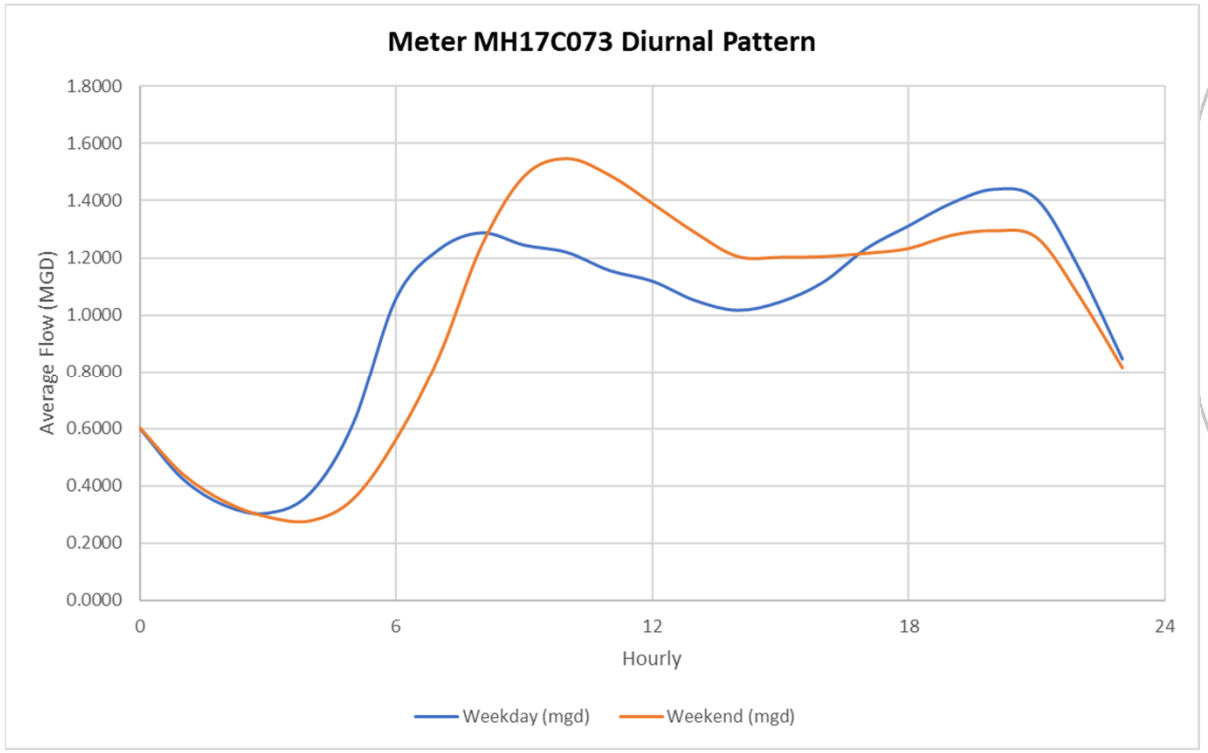


Flow (MGD)
Rainfall (in/hr)

Meter MH17C073 Scattergraph

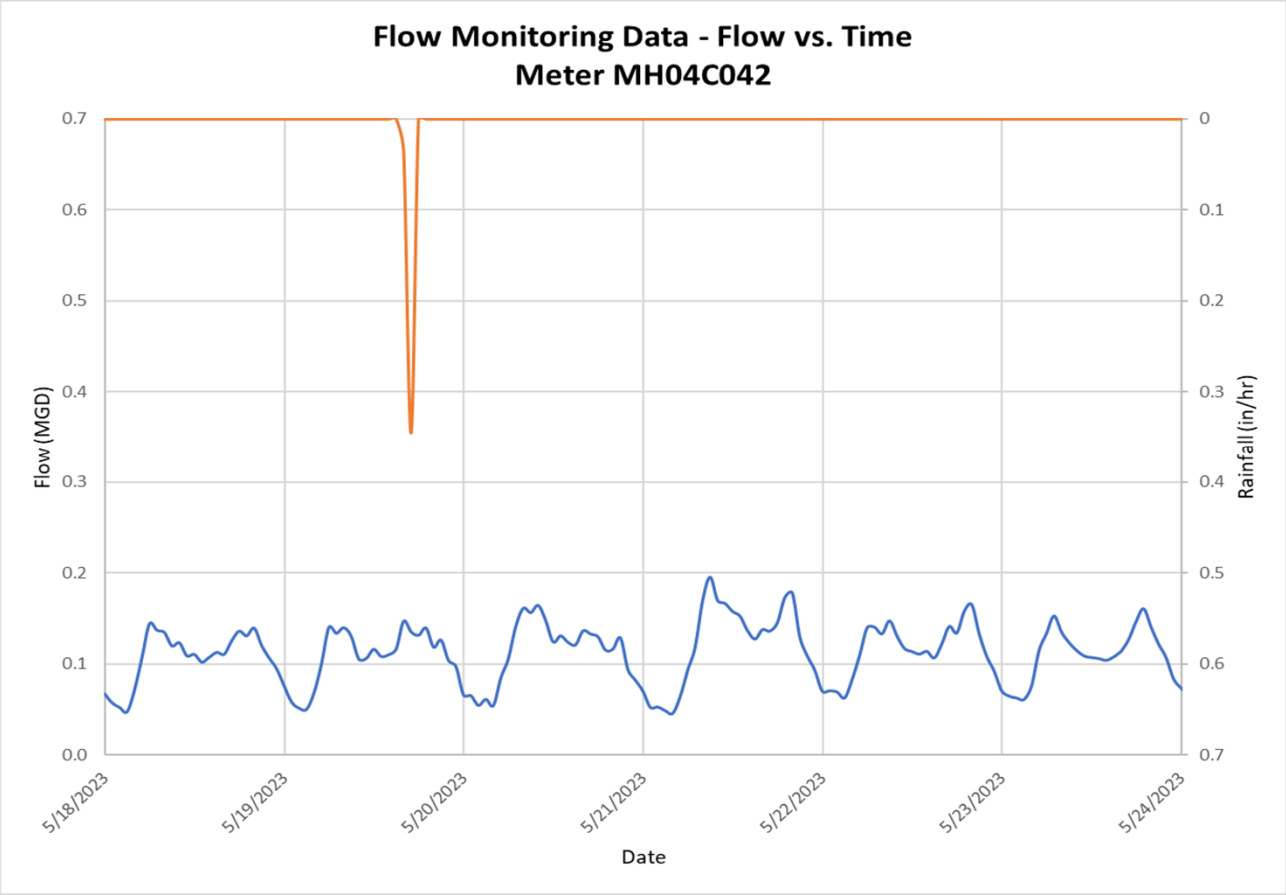


Meter MH17C073
Diurnal Pattern



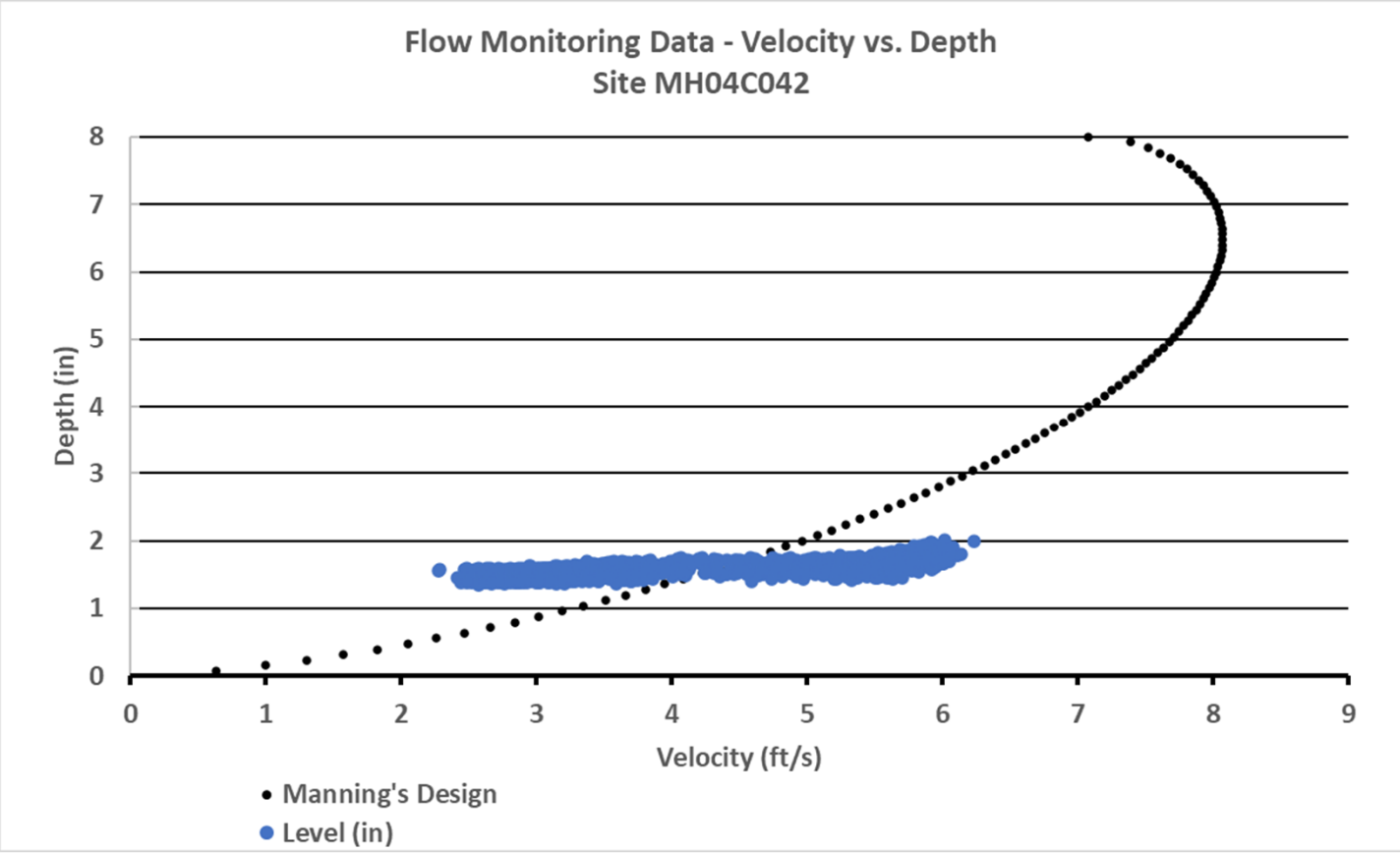
Meter MH04C042

Flow vs. Rainfall

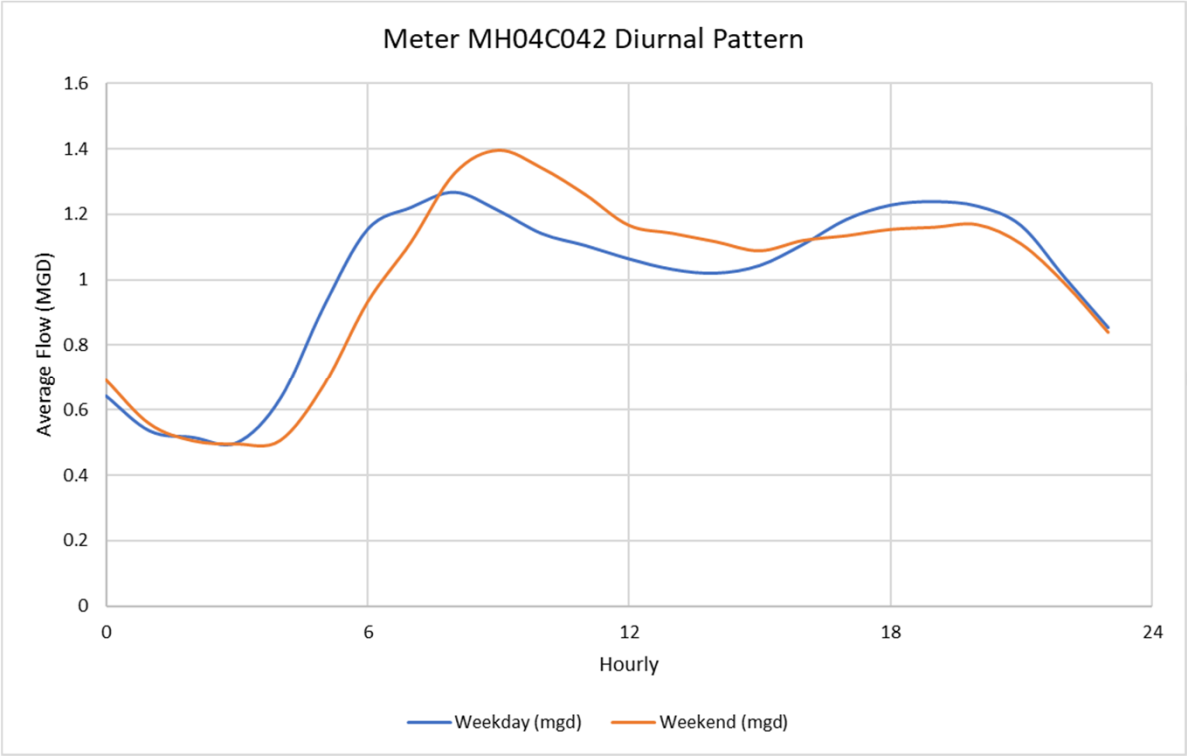


Flow (MGD)
Rainfall (in/hr)

Meter MH04C042 Scattergraph

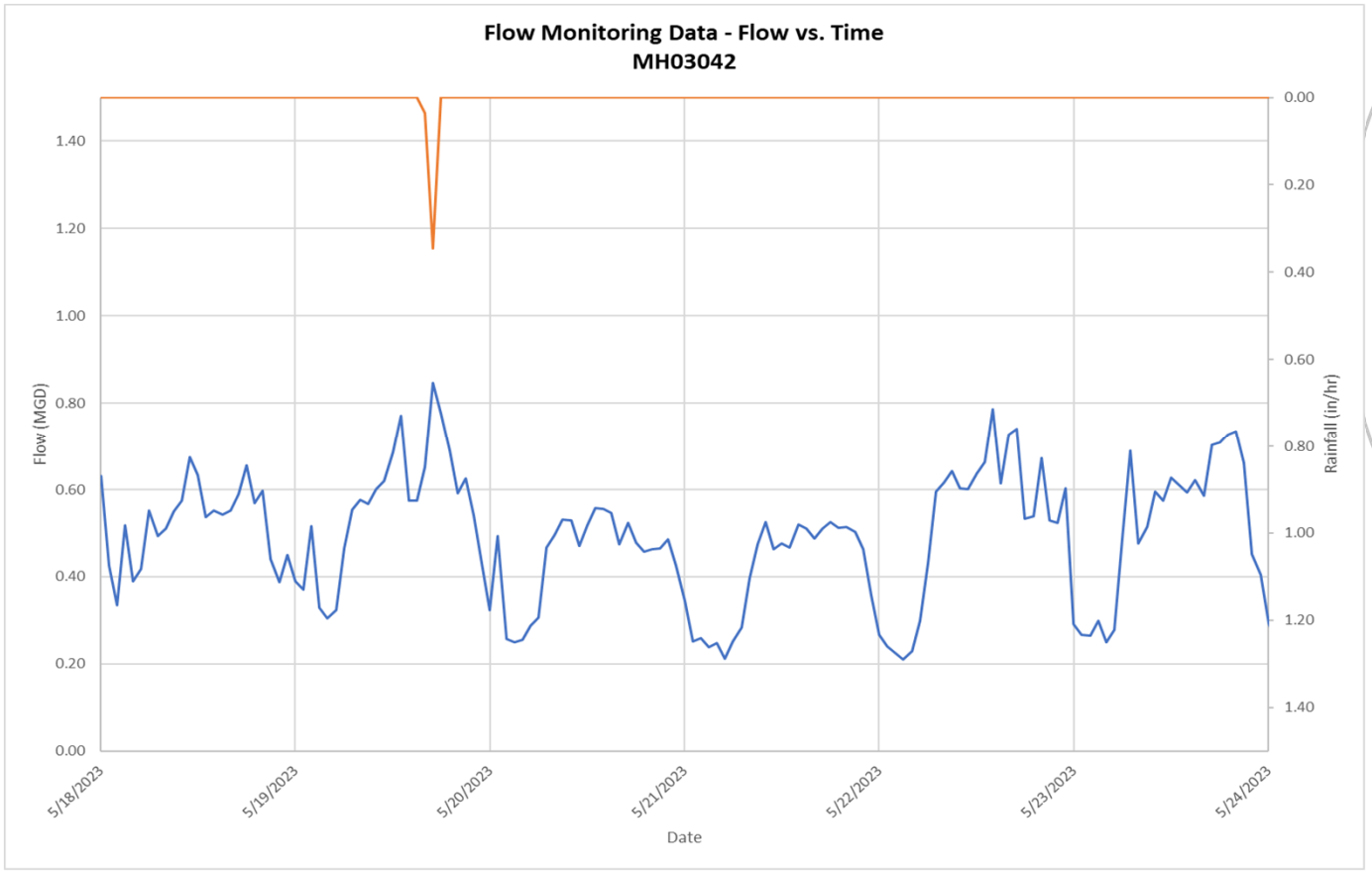


Meter MH04C042
Diurnal Pattern



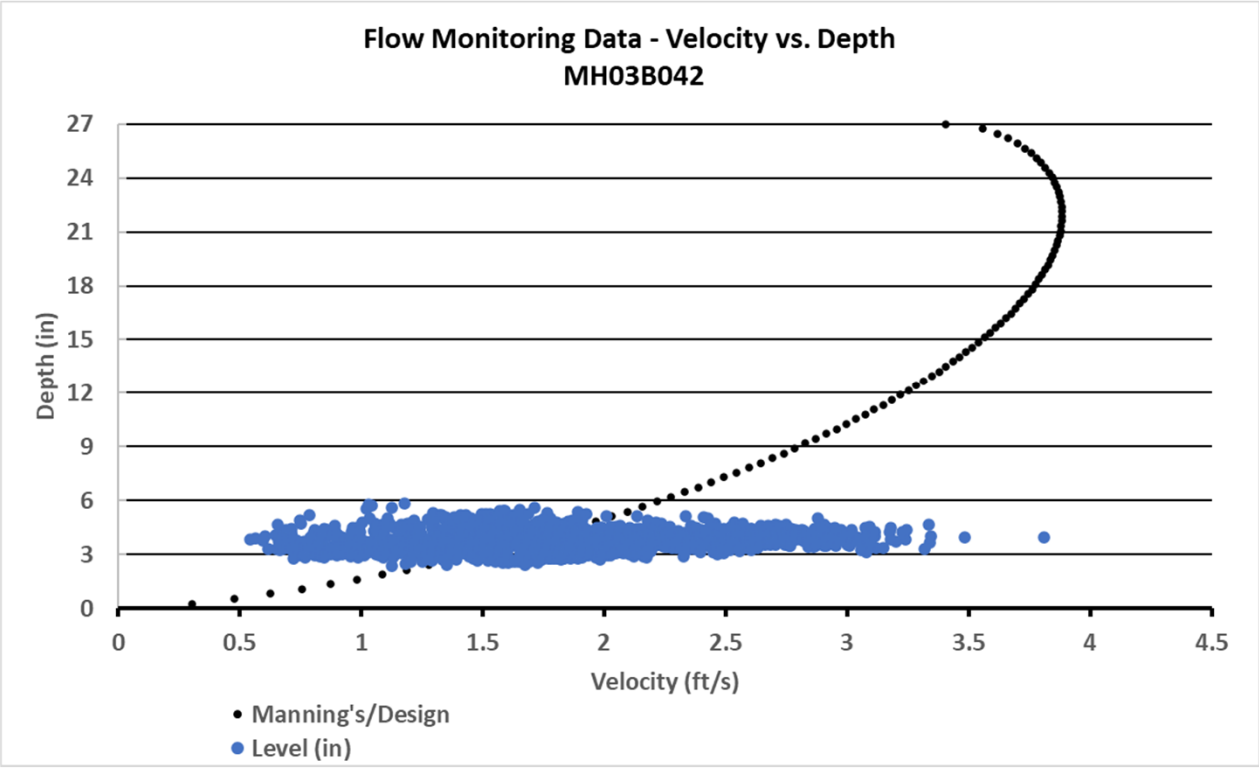
Meter MH03B042

Flow vs. Rainfall

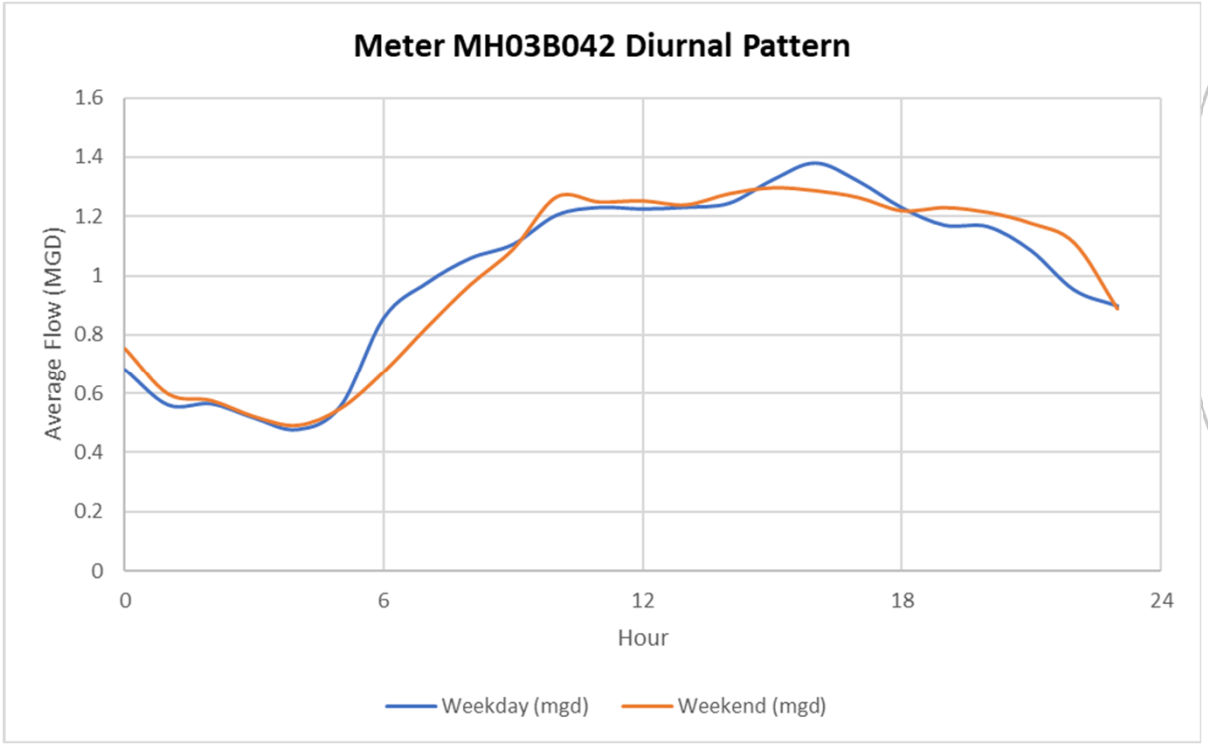


Flow (MGD)
Rainfall (in/hr)

Meter MH03B042 Scattergraph

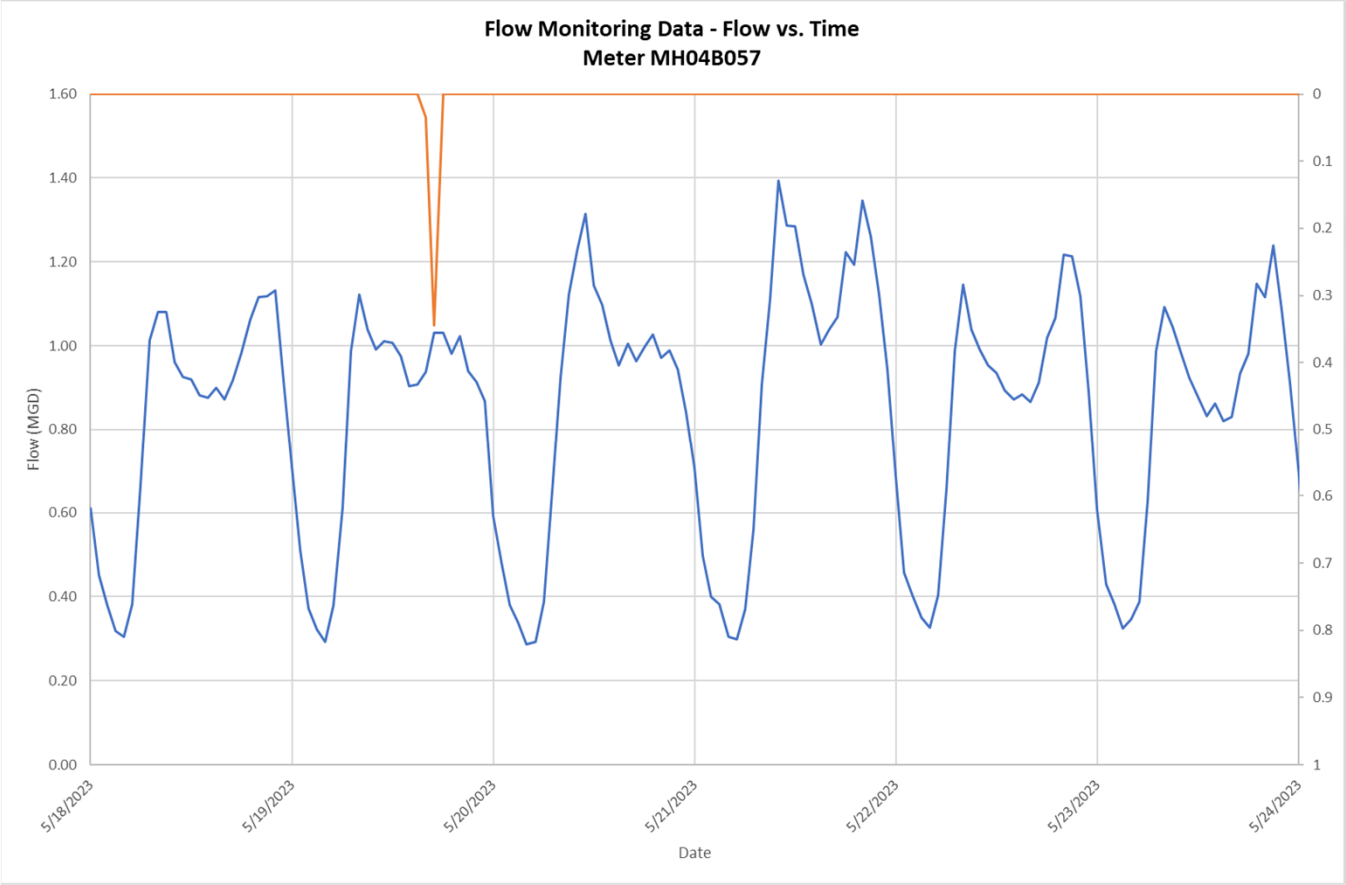


Meter MH03B042
Diurnal Pattern

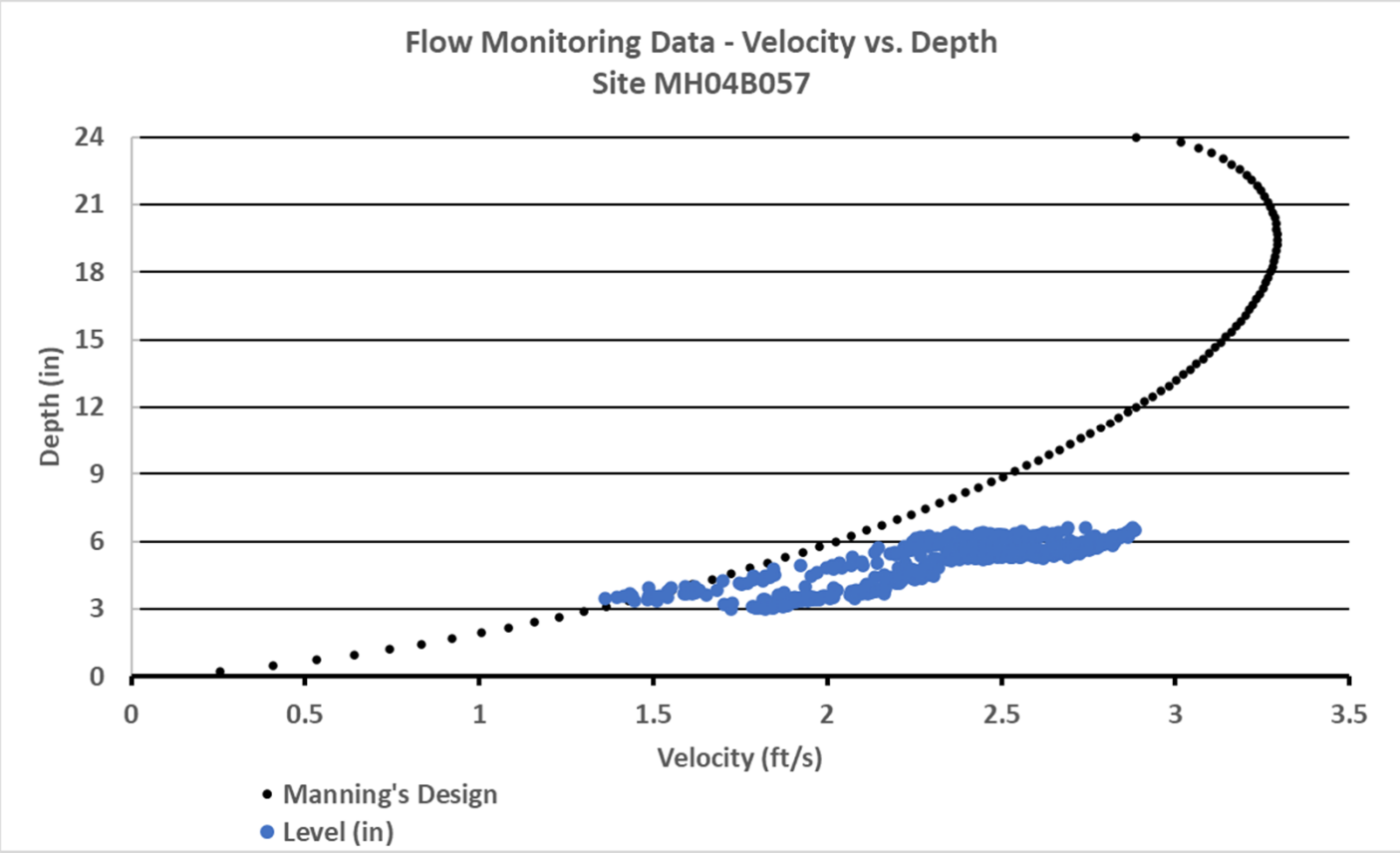


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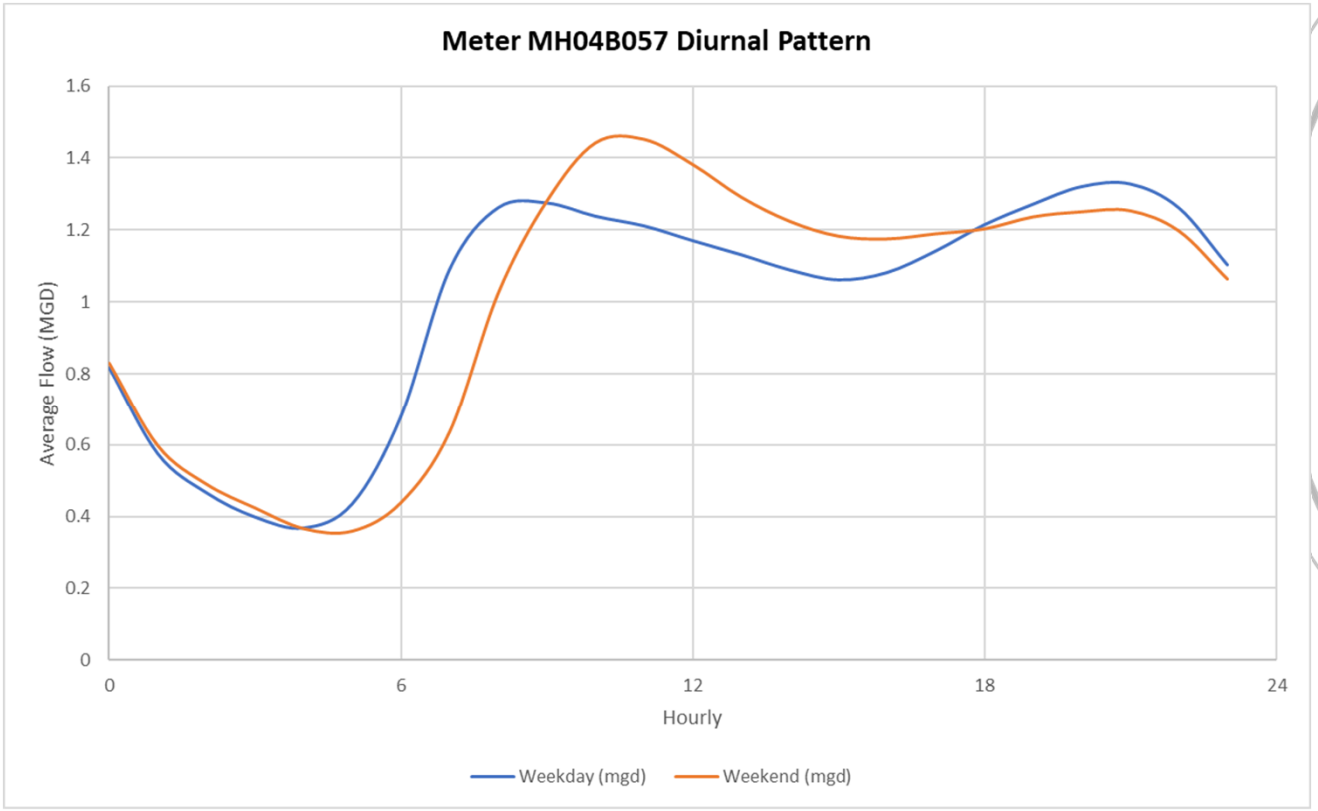
Flow vs Rainfall



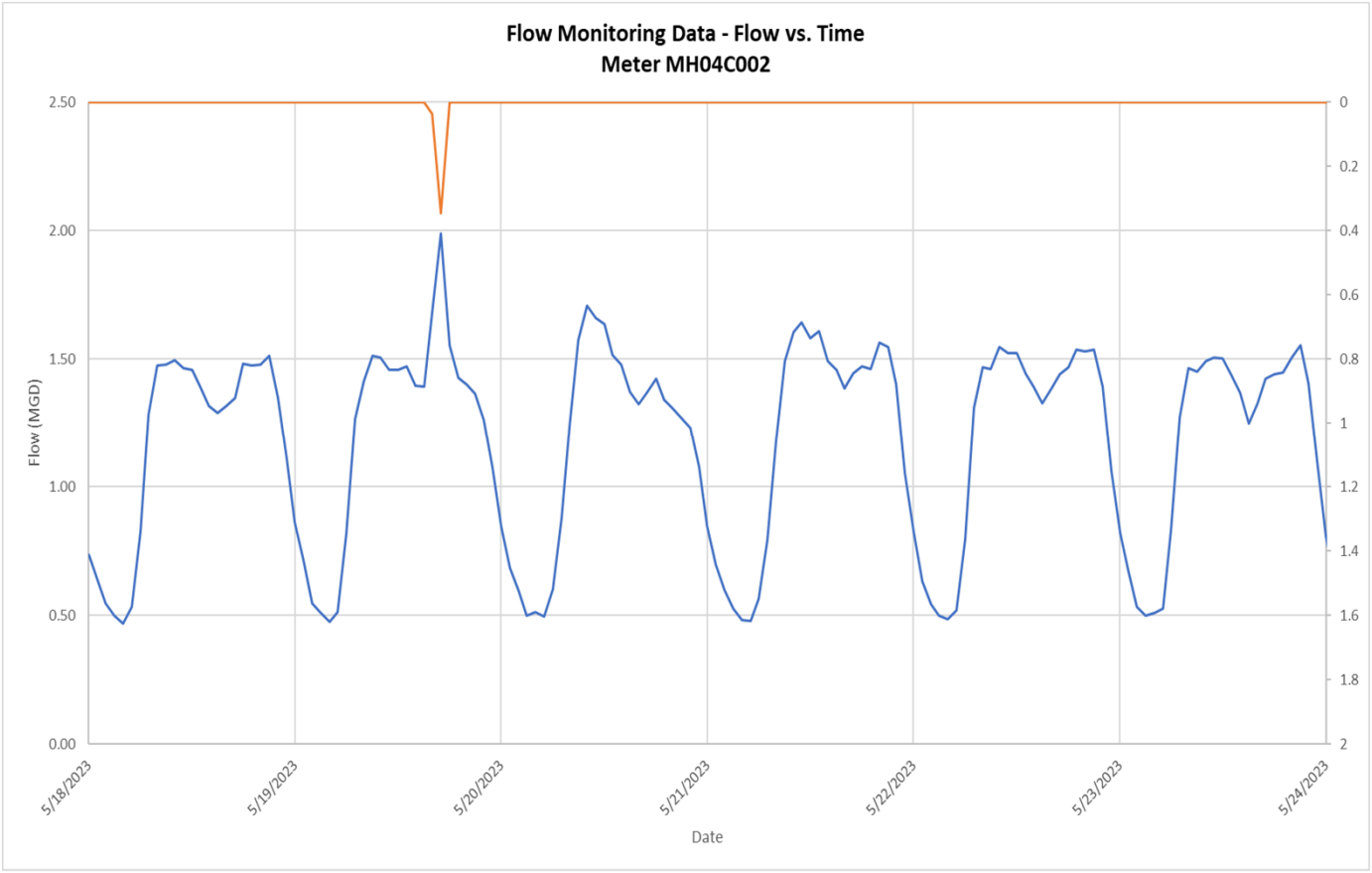
Meter MH04B057 Scattergraph



Meter MH04B057
Diurnal Pattern

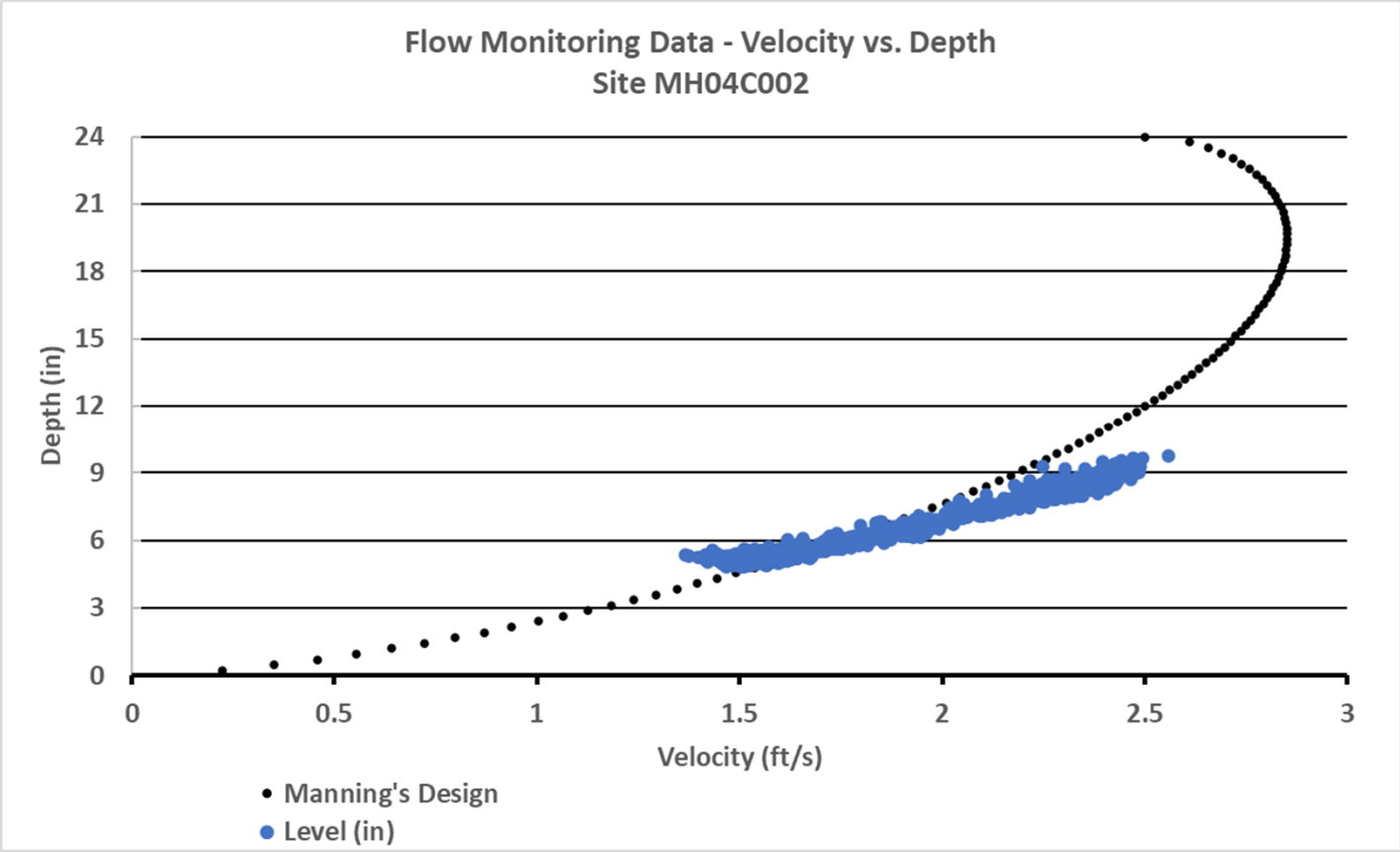


Meter MH04C002
Flow vs Rainfall

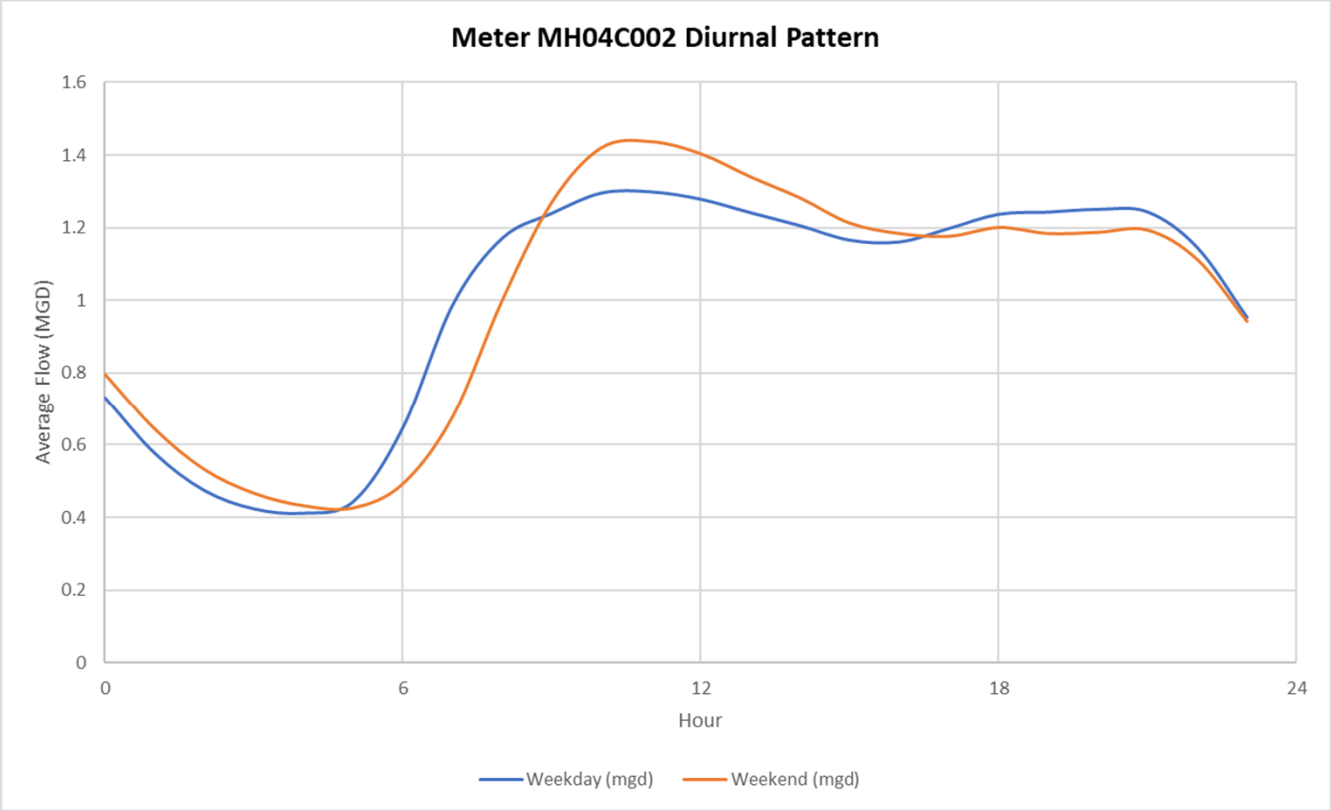


Flow (MGD)
Rainfall (in/hr)

Meter MH04C002 Scattergraph

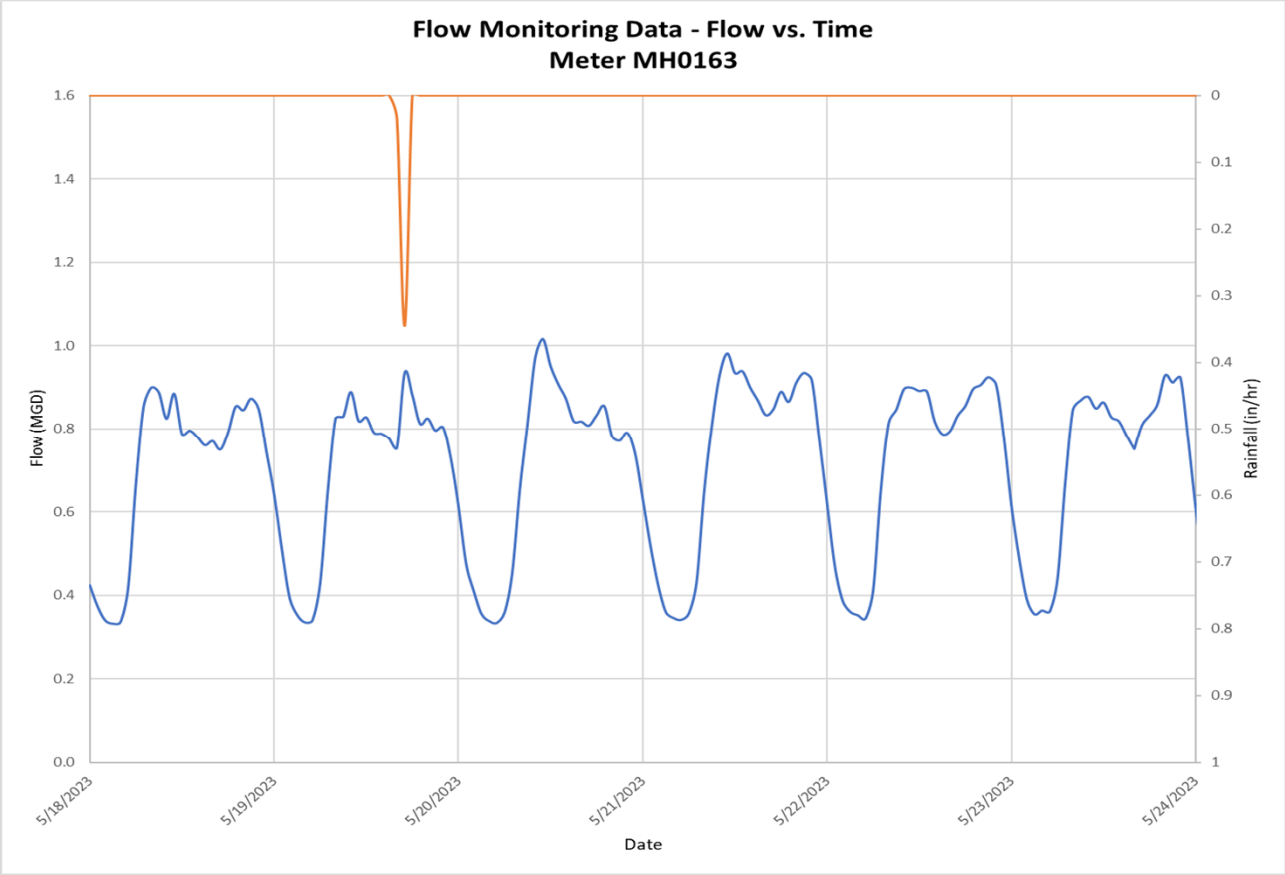


Meter MH04C002
Diurnal Pattern



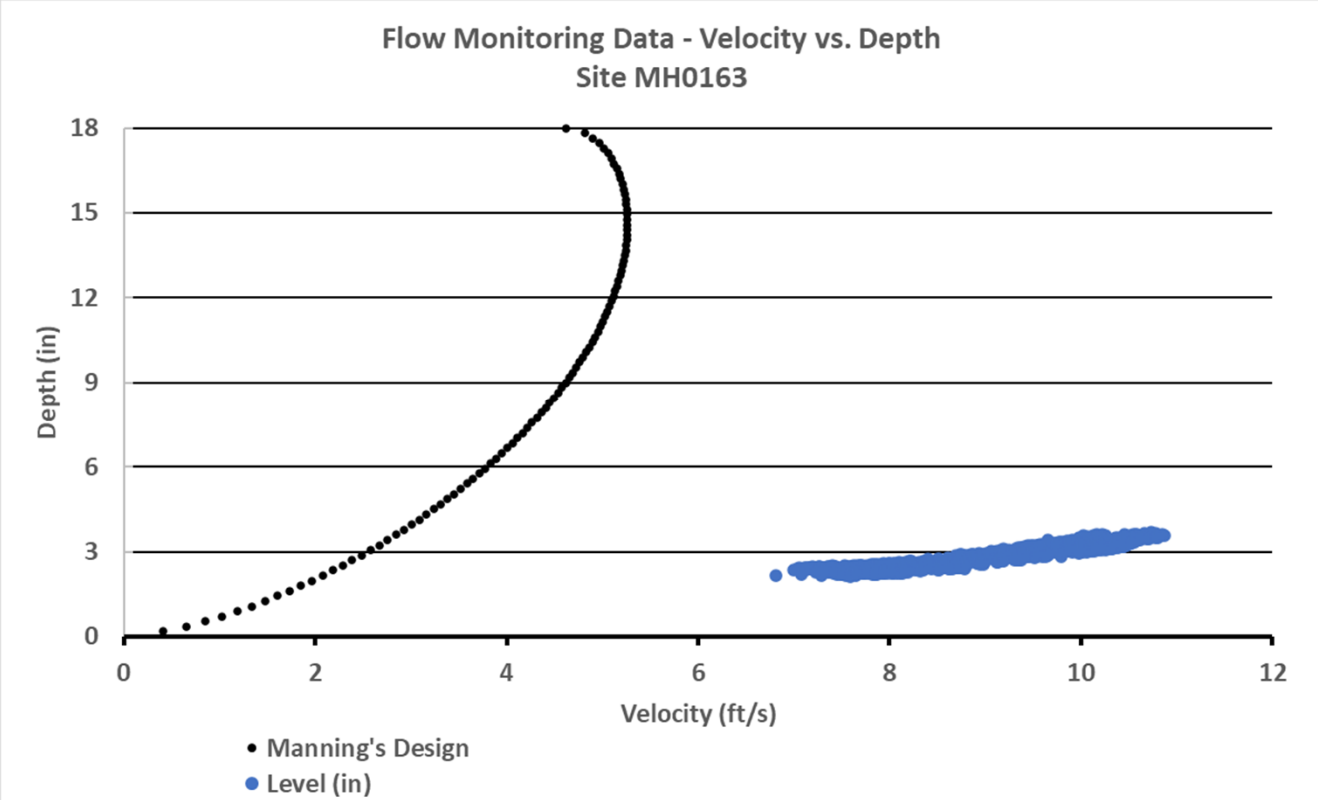
Meter MH0163

Flow vs. Rainfall

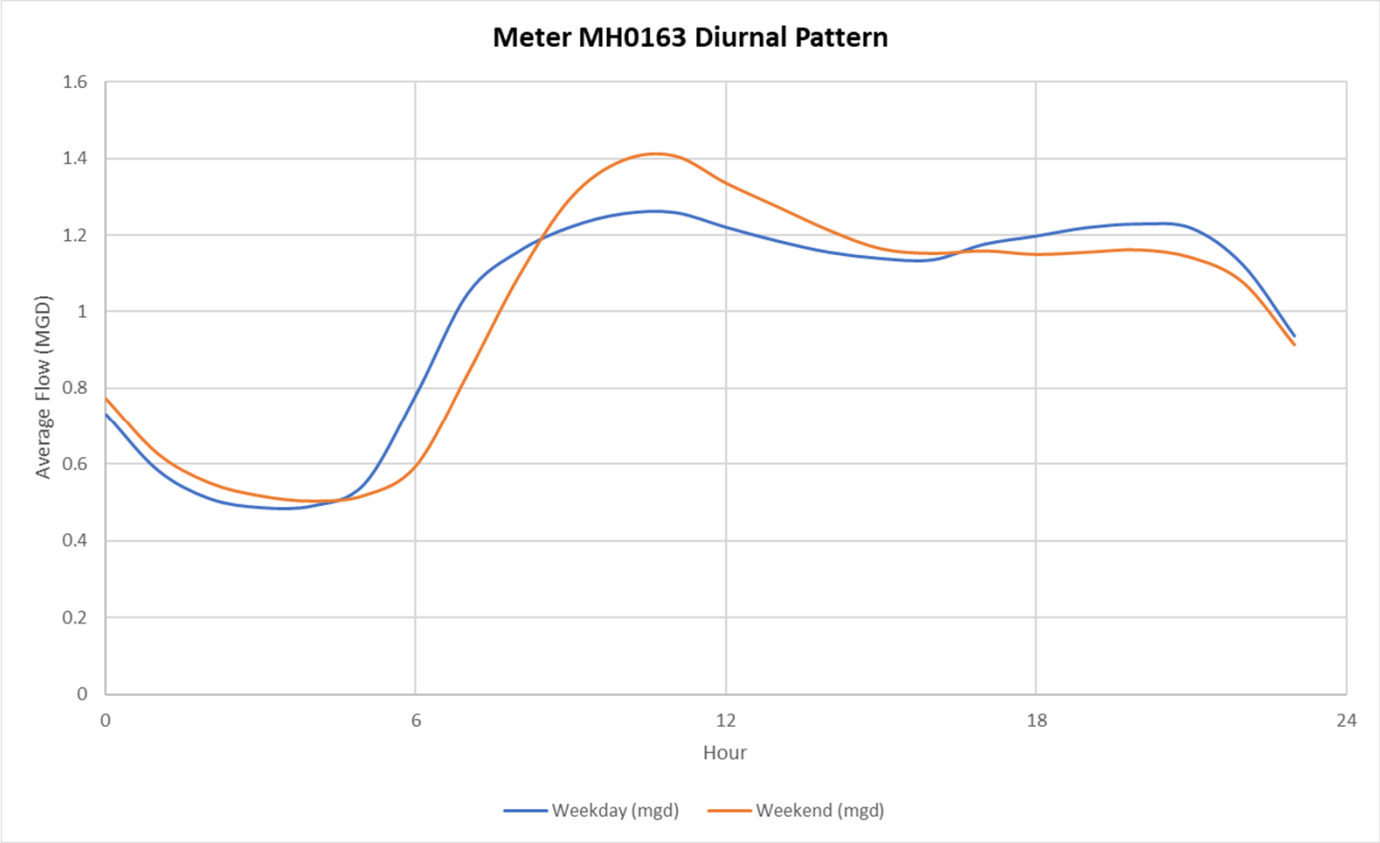


Flow (MGD)
Rainfall (in/hr)

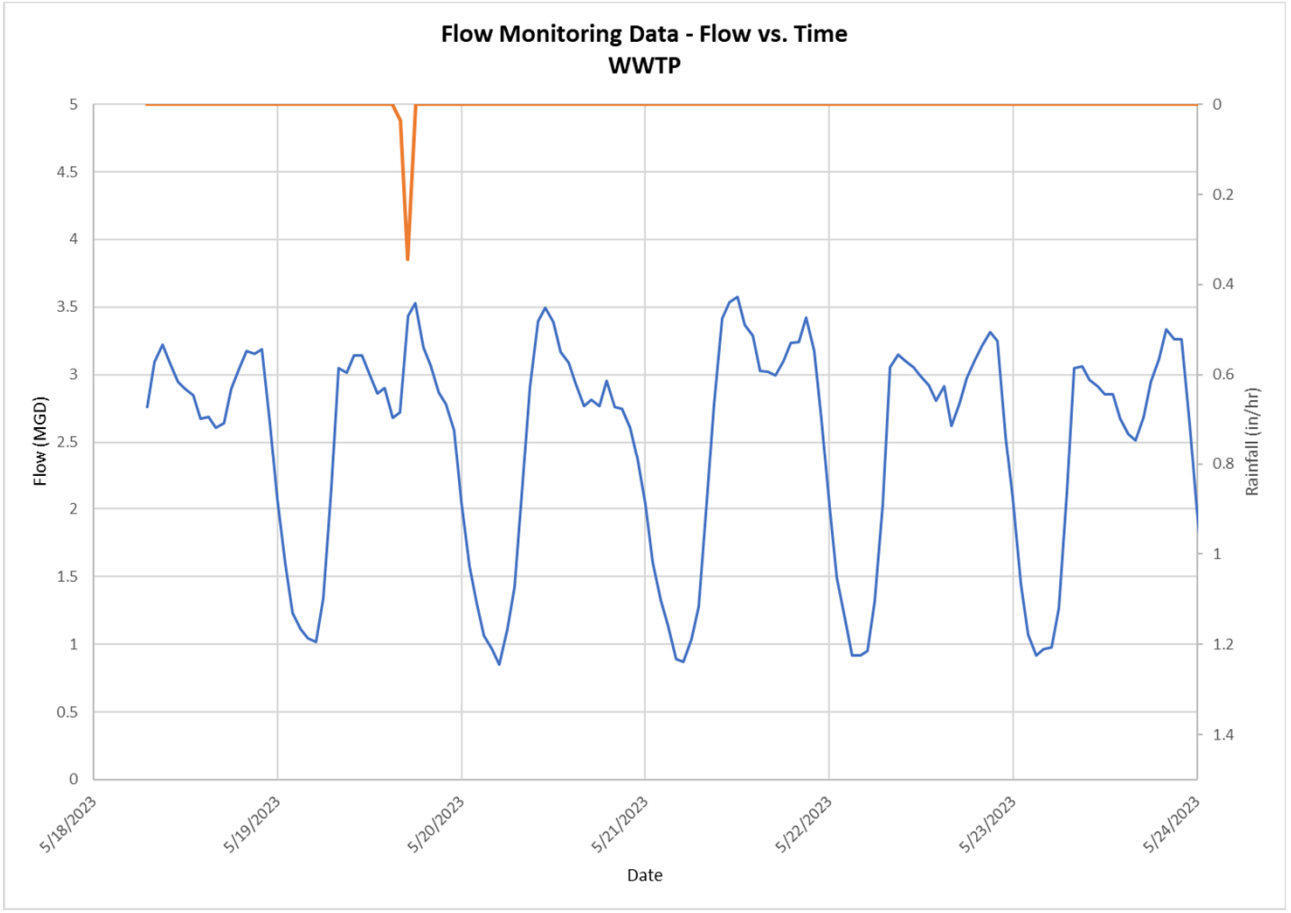
Meter MH0163
Scattergraph



Meter MH0163
Diurnal Pattern



Meter WWTP
Flow vs. Rainfall



Flow (MGD)
Rainfall (in/hr)

APPENDIX C
Land Use Flow Factor Development

Table 1 - Existing Acreage by Land Use Classification of Large and Special Users

		Flow Meter Basins - Acres							
Land Use Classification	**Total**	**MH0087**	**MH03B042**	**MH17C073**	**MH0163**	**MH04B057**	**MH04C002**	**MH04C042**	**WWTP**
Vacant	1134.6	0.0	678.1	0.0	456.5	0.0	0.0	0.0	0.0
Low Density Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Medium Density Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High Density Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Airport	1246.2	0.0	1246.2	0.0	0.0	0.0	0.0	0.0	0.0
Commercial	1.7	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0
Park	5.2	0.0	0.0	0.0	5.2	0.0	0.0	0.0	0.0
Public Facility	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mixed-Used	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial	23.0	0.0	23.0	0.0	0.0	0.0	0.0	0.0	0.0
Fairgrounds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	**2410.7**	**0.0**	**1949.0**	**0.0**	**461.7**	**0.0**	**0.0**	**0.0**	**0.0**

Note:

1. Source: GIS data provided by City

2. WWTP Basin is considered an unmetered basin.

Table 2 - Existing Acreage by Land Use Classification without Large and Special Users

		Flow Meter Basins - Acres							
Land Use Classification	**Total**	**MH0087**	**MH03B042**	**MH17C073**	**MH0163**	**MH04B057**	**MH04C002**	**MH04C042**	**WWTP**
Vacant	7194.7	96.4	1588.7	1119.1	1499.9	1735.1	189.2	12.8	953.6
Low Density Residential	656.2	184.7	0.0	130.6	66.7	104.6	104.4	40.0	25.2
Medium Density Residential	454.0	68.5	0.0	0.3	188.0	0.0	48.9	66.0	82.3
High Density Residential	1350.2	12.2	117.9	327.8	358.5	322.8	120.1	0.0	91.0
Airport	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Commercial	524.7	0.0	44.0	0.0	189.8	3.1	235.6	15.1	37.1
Park	76.6	20.6	11.7	3.1	23.6	0.0	10.2	4.4	3.0
Public Facility	310.9	37.9	36.6	81.3	62.4	0.0	37.3	0.0	55.2
Mixed-Used	88.3	3.4	54.9	4.4	21.1	0.0	4.6	0.0	0.0
Industrial	517.6	0.0	472.3	0.0	45.3	0.0	0.0	0.0	0.0
Fairgrounds	287.8	0.0	0.0	0.0	287.8	0.0	0.0	0.0	0.0
TOTAL without Large and Special Users	**11461.1**	**423.7**	**2326.1**	**1666.5**	**2743.2**	**2165.7**	**750.2**	**138.2**	**1247.4**

Note:

1. Source: GIS data provided by City

2. WWTP Basin is considered an unmetered basin.

Table 3 - Planning Flow Factors (gpd/acre)

		Flow Meter Basins - gpd/acre							
Land Use Classification	**Total**	**MH0087**	**MH03B042**	**MH17C073**	**MH0163**	**MH04B057**	**MH04C002**	**MH04C042**	**WWTP**
Vacant	**0**	0	0	0	0	0	0	0	0
Low Density Residential	**510**	550	0	350	550	500	600	700	510
Medium Density Residential	**790**	700	0	0	650	0	950	1,200	790
High Density Residential	**920**	900	700	600	1,000	1,075	1,400	0	920
Airport [(1)]		0	0	0	0	0	0	0	0
Commercial	**600**	0	500	0	570	600	650	550	600
Park	**0**	0	0	0	0	0	0	0	0
Public Facility	**570**	600	450	460	650	0	800	0	570
Mixed-Used	**680**	700	650	450	750	0	1,000	0	0
Industrial	**400**	0	400	0	400	0	0	0	0
Fairgrounds	**100**	0	0	0	100	0	0	0	0

Note:

1) Airport acreage and flow have been removed for the purpose of this analysis as it is one of the special users.

Table 4 - ADWF by Land Use Classification (gpd) excluding Large and Special Users

		Flow Meter Basins - gpd							
Land Use Classification	**Total**	**MH0087**	**MH03B042**	**MH17C073**	**MH0163**	**MH04B057**	**MH04C002**	**MH04C042**	WWTP
Vacant	**0**	0	0	0	0	0	0	0	0
Low Density Residential	**339,797**	101,587	0	45,695	36,709	52,311	62,647	27,996	12,852
Medium Density Residential	**360,810**	47,970	0	0	122,224	0	46,430	79,200	64,986
High Density Residential	**1,247,445**	10,938	82,526	196,660	358,456	347,040	168,082	0	83,743
Airport	**0**	0	0	0	0	0	0	0	0
Commercial	**315,755**	0	22,007	0	108,190	1,877	153,118	8,298	22,264
Park	**0**	0	0	0	0	0	0	0	0
Public Facility	**178,591**	22,760	16,486	37,417	40,584	0	29,876	0	31,468
Mixed-Used	**60,415**	2,379	35,672	1,966	15,814	0	4,584	0	0
Industrial	**207,030**	0	188,930	0	18,101	0	0	0	0
Fairgrounds	**28,782**	0	0	0	28,782	0	0	0	0
Large and Special Users			77,084.771		1,995				
Total Calculated ADWF (gpd)	**2,738,626**	**185,634**	**345,622**	**281,738**	**728,861**	**401,228**	**464,737**	**115,494**	**215,313**
Total Measured ADWF (gpd)	**2,728,920**	**185,840**	**345,672**	**281,068**	**723,927**	**401,766**	**466,278**	**115,372**	**208,997**
Difference	**-0.4%**	**0.1%**	**0.0%**	**-0.2%**	**-0.7%**	**0.1%**	**0.3%**	**-0.1%**	**-3.0%**

APPENDIX D
Technical Memorandum 4 - Sewer System Model Conversion Recommendation

CITY OF REDMOND

Wastewater Collection System Master Plan Update



TECHNICAL MEMORANDUM 4

Sewer System Model Conversion Recommendation

FINAL / January 2025

CITY OF REDMOND

Wastewater Collection System Master Plan Update

TECHNICAL MEMORANDUM 4

Sewer System Model Conversion Recommendation

FINAL / January 2025

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TM 4 SEWER SYSTEM MODEL CONVERSION RECOMMENDATION

4.1 Introduction

The City of Redmond (City) owns and operates a sanitary sewer system consisting of approximately 3,700 manholes and 160 miles of pipe. Carollo Engineers (Carollo) is assisting Anderson Perry & Associates Inc, (AP) and the City with developing a Collection System Master Plan (CSMP) by updating its sanitary sewer collection system model and using it to perform a capacity analysis of the collection system. Sanitary Sewer collection system models are valuable tools used to assess the performance of collection systems during dry and wet weather conditions, and to plan for future improvements.

The City's current sewer system hydraulic model is built with Innovyze InfoSWMM. Innovyze was recently acquired by Autodesk and Autodesk has decided to discontinue the InfoSWMM software. Carollo's understanding is that no updates will be made to ArcGIS desktop for InfoSWMM compatibility after February of 2024. After this time, InfoSWMM will be phased out over a two-year period. InfoSWMM's reliability has become a concern as Autodesk phases out updates and support to the software. Carollo InfoSWMM users have noticed features failing recently as the software is phased out. As part of the City's CSMP capacity analysis, the Carollo team noticed abnormalities in the model results and has been confirming InfoSWMM results in the United States Environmental Protection Agency (USEPA) Storm Water Management Model (SWMM), which is the engine that most sewer modeling software is built upon.

4.2 Recommended Hydraulic Modeling Software

While permanently converting to USEPA SWMM is an option, Carollo does not recommend selecting USEPA SWMM as the City's long-term modeling software primarily because it does not have a scenario manager. A scenario manager simplifies the model update and analysis process by allowing users to make an attribute update such as pipe diameter in one scenario and have that value automatically reflected in all applicable scenarios. In USEPA SWMM, each update must be adjusted manually in each scenario, which takes more time and can lead to mistakes.

Carollo recommends that the City convert their InfoSWMM hydraulic model to a new software before completing the CSMP capacity analysis, due to the current unreliability of the InfoSWMM software. After reviewing the collection system hydraulic model options, Carollo recommends InfoWorks ICM for the City's sewer model conversion for the following reasons:

- Includes a scenario manager.
- Widespread use among consultants and many consultants maintain licenses for this software.
- Responsive customer support and extensive online resources give users readily accessible assistance.
- Proven track record and longevity in the industry.

- Robust tools for data validation and user-friendly GIS integration capabilities.
- Tools available to make the model conversion process go smoothly.
- Both the InfoWorks ICM and InfoWater Pro, which is the City's water system hydraulic modeling software, are AutoDesk products.

4.3 Hydraulic Model Software Options

InfoWorks ICM is not the only available option for collection system models. This section provides a brief review of all the hydraulic modeling software options available on the market for the City's sewer collection system.

4.3.1 USEPA SWMM

The USEPA SWMM is a robust, windows-based desktop program designed for analyzing the performance of sewer systems under various conditions. This open-source public software is freely available worldwide which includes versatility, open-source nature, and continuous support from the USEPA. The potential disadvantages of utilizing USEPA SWMM are limited compatibility with GIS, lacks dynamic import, no scenario manager, and no built-in capability to compare results of multiple simulations. Additionally, it does not facilitate flow calculations based on GIS land use. Most importantly, since the model is an open-source tool available to the public at no cost, USEPA SWMM lacks dedicated customer service for troubleshooting, which may pose a challenge for users seeking assistance with model-related issues.

4.3.2 InfoWorks ICM

This modeling software is tailored for sewer system analysis under various conditions. As proprietary software by AutoDesk, it provides a robust set of features for modeling hydraulic and hydrological processes. While InfoWorks ICM offers advantages such as advanced GIS integration, dynamic import capabilities, a scenario manager, and the ability to compare results from multiple simulations, there are potential drawbacks. Users should be mindful of the software's cost and the need for licensing. Additionally, the proprietary nature of InfoWorks ICM may limit its accessibility compared to open-source alternatives. Nevertheless, the dedicated customer support provided by InfoWorks ICM is a valuable resource for users encountering challenges and seeking assistance in optimizing their sewer system models. The computation method can be USEPA SWMM, or a proprietary solver.

4.3.3 SewerGEMS

SewerGEMS by Bentley is a modeling software designed for sewer system analysis, providing a comprehensive set of features. This proprietary software is known for its seamless integration with GIS, dynamic import capabilities, and an efficient scenario manager. Users benefit from the ability to compare results from multiple simulations, enhancing the software's versatility. However, similar to InfoWorks ICM and Mike+, potential drawbacks include the associated licensing costs and the need for user training due to its complexity. The proprietary nature of SewerGEMS may limit collaboration compared to open-source alternatives. On the positive side, Bentley also offers dedicated customer support, providing valuable assistance for troubleshooting and optimizing sewer system models. SewerGEMS has a proprietary solver or can use the USEPA SWMM Engine.

4.3.4 AquaTwin Sewer 2D

AquaTwin Sewer 2D, a novel sewer system analysis software created by Aquanuity, operates as a 64-bit extension application within ArcGIS Pro. Leveraging the industry-standard USEPA SWMM 5 nonlinear reservoir, AquaTwin Sewer 2D provides advanced modeling capabilities. Similar to other software highlighted in this tech memo, it facilitates visual result comparison across multiple simulations and incorporates a scenario manager for enhanced analysis and decision-making. AquaTwin is new to the market and does not have the track record of other proprietary software.

4.3.5 Mike+

Mike+ developed by DHI, seamlessly integrates with GIS, with the GIS Environment embedded in ArcGIS Pro or available as a standalone option. The software supports direct reading and writing of shapefiles, offering a dynamic import capability, and allowing users to insert a background image into their models. Users should be mindful of the software's cost and the need for licensing. Similar to other leading modeling tools like infoworks ICM, SewerGEMS and AquaTwin, Mike+ includes a scenario manager and the ability to visually compare results from multiple simulations. Its proprietary method aligns with the industry standards, resembling approaches used by Bentley. The computation method can be USEPA SWMM, or DHI’s propriety 1D engine.

4.3.6 Hydraulic Modeling Software Summary

Table 4.1 provides a concise comparison of each hydraulic modeling software’s compatibility. This quick reference allows for a streamlined assessment of key compatibility features for a comprehensive evaluation.

Table 4.1 Overview of Technical Characteristics of Available Sewer Hydraulic Modeling Software

Technical Characteristics	USEPA SWMM 5	AutoDesk/Innovyze InfoWorks ICM	Bentley SewerGEMS	Aquanuity AquaTwin Sewer	DHI Mike+
GIS Compatible	Limited	Yes	Yes	Yes	Yes
GIS Environment	Stand alone	Stand alone	Embedded in ArcGIS Pro/Stand alone	Stand alone	Embedded in ArcGIS Pro/Stand alone
Reads shapefiles directly	Yes	Yes	Yes	Yes	Yes
Writes to shapefiles directly	Yes	Yes	Yes	Yes	Yes
Dynamic Import	No	Yes	Yes	Yes	Yes
Background Image	Yes	Yes	Yes	Yes	Yes
Reads shapefiles directly	Yes	Yes	Yes	Yes	Yes
Graphically compares the results of multiple simulations	No	Yes	Yes	Yes	Yes
Computation method	Dynamic Wave and Kinematic Wave	Dynamic Wave and Kinematic Wave	Dynamic Wave and Kinematic Wave	Dynamic Wave and Kinematic Wave	Dynamic Wave
Solution Engine	USEPA SWMM	Proprietary USEPA SWMM	Proprietary USEPA SWMM	USEPA SWMM	Proprietary USEPA SWMM
Customizable tabular reports	Yes	Yes	Yes	Yes	Yes
Graph Capabilities	Yes	Yes	Yes	Yes	Yes
Results Map Display	Yes	Yes	Yes	Yes	Yes
Export tabular data to excel	Yes	Yes	Yes	Yes	Yes
Internet-based model network/output viewer available	No	No	No	Yes	No
Spatial Projection/ Coordinate System	No	Yes	Yes	Yes	Yes
Tools to fix GIS data topology problems	Partial	Yes	Yes	Yes	Yes
Model Review/ Verification Tool	No	Yes	Yes	Yes	Yes
Automatically sizes new mains	No	No	Yes	No	Yes
Calculates pipe replacement costs	No	No	Yes	No	No
Radar Rainfall data input from web	No	Yes	No	Yes	No
Single license cost	$0(1)	$7,500(2)	$10,183(3)(4)	$ Unknown	$7,920(5)

Notes:
(1) USEPA SWMM is free to use as it is an open-source public software.
(2) This annual cost is for the InfoWorks ICM standard package (1D only) per user; there is an InfoWorks ICM Ultimate Package for $18,000 user/year with (1D and 2D/all functionality)
(3) This cost is for SewerGEMS 10,000 pipe Virtuoso subscription, which includes an annual term license for a single user.
(4) SewerGEMS includes EPA SWMM engine and SewerCAD and all of its capabilities.
(5) Mike Urban cost is the annual price for the Collection Systems Subscription package for one user; there are options to purchase the package for 1,2,5 or 10 concurrent users. The cost is $14,260 annually for 2 concurrent users, $23,760 annually for 5 concurrent users, and $31,680 annually for 10 concurrent uses.

APPENDIX E
Technical Memorandum 1 - Hydraulic Model Development

CITY OF REDMOND

Wastewater Collection System Master Plan Update



TECHNICAL MEMORANDUM 1

Hydraulic Model Development

FINAL / January 2025

CITY OF REDMOND

Wastewater Collection System Master Plan Update

TECHNICAL MEMORANDUM 1

Hydraulic Model Development

FINAL / January 2025

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Abbreviations

ADWF	average dry weather flow
Carollo	Carollo Engineers
City	City of Redmond
CIWEM	Chartered Institution of Water and Environmental Management
CSMP	Collection System Master Plan
DWF	dry weather flow
GIS	geographic information system
gpm	gallons per minute
I/I	inflow and infiltration
ICM	Integrated Catchment Model
ID	identification
RDII	rainfall derived inflows and infiltration
UDG	Urban Drainage Group
WPCF	Water Pollution Control Facility
WWF	wet weather flow

TM 1 HYDRAULIC MODEL DEVELOPMENT

1.1 Introduction

This technical memorandum summarizes the development of the City of Redmond's (City) collection system hydraulic model to support the City's Collection System Master Plan (CSMP). A hydraulic model of a sewer collection system is a simplified representation of the real system and, thus, can be used to assess its conveyance capacity and size new infrastructure. In addition, this type of model can simulate "what if" scenarios that assess how future developments, land-use changes, and different sized storms affect the collection system and identify what areas or components will likely be capacity deficient.

1.2 Hydraulic Modeling Overview

The existing model used by the City was developed in the Innovyze (now Autodesk) InfoSWMM modeling software. Due to Autodesk's discontinuation of the InfoSWMMM modelling software, the City opted to convert its hydraulic model to a different software. Several alternative modeling software packages were reviewed. Based on this review and in consultation with the City, Innovyze's InfoWorks Integrated Catchment Model (ICM), version 2023.5, was selected because of its scenario manager, widespread use among consultants (many of whom maintain licenses for this software), responsive customer support, extensive online resources giving users readily accessible assistance, proven track record, and longevity in the industry.

1.2.1 Elements of the Hydraulic Model

The following provides a brief overview of the major elements of the hydraulic model and the required input parameters associated with each:

- **Manhole Nodes:** Sewer manholes, cleanouts, as well as other locations where pipe sizes change or where pipelines intersect are represented by nodes in the hydraulic model. Required inputs for manhole nodes include rim elevation, invert elevation, and surcharge depth (used to represent pressurized systems). Nodes are also used to represent locations where flows are split or diverted between two or more downstream links.
- **Pipe Links:** Gravity sewers and force mains are represented as pipe links in the hydraulic model. Input parameters for pipes include length, friction factor (e.g., Manning's n for gravity mains, Hazen Williams C for force mains), invert elevations, diameter, and whether the pipe is a force main.
- **Storage Nodes:** For sewer system modeling, storage nodes typically are used to represent pump station wet wells (although other storage basins, etc. can be modeled as storage nodes). Input parameters for storage nodes include invert elevation, wet well depth, and wet well cross section.
- **Pump Links:** Pumps are included in the hydraulic model as links. Input parameters for pumps include pump curves and operational controls (e.g., pump on-off levels, etc.).

- **Outfall Nodes:** Outfalls represent areas where flow leaves the system. For sewer system modeling, an outfall typically represents the connection to the influent pump station at a wastewater treatment plant. For the City, the main outfall in the system is located north of the Service Area discharging to the City's Water Pollution Control Facility (WPCF).
- **Subcatchments:** Subcatchments represent areas of land whose topography and drainage characteristics direct flow to a single discharge point into the sewer system. Subcatchments can be used to define sanitary flows or to route a portion of the rainfall runoff into the system. Inflow conditions for the catchments are defined model inputs.
- **Inflows:** The following are the three types of sewer flow sources that can be injected into individual model nodes (and storage nodes):
  - **Dry weather:** Dry weather inflow simulates base sanitary wastewater flows and represents the average flow. The dry weather flow (DWF) can be multiplied by up to four patterns that vary the flow by month, hour, and day of week (e.g., weekday or weekend). The dry weather diurnal patterns are adjusted during the dry weather calibration process to match the typical daily flow fluctuations as observed at the flow meters. Two diurnal patterns were developed for each basin: one representing weekdays and the other representing weekend days.
  - **Rainfall derived inflows and infiltration (RDII):** RDII are flows into the collection system originating from rainfall. Several models are available in InfoWorks to capture these effects. The models have several parameters that are adjusted during the wet weather calibration process to model flows into the collection system during different storm events.

1.3 Modeled Collection System Facilities

To update the model, the City's existing collection system model was compared to the City's geographic information system (GIS) data provided by the City in August 2023. Carollo Engineers (Carollo) made corrections to the model where discrepancies were identified by consulting with the City and reviewing as-built drawings. Figure 1.1 highlights the comparison before and after the model update.

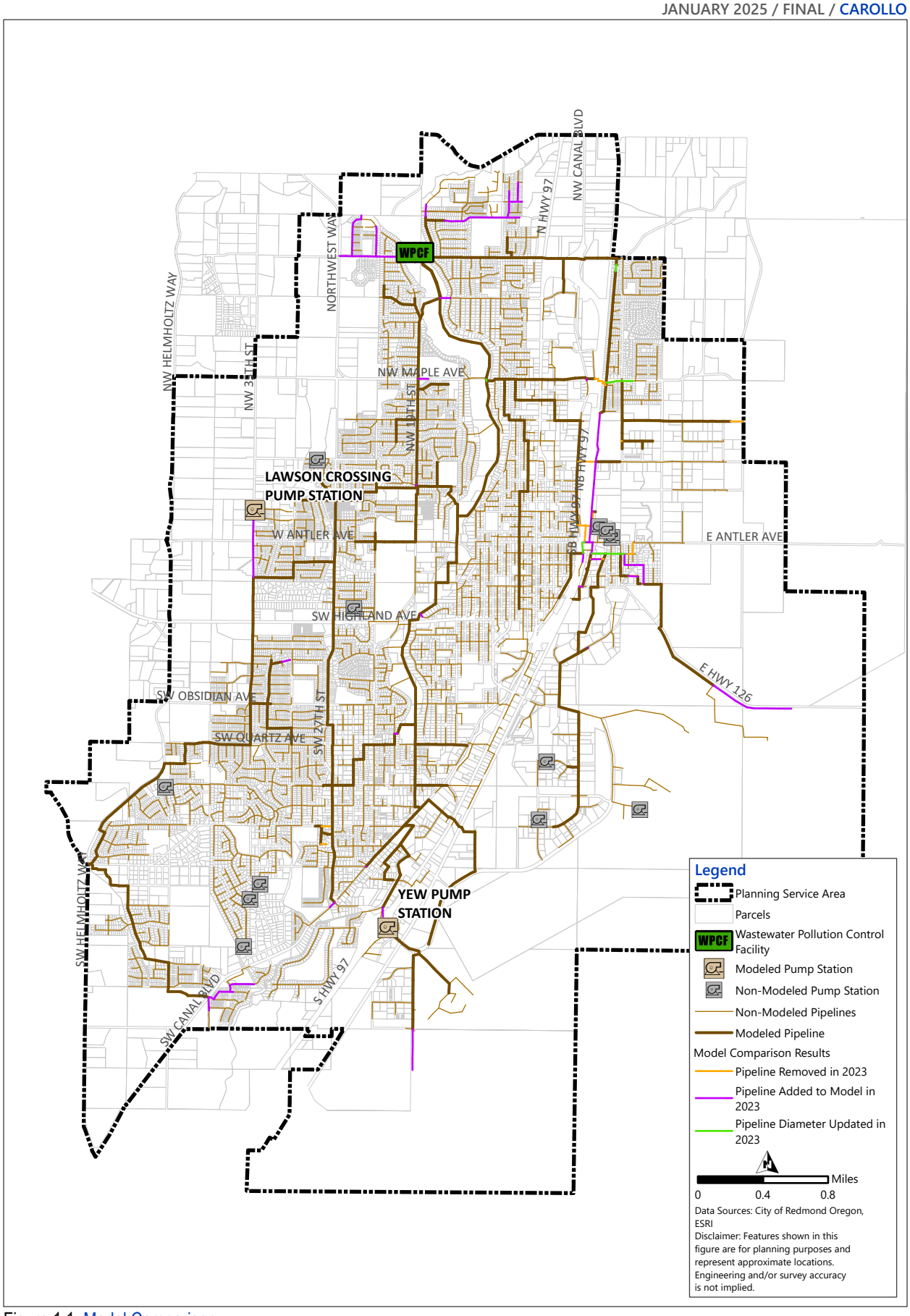


Figure 1.1 Model Comparison
CITY OF REDMOND
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE

1.3.1 Gravity Collection System

The topography of the City's service area is such that most of the system is operated under gravity flow conditions, with 14 pump stations located within the service area. The benefit of having a skeletonized model is to reduce complexity of the model enabling the City to observe the most critical components of the system, making it easier to understand and manage. Since the completion of the 2007 CSMP, the City has implemented recommended projects such as the installation of pipes in the Upas area located north of the City and a portion of the East Side Interceptor.

Table 1.1 summarizes the City's collection system and modeled portion, which is primarily gravity pipelines 10 inches in diameter and larger with some 8-inch gravity sewers included for system connectivity.

Table 1.1 Modeled System Gravity Pipelines(1)

Diameter (inches)	Modeled Pipe Length (feet)	Total Pipe Length (feet)	Percent of Modeled System (%)
Unknown	-	827,968	-
6	-	2,748	-
8	15,527	624,186	2.5
10	54,889	55,813	98.3 (2)
12	39,947	40,466	98.7 (2)
15	28,158	28,157	100.0
16	94	94	100.0
18	15,806	15,806	100.0
21	8,254	8,254	100.0
24	25,542	28,457	89.8 (3)
27	7,427	7,427	100.0
30	10,493	10,493	100.0
36	34	34	100.0
Total	**206,170**	**1,649,576**	**12.5**

Notes:
(1) Source: City of Redmond GIS database, August 2023.
(2) Per the City's comments, pipes that are end-capped or filled with concrete are excluded in the model.
(3) The remaining length of 24-inch pipeline that was not modeled is in the Upas area. Per the City, this 24-inch is currently offline and therefore not included in the model.

1.3.2 Pump Station and Force Main

Of the 14 pump stations that the City owns, two were included in the model. Yew and Lawson Crossing pump stations were selected to be included in the model because these two pump stations are in proximity to areas where the City anticipates growth to occur which may contribute flow to the pump stations in the future. Detailed information was available for these two pump stations and is summarized in Table 1.2. Wastewater from the pump stations is conveyed via force mains, up to 4,351 feet before transitioning to gravity sewers. An inventory of all force mains in the collection system and modeled force mains is summarized in Table 1.3.

Table 1.2 Modeled Pump Station Summary

Pump Station	Pump No.	Design Flow (gpm)	Design Head (feet)	Start Level in Wet Well (feet)	Stop Level in Wet Well (feet)
Lawson Crossing	1	385	72	4.0	3.0
	2	385	72	4.5	3.0
Yew	1	450	37	6.5	3.2
	2	450	37	7.0	3.2

Notes:
gpm - gallons per minute.

Table 1.3 Modeled System Force Main Pipelines(1)

Diameter (inches)	Modeled Force Main Length (feet)	Total Force Main Length (feet)	Percent of Modeled System (%)	Associated Pump Station
Unknown	-	12,571	-	
4	2,244	2,244	100.0	Lawson Crossing Pump Station
6	-	1,082	-	
8	4,351	4,351	100.0	Yew Pump Station
Total	**6,595**	**20,248**	**32.6%**	

Notes:
(1) Source: City of Redmond GIS database, August 2023.

1.3.3 Hydraulic Model Construction

The City's hydraulic model combines information on the physical and operational characteristics of the sewer collection system and performs calculations to solve a series of mathematical equations to simulate flows in pipes. The model construction process consisted of eight steps, as described below:

- **Step 1 -** The City's GIS shapefiles and InfoSWMM model for the sewer collection system were obtained. The City revised the GIS shapefiles with specific attention to the infrastructure to be modeled.
- **Step 2 -** The GIS data were reviewed and formatted to allow easy import into the Infoworks ICM modeling platform. The City's GIS did not have elevation information for all of the City's pipelines and manholes. Manhole rim elevations were calculated in GIS using elevation contours and manhole invert elevations were based on neighboring pipe invert elevations.
- **Step 3 -** The City's GIS data set was skeletonized and includes gravity sewers 10 inches in diameter and greater with the exception of a few 8-inch-diameter pipes. Skeletonization is the process by which sewer systems are stripped of pipelines not considered essential for the intended analysis purpose. The purpose of skeletonizing a system is to develop a model that accurately simulates the hydraulics of a collection system, while at the same time reducing the complexity of a large model. The skeletonized GIS data was compared and verified with the InfoSWMM model and input from City staff.

- **Step 4 -** The collection system pipeline and facility data were obtained from the City in GIS shapefile format and were imported into the modeling software. Physical and operational data for the City's sewer collection facilities was not available from the GIS data. This type of data, such as wet well dimensions, pump station physical properties and operational setpoints, and other special features, were input manually into the model based on available information such as as-built drawings and pump curves. The model was checked for connectivity issues, which were fixed.
- **Step 5 -** Once all the relevant data was input into the hydraulic model, the model was reviewed to verify that the model data was input correctly and that the flow direction, size, and layout of the modeled pipelines were logical. Additionally, the modeled pump stations were also checked to verify that they operated correctly (i.e. pumps were turning on and off according to settings and were operating reasonably on their pump curves).
- **Step 6 -** Dry weather sewer flows were then allocated to the appropriate model subcatchments, which were connected to the appropriate model nodes as described in Section 1.4.2.
- **Step 7 -** The hydraulic model contains certain run parameters set by the user at the beginning of the project. These include run dates, time steps, reporting parameters, output units, and flow routing method. Once the run parameters were established, the model was debugged to ensure that it ran without errors or warnings.

The sewer system model comprises of roughly 40.3 miles of sanitary sewer pipelines which includes both gravity and force mains, ranging in diameter from 4 inches to 36 inches and two City-owned sanitary sewer pump stations. Figure 1.2 shows the overview of the City's hydraulic model.

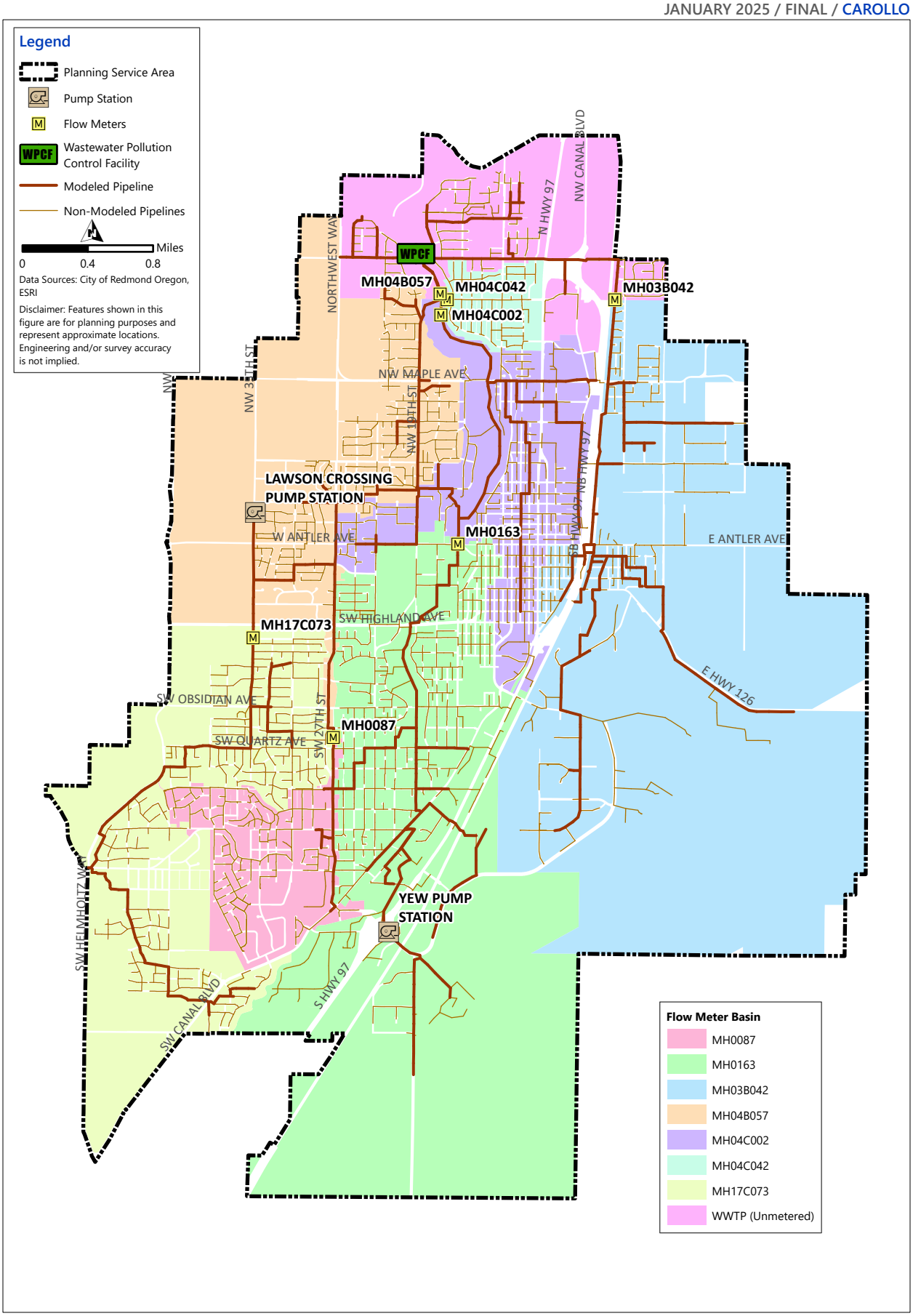


Figure 1.2 City of Redmond's Hydraulic Model

1.3.4 Flow Loading

Determining the quantity of dry and wet weather sewer flows generated by a municipality and how they are distributed throughout the collection system is an important component of the hydraulic modeling process. Various techniques can be used to assign sewer flows to individual model nodes, depending on the type of data that is available. Adequate estimates of the volume of wastewater are important in maintaining and sizing sewer system facilities, both for present and future conditions.

1.3.4.1 Flow Meter Basins

There were seven flow meters installed throughout the City's service area, as determined by the City and ADS Environmental Services. The tributary sewer system of each flow meter and the area downstream of the last flow meter but upstream of the water pollution control facility constitutes a flow meter basin. There are eight flow meter basins. Flow meter basins are used for hydraulic modeling to ensure that the mass balance reflects real-world conditions as closely as possible and that the flow factors align with what each basin produces in relation to its land use. For more information regarding the flow meter basins and flow factor development, see Chapter 3 of the City's CSMP.

1.3.4.2 Wastewater Flow Allocation

Sanitary sewer flows were developed based on analyses of the City's flow meter data described in Chapter 3 of the City's CSMP. Measured average dry weather flow for each meter basin was used to develop land use-specific flow factors (in gallons per acre per day, or gpad). The flow factors and land use data specific to each model basin were used to estimate an average DWF, as described below:

- **Step 1:** the City's eight flow monitoring basins were subdivided into 1,918 individual model subcatchments based on contiguous tax parcels. Figure 1.3 shows the subcatchments developed to allocate flows in the hydraulic model. Each subcatchment represents the geographic area that contributes flows into a single model node (i.e., trunk system manhole).
- **Step 2:** DWF for each model subcatchment was calculated by multiplying the land use flow factors by the land use acreage.
- **Step 3:** The subcatchment DWF was allocated to the appropriate node in the sewer system model.
- **Step 4:** The allocated DWFs were adjusted as necessary during the DWF calibration process (see Section 1.4.2) to closely match the actual measured DWFs recorded during the flow monitoring period.

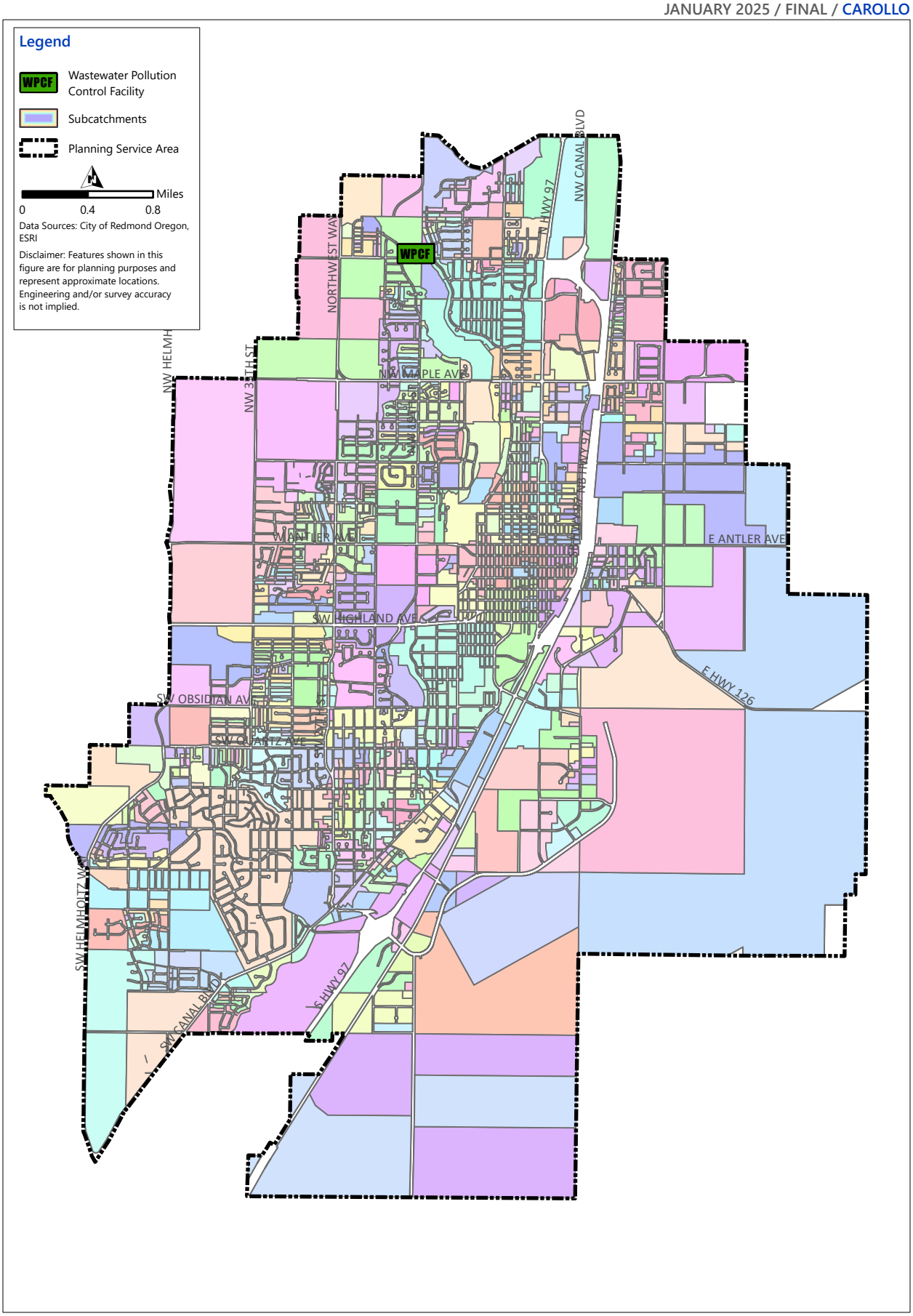


Figure 1.3 Subcatchments
CITY OF REDMOND
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE

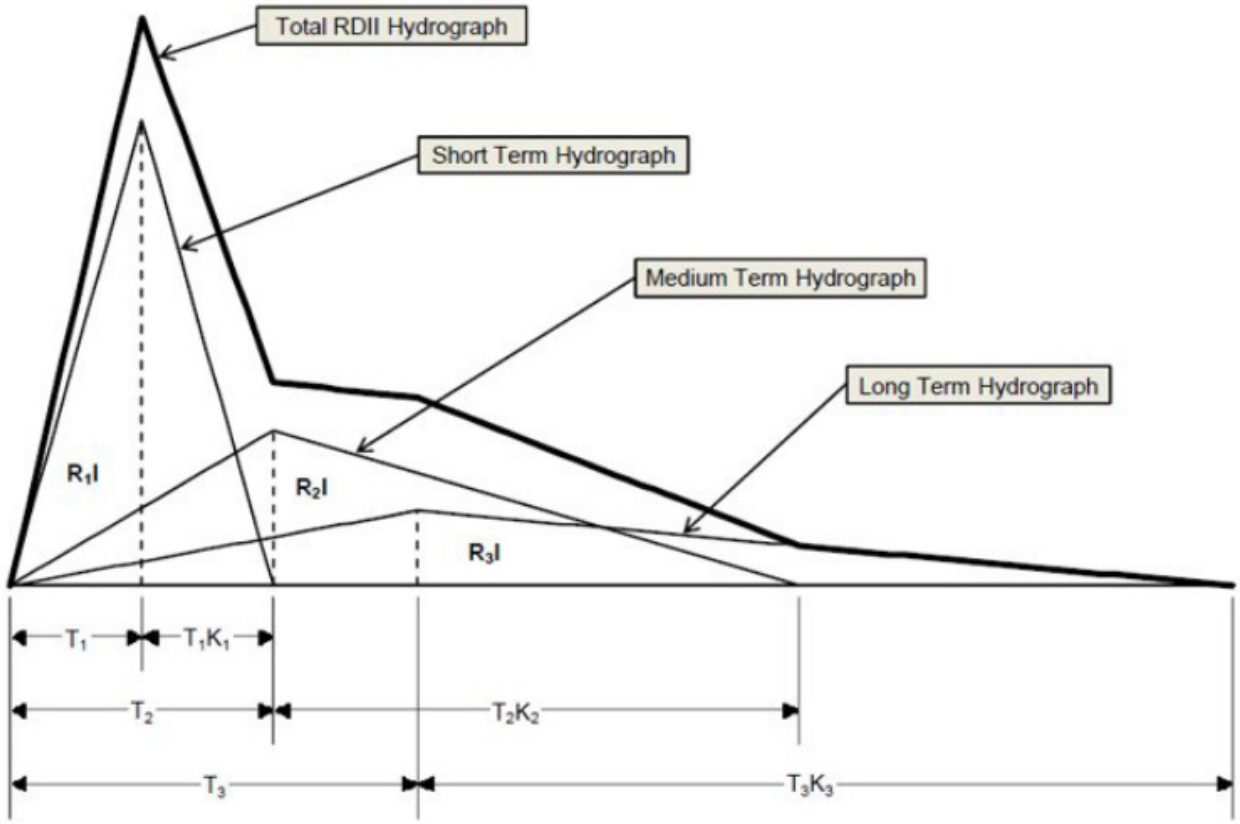
RDII Allocation

Response to rainfall in the sewer system is typically seen immediately as inflow or hours after the storm as infiltration. Inflow is the stormwater that enters the sewer system through a direct connection to the system such as roof drain and downspout connections, leaky manhole covers, and illicit storm drain connections. Infiltration enters the sewer system by percolating through the soil and then through defects in pipelines, manholes, and joints.

RDII is modeled through the development of unit hydrographs, which provide a method for the hydraulic model to simulate the inflow and infiltration (I/I) volume and rate entering the collection system based on the intensity and duration of storm events, as well as the location within the collection system. For this system the RTK unit hydrograph approach was used. Figure 1.4 illustrates the parameters associated with approximating RDII using the RTK unit hydrograph approach. Parameters to allocate RDII are related to the contributing (sewered) area of each flow monitoring basin. The unit hydrograph in Figure 1.4 is described by the following parameters (USEPA, 2007):

- R: the fraction of rainfall volume that enters the sewer system as RDII and equals the volume under the hydrograph.
- T: the time from the onset of rainfall to the peak of the unit hydrograph in hours.
- K: the ratio of time to recession of the unit hydrograph to the time to peak.

As can be seen, three-unit hydrographs are typically simulated because the shape of an RDII hydrograph is too complex to be well represented by a single unit hydrograph. The first triangle represents the most rapidly responding inflow component and has a T of one to three hours. The second triangle includes both rainfall-derived inflow and infiltration and has a longer T value. The third triangle includes infiltration that may continue long after the storm event has ended and has the longest T value. In the initial RDII allocation, the R, T, K parameters for each of the three triangles are defined for and assigned to each model subcatchment based on the downstream meter into which the model subcatchments flow. The sum of the R values for each of the three-unit hydrographs (i.e., R1, R2, and R3) must equal the total R value for the rainfall event (and cannot be greater than 1).



Source: USEPA, 2007)

Figure 1.4 RTK Unit Hydrograph Description

For each flow monitor basing a RDII hydrograph was developed to describe the RDII occurring within that section of the system. Seven RDII hydrographs were developed for the City's hydraulic model (one per flow monitoring basin except the WPCF basin) and were calibrated as part of the wet weather calibration process, described in Section 1.4.3.

1.4 Hydraulic Model Calibration

Hydraulic model calibration is a crucial component of the hydraulic modeling effort. The calibration process consists of calibrating both dry and wet weather conditions. DWF calibration sets the baseline conditions for system responses during average daily flows and provides an initial check on the system hydraulics. Wet weather flow (WWF) calibration consists of calibrating the hydraulic model to a range of storm events to match the peak flow and volume of RDII into the sewer system, including timing, as well as the average and peak depth.

1.4.1 Calibration Guidelines

Confidence in the model calibration was evaluated primarily on graphical "best-fit" comparisons of model and monitored data for determining calibration fitness. Once the model suitably replicated the metered responses, a set of quantitative guidelines appropriate for this planning model were applied to dry weather and wet weather calibration events. Model calibration was quantitatively assessed by comparing

model predictions with the observed data expressed in terms of percent deviation. This type of evaluation presupposes a good degree of confidence in the comparative information, the observed flow and depth data, and the rainfall data. Quantitative guidelines for assessing model calibration were developed based on industry best practices as well as guidelines contained in the *Code of Practice for the Hydraulic Modeling of Urban Drainage Systems* (CIWEM, 2017).[1]

1.4.1.1 Dry Weather Calibration Guidelines

To calibrate dry weather conditions, the model was simulated for a two-day period representing one weekday and one weekend day. Modeled flows and depths were then compared to the observed flows and depths for each meter. Both the modeled and observed flow hydrographs should closely follow each other in both shape and magnitude. In addition to the shape, the flow hydrographs were assessed using the following as a general guide:

- The timing of flow peaks and troughs should be within one hour.
- The peak flow rate should be within the range of ±10 percent.
- The volume of flow (or the average rate of flow) should be within the range of ±10 percent.
- The unsurcharged depth should be within ±10 percent or ±4 inches, whichever is greater.

1.4.1.2 Wet Weather Calibration Guidelines

To calibrate wet weather conditions, ideally storm periods containing at least three separate storms are simulated. Simulating long periods with a number of storm events allows the model calibration to better account for the effect of back-to-back storm events. Only one storm event was captured during the flow monitoring period; therefore, only one storm event was used to calibrate the model. A second storm event outside the flow monitoring period was used to validate that the modeled flow using the RTK parameters from the calibration event aligned with the measured flow to the WPCF captured during the second storm event. Model-simulated flows and depths are assessed graphically for goodness of fit with the observed flows and depths.

In addition to the graphical assessment, the flow hydrographs were assessed using following as a general guide:

1. The timing of the peaks and troughs should be similar.
2. The peak flow rates at significant peaks should be in the range of +25 percent to -15 percent of measured flow and should be generally similar throughout.
3. The modeled volume of flow should be within +20 percent to -10 percent of measured volume of flow.
4. The depth of surcharge should be in the range of +20-inches to -4-inches.
5. The difference between maximum unsurcharged depth should be within the range of ± 4-inches.

[1] https://www.ciwem.org/assets/pdf/Special%20Interest%20Groups/Urban%20Drainage%20Group/Code%20of%20Practice%20for%20the%20Hydraulic%20Modelling%20of%20Ur.pdf

The Chartered Institution of Water and Environmental Management (CIWEM) Urban Drainage Group (UDG) recommends that for wet weather calibration, the use of a single calibration period incorporating a number of rainfall events should be considered whenever possible. In other words, if the flow monitoring program captured several back-to-back storms, it may be preferable to use the back-to-back storms events as the calibration storms, as opposed to calibrating to two separate storms that have occurred weeks or months apart.

Model calibration simulations should be run for a duration long enough that the RDII response is no longer apparent in the measured data.

1.4.2 Dry Weather Flow Calibration

1.4.2.1 Dry Weather Calibration Process

The DWF calibration process consists of several elements, as outlined below:

- **Divide the system into areas tributary to each flow meter.** The first step in the calibration process was to divide the City into flow meter tributary areas. Eight tributary areas were created, one for each flow meter from the flow monitoring program, plus the WPCF. Figure 1.2 shows the locations of each flow monitoring site and their associated tributary area. Additional details, including a schematic of the flow meters, is provided in Chapter 3 of the City's CSMP.
- **Define flow volumes within each area.** The next step was to define the flow volumes within each area, which was accomplished in the flow allocation step.
- **Create diurnal patterns to match the temporal distribution of flow.** A diurnal curve is a pattern of hourly multipliers that are applied to the base flow to simulate the variation in flow that occurs throughout the day. Two diurnal curves were developed for each flow monitoring tributary area, one representing weekday flow and one representing weekend flow. The diurnal patterns were initially developed based on the flow monitoring data and adjusted as part of the calibration process until the model-simulated flows closely matched the field-measured flows. Figure 1.5 shows the calibrated weekday and weekend diurnal patterns for the area tributary to Meter MH04C042. Similar diurnal curves were developed for each of the meters and its tributary area. These additional curves are available in Appendix 1A.

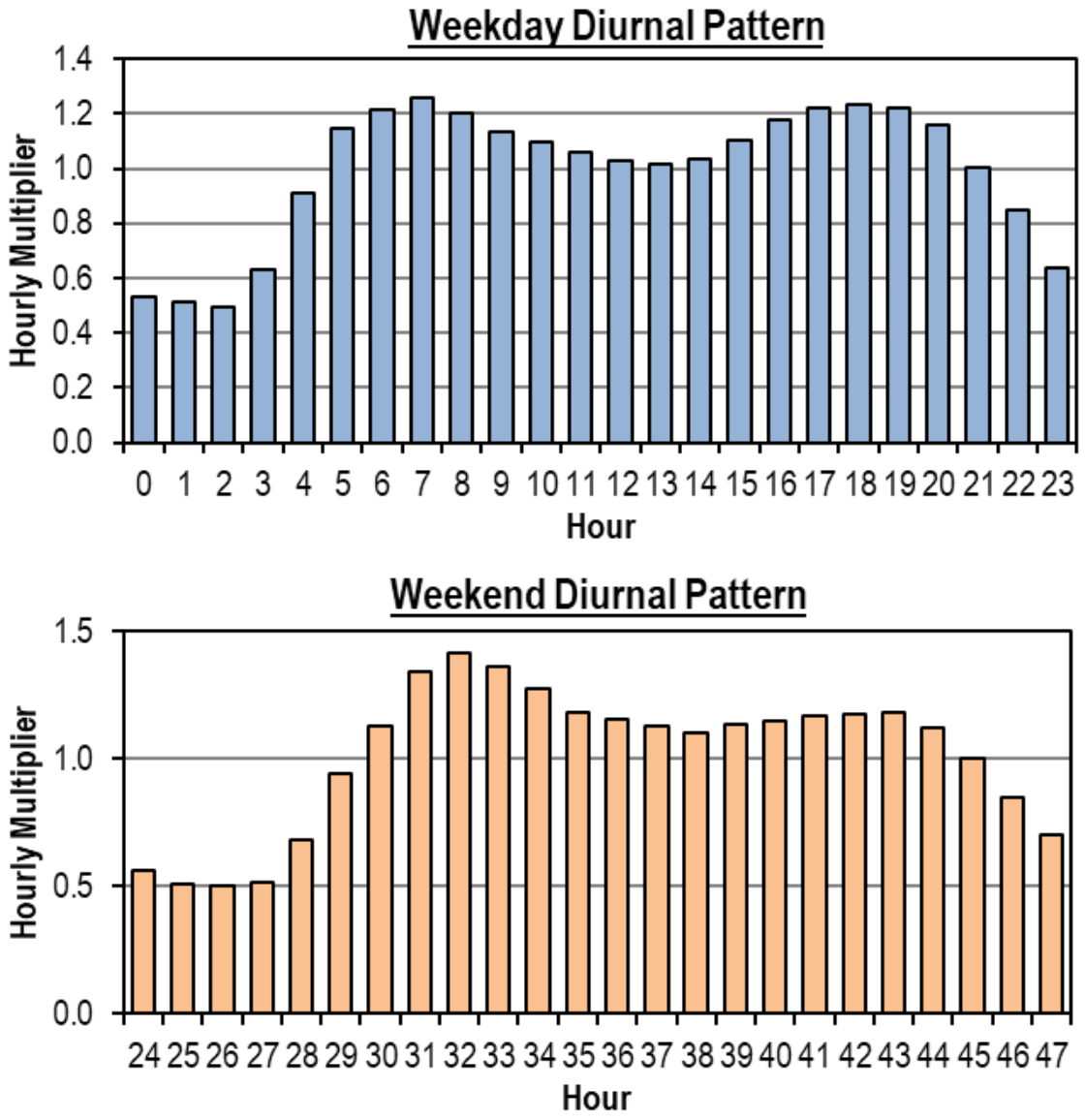


Figure 1.5 Example Diurnal Pattern (MH04C42)

1.4.2.2 Dry Weather Calibration Results and Discussion

Table 1.4 provides a summary of the DWF calibration using the average and daily peak flow results for both weekday and weekend conditions. As shown in Table 1.4, the model-simulated average and peak flows for both weekday and weekend DWF were all within 10 percent. In general, the percentage difference between the overall modeled and measured DWF ranged between +3.4 and -1.5 percent, with most differences being less than 2 percent.

Appendix 1A contains a detailed DWF calibration summary sheet for each of the seven metering sites. Each calibration sheet provides plots that compare the model-simulated and field-measured flow data for both weekday and weekend conditions. An example of the dry weather calibration for MH04C042 is shown on Figure 1.6.

There is a good overall correlation of the field-measured data to the model output results. All meters meet criteria for level, indicating a well calibrated model for DWFs. While there is no specific criteria for velocity, it was noted that at a couple flow meter sites, the simulated velocity differed from the measured velocity by as much as -67 percent to +33 percent (see Appendix 1A). The presence of debris, sedimentation, or blockages within the sewer system can impact the flow velocity and cause differences between the data and calibrated results.

Table 1.4 Dry Weather Flow Calibration Results

Flow Meter ID	Pipe Diameter (inches)	Weekday			Weekend			ADWF Percent Difference (%)
		Flow Volume Difference (%)	Peak Flow Difference (%)	Max Level Difference (inches)	Flow Volume Difference (%)	Peak Flow Difference (%)	Max Level Difference (inches)	
MH0163	18	-0.4%	3.7%	2.86	0.9%	1.1%	2.97	0.0%
MH0087	18	2.3%	1.6%	0.58	1.7%	-0.9%	0.55	2.1%
MH17C073	15	3.5%	0.8%	1.02	3.4%	-0.2%	0.75	3.4%
MH03B042	27	0.1%	-2.2%	0.63	1.6%	-0.6%	0.50	0.4%
MH04C002	24	0.7%	-2.3%	1.12	1.5%	-0.1%	1.20	0.9%
MH04C042	8	-1.2%	-1.3%	0.19	-1.5%	-1.4%	0.20	-1.3%
MH04B057	30	1.9%	-1.4%	1.22	2.9%	1.8%	1.39	2.2%

Notes:
ADWF - average dry weather flow; ID - identification.

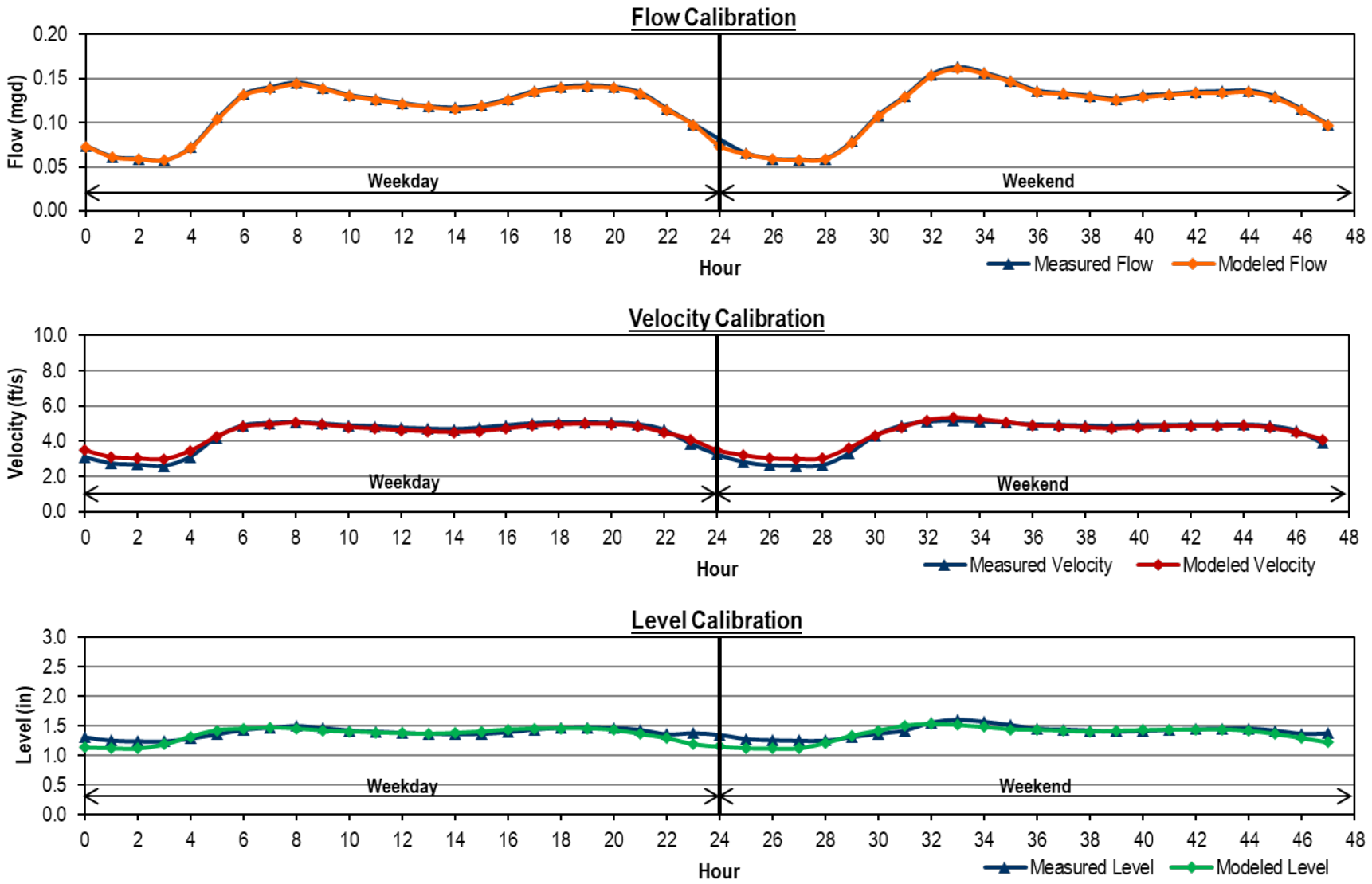


Figure 1.6 Example Diurnal Pattern (MH04C042)

1.4.3 Wet Weather Flow Calibration

1.4.3.1 Wet Weather Flow Calibration Process

The WWF calibration enables the hydraulic model to accurately simulate RDII entering the collection system during a large storm. As outlined below, the WWF calibration process consists of several elements:

- **Identify calibration rainfall events.** The WWF calibration process consists of running model simulations of historic rainfall events based on data collected as part of the flow monitoring program. The goal of any wet weather flow monitoring program is to capture and characterize a system's response to a significant rainfall event, preferably during wet antecedent moisture conditions.

  The selection of a particular calibration storm or group of storms is based on a review of the flow and rainfall data. For WWF calibration, the model was run from May 18 to May 24, 2023, and calibrated to only one rainfall event from May 19 to May20, 2023, because this is the only event that occurred during the flow monitoring period. Since there was only one recorded rainfall event throughout the flow monitoring period, a second storm event on May 6, 2023 (outside the flow monitoring period) was considered. The City provided measured data for the WPCF, which was compared to the modeled results to ensure that the RTK parameters inserted in the model closely reflect real-world conditions.

  To run a model simulation for the period of these storms, the hourly rainfall data were input into the model for these events.

- **Define RDII tributary areas.** For the WWF calibration, RDII flows are added to the system already conveying the DWF. The model calculates RDII by assigning "RDII Inflows" to each node in the model. RDII inflows consist of both a unit hydrograph and the total area that is tributary to the model node. The RDII tributary areas were calculated in GIS using the loading polygons, excluding any large vacant, open space, or other areas in the system which are not expected to contribute RDII into the collection system. The tributary area provides a means to transform hourly rainfall depth from the rainfall hyetographs into a rainfall volume. The rainfall volume is transformed into actual RDII flows using the unit hydrograph, as described in the next step.

- **Create I/I parameter database and modify to match field-measured flows.** The main step in the WWF calibration process involves adjusting the RTK unit hydrograph parameters for each flow monitoring tributary area. Appendix 1B summarizes all calibrated parameters by flow monitoring site. As with the dry weather calibration, the wet weather calibration process compared the meter data with the model output. Comparisons were made for average and peak flows as well as the temporal distribution of flow until flows returned to their baseline levels. According to the CIWEM UDG, a hydraulic model is generally considered to be satisfactorily calibrated to WWF conditions if the modeled peak flows satisfy the guidelines presented in Section 1.4.1.2 above.

- **Adjust model variables to match field-measured velocity and flow depths.** Once the model-simulated flows matched the field-measured flows within the acceptable limits, the model-simulated velocity and flow depth were compared to the field-measured velocity and flow depth. Adjustments were made to various model parameters until the modeled and measured velocity and depth closely matched one another. The primary parameter varied is the pipe roughness (Manning's n), although other parameters can also be adjusted as calibration results are generated. Sediment buildup and

movement in the pipe will also influence the level and depth, but these are very difficult to quantify and can change frequently, therefore they are not included in the calibration.

Manning's roughness coefficients, or n values, have industry accepted ranges based on a number of variables. Roughness coefficients increase over time depending on the construction methods, installation quality, system maintenance, and other environmental factors. There can be certain factors within the City's collection system that can result in roughness coefficients which differ from the typical range. For example, joint misalignment, cracks, and debris (e.g., root intrusion, etc.) lead to increased turbulence in a pipe, which affects the Manning's n factor.

If the model is unable to reasonably match the field-measured flow depth and velocity without leaving the acceptable range of calibration head loss factors, further investigation is conducted to help determine the cause of the discrepancy. Some issues that could cause such a discrepancy include errors in the slope or diameter of a pipeline, downstream blockages, pipeline sags, and, in some cases, influences from downstream pump station operations.

1.4.3.2 Wet Weather Calibration Results and Discussion

An example of the wet weather calibration for MH04C042 is shown in Figure 1.7. Table 1.5 provides a summary of the wet weather flow calibration using the average and peak flow results for all seven sites. As shown in Table 1.5, the model simulated average and peak flows at all meter sites were within the acceptable tolerances for the only storm used for calibration, except for meter MH04C002. As stated in Chapter 3 of the City's CSMP, the model was not calibrated to the peak flow percentage for meter MH04C002 because the flow monitoring program identified a direct storm drain connection to the sewer pipeline. The storm drain was disconnected, thus eliminating its influence on the sewer system, so the peak measured flow was no longer appropriate for calibration. Therefore, these model results were considered calibrated and ready to use for capacity analysis purposes.

As noted previously, a storm event on May 6, 2023, that occurred prior to the flow monitoring period was used to validate the model by comparing the modeled results to the influent flow measured at the WPCF. The results are presented in Figure 1.8. Note that the measured flows are slightly lower than the modeled results. This was expected and not corrected for because the mass balance of the measured flows at the flow monitoring sites resulted in a negative flow from the area downstream of the last flow meter site when compared to the influent flow at the WPCF measured during the same period. The measurements at the WPCF are therefore suspected to be reporting lower values than the actual flow and the modeled results are conservative.

Appendix 1C contains a detailed wet weather flow calibration summary sheet for each of the seven meter sites. Each calibration sheet provides plots that compare the model-simulated and field-measured flow, velocity, and level data for the calibration storms.

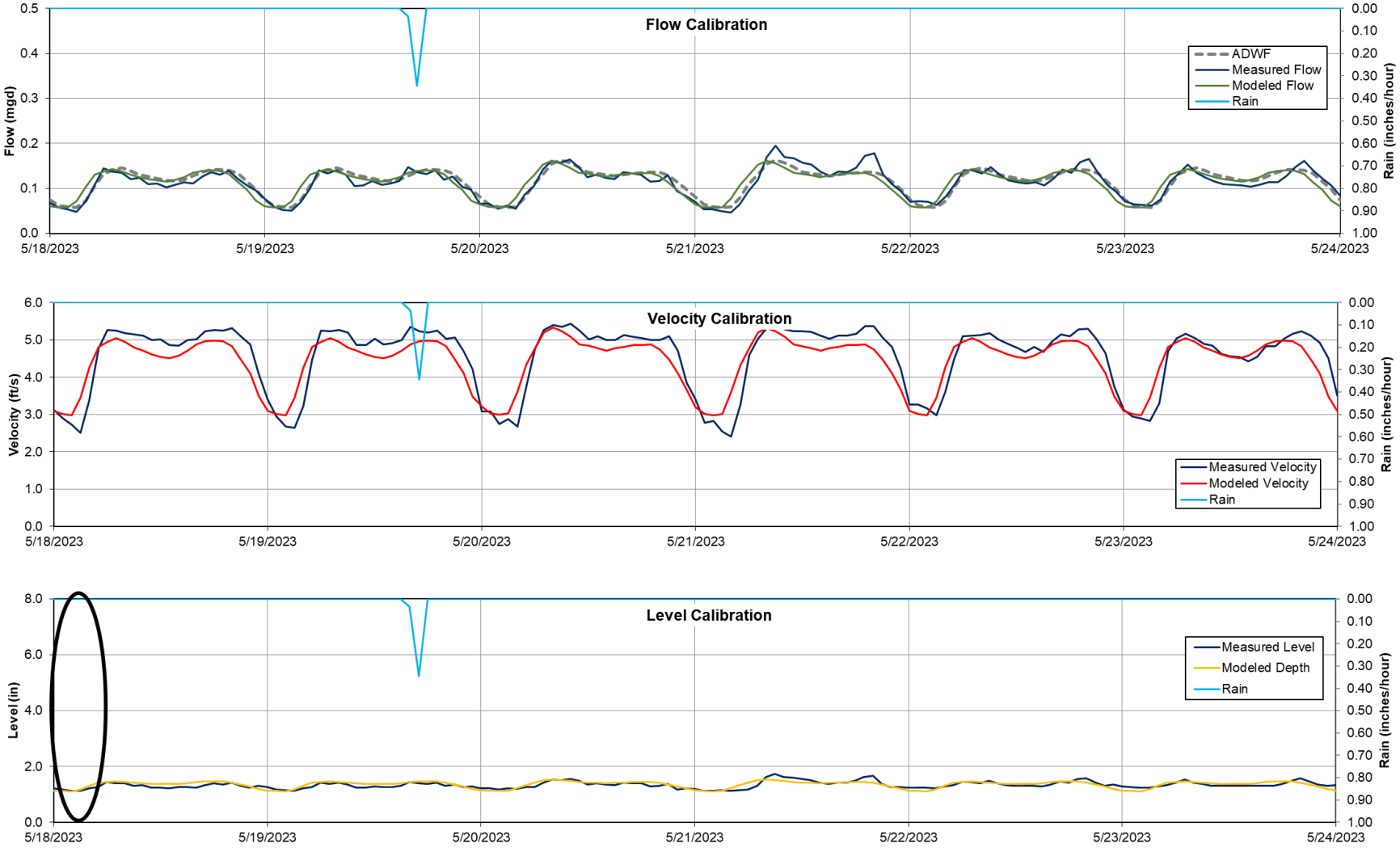


Figure 1.7 Example of Wet Weather Calibration - Meter MH04C042

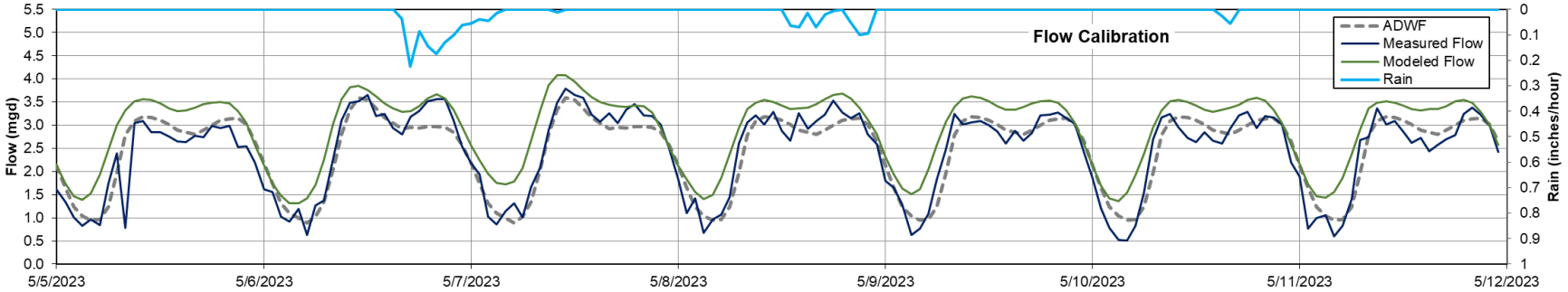


Figure 1.8 Verification of Wet Weather Calibration - WPCF

Table 1.5 Wet Weather Flow Calibration Results

Flow Meter ID	Pipe Diameter (inches)	Calibration Storm A - Percent Error and Difference Comparison		
		Total Volume Flow (%)	Peak Flow (%)	Level Difference (inches)
MH0163	18	3.4%	-2.6%	-2.8
MH0087	18	2.5%	-13.2%	0.8
MH17C073	15	4.8%	5.0%	0.5
MH03B042	27	-9.2%	-11.4%	-1.1
MH04C002	24	0.9%	-22.8%(1)	1.9
MH04C042	8	1.0%	-2.3%	0.0
MH04B057	30	9.7%	8.3%	0.1

Notes:
(1) Meter MH04C002 is not shown as calibrated because the storm drain directly connected to the sewer pipeline has been capped and disconnected, eliminating its influence on the sewer system.

1.4.4 Hydraulic Model Calibration Summary

Calibration of the City's hydraulic model was a multi-step process that involved comparing model-simulated flow to the actual field-measured data for both dry and wet weather conditions. The model met all CIWEM standards for ADWF. Results showed the model met CIWEM standards for calculations of flow during peak WWF, with the exception of the MH04C002 site at which the City identified a direct stormwater connection upstream. The CIWEM level standards were met at all of the meter sites used for model calibration.

The City should be aware of the following limitations to the hydraulic model. The model calibration parameters, and therefore any projected design storm flows, have greater uncertainty in larger drainage areas that were not modeled in detail. Model predictions will be more accurate within the range of storms calibrated to (i.e., less than 1-year, 24-hour storm events based on the classification of the May 19, 2023 – the only storm event used for calibration in 2023). It is important to note that the model will tend to overpredict volumes and peak flows from larger storms outside the range of storms to which the model was calibrated, which will provide conservative results.

While the accuracy limitations are unavoidable, the model still represents the best available tool to adequately represent complex system interactions for trunk line capacity evaluations and alternatives analysis.

1.5 Hydraulic Model Maintenance

Maintaining the hydraulic model is crucial for ensuring that it reflects the City's sewer system in real-world conditions as much as possible thus creating reliability over time. As new pipe installations are completed, it is essential to update the GIS to reflect these changes. Additionally, as the City expands and more development occurs, the resulting flows should be incorporated into the model to account for increased demand for the sewer system. CIWEM UDG recommends calibrating to wet weather conditions for storm period containing at least three separate storms. However, the current model was only calibrated using data from only one storm event, as it is the only available storm in the calibration data set. Therefore, when a significant number of changes have occurred in the City's sewer system, or new flow meter data has been collected from additional storm events, it is recommended to recalibrate the model. Regular updates and recalibration help maintain an accurate representation of the City's sewer system, ensuring effective planning and management.

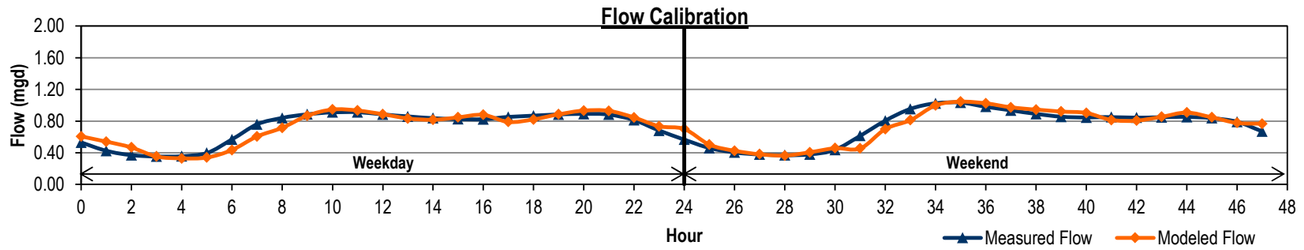
APPENDIX 1A

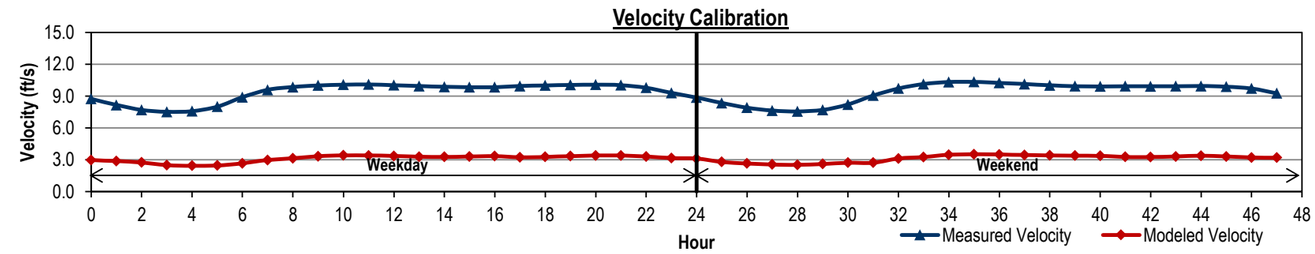
DRY WEATHER FLOW CALIBRATION RESULTS

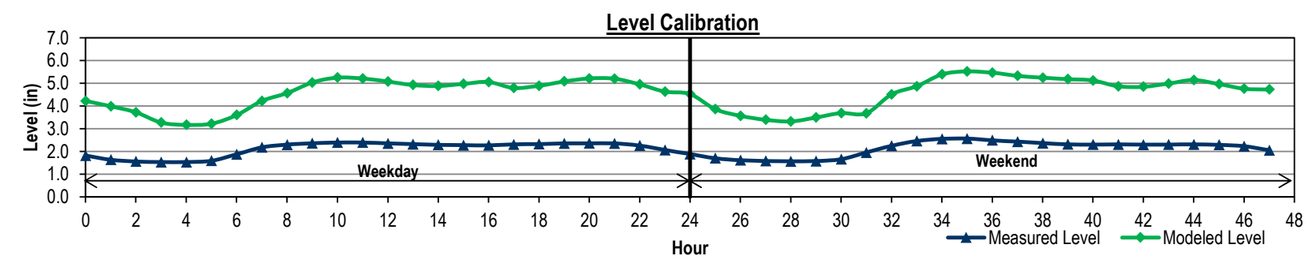
City of Redmond, OR
Wastewater Collection Master Plan
FLOW MONITORING SITE MH0163 DRY WEATHER FLOW CALIBRATION

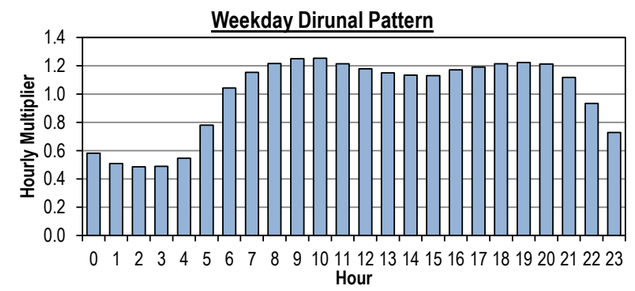
		Measured Data			Modeled Data				Diurnal		
	Hour	Flow (mgd)	Level (in)	Velocity (ft/s)	Flow (mgd)	Level (in)	Velocity (ft/s)	Level Diff (in)	Initial Curve	Modified Curve	Calibrated Diurnal
Weekday	0	0.53	1.82	8.75	0.61	4.22	2.97	-2.40	0.58	0.58	0.58
	1	0.42	1.64	8.17	0.54	3.99	2.87	-2.35	0.51	0.51	0.51
	2	0.37	1.56	7.70	0.47	3.72	2.74	-2.17	0.48	0.48	0.48
	3	0.35	1.53	7.52	0.35	3.27	2.49	-1.74	0.49	0.49	0.49
	4	0.36	1.53	7.59	0.33	3.17	2.43	-1.64	0.55	0.55	0.55
	5	0.40	1.59	8.01	0.34	3.22	2.46	-1.63	0.78	0.78	0.78
	6	0.57	1.87	8.90	0.43	3.61	2.67	-1.73	1.04	1.04	1.04
	7	0.76	2.18	9.60	0.61	4.22	2.97	-2.04	1.15	1.15	1.15
	8	0.84	2.30	9.86	0.71	4.57	3.13	-2.27	1.22	1.22	1.22
	9	0.89	2.36	10.01	0.87	5.03	3.32	-2.67	1.25	1.25	1.25
	10	0.91	2.39	10.08	0.95	5.25	3.42	-2.86	1.25	1.25	1.25
	11	0.91	2.39	10.10	0.93	5.21	3.41	-2.82	1.22	1.22	1.22
	12	0.88	2.36	10.03	0.89	5.08	3.35	-2.72	1.18	1.18	1.18
	13	0.86	2.32	9.96	0.83	4.93	3.29	-2.61	1.15	1.15	1.15
	14	0.84	2.29	9.88	0.82	4.88	3.26	-2.59	1.13	1.13	1.13
	15	0.83	2.27	9.85	0.85	4.97	3.30	-2.70	1.13	1.13	1.13
	16	0.82	2.27	9.85	0.88	5.06	3.34	-2.79	1.17	1.17	1.17
	17	0.85	2.31	9.96	0.79	4.80	3.23	-2.49	1.19	1.19	1.19
	18	0.87	2.33	10.01	0.82	4.89	3.27	-2.56	1.21	1.21	1.21
	19	0.88	2.35	10.05	0.89	5.08	3.34	-2.73	1.22	1.22	1.22
	20	0.89	2.36	10.08	0.93	5.21	3.40	-2.85	1.21	1.21	1.21
	21	0.88	2.35	10.04	0.93	5.20	3.40	-2.85	1.12	1.12	1.12
	22	0.81	2.26	9.79	0.84	4.96	3.30	-2.70	0.93	0.93	0.93
	23	0.68	2.07	9.30	0.73	4.63	3.16	-2.57	0.73	0.73	0.73
Weekend	24	0.57	1.88	8.87	0.70	4.53	3.11	-2.64	0.63	0.63	0.63
	25	0.46	1.70	8.35	0.50	3.86	2.80	-2.16	0.56	0.56	0.56
	26	0.40	1.62	7.91	0.42	3.57	2.65	-1.95	0.52	0.52	0.52
	27	0.38	1.58	7.64	0.38	3.39	2.55	-1.81	0.51	0.51	0.51
	28	0.37	1.57	7.55	0.36	3.32	2.51	-1.76	0.52	0.52	0.52
	29	0.38	1.58	7.70	0.41	3.49	2.60	-1.91	0.60	0.60	0.60
	30	0.44	1.66	8.21	0.46	3.69	2.72	-2.03	0.84	0.84	0.84
	31	0.61	1.95	9.06	0.46	3.68	2.72	-1.73	1.11	1.11	1.11
	32	0.80	2.25	9.72	0.70	4.51	3.12	-2.27	1.31	1.31	1.31
	33	0.95	2.46	10.14	0.81	4.87	3.26	-2.41	1.41	1.41	1.41
	34	1.02	2.55	10.33	1.00	5.39	3.47	-2.84	1.42	1.42	1.42
	35	1.03	2.57	10.35	1.04	5.52	3.52	-2.96	1.35	1.35	1.35
	36	0.98	2.49	10.25	1.02	5.47	3.49	-2.97	1.29	1.29	1.29
	37	0.94	2.43	10.14	0.97	5.33	3.44	-2.90	1.22	1.22	1.22
	38	0.89	2.37	10.02	0.94	5.25	3.41	-2.88	1.17	1.17	1.17
	39	0.85	2.32	9.94	0.92	5.18	3.38	-2.87	1.16	1.16	1.16
	40	0.85	2.30	9.91	0.90	5.12	3.37	-2.82	1.17	1.17	1.17
	41	0.85	2.31	9.94	0.81	4.87	3.26	-2.56	1.16	1.16	1.16
	42	0.84	2.30	9.93	0.81	4.85	3.25	-2.55	1.17	1.17	1.17
	43	0.85	2.30	9.93	0.85	4.99	3.31	-2.69	1.17	1.17	1.17
	44	0.85	2.31	9.96	0.91	5.14	3.37	-2.83	1.15	1.15	1.15
	45	0.84	2.29	9.89	0.85	4.96	3.31	-2.67	1.09	1.09	1.09
	46	0.79	2.23	9.72	0.78	4.76	3.21	-2.53	0.92	0.92	0.92
	47	0.67	2.05	9.27	0.77	4.73	3.20	-2.67	0.78	0.78	0.78
Average											
Weekday		0.73	2.11	9.38	0.72	4.55	3.10	-2.44	1.00	1.00	1.00
Weekend		0.73	2.13	9.36	0.74	4.60	3.13	-2.48	1.01	1.01	1.01
ADWF[1]		0.73	2.12	9.38	0.73	4.56	3.11	-2.45	1.00	1.00	1.00
% Error											
Weekday					-0.4%	115.3%	-66.9%	2.86			
Weekend					0.9%	116.3%	-66.6%	2.97			

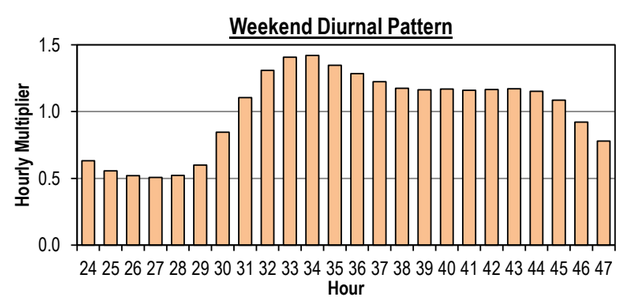
Note:











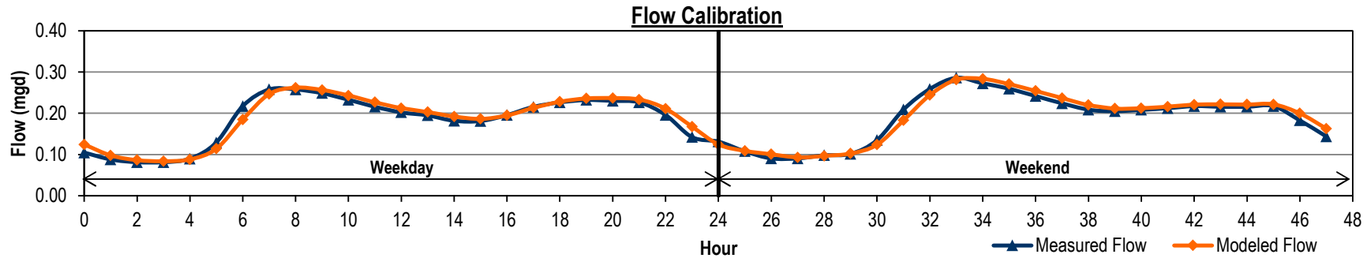
City of Redmond, OR

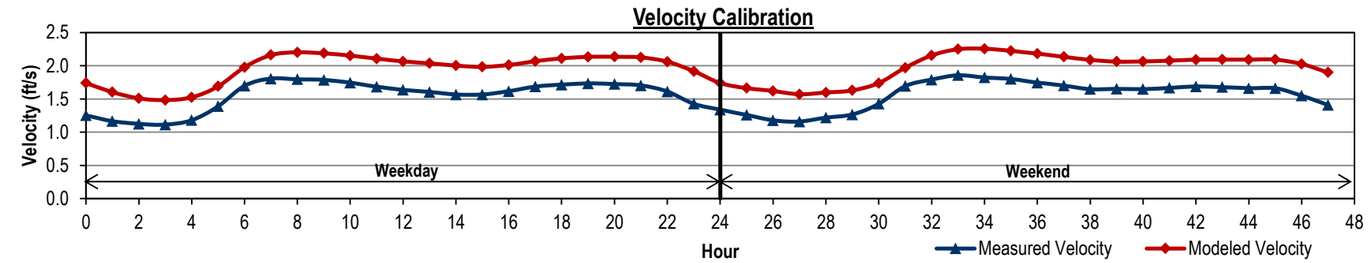
Wastewater Collection Master Plan

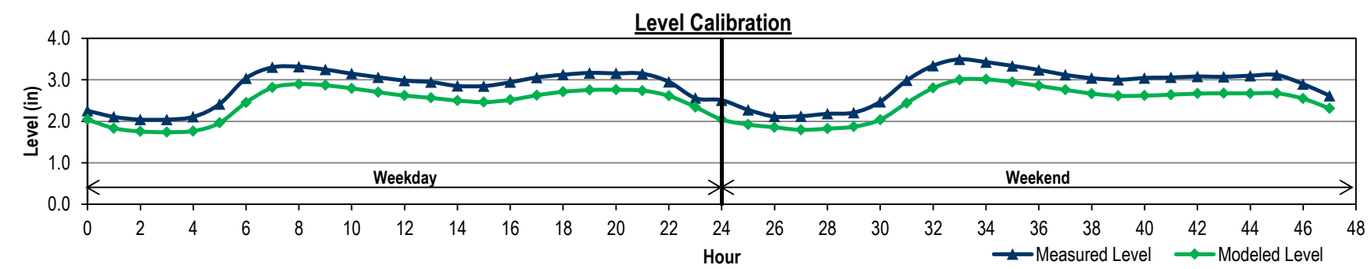
FLOW MONITORING SITE MH0087 DRY WEATHER FLOW CALIBRATION

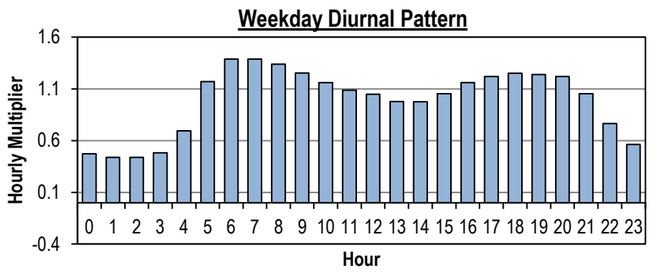
		Measured Data			Modeled Data				Diurnal		
	Hour	Flow (mgd)	Level (in)	Velocity (ft/s)	Flow (mgd)	Level (in)	Velocity (ft/s)	Level Diff (in)	Initial Curve	Modified Curve	Calibrated Diurnal
Weekday	0	0.10	2.25	1.25	0.12	2.04	1.74	0.21	0.47	0.47	0.47
	1	0.09	2.11	1.17	0.10	1.83	1.60	0.28	0.44	0.44	0.44
	2	0.08	2.04	1.13	0.09	1.76	1.51	0.29	0.44	0.44	0.44
	3	0.08	2.04	1.11	0.08	1.74	1.48	0.30	0.48	0.48	0.48
	4	0.09	2.11	1.18	0.09	1.77	1.53	0.34	0.69	0.69	0.69
	5	0.13	2.41	1.39	0.11	1.96	1.69	0.45	1.17	1.17	1.17
	6	0.22	3.04	1.70	0.18	2.45	1.98	0.58	1.39	1.39	1.39
	7	0.26	3.30	1.81	0.25	2.81	2.16	0.49	1.39	1.39	1.39
	8	0.26	3.32	1.80	0.26	2.90	2.20	0.42	1.34	1.34	1.34
	9	0.25	3.25	1.79	0.26	2.87	2.19	0.38	1.25	1.25	1.25
	10	0.23	3.15	1.75	0.24	2.79	2.15	0.36	1.16	1.16	1.16
	11	0.22	3.06	1.68	0.23	2.70	2.11	0.36	1.09	1.09	1.09
	12	0.20	2.98	1.64	0.21	2.62	2.07	0.36	1.05	1.05	1.05
	13	0.19	2.94	1.61	0.20	2.56	2.04	0.38	0.98	0.98	0.98
	14	0.18	2.85	1.57	0.19	2.50	2.00	0.35	0.97	0.97	0.97
	15	0.18	2.85	1.57	0.19	2.46	1.98	0.39	1.05	1.05	1.05
	16	0.20	2.94	1.62	0.19	2.52	2.01	0.43	1.16	1.16	1.16
	17	0.22	3.05	1.69	0.21	2.63	2.07	0.43	1.22	1.22	1.22
	18	0.23	3.13	1.72	0.23	2.71	2.11	0.41	1.25	1.25	1.25
	19	0.23	3.16	1.73	0.24	2.75	2.13	0.41	1.24	1.24	1.24
	20	0.23	3.16	1.73	0.24	2.76	2.14	0.40	1.22	1.22	1.22
	21	0.23	3.15	1.70	0.23	2.74	2.13	0.41	1.05	1.05	1.05
	22	0.20	2.95	1.61	0.21	2.61	2.06	0.34	0.77	0.77	0.77
	23	0.14	2.56	1.43	0.17	2.34	1.92	0.22	0.56	0.56	0.56
Weekend	24	0.13	2.51	1.34	0.12	2.04	1.74	0.47	0.58	0.58	0.58
	25	0.11	2.27	1.26	0.11	1.92	1.66	0.35	0.49	0.49	0.49
	26	0.09	2.11	1.18	0.10	1.86	1.62	0.26	0.49	0.49	0.49
	27	0.09	2.12	1.16	0.09	1.79	1.57	0.33	0.53	0.53	0.53
	28	0.10	2.18	1.22	0.10	1.82	1.60	0.36	0.55	0.55	0.55
	29	0.10	2.21	1.27	0.10	1.87	1.63	0.34	0.73	0.73	0.73
	30	0.13	2.47	1.43	0.12	2.04	1.74	0.43	1.12	1.12	1.12
	31	0.21	2.99	1.69	0.18	2.44	1.97	0.55	1.39	1.39	1.39
	32	0.26	3.34	1.79	0.24	2.80	2.16	0.54	1.54	1.54	1.54
	33	0.29	3.49	1.86	0.28	3.00	2.25	0.49	1.47	1.47	1.47
	34	0.27	3.43	1.82	0.28	3.01	2.26	0.41	1.40	1.40	1.40
	35	0.26	3.34	1.80	0.27	2.94	2.22	0.39	1.30	1.30	1.30
	36	0.24	3.24	1.75	0.25	2.86	2.18	0.38	1.21	1.21	1.21
	37	0.22	3.12	1.70	0.24	2.76	2.14	0.36	1.12	1.12	1.12
	38	0.21	3.04	1.65	0.22	2.67	2.09	0.37	1.10	1.10	1.10
	39	0.21	3.00	1.65	0.21	2.61	2.06	0.38	1.12	1.12	1.12
	40	0.21	3.04	1.65	0.21	2.62	2.07	0.42	1.14	1.14	1.14
	41	0.21	3.06	1.67	0.22	2.64	2.08	0.42	1.17	1.17	1.17
	42	0.22	3.08	1.69	0.22	2.67	2.09	0.41	1.16	1.16	1.16
	43	0.22	3.07	1.68	0.22	2.67	2.09	0.40	1.16	1.16	1.16
	44	0.22	3.10	1.66	0.22	2.67	2.09	0.43	1.17	1.17	1.17
	45	0.22	3.12	1.66	0.22	2.67	2.09	0.44	0.98	0.98	0.98
	46	0.18	2.90	1.55	0.20	2.55	2.03	0.35	0.77	0.77	0.77
	47	0.14	2.62	1.41	0.16	2.31	1.90	0.31	0.71	0.71	0.71
Average											
	Weekday	**0.18**	**2.83**	**1.56**	**0.19**	**2.45**	**1.96**	**0.37**	**0.99**	**0.99**	**0.99**
	Weekend	**0.19**	**2.87**	**1.56**	**0.19**	**2.47**	**1.97**	**0.40**	**1.02**	**1.02**	**1.02**
	ADWF[1]	**0.19**	**2.84**	**1.56**	**0.19**	**2.46**	**1.96**	**0.38**	**1.00**	**1.00**	**1.00**
% Error											
	Weekday				2.3%	-13.2%	25.8%	0.58			
	Weekend				1.7%	-13.9%	26.1%	0.55			

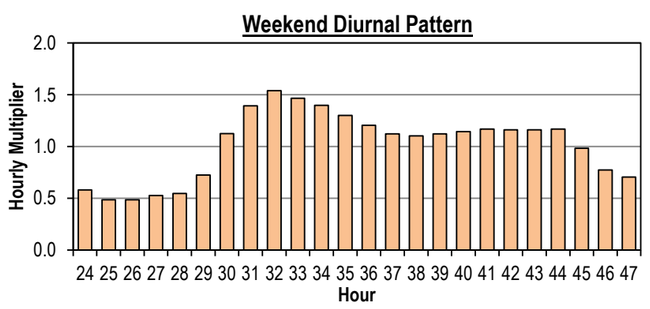
Note:











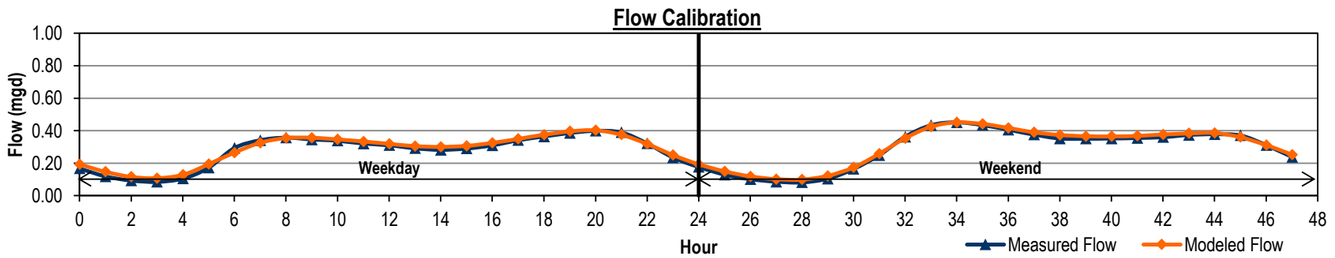
City of Redmond, OR

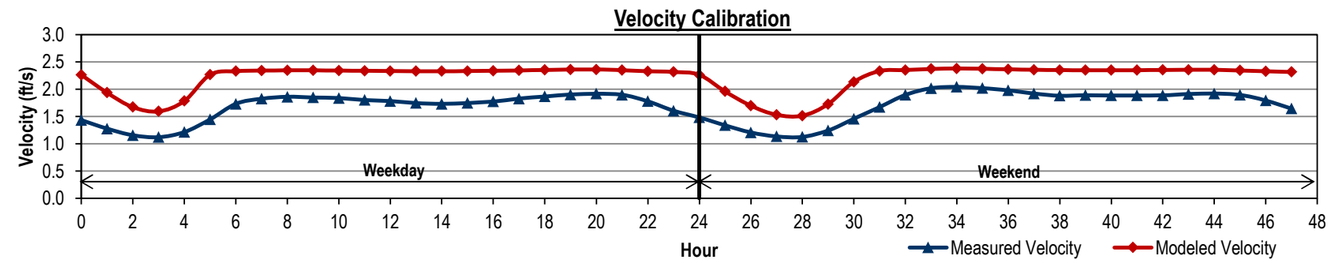
Wastewater Collection Master Plan

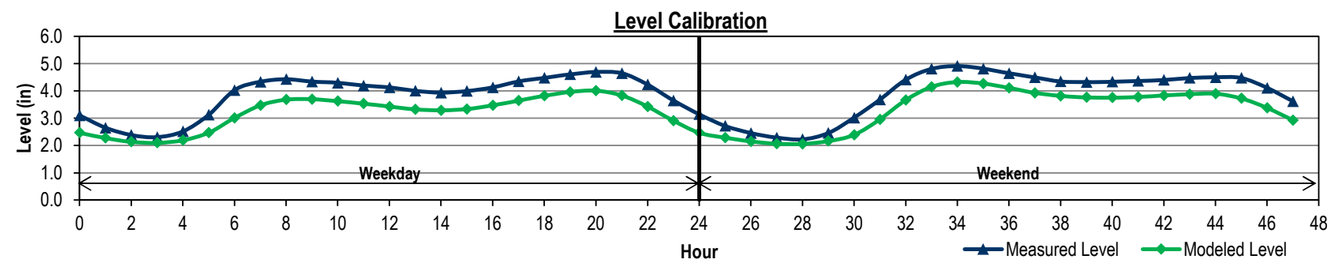
FLOW MONITORING SITE MH17C073 DRY WEATHER FLOW CALIBRATION

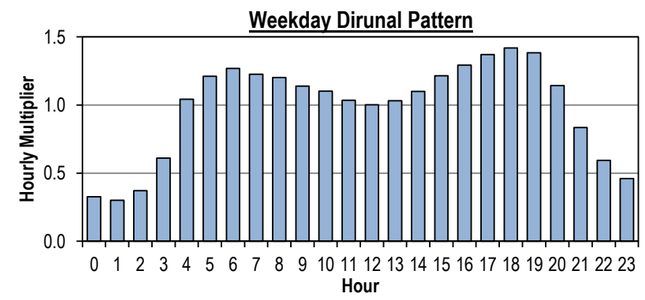
		Measured Data			Modeled Data				Diurnal		
	Hour	Flow (mgd)	Level (in)	Velocity (ft/s)	Flow (mgd)	Level (in)	Velocity (ft/s)	Level Diff (in)	Initial Curve	Modified Curve	Calibrated Diurnal
Weekday	0	0.17	3.10	1.44	0.19	2.47	2.26	0.64	0.42	0.33	0.33
	1	0.12	2.65	1.28	0.15	2.27	1.94	0.37	0.33	0.30	0.30
	2	0.09	2.38	1.16	0.12	2.13	1.67	0.25	0.30	0.37	0.37
	3	0.08	2.30	1.12	0.11	2.09	1.60	0.21	0.37	0.61	0.61
	4	0.10	2.51	1.21	0.13	2.19	1.78	0.32	0.61	1.04	1.04
	5	0.17	3.13	1.45	0.19	2.47	2.27	0.66	1.04	1.21	1.21
	6	0.29	4.03	1.73	0.26	3.01	2.33	1.02	1.21	1.27	1.27
	7	0.34	4.33	1.83	0.33	3.47	2.34	0.87	1.27	1.23	1.23
	8	0.36	4.43	1.86	0.35	3.68	2.35	0.75	1.23	1.20	1.20
	9	0.34	4.34	1.85	0.36	3.69	2.35	0.65	1.20	1.14	1.14
	10	0.34	4.30	1.84	0.35	3.62	2.34	0.67	1.14	1.10	1.10
	11	0.32	4.19	1.80	0.33	3.53	2.34	0.66	1.10	1.04	1.04
	12	0.31	4.13	1.78	0.32	3.43	2.33	0.70	1.04	1.00	1.00
	13	0.29	4.01	1.75	0.30	3.32	2.33	0.68	1.00	1.03	1.03
	14	0.28	3.94	1.73	0.30	3.29	2.33	0.65	1.03	1.10	1.10
	15	0.29	3.99	1.75	0.31	3.33	2.33	0.66	1.10	1.21	1.21
	16	0.31	4.13	1.78	0.33	3.47	2.34	0.66	1.21	1.29	1.29
	17	0.34	4.35	1.83	0.35	3.64	2.35	0.70	1.29	1.37	1.37
	18	0.36	4.48	1.87	0.37	3.82	2.35	0.66	1.37	1.42	1.42
	19	0.39	4.61	1.90	0.40	3.96	2.36	0.65	1.42	1.38	1.38
	20	0.40	4.69	1.92	0.40	4.01	2.36	0.68	1.38	1.14	1.14
	21	0.39	4.65	1.90	0.38	3.83	2.35	0.81	1.14	0.83	0.83
	22	0.32	4.24	1.78	0.32	3.43	2.33	0.81	0.83	0.59	0.59
	23	0.23	3.64	1.60	0.25	2.90	2.32	0.74	0.59	0.46	0.46
Weekend	24	0.18	3.14	1.48	0.19	2.47	2.26	0.68	0.46	0.36	0.36
	25	0.13	2.72	1.34	0.15	2.29	1.96	0.43	0.36	0.30	0.30
	26	0.10	2.45	1.21	0.12	2.15	1.70	0.31	0.30	0.29	0.29
	27	0.09	2.29	1.14	0.10	2.06	1.53	0.22	0.29	0.37	0.37
	28	0.08	2.23	1.13	0.10	2.05	1.51	0.17	0.37	0.58	0.58
	29	0.10	2.46	1.24	0.12	2.16	1.73	0.29	0.58	0.89	0.89
	30	0.16	3.02	1.46	0.17	2.39	2.13	0.63	0.89	1.29	1.29
	31	0.25	3.68	1.67	0.26	2.95	2.33	0.73	1.29	1.54	1.54
	32	0.36	4.41	1.90	0.35	3.66	2.35	0.75	1.54	1.61	1.61
	33	0.43	4.81	2.02	0.42	4.15	2.37	0.66	1.61	1.55	1.55
	34	0.45	4.91	2.04	0.45	4.32	2.38	0.59	1.55	1.44	1.44
	35	0.43	4.81	2.02	0.44	4.27	2.37	0.55	1.44	1.34	1.34
	36	0.41	4.65	1.98	0.42	4.11	2.37	0.54	1.34	1.25	1.25
	37	0.38	4.49	1.92	0.39	3.93	2.36	0.57	1.25	1.25	1.25
	38	0.35	4.34	1.88	0.37	3.81	2.35	0.53	1.25	1.25	1.25
	39	0.35	4.32	1.89	0.37	3.76	2.35	0.56	1.25	1.26	1.26
	40	0.35	4.33	1.88	0.36	3.75	2.35	0.58	1.26	1.28	1.28
	41	0.35	4.36	1.89	0.37	3.77	2.35	0.59	1.28	1.33	1.33
	42	0.36	4.40	1.89	0.38	3.83	2.35	0.57	1.33	1.34	1.34
	43	0.37	4.47	1.91	0.38	3.88	2.36	0.59	1.34	1.32	1.32
	44	0.38	4.50	1.92	0.39	3.89	2.36	0.60	1.32	1.10	1.10
	45	0.37	4.48	1.90	0.36	3.72	2.34	0.75	1.10	0.85	0.85
	46	0.31	4.11	1.79	0.31	3.38	2.33	0.73	0.85	0.63	0.63
	47	0.24	3.62	1.64	0.25	2.92	2.32	0.70	0.63	0.70	0.70
Average											
Weekday		**0.28**	**3.86**	**1.67**	**0.29**	**3.21**	**2.23**	**0.64**	**0.99**	**0.99**	**0.99**
Weekend		**0.29**	**3.88**	**1.71**	**0.30**	**3.32**	**2.20**	**0.56**	**1.04**	**1.05**	**1.05**
ADWF[1]		**0.28**	**3.86**	**1.68**	**0.29**	**3.24**	**2.23**	**0.62**	**1.00**	**1.00**	**1.00**
% Error											
Weekday					**3.5%**	**-16.7%**	**33.6%**	**1.02**			
Weekend					**3.4%**	**-14.3%**	**28.4%**	**0.75**			

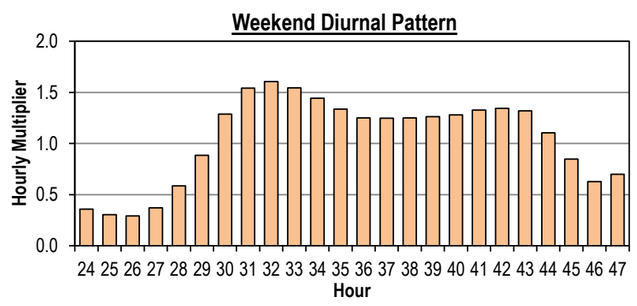
Note:











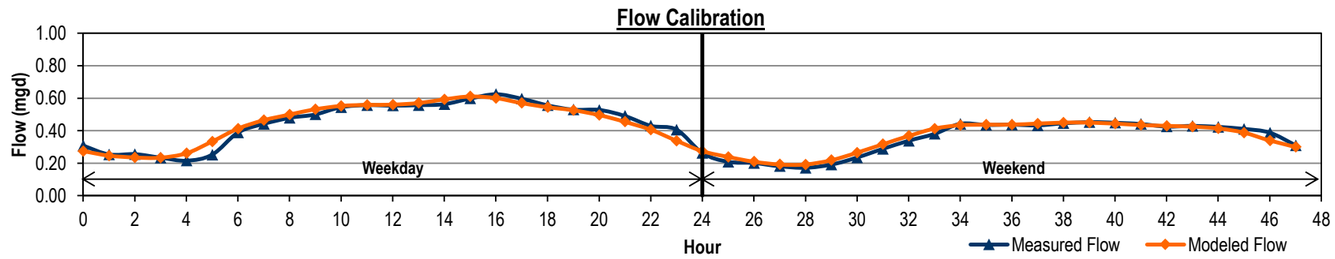
City of Redmond, OR

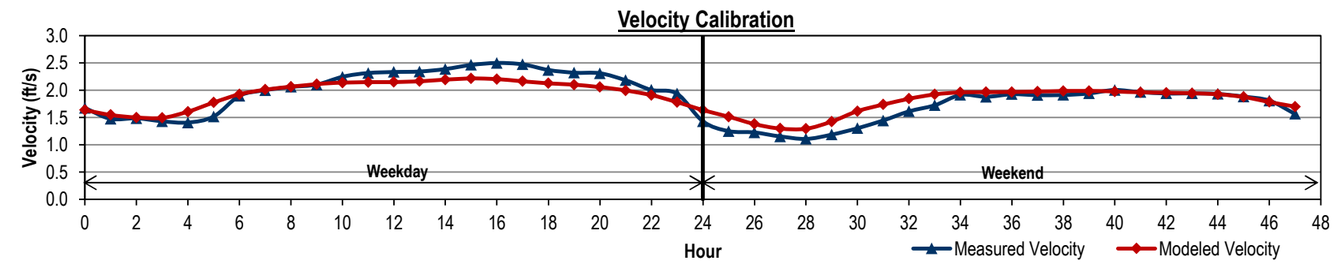
Wastewater Collection Master Plan

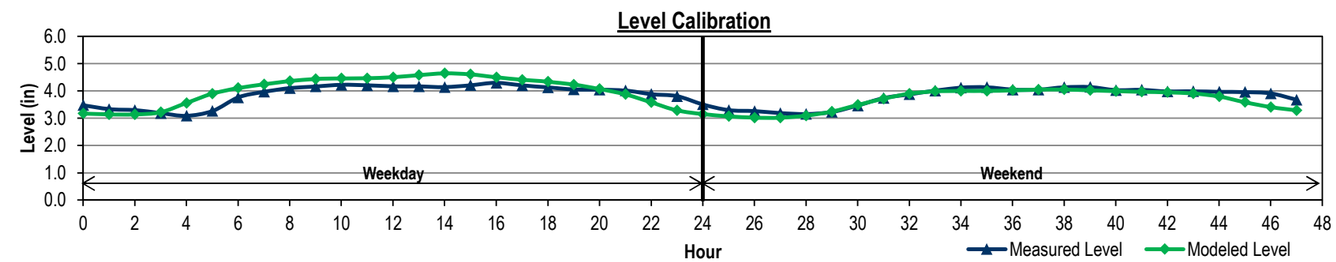
FLOW MONITORING SITE MH03B042 DRY WEATHER FLOW CALIBRATION

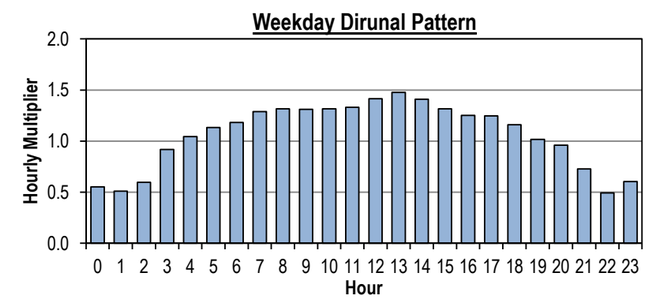
		Measured Data			Modeled Data				Diurnal		
		Flow	Level	Velocity	Flow	Level	Velocity	Level Diff	Initial	Modified	Calibrated
	Hour	(mgd)	(in)	(ft/s)	(mgd)	(in)	(ft/s)	(in)	Curve	Curve	Diurnal
Weekday	0	0.31	3.48	1.67	0.27	3.17	1.64	0.31	0.60	0.60	0.55
	1	0.25	3.33	1.48	0.25	3.14	1.55	0.19	0.60	0.55	0.51
	2	0.26	3.29	1.48	0.23	3.14	1.50	0.16	0.55	0.51	0.60
	3	0.23	3.18	1.43	0.23	3.22	1.49	-0.03	0.51	0.60	0.92
	4	0.22	3.09	1.41	0.26	3.56	1.61	-0.47	0.60	0.92	1.04
	5	0.25	3.26	1.52	0.33	3.89	1.77	-0.63	0.92	1.04	1.13
	6	0.39	3.76	1.90	0.41	4.10	1.92	-0.34	1.04	1.13	1.18
	7	0.44	3.97	2.00	0.46	4.24	2.01	-0.27	1.13	1.18	1.29
	8	0.48	4.10	2.06	0.50	4.36	2.06	-0.26	1.18	1.29	1.32
	9	0.50	4.16	2.10	0.53	4.44	2.11	-0.27	1.29	1.32	1.31
	10	0.54	4.22	2.25	0.55	4.46	2.14	-0.23	1.32	1.31	1.32
	11	0.56	4.20	2.31	0.56	4.46	2.15	-0.26	1.31	1.32	1.33
	12	0.55	4.17	2.33	0.56	4.50	2.15	-0.33	1.32	1.33	1.41
	13	0.56	4.16	2.34	0.57	4.58	2.16	-0.41	1.33	1.41	1.48
	14	0.56	4.14	2.39	0.59	4.64	2.19	-0.50	1.41	1.48	1.41
	15	0.60	4.21	2.47	0.61	4.61	2.22	-0.40	1.48	1.41	1.32
	16	0.62	4.29	2.50	0.60	4.50	2.20	-0.21	1.41	1.32	1.25
	17	0.60	4.20	2.47	0.57	4.41	2.16	-0.20	1.32	1.25	1.25
	18	0.56	4.13	2.37	0.54	4.34	2.13	-0.21	1.25	1.25	1.16
	19	0.53	4.05	2.32	0.53	4.23	2.10	-0.17	1.25	1.16	1.02
	20	0.53	4.04	2.31	0.50	4.07	2.06	-0.03	1.16	1.02	0.96
	21	0.49	4.01	2.18	0.45	3.87	1.99	0.14	1.02	0.96	0.73
	22	0.43	3.88	2.01	0.41	3.58	1.91	0.30	0.96	0.73	0.49
	23	0.41	3.81	1.94	0.34	3.28	1.78	0.52	0.73	0.49	0.60
Weekend	24	0.26	3.51	1.43	0.27	3.15	1.64	0.36	0.49	0.47	0.43
	25	0.21	3.29	1.25	0.24	3.07	1.51	0.23	0.47	0.43	0.40
	26	0.20	3.26	1.23	0.21	3.02	1.38	0.24	0.43	0.40	0.45
	27	0.18	3.19	1.15	0.19	3.02	1.30	0.17	0.40	0.45	0.56
	28	0.17	3.15	1.11	0.19	3.09	1.29	0.06	0.45	0.56	0.68
	29	0.19	3.22	1.19	0.22	3.24	1.42	-0.01	0.56	0.68	0.80
	30	0.23	3.46	1.30	0.26	3.48	1.62	-0.02	0.68	0.80	0.90
	31	0.29	3.73	1.45	0.32	3.71	1.74	0.02	0.80	0.90	1.04
	32	0.34	3.88	1.61	0.37	3.90	1.84	-0.02	0.90	1.04	1.03
	33	0.38	4.01	1.72	0.41	3.99	1.92	0.02	1.04	1.03	1.03
	34	0.44	4.12	1.91	0.43	4.00	1.96	0.12	1.03	1.03	1.02
	35	0.44	4.13	1.88	0.44	4.00	1.97	0.13	1.03	1.02	1.05
	36	0.44	4.05	1.93	0.44	4.02	1.97	0.03	1.02	1.05	1.07
	37	0.43	4.05	1.91	0.44	4.05	1.98	0.00	1.05	1.07	1.06
	38	0.45	4.13	1.91	0.45	4.05	1.99	0.09	1.07	1.06	1.04
	39	0.45	4.14	1.94	0.45	4.02	1.99	0.12	1.06	1.04	1.01
	40	0.45	4.03	2.00	0.44	3.99	1.98	0.04	1.04	1.01	1.01
	41	0.44	4.04	1.96	0.43	3.97	1.96	0.07	1.01	1.01	1.00
	42	0.43	3.98	1.94	0.43	3.95	1.95	0.03	1.01	1.00	0.97
	43	0.43	3.99	1.94	0.42	3.90	1.94	0.08	1.00	0.97	0.92
	44	0.42	3.97	1.93	0.41	3.79	1.93	0.17	0.97	0.92	0.73
	45	0.41	3.96	1.88	0.39	3.59	1.88	0.37	0.92	0.73	0.62
	46	0.39	3.90	1.81	0.34	3.41	1.78	0.50	0.73	0.62	0.70
	47	0.31	3.68	1.57	0.30	3.28	1.70	0.39	0.62	0.70	0.47
Average											
Weekday		**0.45**	**3.88**	**2.05**	**0.45**	**4.03**	**1.96**	**-0.15**	**1.07**	**1.07**	**1.07**
Weekend		**0.35**	**3.79**	**1.67**	**0.35**	**3.65**	**1.78**	**0.13**	**0.82**	**0.83**	**0.83**
ADWF[1]		**0.42**	**3.85**	**1.94**	**0.42**	**3.92**	**1.91**	**-0.07**	**1.00**	**1.00**	**1.00**
% Error											
Weekday					0.1%	3.9%	-4.5%	0.63			
Weekend					1.6%	-3.5%	6.7%	0.50			

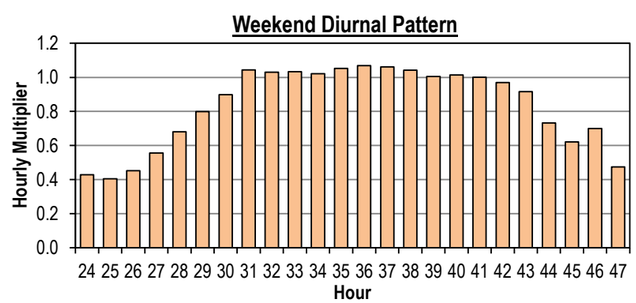
Note:











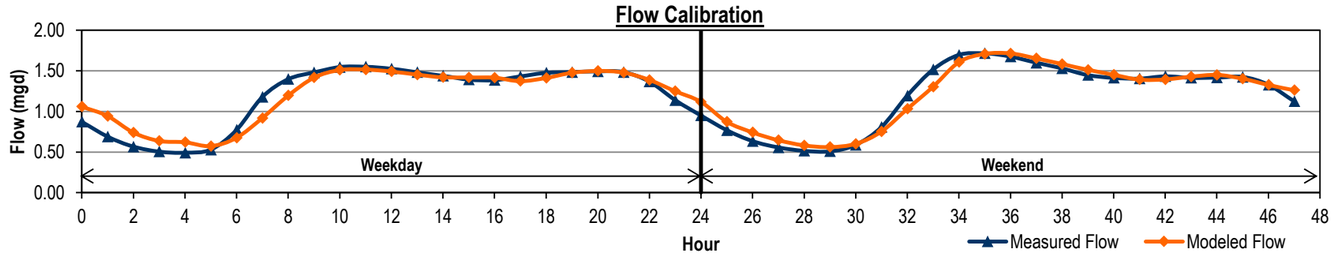
City of Redmond, OR

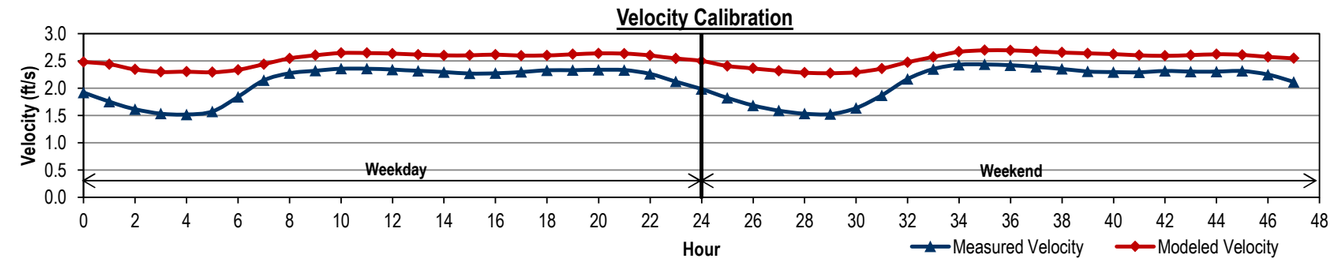
Wastewater Collection Master Plan

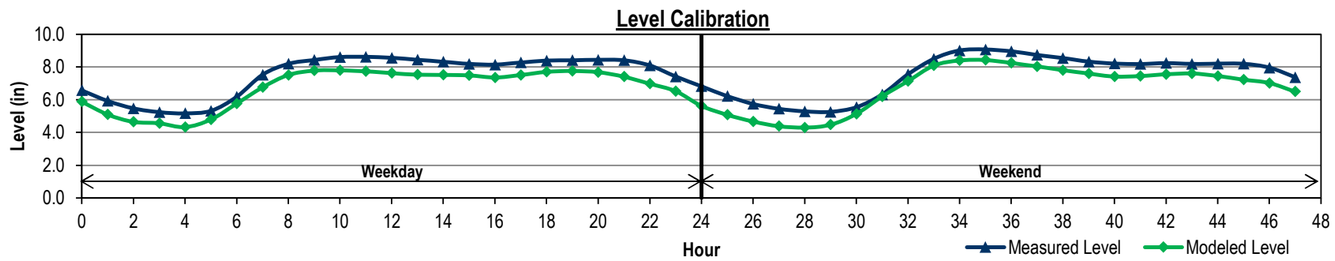
FLOW MONITORING SITE MH04C002 DRY WEATHER FLOW CALIBRATION

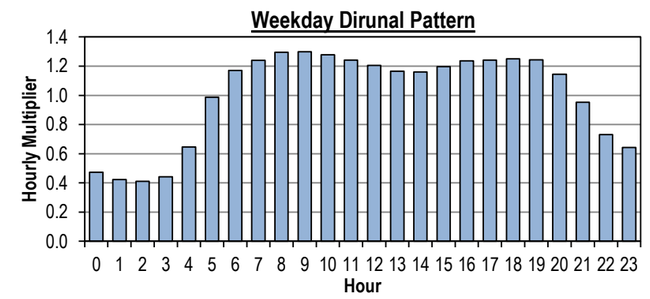
		Measured Data			Modeled Data				Diurnal		
		Flow	Level	Velocity	Flow	Level	Velocity	Level Diff	Initial	Modified	Calibrated
	Hour	(mgd)	(in)	(ft/s)	(mgd)	(in)	(ft/s)	(in)	Curve	Curve	Diurnal
Weekday	0	0.87	6.58	1.92	1.06	5.88	2.48	0.70	0.58	0.47	0.47
	1	0.69	5.93	1.75	0.94	5.10	2.44	0.83	0.47	0.42	0.42
	2	0.57	5.48	1.61	0.74	4.65	2.34	0.82	0.42	0.41	0.41
	3	0.50	5.24	1.53	0.64	4.57	2.30	0.67	0.41	0.44	0.44
	4	0.49	5.18	1.52	0.62	4.33	2.30	0.85	0.44	0.65	0.65
	5	0.53	5.32	1.57	0.57	4.80	2.29	0.52	0.65	0.99	0.99
	6	0.77	6.18	1.84	0.68	5.77	2.34	0.41	0.99	1.17	1.17
	7	1.18	7.53	2.15	0.92	6.76	2.44	0.77	1.17	1.24	1.24
	8	1.40	8.20	2.28	1.20	7.52	2.55	0.68	1.24	1.29	1.29
	9	1.48	8.43	2.32	1.42	7.79	2.60	0.64	1.29	1.30	1.30
	10	1.55	8.61	2.36	1.51	7.80	2.64	0.81	1.30	1.28	1.28
	11	1.55	8.62	2.36	1.51	7.74	2.65	0.88	1.28	1.24	1.24
	12	1.53	8.56	2.34	1.49	7.63	2.63	0.93	1.24	1.20	1.20
	13	1.48	8.45	2.32	1.45	7.54	2.62	0.91	1.20	1.16	1.16
	14	1.44	8.32	2.30	1.42	7.52	2.60	0.80	1.16	1.16	1.16
	15	1.39	8.19	2.27	1.42	7.49	2.60	0.70	1.16	1.20	1.20
	16	1.39	8.15	2.27	1.42	7.36	2.61	0.79	1.20	1.24	1.24
	17	1.43	8.28	2.30	1.37	7.51	2.60	0.77	1.24	1.24	1.24
	18	1.48	8.39	2.33	1.41	7.71	2.60	0.69	1.24	1.25	1.25
	19	1.48	8.42	2.33	1.48	7.76	2.62	0.66	1.25	1.24	1.24
	20	1.49	8.44	2.34	1.50	7.69	2.64	0.75	1.24	1.14	1.14
	21	1.48	8.42	2.33	1.48	7.41	2.63	1.01	1.14	0.95	0.95
	22	1.37	8.10	2.26	1.39	6.98	2.60	1.12	0.95	0.73	0.73
	23	1.14	7.42	2.12	1.25	6.52	2.54	0.90	0.73	0.64	0.64
Weekend	24	0.95	6.83	1.99	1.12	5.62	2.50	1.20	0.64	0.53	0.53
	25	0.77	6.23	1.82	0.87	5.09	2.41	1.14	0.53	0.47	0.47
	26	0.63	5.75	1.68	0.74	4.68	2.36	1.07	0.47	0.43	0.43
	27	0.56	5.45	1.59	0.65	4.39	2.32	1.06	0.43	0.43	0.43
	28	0.51	5.29	1.53	0.58	4.30	2.28	0.99	0.43	0.49	0.49
	29	0.51	5.26	1.53	0.56	4.48	2.28	0.79	0.49	0.68	0.68
	30	0.59	5.55	1.64	0.60	5.14	2.29	0.41	0.68	1.00	1.00
	31	0.81	6.32	1.87	0.75	6.20	2.36	0.12	1.00	1.27	1.27
	32	1.19	7.56	2.17	1.03	7.14	2.48	0.42	1.27	1.42	1.42
	33	1.52	8.50	2.35	1.30	8.09	2.57	0.41	1.42	1.44	1.44
	34	1.70	9.01	2.43	1.61	8.40	2.67	0.61	1.44	1.40	1.40
	35	1.71	9.08	2.44	1.71	8.43	2.70	0.65	1.40	1.34	1.34
	36	1.67	8.96	2.42	1.71	8.25	2.69	0.71	1.34	1.28	1.28
	37	1.60	8.74	2.39	1.65	8.04	2.67	0.70	1.28	1.21	1.21
	38	1.53	8.55	2.35	1.58	7.81	2.66	0.74	1.21	1.18	1.18
	39	1.45	8.33	2.31	1.51	7.60	2.64	0.73	1.18	1.18	1.18
	40	1.41	8.22	2.30	1.45	7.42	2.63	0.80	1.18	1.20	1.20
	41	1.40	8.19	2.29	1.39	7.45	2.60	0.74	1.20	1.18	1.18
	42	1.43	8.25	2.32	1.39	7.56	2.59	0.69	1.18	1.19	1.19
	43	1.41	8.19	2.31	1.43	7.61	2.61	0.58	1.19	1.19	1.19
	44	1.42	8.20	2.31	1.45	7.45	2.62	0.75	1.19	1.11	1.11
	45	1.42	8.20	2.32	1.40	7.23	2.61	0.98	1.11	0.94	0.94
	46	1.33	7.96	2.25	1.33	7.02	2.57	0.94	0.94	0.80	0.80
	47	1.12	7.38	2.12	1.26	6.50	2.55	0.87	0.80	0.70	0.70
Average											
Weekday		1.19	7.52	2.11	1.20	6.74	2.53	0.77	1.00	1.00	1.00
Weekend		1.19	7.50	2.11	1.21	6.75	2.53	0.75	1.00	1.00	1.00
ADWF[1]		1.19	7.51	2.11	1.21	6.74	2.53	0.77	1.00	1.00	1.00
% Error											
Weekday					0.7%	-10.3%	19.6%	1.12			
Weekend					1.5%	-10.1%	19.6%	1.20			

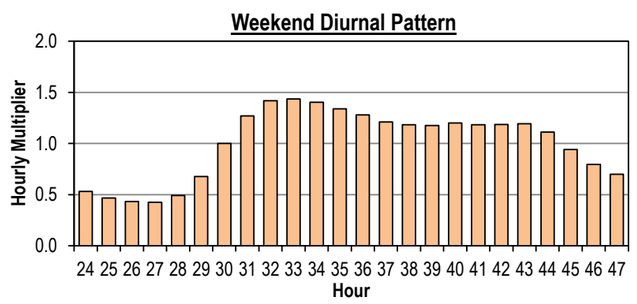
Note:











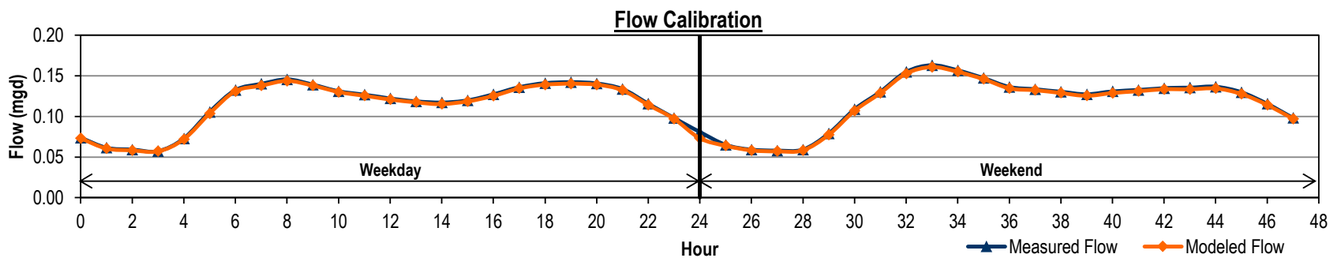
City of Redmond, OR

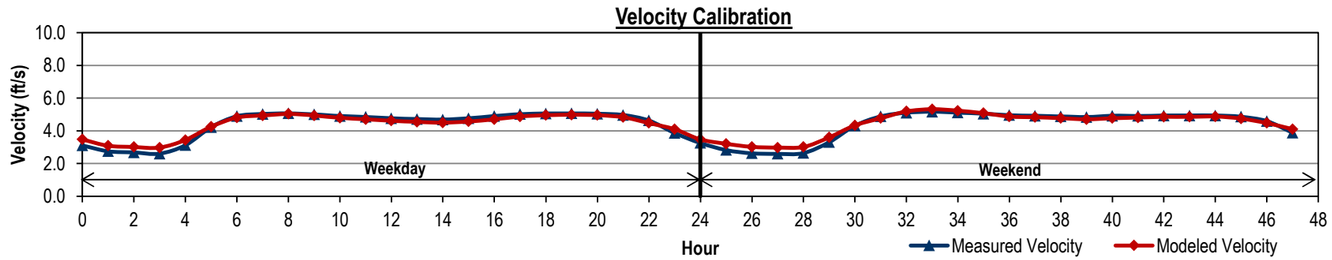
Wastewater Collection Master Plan

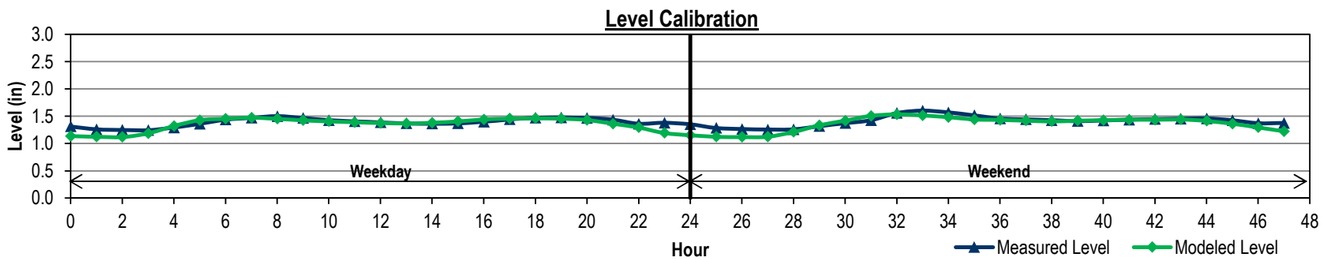
FLOW MONITORING SITE MH04C042 DRY WEATHER FLOW CALIBRATION

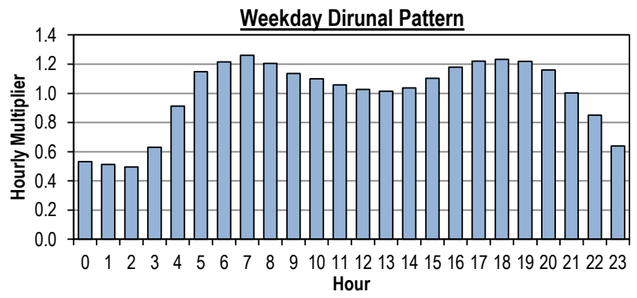
		Measured Data			Modeled Data				Diurnal		
		Flow	Level	Velocity	Flow	Level	Velocity	Level Diff	Initial	Modified	Calibrated
	Hour	(mgd)	(in)	(ft/s)	(mgd)	(in)	(ft/s)	(in)	Curve	Curve	Diurnal
Weekday	0	0.07	1.31	3.11	0.07	1.13	3.48	0.18	0.53	0.53	0.53
	1	0.06	1.26	2.76	0.06	1.12	3.09	0.13	0.51	0.51	0.51
	2	0.06	1.25	2.68	0.06	1.12	3.02	0.13	0.50	0.50	0.50
	3	0.06	1.24	2.61	0.06	1.19	2.98	0.06	0.63	0.63	0.63
	4	0.07	1.29	3.13	0.07	1.32	3.44	-0.03	0.91	0.91	0.91
	5	0.11	1.36	4.22	0.10	1.43	4.25	-0.07	1.15	1.15	1.15
	6	0.13	1.44	4.89	0.13	1.45	4.81	-0.01	1.21	1.21	1.21
	7	0.14	1.47	5.03	0.14	1.47	4.94	0.00	1.26	1.26	1.26
	8	0.15	1.50	5.07	0.14	1.45	5.04	0.05	1.21	1.21	1.21
	9	0.14	1.47	5.01	0.14	1.42	4.94	0.04	1.14	1.14	1.14
	10	0.13	1.43	4.90	0.13	1.40	4.79	0.02	1.10	1.10	1.10
	11	0.13	1.40	4.85	0.13	1.39	4.71	0.02	1.06	1.06	1.06
	12	0.12	1.39	4.77	0.12	1.37	4.62	0.01	1.03	1.03	1.03
	13	0.12	1.37	4.72	0.12	1.37	4.55	0.00	1.01	1.01	1.01
	14	0.12	1.36	4.69	0.12	1.38	4.50	-0.02	1.04	1.04	1.04
	15	0.12	1.37	4.77	0.12	1.40	4.57	-0.04	1.10	1.10	1.10
	16	0.13	1.40	4.91	0.13	1.44	4.71	-0.04	1.18	1.18	1.18
	17	0.14	1.44	5.02	0.13	1.46	4.88	-0.01	1.22	1.22	1.22
	18	0.14	1.47	5.06	0.14	1.46	4.96	0.01	1.23	1.23	1.23
	19	0.14	1.48	5.07	0.14	1.46	4.98	0.02	1.22	1.22	1.22
	20	0.14	1.47	5.04	0.14	1.43	4.96	0.04	1.16	1.16	1.16
	21	0.13	1.43	4.97	0.13	1.36	4.84	0.07	1.00	1.00	1.00
	22	0.12	1.36	4.64	0.11	1.29	4.48	0.07	0.85	0.85	0.85
	23	0.10	1.38	3.87	0.10	1.19	4.10	0.19	0.64	0.64	0.64
Weekend	24	0.08	1.35	3.26	0.07	1.15	3.48	0.20	0.56	0.56	0.56
	25	0.07	1.28	2.83	0.06	1.12	3.20	0.16	0.51	0.51	0.51
	26	0.06	1.26	2.63	0.06	1.12	3.02	0.15	0.50	0.50	0.50
	27	0.06	1.25	2.60	0.06	1.12	2.98	0.13	0.51	0.51	0.51
	28	0.06	1.26	2.64	0.06	1.21	3.02	0.05	0.68	0.68	0.68
	29	0.08	1.32	3.31	0.08	1.33	3.60	-0.02	0.94	0.94	0.94
	30	0.11	1.37	4.31	0.11	1.42	4.33	-0.04	1.13	1.13	1.13
	31	0.13	1.42	4.88	0.13	1.50	4.77	-0.08	1.34	1.34	1.34
	32	0.15	1.56	5.11	0.15	1.53	5.19	0.02	1.41	1.41	1.41
	33	0.16	1.60	5.17	0.16	1.51	5.32	0.09	1.36	1.36	1.36
	34	0.16	1.57	5.12	0.16	1.48	5.23	0.09	1.28	1.28	1.28
	35	0.15	1.52	5.05	0.15	1.44	5.08	0.08	1.18	1.18	1.18
	36	0.14	1.46	4.96	0.13	1.43	4.88	0.03	1.16	1.16	1.16
	37	0.13	1.44	4.92	0.13	1.42	4.84	0.02	1.13	1.13	1.13
	38	0.13	1.43	4.88	0.13	1.40	4.77	0.02	1.10	1.10	1.10
	39	0.13	1.41	4.84	0.13	1.42	4.71	-0.01	1.13	1.13	1.13
	40	0.13	1.42	4.92	0.13	1.43	4.77	0.00	1.15	1.15	1.15
	41	0.13	1.43	4.91	0.13	1.43	4.81	0.00	1.17	1.17	1.17
	42	0.13	1.45	4.94	0.13	1.43	4.86	0.01	1.17	1.17	1.17
	43	0.14	1.45	4.94	0.13	1.44	4.86	0.01	1.18	1.18	1.18
	44	0.14	1.46	4.94	0.13	1.41	4.88	0.05	1.12	1.12	1.12
	45	0.13	1.42	4.87	0.13	1.36	4.75	0.06	1.00	1.00	1.00
	46	0.12	1.37	4.59	0.11	1.29	4.48	0.08	0.85	0.85	0.85
	47	0.10	1.38	3.89	0.10	1.22	4.10	0.15	0.70	0.70	0.70
Average											
Weekday		**0.11**	**1.39**	**4.41**	**0.11**	**1.35**	**4.40**	**0.03**	**1.00**	**1.00**	**1.00**
Weekend		**0.12**	**1.41**	**4.35**	**0.11**	**1.36**	**4.41**	**0.05**	**1.01**	**1.01**	**1.01**
ADWF[1]		**0.12**	**1.40**	**4.39**	**0.11**	**1.36**	**4.41**	**0.04**	**1.00**	**1.00**	**1.00**
% Error											
Weekday					**-1.2%**	**-2.5%**	**-0.1%**	**0.19**			
Weekend					**-1.5%**	**-3.7%**	**1.4%**	**0.20**			

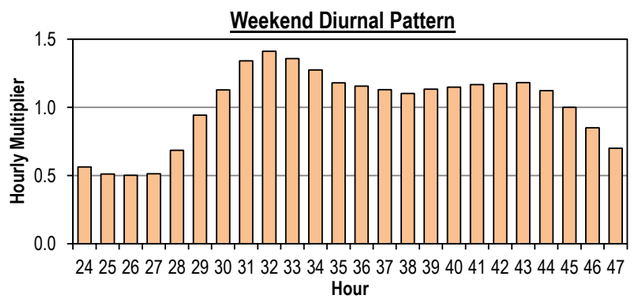
Note:











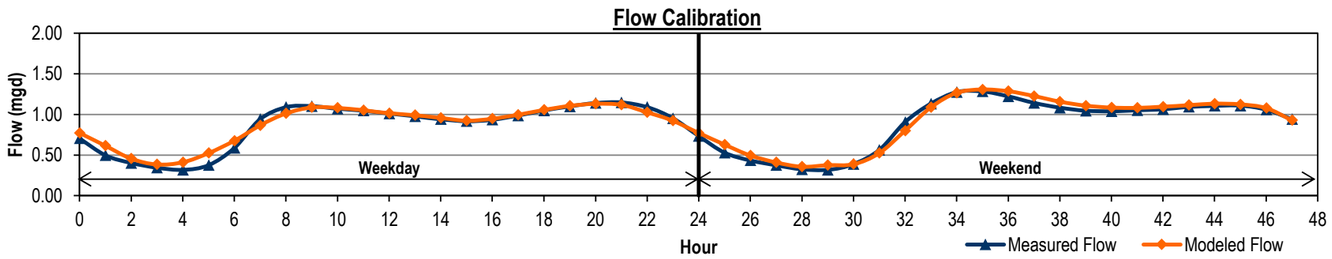
City of Redmond, OR

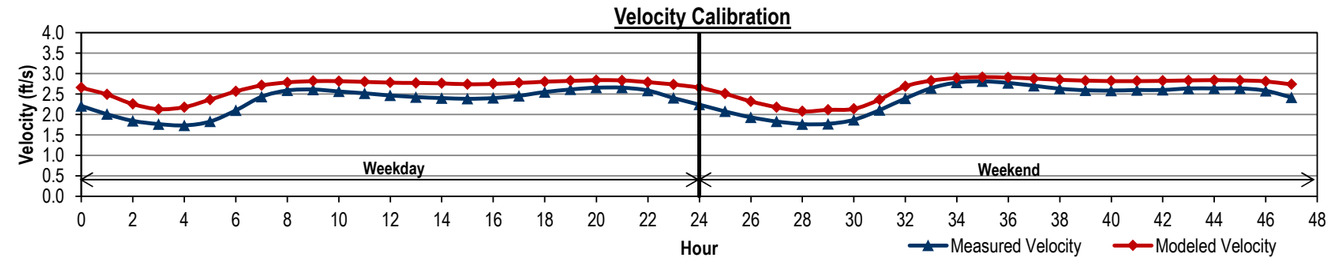
Wastewater Collection Master Plan

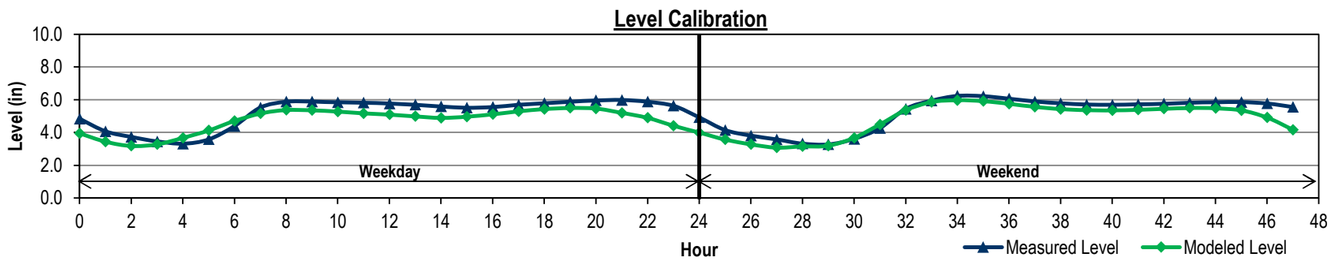
FLOW MONITORING SITE MH04B057 DRY WEATHER FLOW CALIBRATION

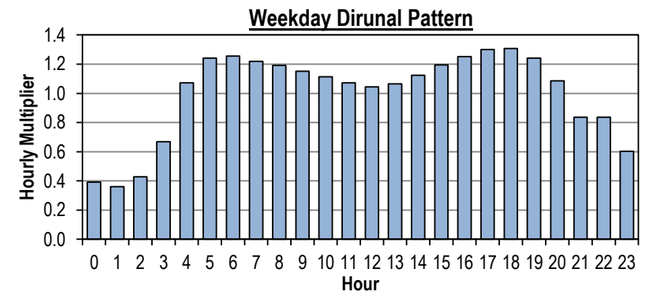
		Measured Data			Modeled Data				Diurnal		
	Hour	Flow (mgd)	Level (in)	Velocity (ft/s)	Flow (mgd)	Level (in)	Velocity (ft/s)	Level Diff (in)	Initial Curve	Modified Curve	Calibrated Diurnal
Weekday	0	0.70	4.84	2.21	0.77	3.95	2.66	0.89	0.57	0.40	0.39
	1	0.50	4.07	2.01	0.61	3.44	2.49	0.63	0.46	0.36	0.36
	2	0.40	3.73	1.84	0.45	3.18	2.26	0.55	0.40	0.43	0.43
	3	0.34	3.46	1.76	0.38	3.28	2.13	0.18	0.36	0.67	0.67
	4	0.32	3.32	1.73	0.41	3.67	2.18	-0.35	0.43	1.08	1.07
	5	0.38	3.58	1.83	0.52	4.13	2.36	-0.54	0.67	1.25	1.24
	6	0.59	4.40	2.10	0.68	4.71	2.56	-0.31	1.08	1.27	1.25
	7	0.94	5.52	2.44	0.86	5.16	2.71	0.36	1.25	1.23	1.22
	8	1.09	5.88	2.59	1.01	5.37	2.78	0.51	1.27	1.20	1.19
	9	1.10	5.89	2.61	1.09	5.36	2.82	0.53	1.23	1.16	1.15
	10	1.07	5.85	2.56	1.08	5.27	2.81	0.57	1.20	1.12	1.11
	11	1.05	5.83	2.52	1.05	5.17	2.80	0.65	1.16	1.08	1.07
	12	1.01	5.77	2.47	1.01	5.10	2.78	0.67	1.12	1.05	1.04
	13	0.98	5.70	2.43	0.99	4.99	2.77	0.71	1.08	1.07	1.06
	14	0.94	5.59	2.40	0.96	4.89	2.76	0.70	1.05	1.13	1.12
	15	0.92	5.52	2.38	0.92	4.97	2.74	0.55	1.07	1.21	1.19
	16	0.93	5.56	2.40	0.95	5.11	2.75	0.44	1.13	1.26	1.25
	17	0.99	5.69	2.46	1.00	5.29	2.77	0.40	1.21	1.31	1.30
	18	1.05	5.79	2.55	1.06	5.43	2.80	0.36	1.26	1.32	1.31
	19	1.10	5.88	2.61	1.11	5.50	2.82	0.38	1.31	1.25	1.24
	20	1.14	5.96	2.66	1.13	5.46	2.84	0.50	1.32	1.10	1.09
	21	1.15	5.99	2.66	1.12	5.20	2.83	0.79	1.25	0.84	0.84
	22	1.09	5.89	2.59	1.03	4.90	2.79	0.99	1.10	0.84	0.84
	23	0.95	5.64	2.40	0.92	4.41	2.73	1.22	0.84	0.61	0.60
Weekend	24	0.73	4.93	2.24	0.77	3.99	2.66	0.94	0.84	0.50	0.49
	25	0.53	4.15	2.08	0.63	3.57	2.51	0.58	0.61	0.43	0.43
	26	0.43	3.81	1.93	0.49	3.28	2.32	0.54	0.50	0.37	0.37
	27	0.37	3.58	1.83	0.41	3.08	2.18	0.50	0.43	0.37	0.36
	28	0.32	3.32	1.77	0.36	3.15	2.08	0.17	0.37	0.45	0.44
	29	0.32	3.28	1.77	0.38	3.20	2.11	0.08	0.37	0.65	0.64
	30	0.39	3.61	1.87	0.39	3.67	2.14	-0.06	0.45	1.04	1.03
	31	0.56	4.27	2.11	0.52	4.49	2.36	-0.22	0.65	1.30	1.29
	32	0.90	5.45	2.39	0.80	5.37	2.69	0.08	1.04	1.47	1.45
	33	1.13	5.95	2.65	1.09	5.87	2.83	0.08	1.30	1.48	1.46
	34	1.27	6.24	2.78	1.27	5.97	2.89	0.26	1.47	1.41	1.39
	35	1.28	6.22	2.81	1.31	5.91	2.91	0.30	1.48	1.31	1.30
	36	1.22	6.07	2.77	1.29	5.76	2.90	0.31	1.41	1.25	1.23
	37	1.14	5.89	2.70	1.22	5.57	2.88	0.32	1.31	1.20	1.19
	38	1.08	5.78	2.63	1.16	5.43	2.85	0.35	1.25	1.20	1.18
	39	1.05	5.71	2.59	1.11	5.36	2.83	0.34	1.20	1.21	1.20
	40	1.04	5.70	2.58	1.08	5.35	2.82	0.34	1.20	1.22	1.21
	41	1.05	5.72	2.60	1.08	5.39	2.82	0.33	1.21	1.26	1.25
	42	1.06	5.76	2.60	1.09	5.45	2.82	0.31	1.22	1.27	1.26
	43	1.09	5.82	2.63	1.12	5.50	2.83	0.32	1.26	1.28	1.26
	44	1.11	5.85	2.64	1.13	5.48	2.84	0.37	1.27	1.22	1.21
	45	1.11	5.86	2.64	1.12	5.35	2.83	0.51	1.28	1.08	1.07
	46	1.06	5.78	2.58	1.08	4.92	2.81	0.86	1.22	0.57	0.57
	47	0.94	5.56	2.42	0.93	4.16	2.74	1.39	1.08	0.46	0.46
Average											
Weekday		**0.86**	**5.22**	**2.34**	**0.88**	**4.75**	**2.66**	**0.47**	**0.99**	**1.01**	**1.00**
Weekend		**0.88**	**5.18**	**2.40**	**0.91**	**4.80**	**2.65**	**0.38**	**1.02**	**1.00**	**0.99**
ADWF[1]		**0.87**	**5.21**	**2.36**	**0.89**	**4.76**	**2.66**	**0.45**	**1.00**	**1.01**	**1.00**
% Error											
Weekday					**1.9%**	**-9.1%**	**13.8%**	**1.22**			
Weekend					**2.9%**	**-7.2%**	**10.5%**	**1.39**			

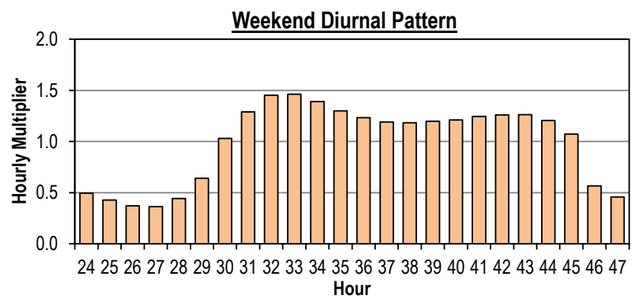
Note:











APPENDIX 1B

RDII PARAMETERS

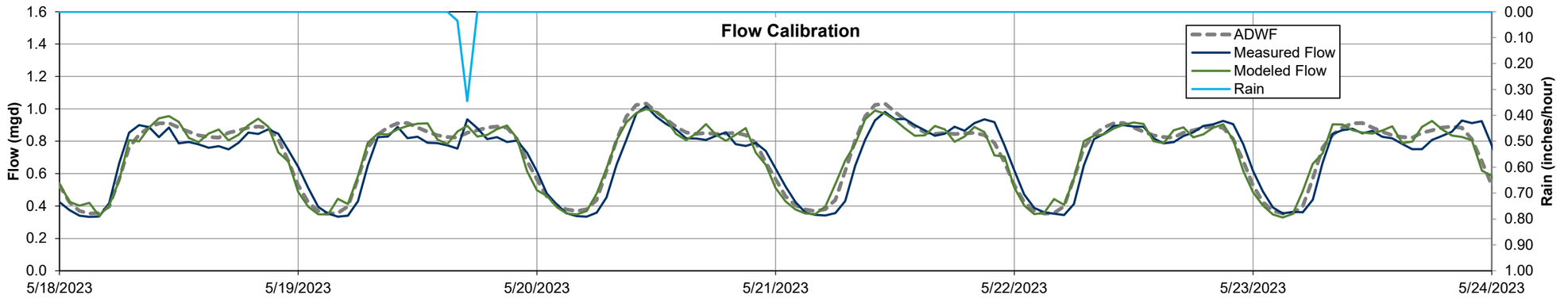
RTK hydrograph ID	Response ratio R - short term	Time to peak T - short term (hours)	Recession limb ratio K - short term	Response ratio R - medium term	Time to peak T - medium term (hours)	Recession limb ratio K - medium term	Response ratio R - long term	Time to peak T - long term (hours)	Recession limb ratio K - long term	Max initial abstraction depth - short term (in)	Initial abstraction recovery rate - short term (in/day)	Initial abstraction depth - short term (in)	Max initial abstraction depth - medium term (in)	Initial abstraction recovery rate - medium term (in/day)	Initial abstraction depth - medium term (in)	Max initial abstraction depth - long term (in)	Initial abstraction recovery rate - long term (in/day)	Initial abstraction depth - long term (in)
MH0087	0.001	0.5	1.5	0.001	5	2	0.001	10	2.5	0	0	0	0	0	0	0	0	0
MH0163	0	0.5	1.5	0	1	2	0	10	2.5	0	0	0	0	0	0	0	0	0
MH03B042	0.003	0.5	1.5	0.004	5	2	0.003	10	2.5	0	0	0	0	0	0	0	0	0
MH04B057	0	0.5	1.5	0.001	5	2	0	10	2.5	0	0	0	0	0	0	0	0	0
MH04C002	0.001	0.5	1.5	0	5	2	0	10	2.5	0	0	0	0	0	0	0	0	0
MH04C042	0	0.5	1.5	0	1	2	0.001	10	2.5	0	0	0	0	0	0	0	0	0
MH17C073	0	0.5	1.5	0.001	1	2	0.001	10	2.5	0	0	0	0	0	0	0	0	0
MH17C073_20YR	0.001	0.5	1.5	0.002	1	2	0.002	10	2.5	0	0	0	0	0	0	0	0	0
MH04C002_20YR	0.002	0.5	1.5	0.001	5	2	0.001	10	2.5	0	0	0	0	0	0	0	0	0
MH04C042_20YR	0.001	0.5	1.5	0.001	1	2	0.002	10	2.5	0	0	0	0	0	0	0	0	0
MH04B057_20YR	0.001	0.5	1.5	0.002	5	2	0.001	10	2.5	0	0	0	0	0	0	0	0	0
MH03B042_20YR	0.004	0.5	1.5	0.005	5	2	0.004	10	2.5	0	0	0	0	0	0	0	0	0
MH0087_20YR	0.002	0.5	1.5	0.002	5	2	0.002	10	2.5	0	0	0	0	0	0	0	0	0
MH0163_20YR	0.001	0.5	1.5	0.001	1	2	0.001	10	2.5	0	0	0	0	0	0	0	0	0
MH17C073_BUILDOUT	0.001	0.5	1.5	0.002	1	2	0.002	10	2.5	0	0	0	0	0	0	0	0	0
MH04C002_BUILDOUT	0.002	0.5	1.5	0.001	5	2	0.001	10	2.5	0	0	0	0	0	0	0	0	0
MH04C042_BUILDOUT	0.001	0.5	1.5	0.001	1	2	0.002	10	2.5	0	0	0	0	0	0	0	0	0
MH04B057_BUILDOUT	0.001	0.5	1.5	0.002	5	2	0.001	10	2.5	0	0	0	0	0	0	0	0	0
MH03B042_BUILDOUT	0.004	0.5	1.5	0.005	5	2	0.004	10	2.5	0	0	0	0	0	0	0	0	0
MH0087_BUILDOUT	0.002	0.5	1.5	0.002	5	2	0.002	10	2.5	0	0	0	0	0	0	0	0	0
MH0163_BUILDOUT	0.001	0.5	1.5	0.001	1	2	0.001	10	2.5	0	0	0	0	0	0	0	0	0

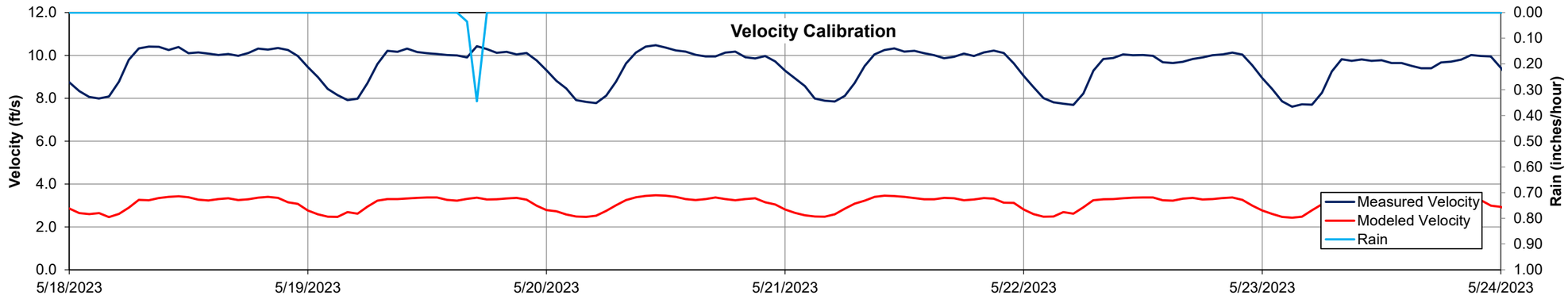
APPENDIX 1C

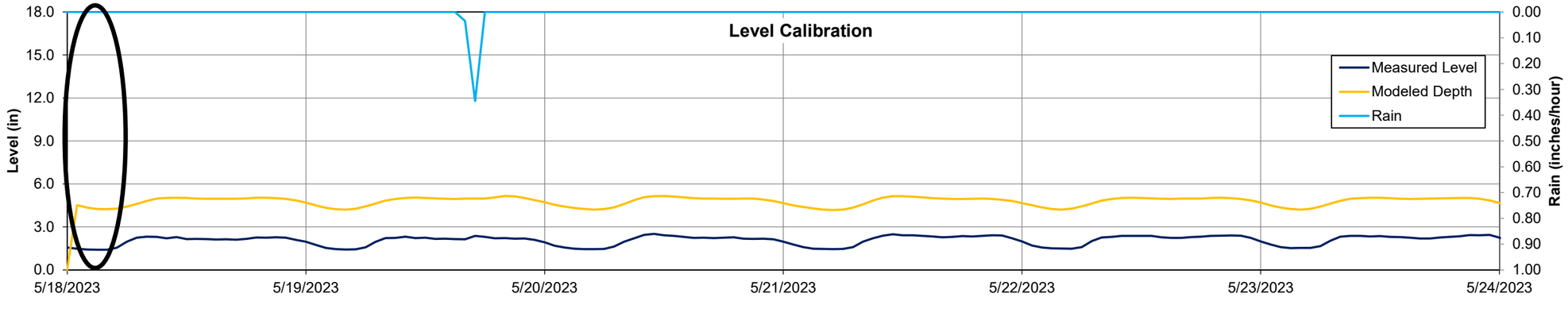
WET WEATHER FLOW CALIBRATION RESULTS

FLOW MONITORING MH0163 WET WEATHER FLOW CALIBRATION
Wastewater Collection Master Plan
City of Redmond

Location: KORREDMO146
Pipeline diameter: 18"
City Manhole ID: MH0163

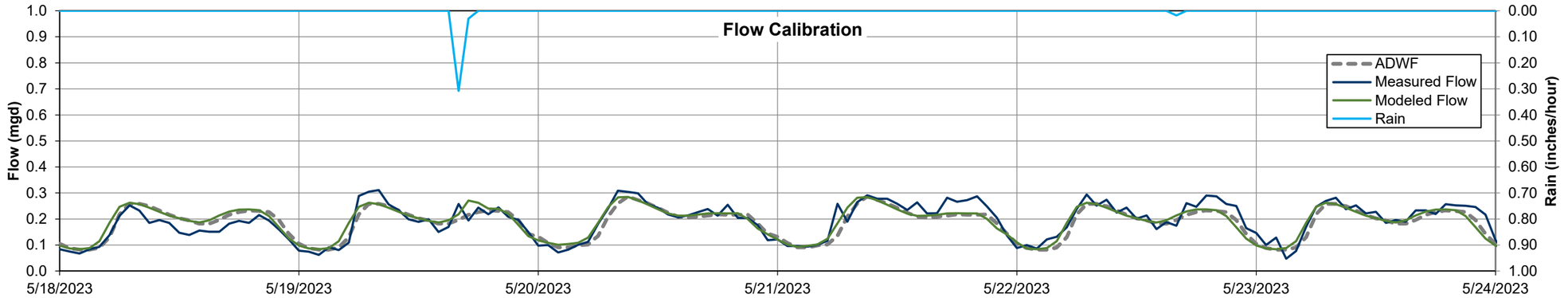


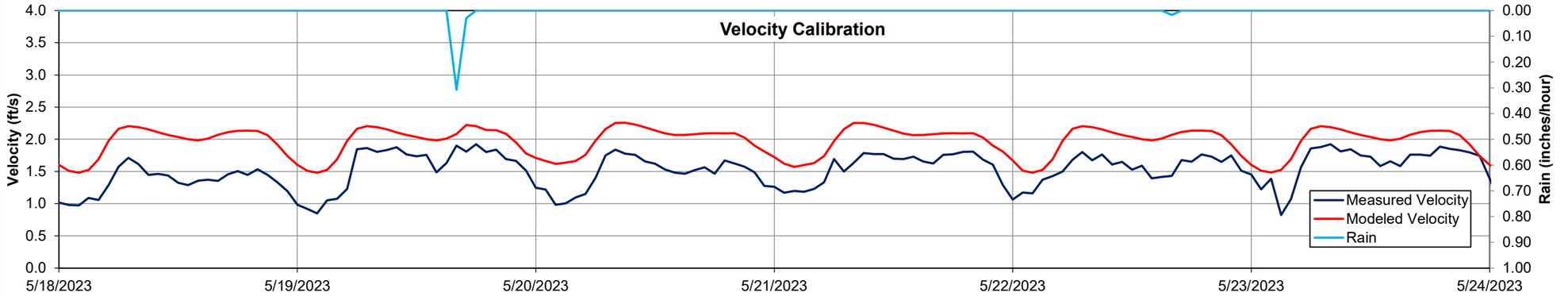


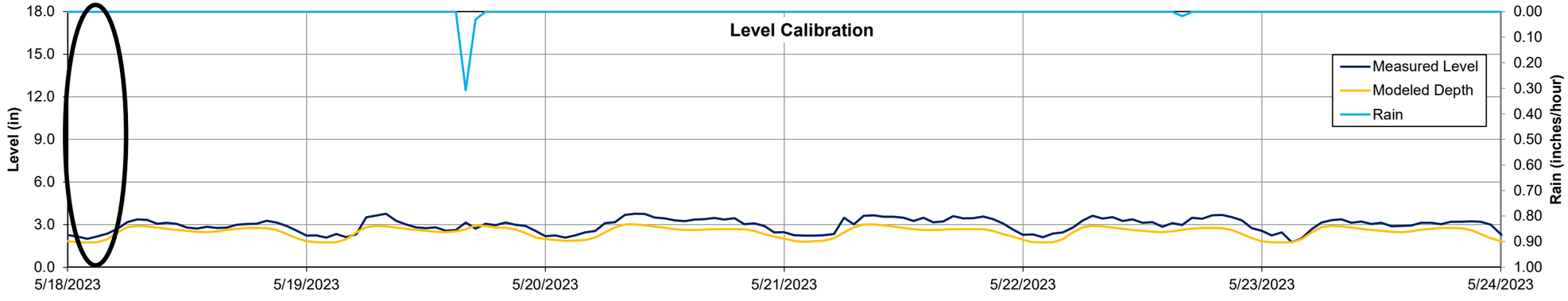


FLOW MONITORING MH0087 WET WEATHER FLOW CALIBRATION
Wastewater Collection Master Plan
City of Redmond

Location: KORREDMO83
Pipeline diameter: 18"
City Manhole ID: MH0087

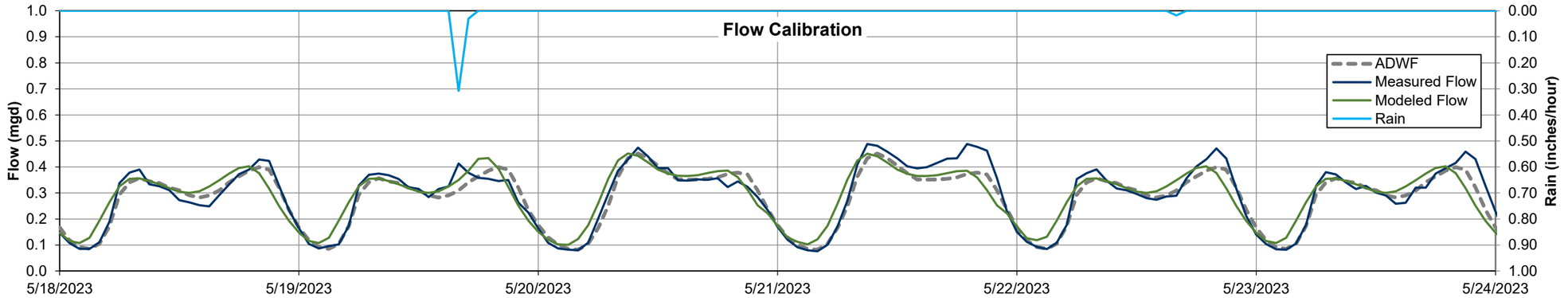


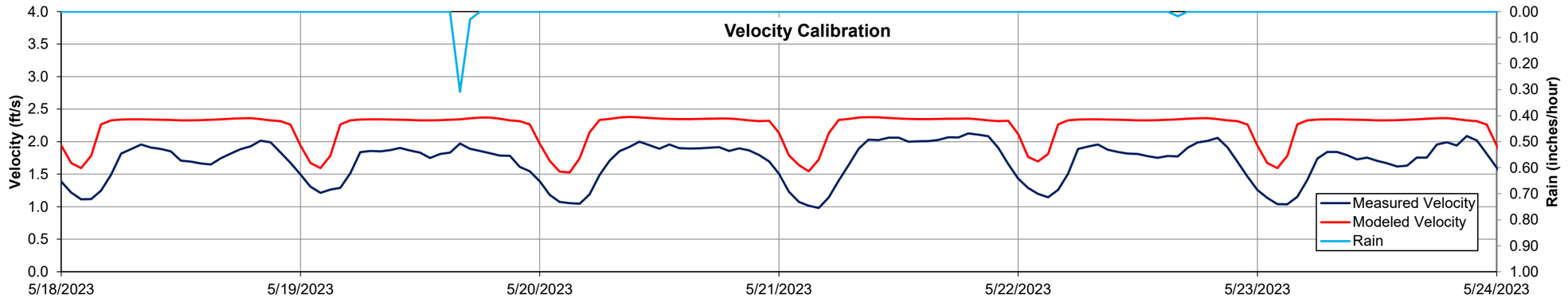


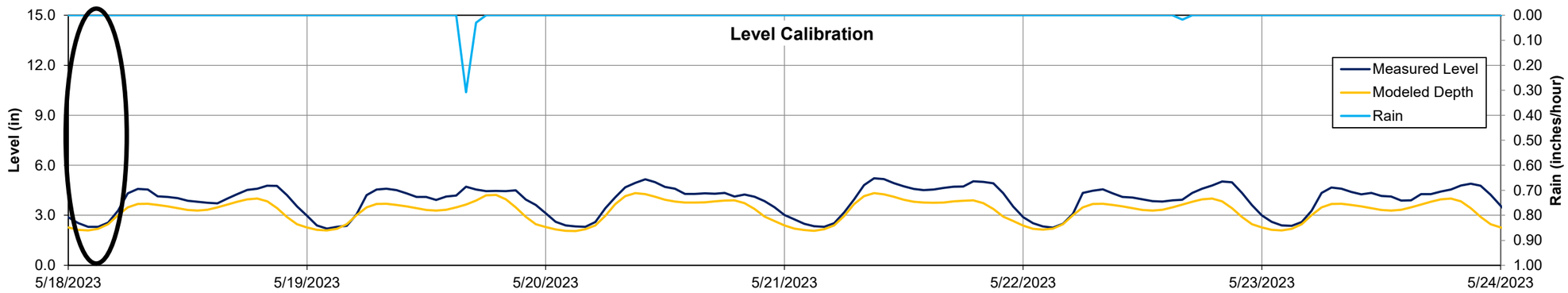


FLOW MONITORING MH017C073 WET WEATHER FLOW CALIBRATION
Wastewater Collection Master Plan
City of Redmond

Location: KORREDMO83
Pipeline diameter: 15"
City Manhole ID: MH017C073

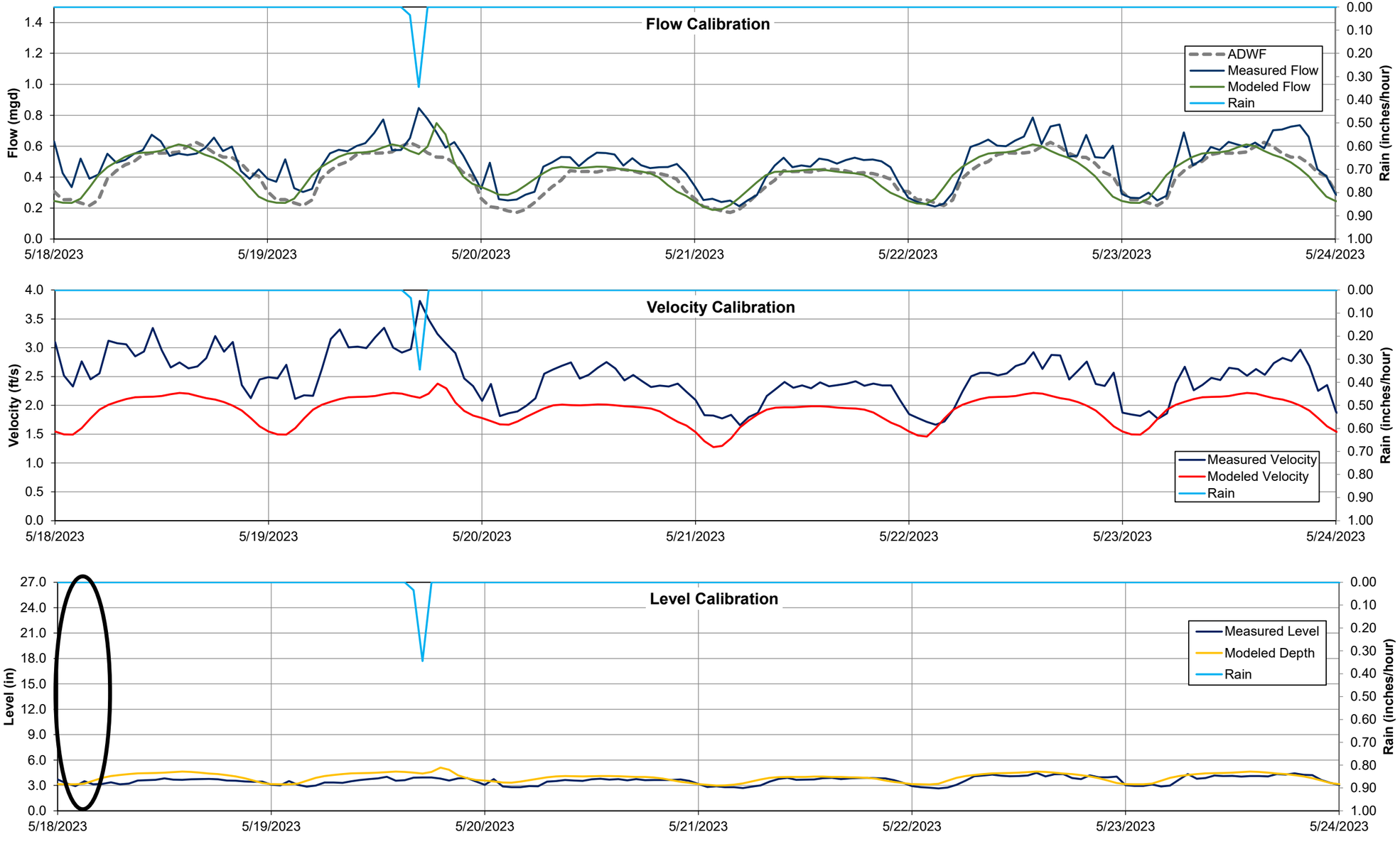






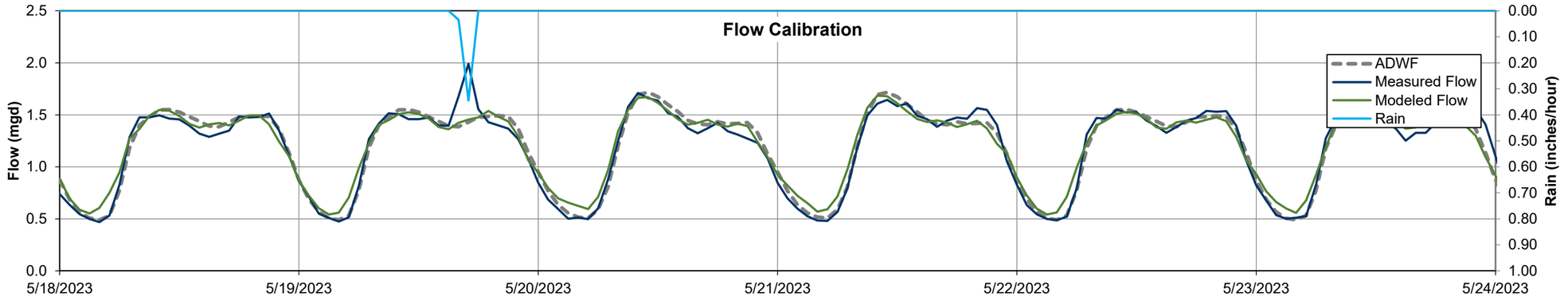
FLOW MONITORING MH03B042 WET WEATHER FLOW CALIBRATION
Wastewater Collection Master Plan
City of Redmond

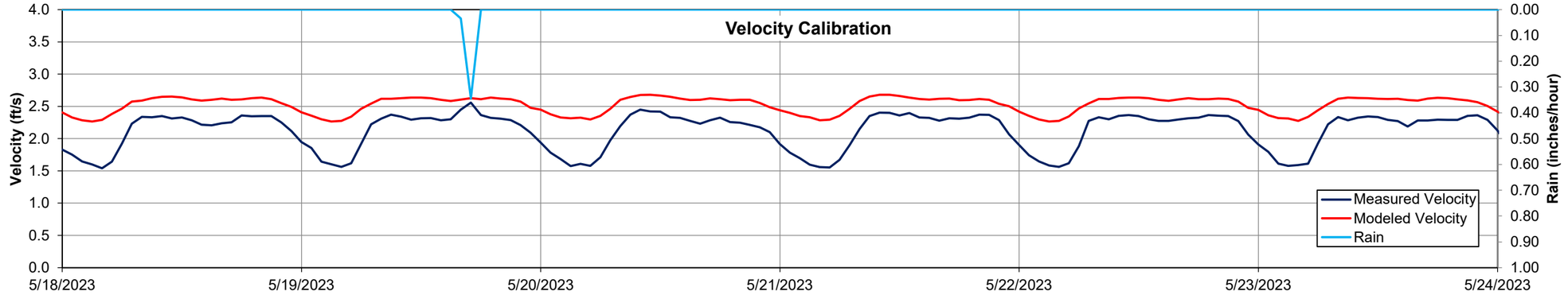
Location: KORREDMO146
Pipeline diameter: 27"
City Manhole ID: MH03B042

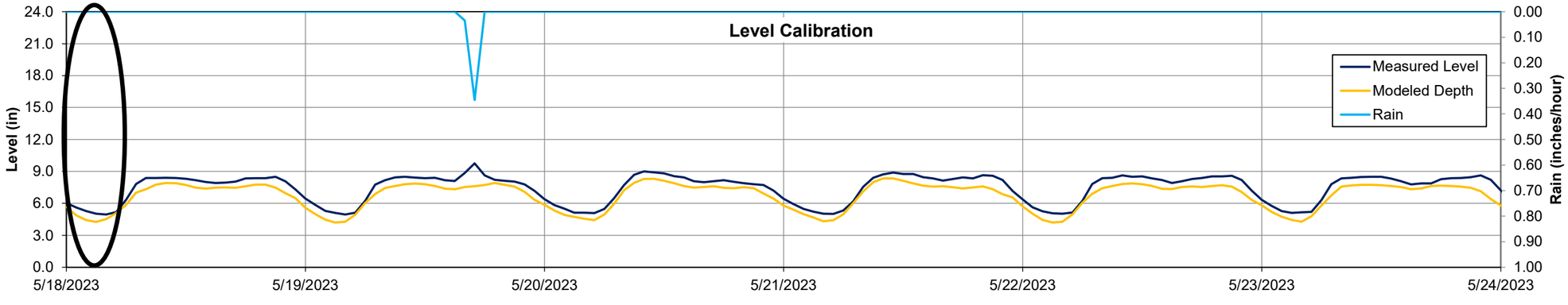


FLOW MONITORING MH04C002 WET WEATHER FLOW CALIBRATION
Wastewater Collection Master Plan
City of Redmond

Location: KORREDMO146
Pipeline diameter: 24"
City Manhole ID: MH04C002

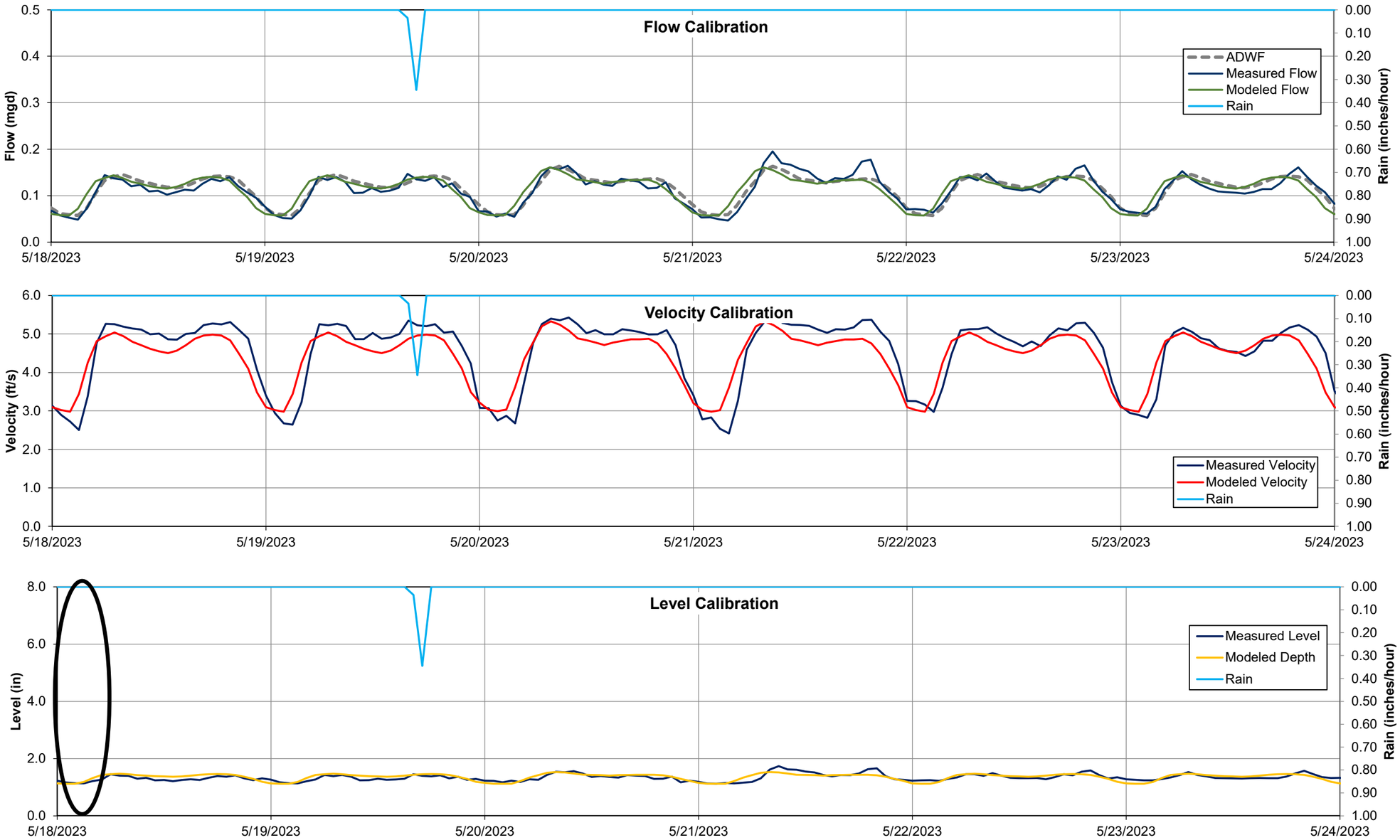






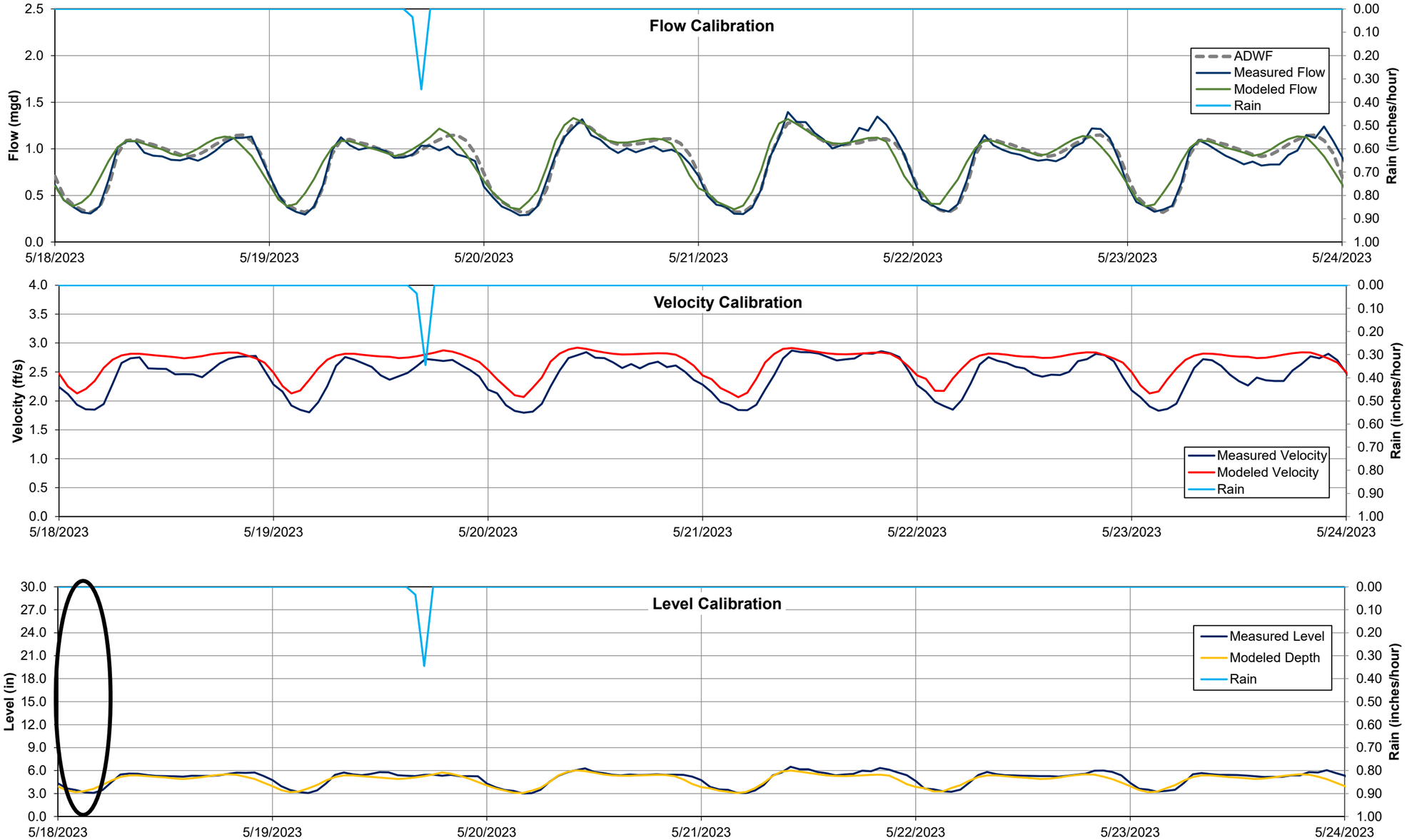
FLOW MONITORING MH04C042 WET WEATHER FLOW CALIBRATION
Wastewater Collection Master Plan
City of Redmond

Location: KORREDMO146
Pipeline diameter: 8"
City Manhole ID: MH04C042



FLOW MONITORING MH04B057 WET WEATHER FLOW CALIBRATION
Wastewater Collection Master Plan
City of Redmond

Location: KORREDMO146
Pipeline diameter: 30"
City Manhole ID: MH04B057



APPENDIX F
Technical Memorandum 3 - Redmond East Gateway Sewer System Capacity Analysis

CITY OF REDMOND

Wastewater Collection System Master Plan Update



TECHNICAL MEMORANDUM 3

Redmond East Gateway Sewer System Capacity Analysis

FINAL / January 2025

CITY OF REDMOND

Wastewater Collection System Master Plan Update

TECHNICAL MEMORANDUM 3

Redmond East Gateway Sewer System Capacity Analysis

FINAL / January 2025

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TM 3 REDMOND EAST GATEWAY SEWER SYSTEM MODEL ANALYSIS

3.1 Background and Purpose

Carollo Engineers (Carollo) is assisting Anderson Perry & Associates Inc, (AP) and the City of Redmond (City) with developing a Collection System Master Plan (CSMP) by updating the City's sanitary sewer collection system model and performing a capacity analysis of the collection system.

The City requested Carollo evaluate how proposed development in the Redmond East Gateway area (East Gateway) will affect the capacity of the City's sewer collection system. East Gateway is located in the southwest part of the City's collection system and is shown in Figure 3.1. For this evaluation, the City provided the developers' assumptions on sewer flows that are anticipated to enter the City's collection system.

This technical memorandum compares the CSMP flow assumptions based on system-wide land use flow factors with the developer-provided assumptions, discusses the updates to the hydraulic model, and presents the resulting capacity of to the City's East Gateway sewer collection system.

3.2 Evaluation Description

The assumptions and information from the City's CSMP, which is under development as this developer review analysis is performed, will be used as the basis for this analysis including the hydraulic model developed as part of that effort. For this evaluation, the development-specific flows provided by the City are used in place of the land use-based flow factors developed for the CSMP based on flow meter data.

Figure 3.1 shows the extent of the Planning Service Area, the location of the East Gateway area, and the manholes where East Gateway flow was allocated to pipes in the collection system model. For more detailed information on the proposed developments refer to *Redmond East Gateway Conceptual Utility Narrative for City of Redmond Infrastructure Allocation* prepared by Know Ledge Engineering, LLC dated January 4, 2024 in Appendix 3A.

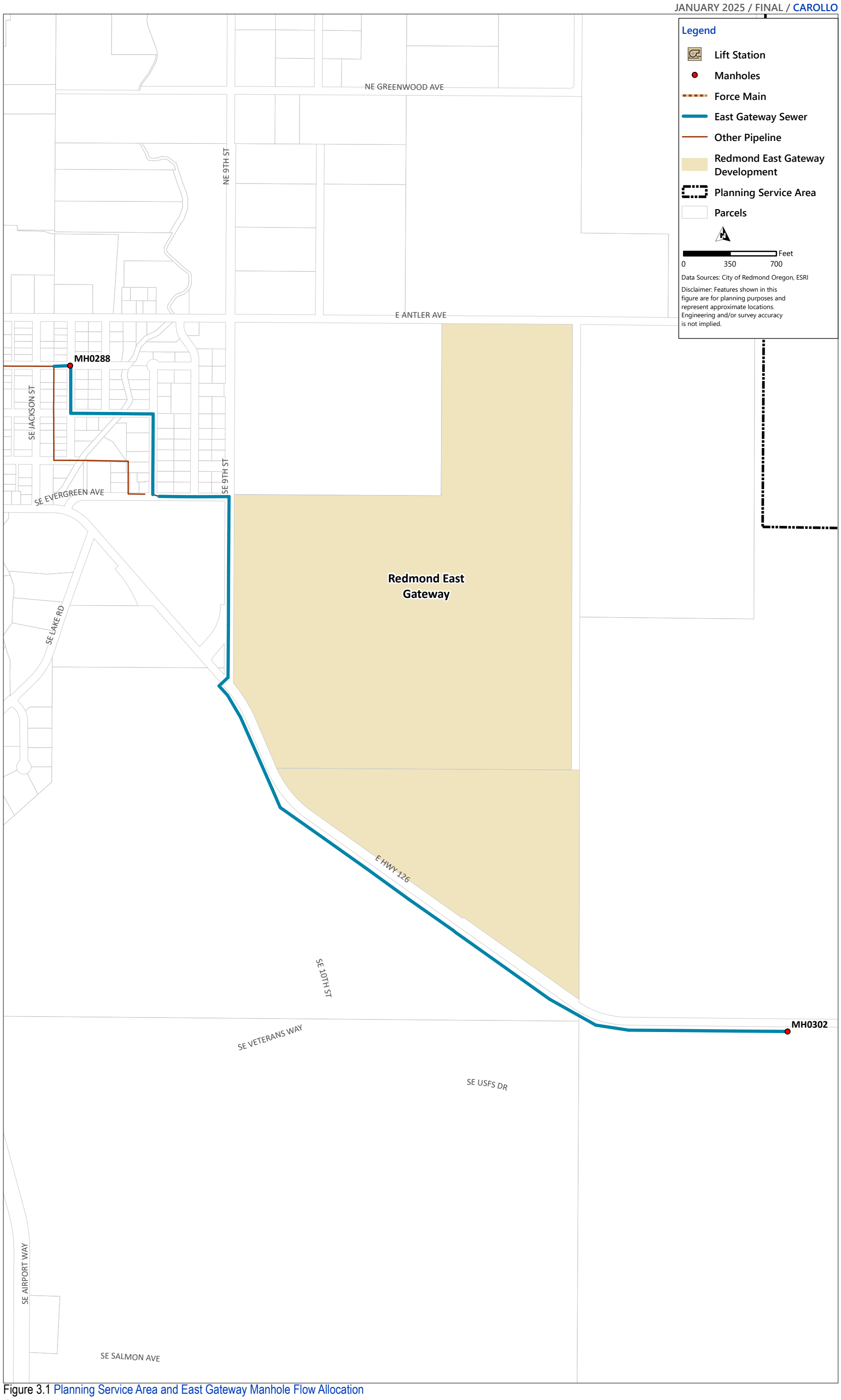


Figure 3.1 Planning Service Area and East Gateway Manhole Flow Allocation

3.3 Wastewater Flow Projection

This section summarizes the wastewater flows developed for the CSMP and the developers' flow assumptions provided by the City.

3.3.1 Wastewater Flow Factors Development

Land use flow factors were established as part of the CSMP to estimate average dry weather flow for the City's wastewater collection system and to project future flows within the Planning Service Area boundary. A flow factor, with units of gallons per acre per day, is developed for each of the land use classification using flow meter data to provide a means to translate sewered acreage into wastewater flow. The resulting flow is then input into the appropriate sewer area in the sewer system model. For more information on how flow factors are developed, refer to the CSMP.

3.3.2 General Flow Assumptions

Wastewater flows are categorized as dry weather flows and wet weather flows:

- Dry weather flows mostly account for the City's customer wastewater production.
- Wet weather flows include some groundwater and stormwater that inevitably enter the sanitary sewer system through defects in pipes and manholes, and illicit storm drain connections. This portion of flow entering the system is called inflow and infiltration (I/I).

3.3.3 Developers' Flow Assumptions

The City provided the anticipated flow of the East Gateway development and allocation of flow to specific manholes in the *Redmond East Gateway Conceptual Utility Narrative for City of Redmond Infrastructure Allocation* prepared by Know Ledge Engineering, LLC dated January 4, 2024. In Carollo's evaluation, the I/I and wet weather flow from this area is already accounted for in the CSMP model calibration, therefore only the wastewater dry weather flow component was increased. Table 3.1 provides a detailed breakdown of flow assumptions for both the CSMP and East Gateway developers' assumptions.

Table 3.1 Flow Projection Comparison: CSMP and Developers' Assumptions

Development	Acres	Loading Manhole ID[2,3]	Developer Provided Land Use	City Land Use	CSMP Flow Factor (gpad)	CSMP Buildout Flow (mgd)	Developers' Average Flow Estimate (mgd)	Developer Flow Factor (gpad)	Difference Between Developer and CSMP Flow Factor
Redmond East Gateway	72.0	MH0288 [2]	Light Industrial	Limited-Service Commercial/Light Industrial	400	0.03	0.07	1,000	
Redmond East Gateway	59.0	MH0288/ MH0302[1] [2]	Heavy Industrial	Limited-Service Commercial/Light Industrial	400	0.03	0.06	1,000	
Redmond East Gateway	42.5	MH0302	Commercial	Light Industrial	400	0.02	0.09	2,000	
Total	**173.5**					**0.08**	**0.22**		**275%**

Notes:
(1) 27.8 acres of heavy industrial land use were assigned to MH0302 and 31.2 acres were assigned to MH0288.
(2) In the scenario of Buildout w/ HB 2001 scenario, East Gateway Taxlot ID: 1513150000101 has flow allocated to MH15B060 just upstream of MH0288.
(3) The projected flow values for both CSMP and developers' flow assumptions in the East Gateway development were determined using the information provided in the "Redmond East Gateway Conceptual Utility Narrative for City of Redmond Infrastructure Allocation" report from the City. In cases where the designated manhole in this report is not available due to the City's skeletal model, it is then assigned to the nearest downstream manhole that is available.

gpad - gallons per acre-day; gpm - gallons per minute; ID - identification; mgd - million gallons per day.

3.4 Hydraulic Model Analysis

As part of the CSMP, Carollo ran the model for a build-out scenario that included House Bill 2001 densification assumptions (Built-out with HB2001). For this evaluation, the build-out with HB2001 scenario, incorporating the developers' flow assumptions were ran to compare the capacity in the East Gateway area between the CSMP projected flows and updated developer-specific' anticipated flows.

The performance criteria used to evaluate the sewer capacity of East Gateway during the design storm are the same as the criteria used in the CSMP. The maximum allowable hydraulic grade line for existing pipelines is no less than 2 feet of freeboard from the manhole rim.

3.4.1 CSMP Build-out with HB 2001 Scenario

Figure 3.2 shows the existing pipes in the service area under future peak wet weather flow (PWWF) conditions for the Build-out with HB2001 scenario. As shown, the model identifies two manholes with deficiencies, as presented in the CSMP. These two manholes with less than 2-foot of freeboard are located near the intersection of Southeast (SE) Evergreen Avenue and SE 7th Street (St) and intersection of SE Black Butte and SE 5th St. Additionally, the model results indicate the surcharging of pipes in the East Gateway, with d/D of equal to or greater than 1.0.

3.4.2 Developers' Flow Assumption Build-out with HB 2001 Scenario

The analysis of the build-out service area with HB 2001, replacing the CSMP projected flows with the developers' flow assumptions, followed the same methodology as the CSMP build-out scenario. Figure 3.3 shows the model result, seven manholes have deficiencies (less than 2 feet of freeboard). Furthermore, the model results indicate multiple pipes experiencing surcharging (d/D of 1.0 or greater). These findings show that additional deficiencies are triggered by higher developer-specific flows in the East Gateway area. In Figure 3.3, it is important to note that the model results also pertain to the West Cascade Trunk area southwest of the City's system and are distinct from the outcomes related to East Gateway modeled deficiencies. For more information, refer to *"Technical Memorandum 2 - West Cascade Trunk Development Review Sewer System Capacity Analysis."* Prepared by Carollo Engineers. dated February 2024.

3.4.3 Flow Monitoring Recommendation

In the build-out with HB 2001 scenario, certain manholes triggered the City's criteria for being deficient with an HGL 2 feet from the manhole rim. A flow meter can be used to monitor future flows as development occurs. It is recommended to install this flow meter at manhole MH0295 to monitor the 12-inch upstream sewer pipe ID SS0395. The capacity of the existing 12-inch pipe with full flow is 1.2 mgd. However, the flow can reach 1.6 mgd, at a surcharged state, before the upstream manhole MH0297 triggers the 2 feet from rim deficiency criteria. Existing flow is 0 mgd; therefore, remaining capacity in the pipe segment (ID SS0395) is 1.2 mgd. Figure 3.4 shows the location of the triggered manhole and the recommended flow meter manhole in the East Gateway area.

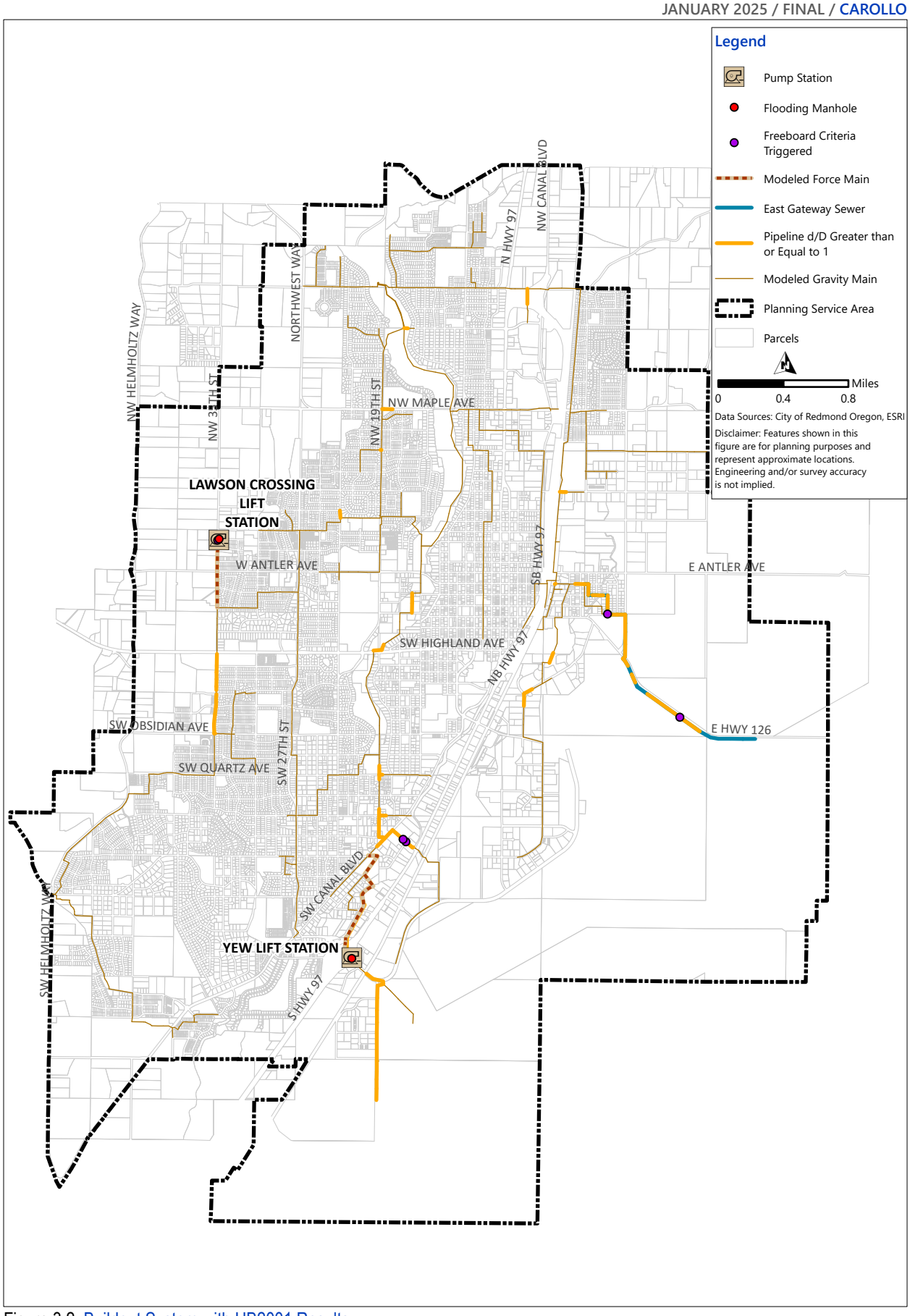


Figure 3.2 Buildout System with HB2001 Results

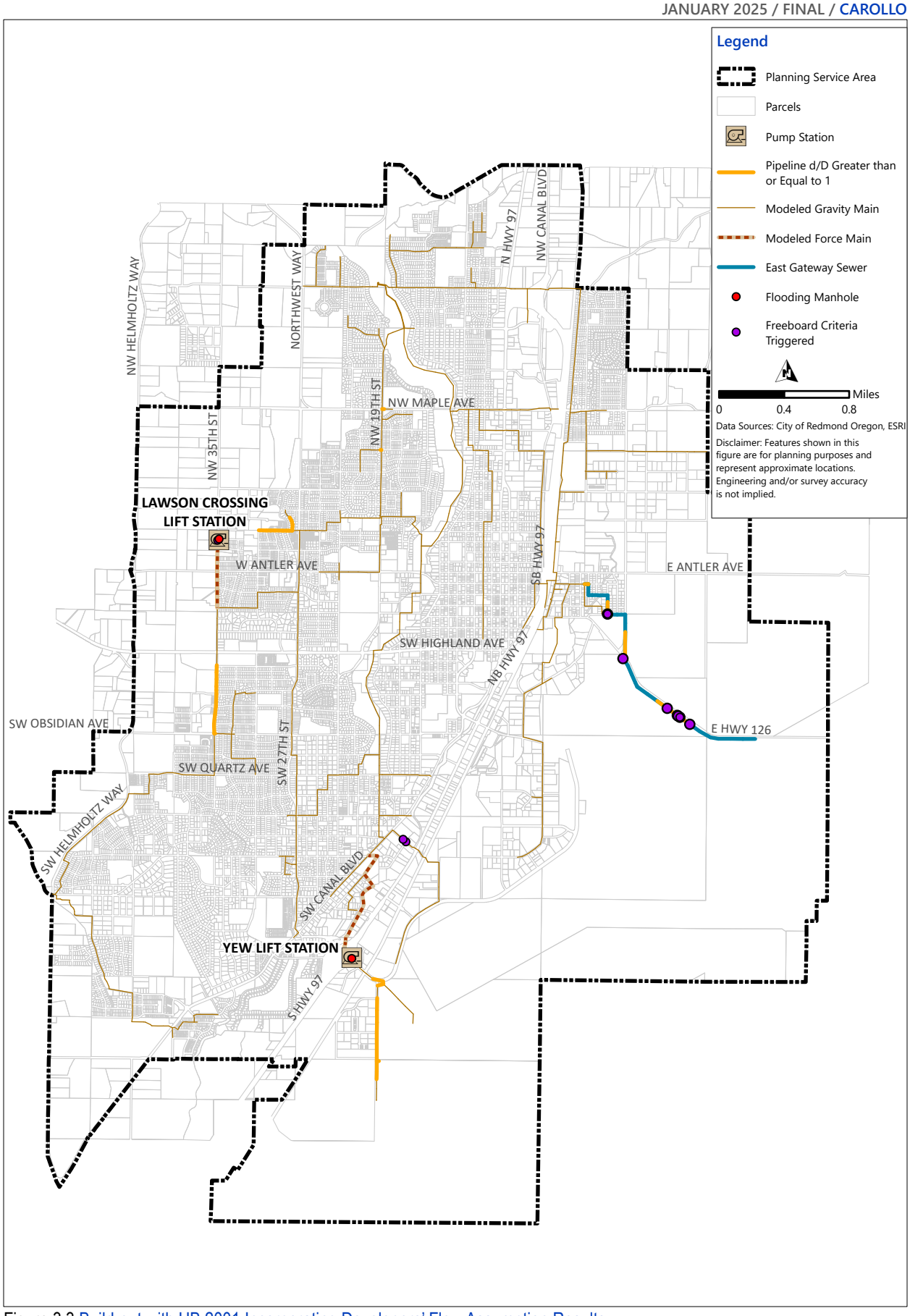


Figure 3.3 Build-out with HB 2001 Incorporating Developers' Flow Assumption Results

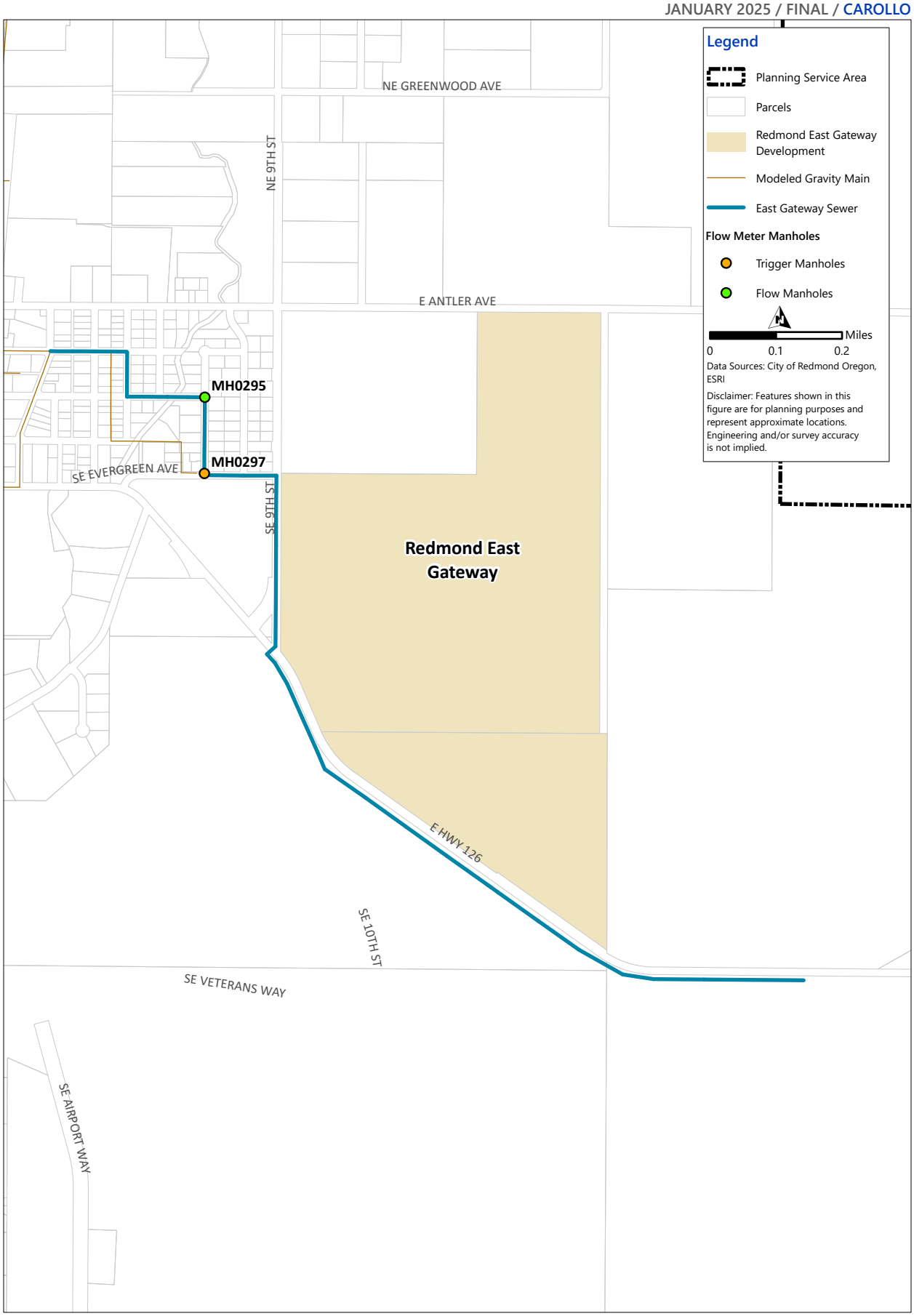


Figure 3.4 East Gateway Flow Monitoring Recommendation

APPENDIX 3A

REDMOND EAST GATEWAY CONCEPTUAL UTILITY NARRATIVE FOR CITY OF REDMOND INFRASTRUCTURE ALLOCATION - KNOWLEDGE ENGINEERING, LLC, JANUARY 4, 2024

KNOW LEDGE
ENGINEERING | CONSULTING

TECHNICAL MEMORANDUM

DATE: January 5, 2024

TO: City of Redmond Engineering and Public Works Departments

FROM: Adam Erlandson, PE

RE: Redmond East Gateway
Conceptual Utility Narrative for City of Redmond Infrastructure Allocation

This memorandum is intended to provide a brief narrative of the proposed Redmond East Gateway Project and the initial utility service strategy for the proposed Master Planned Commercial and Industrial Land Development Project.

PROPOSED DEVELOPEMNT SUMMARY:

The proposed project site is located within the City of Redmond (COR) Limits and consists of two parcels (identified as Deschutes County Taxlot: 151315-00-00101 and -00102). Taxlot -00101 is addressed as 901 E Hwy 126 and Taxlot: -00102 does not yet have an assigned address. The only existing development on the project site is an existing ODOT Road Maintenance Yard which is currently located in the SW Corner of Taxlot -00101. The proposed development site is bordered to the north by East Antler Avenue, a +/-46-acre Light Industrial Parcel (Future Wild Mike's Site) and SE 9th Street to the west, Oregon Highway 126 to the south, and the undeveloped 17th Street right of Way, Oasis Village, and Deschutes County Owned lands to the east.

The overall project site is approximately 204.5-acres in gross area (+/- 196.7-acres within subject parcel boundaries). The site is split zoned with two previously established COR zoning designations. Approximately 41.9-acres of gross area is zoned Limited-Service Commercial (C4-A) and +/-162.6-acres of gross area have been established as Light Industrial (M1). Along with the upcoming Master Development Plan Application, the development team is concurrently pursuing a Comprehensive Map Amendment and Zone Change to rearrange the zoning designation locations, complete a minor addition to the C4-A lands, and alter a portion of the industrial lands to the Heavy Industrial (M2) zoning designation.

As shown on the attached conceptual utility plan, planned new COR public roadways and utilities are being proposed throughout the site to serve the future development blocks/parcels. With the overall size of the project, it is anticipated that the project will ultimately be developed in a phased approach. The final sequencing/timelines of the development are not yet fully established. The project will initially commence with either the extension of SE Evergreen Avenue into the project site to open up the proposed commercial lands of the project or potentially with the easterly extension of E Antler Avenue to open up the various industrial zoning districts in the northern portion of the project site.

SEWER INFRASTRUCTURE SUMMARY AND AVERAGE WASTEWATER FLOW ESTIMATION:

There are two anticipated points of connection to the City of Redmond Sanitary Sewer Collection network. Due to the existing topography and conceptual design efforts completed to date, it is anticipated that upon ultimate development of the project, the site will be divided into two gravity sewer sub-basins. As shown on the attached conceptual plan, the northern portion of the site will drain to the north and connect to the extension of the Antler gravity sewer main and the majority of the southern portion of the site will drain to the

901 NW Carlon, Suite 3
Bend, OR 97703

west towards the Evergreen gravity main. The discharge from these gravity sewer pipe extensions will converge at the intersection of SE Black Butte Blvd and SE 5th Street (COR MH0289) and will be subsequently carried to the Redmond WPCF via the East Side Interceptor. There is a potential for future lots fronting SE 9th Street to connect directly to the existing 12-inch sewer main located along the project frontage, but a majority of the new parcels will be served by planned COR gravity sewer main extensions within the development. Pending final site development plans, some of the lots fronting Highway 126 may require individual private sewer lift stations to connect to the planned gravity main that will be constructed along the proposed SE Glacier Avenue.

Estimated sewer flows from the overall project have been calculated utilizing two different scenarios. Per the current City of Redmond Design Standards, sanitary sewer flows are to be estimated by zoning designations or by known proposed development conditions. Based upon the existing zoning, these lands, even after the proposed zone change would all be classified as commercial and industrial lands which have a designated 1,000 gallons per acre per day flow estimate (per 2020 COR Design Standards, C2.a.9). Overall, it is anticipated that there will be approximately 42.5 net acres of C4-A, 72 net acres of M1, and 59 net acres of M2, for a total of approximately 173.5 net acres of developable land. As shown on Page 1 of the attached calculations, this would equate to an average **daily sewer flow estimate of +/-173,500 gallons per day**. Assuming a 20-hour day, the **average sewer flow rate is estimated at approximately 145 gpm with a peak flow rate of approximately 435 gpm** (based upon a Peaking Factor of 3.0 for flows less than 1 MGD).

If the project were to begin with the extension of SE Evergreen Avenue (and to serve the overall southern sub-basin), the anticipated point of sanitary sewer connection to the City of Redmond system is proposed to be at the existing gravity sewer manhole located at the intersection of SE 9th Streety and SE Evergreen Avenue (MH#15B060). A COR 12-inch gravity sewer main has been previously installed along the project frontage of SE 9th Street and continues to flow westerly along SE Evergreen Avenue. It is anticipated that approximately 42.5 net acres of C4-A, 61.7 net acres of M1, and 28.9 net acres of M2 will be served by the Evergreen collection system.

If the project were to begin with the extension of E Antler Avenue (and to serve the overall northern sewer sub-basin), the anticipated point of connection will be either the termination of the 8" gravity sewer that is to be installed with the Wild Mike's Site Development along E Antler, or if that is not yet complete, would need to be the existing 8-inch stub previously installed on the eastern side of the E Antler and NE 11th Street. As shown on the attached exhibit, approximately 10.4 net acres of M1 and 28.8 net acres of M2 would contribute to the Antler collection system.

Based upon the COR design standards, the proposed zone change will not result in any additional estimated sewer flow. However, multi-family complexes are permitted outright in the C4-A zone and an associated estimate has been provided on Page 2 of the attached calculations for a comparison of potential impacts to sewer flow estimates. If approximately 75% of the C4-A lands were developed as multi-family complexes (with an estimated density of 24 units per acre) and 25% of the C4-A lands were developed as traditional commercial land, the attached flow calculations show that the estimated average daily flow rate for the C4-A lands would be equivalent to 2,140 gallons per acre per day.

$$\text{Gallons per Day (GPD)} = 75\,\% \times \frac{105 \text{ Gallons}}{\text{Day*MF Unit}} \times \frac{24 \text{ MF Units}}{\text{Acre}} + 25\,\% \times \frac{1{,}000 \text{ Gallons}}{\text{Acre x Day}} = 2{,}140 \text{ GPD}$$

This would increase the sewer flow estimate for the overall project to approximately 222,000 gallons per day with an average flow rate of +/-185 gpm and a peak flow rate of +/-555 gpm.

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Bend, OR 97703

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AVERAGE WATER DEMAND FOR PEAK SUMMER DAY:

The project is anticipated to connect to the COR water system at multiple locations. As previously mentioned, if the project starts with the Evergreen Avenue extension into the site, a new water main will be connected to the existing 18" COR Water Main located at the intersection of SE Evergreen and SE 9th Street. If the project starts with the Antler extension, the project will connect into either the 12" water main extension planned with the Wild Mike's Project or, if not yet complete, the point of connection will be the 12" water main stub located on the east side of the E Anteler and NE 11th Street. Pending hydraulic system needs, a possible connection could also be made to the existing 18" COR Water main located on the south side of Veterans Way/Highway 126 intersection (at the time of the planned future intersection control construction).

Water mains are planned to be extended throughout the development site and will be sized to provide a minimum fire flow of 2,500 GPM in commercial zones and 3,500 GPM in industrial zones in accordance with City of Redmond Design Standards.

Similar to the sewer flow calculations, the project's water demand has been estimated in two ways. The first method, provided on Page 3 of the calculations, utilizes the zoning standards and flow estimates provided in the 2021 City of Redmond Water Master Plan, Table 2-8, which utilizes an Average Day Demand (ADD) of 600 gallons/acre-day for non-residential use. This represents an **ADD for the project of approximately 104,100 gallons per day and a maximum day demand (MDD) of approximately 156,100 gallons per day** (MDD/ADD=1.50 for commercial and industrial development). Based upon sewer flow estimates, this is noted as an underestimate of the typical water demand.

With the outright permitted multi-family residential use component of C4-A land, water demand estimates have also been provided utilizing the current conceptual development concept of 75% of the C4-A land being developed as multi-family housing complex(es). This increases the estimated ADD of the project to approximately 325,000 gallons per day and MDD to approximately 670,000 gallons per day.

If you have any questions or need any additional information, please feel free to contact me directly to discuss.

Respectfully,

Adam Erlandson, PE

901 NW Carlon, Suite 3
Bend, OR 97703

TAXLOTS: 1513150000101 & 1513150000102

REDMOND, OR

REDMOND EAST GATEWAY

CONCEPTUAL UTILITY MASTER PLAN
JANUARY 2024

N

0 100' 200' 400'
SCALE: 1" = 200'

NE 9TH STREET (MINOR ARTERIAL)

(E) SSMH RIM ELEV = 3014.97'
I.E. 12" (N) = 3003.97'
I.E. 12" (E) = 3003.92'
I.E. 12" (W) = 3003.82'

SEWER EXTENSION BY OTHERS

8" COR SEWER MAIN EXTENSION

ESTIMATED SEWER FLOW FROM REDMOND EAST GATEWAY TO E ANTLER AVE:
33,212 GPD, 83 GPM PEAK FLOW
NOTE:WASTEWATER FLOW FROM ANTLER CONVERGES WITH SEWER FLOW FROM EVERGREEN AT COR MH0289 (BLACK BUTTE BLVD AND 5TH ST)

E ANTLER AVENUE
(MAJOR COLLECTOR)

(E)12" WATER MAIN STUB

12" COR WATER MAIN EXTENSION

EXISTING TAXLOT LINE/ PROPERTY BOUNDARY

SE 15TH STREET (LOCAL INDUSTRIAL)

M1-1
10.35 ACRES
GPD: 10,350
PEAK FLOW: 25.9 GPM
(TO ANTLER)

M2-1
14.52 ACRES
GPD: 14,520
PEAK FLOW: 36.3 GPM
(TO ANTLER)

ESTIMATED SEWER FLOW FROM REDMOND EAST GATEWAY TO COR MH15B060 AT 9TH AND EVERGREEN:
188,650 GPD, 472 GPM PEAK FLOW
NOTE: WASTEWATER FLOW FROM 9TH CONVERGES WITH SEWER FLOW FROM ANTLER AT COR MH0289 (BLACK BUTTE BLVD AND 5TH ST)

EXISTING TAXLOT LINE/ PROPERTY BOUNDARY

(E) 18" WATER MAIN STUB

EVERGREEN AVE
(LOCAL INDUSTRIAL)

SE 17TH STREET (MAJOR COLLECTOR)

(E) SSMH RIM ELEV = 3024.71'
I.E. 12" (S) =3014.16'
I.E. 12" (W) = 3014.06'

(E) SSMH RIM ELEV = 3025.57'
I.E. 12" (S) = 3018.22'
I.E. 12" (N) = 3018.02'

EXISTING 12" COR SEWER MAIN

SE 9TH STREET (MINOR ARTERIAL)

C4A-1
8.26 ACRES
GPD: 17,672
PEAK FLOW: 44.2 GPM
(TO 9TH)

C4A-3
7.25 ACRES
GPD: 15,506
PEAK FLOW: 38.8 GPM
(TO 9TH)

M1-2
9.06 ACRES
GPD: 9,060
PEAK FLOW: 22.6 GPM
(TO 9TH)

M2-2
16.68 ACRES
GPD: 16,680
PEAK FLOW: 41.7 GPM
(50% TO ANTLER, 50% TO 9TH)

APPROX. SUBJECT PROPERTY BOUNDARY

(E) 18" WATER MAIN

(E) SSMH RIM ELEV = 3034.99'
I.E. (S) = 3020.43'
I.E. (N) = 3020.29'

SE 11TH STREET (LOCAL STREET)

SE FOREST AVE (LOCAL INDUSTRIAL)

HIGHWAY 126

C4A-4
8.65 ACRES
GPD: 18,515
PEAK FLOW: 46.3 GPM
(TO 9TH)

SE 13TH STREET (LOCAL STREET)

SE 14TH STREET (LOCAL INDUSTRIAL)

C4A-2
18.3 ACRES
GPD: 39,172
PEAK FLOW: 97.9 GPM
(TO 9TH)

M1-3
14.10 ACRES
GPD: 14,100
PEAK FLOW: 35.2 GPM
(TO 9TH)

M2-3
27.79 ACRES
GPD: 27,790
PEAK FLOW: 69.5 GPM
(TO 9TH)

SE GLACIER AVE (LOCAL INDUSTRIAL)

M1-4
22.22 ACRES
GPD: 22,220
PEAK FLOW: 55.5 GPM
(TO 9TH)

M1-5
4.51 ACRES
GPD: 4,510
PEAK FLOW: 11.3 GPM
(TO 9TH)

APPROX. SUBJECT PROPERTY BOUNDARY

APPROX. SUBJECT PROPERTY BOUNDARY (R.O.W. DEDICATION TBD)

EXISTING 18" COR WATER MAIN

ANTICIPATED FUTURE CONNECTION INTO EXISTING 18" COR WATER MAIN

R150'

VETERANS WAY (MAJOR COLLECTOR)

HIGHWAY 126

EXISTING 16" COR WATER MAIN

M1-6
11.78 ACRES
GPD: 11,780
PEAK FLOW: 29.5 GPM
(TO 9TH)

LEGEND

- SUBJECT PROPERTY BOUNDARY
- PROPOSED RIGHT OF WAY
- PROPOSED R.O.W. CENTERLINE
- PROPOSED LOT LINE
- FUTURE RIGHT OF WAY LINE
- SS PROPOSED SEWER MAIN
- W PROPOSED WATER MAIN
- APPROX. SEWER BASIN BOUNDARY
- PROPOSED MANHOLE W/ FLOW DIR
- PROPOSED ALT. FLOW DIR
- PROPOSED C-4A ZONE - ±50.7 AC GROSS (±42.5 AC NET) (LIMITED SERVICE COMMERCIAL)
- PROPOSED M1 ZONE - ±85.7 AC GROSS (±72.0 AC NET) (LIGHT INDUSTRIAL)
- PROPOSED M2 ZONE - ±68.1 AC GROSS (±59.0 AC NET) (HEAVY INDUSTRIAL)
- 9TH SEWER FLOW TO 9TH ST
- A SEWER FLOW TO ANTLER

OVERALL WATER PLAN GENERAL NOTE:
PER CITY OF REDMOND DESIGN STANDARDS D.1.a: MINIMUM WATER MAIN SIZE IN COMMERCIAL ZONE SHALL BE 8-INCHES AND SHALL PROVIDE A MINIMUM FIRE FLOW OF 2,500 GPM. MINIMUM WATER MAIN SIZE IN INDUSTRIAL ZONE SHALL BE 12-INCHES AND PROVIDE A MINIMUM FIRE FLOW OF 3,500 GPM.

OVERALL UTILITY PLAN GENERAL NOTE:
THE LAYOUT AND EXTENTS OF THE WATER AND SEWER MAINS SHOWN ON THIS CONCEPTUAL PLAN ARE PRELIMINARY AND SUBJECT TO CHANGE WHEN FINAL LOT CONFIGURATION AND USES ARE ESTABLISHED.

KNOW LEDGE ENGINEERING, LLC
901 NW Carlon Ave., Suite 3
Bend, OR 97703
541.728.6347
adam@kl-engineering.com

CONCEPTUAL UTILITY MASTER PLAN — SCALE: 1" = 200'

Project: Redmond East Gateway
Date: 1/4/24
Wastewater Allocation Worksheet (Zoning Based)
By: BAE, Know Ledge Engineering

	Area			Sewer Flow Calcs		
Zone	(Sq Ft)	(Acres)	GPD/ Acre*	GPD	GPM**	PF GPM***
C4A- Commercial	**1,849,554**	**42.46**	**1,000**	**42,460**	**35.4**	**106.1**

Zone	(Sq Ft)	(Acres)	GPD/ Acre*	GPD	GPM**	PF GPM***
M1- Light Industrial	**3,136,520**	**72.00**	**1,000**	**72,005**	**60.0**	**180.0**

Zone	(Sq Ft)	(Acres)	GPD/ Acre*	GPD	GPM**	PF GPM***
M2- Heavy Industrial	**2,569,733**	**58.99**	**1,000**	**58,993**	**49.2**	**147.5**

Sewer Flow Calcs (Zoning Based)			
	GPD	GPM**	PF GPM
Total:	**173,457**	**144.5**	**433.6**

*Sanitary Sewer flow estimation per 2010 COR Standard Specifications, Design Standards, revised per Special Provisions 10/20/2020, C.2.a.9GPD/ Acre per City of Redmond Design Standards C.2.a.9.

**GPM based on a 20 hour day

***Peaking Factor= 3.0 per City of Redmond Design Standards C.2.a.10

Project: Redmond East Gateway
Date: 1/4/2024
Wastewater Allocation Worksheet (Including Multi-Family Housing)
By: BAE, Know Ledge Engineering

	Area			Sewer Flow Calcs		
Zone	(Sq Ft)	(Acres)	GPD/ Acre*	GPD	GPM**	PF GPM***
C4A- Commercial	**1,849,554**	**42.46**	**2,140**	**90,864**	**75.7**	**227.2**

Zone	(Sq Ft)	(Acres)	GPD/ Acre*	GPD	GPM**	PF GPM***
M1- Light Industrial	**3,136,520**	**72.00**	**1,000**	**72,005**	**60.0**	**180.0**

Zone	(Sq Ft)	(Acres)	GPD/ Acre*	GPD	GPM**	PF GPM***
M2- Heavy Industrial	**2,569,733**	**58.99**	**1,000**	**58,993**	**49.2**	**147.5**

Sewer Flow Calcs (Incl. Multi-Family)			
	GPD	GPM**	PF GPM
Total:	**221,862**	**184.9**	**554.7**

*Sanitary Sewer flow estimation per 2010 COR Standard Specifications, Design Standards, revised per Special Provisions 10/20/2020, C.2.a.9GPD/ Acre per City of Redmond Design Standards C.2.a.9.

*Project estimates 75% of the C4-A to be Mutli-Family housing at a density of 24 DU/ acre with 105 GPD per DU per City of Redmond Design Standards C.2.a.9.

**GPM based on a 20 hour day

***Peaking Factor= 3.0 per City of Redmond Design Standards C.2.a.10

Project: Redmond East Gateway
Date: 1/4/2024
Domestic Water Allocation Worksheet (Zoning Based)
By: BAE, Know Ledge Engineering

	Area			Domestic Water Demand Calcs					
Zone	(Sq Ft)	(Acres)	ADD/Acre* (gal)	ADD (gal)	ADD (gpm)	MDD** (gal)	MDD (gpm)	PHD** (gal)	PHD (gpm)
C4-A	**1,849,554**	**42.5**	**600**	**25,476**	**18**	**38,214**	**26.5**	**1,592**	**26.5**

Zone	(Sq Ft)	(Acres)	ADD/Acre (gal)	ADD (gal)	ADD (gpm)	MDD** (gal)	MDD (gpm)	PHD** (gal)	PHD (gpm)
M1	**3,136,520**	**72.0**	**600**	**43,203**	**30**	**64,804**	**45.0**	**2,700**	**45.0**

Zone	(Sq Ft)	(Acres)	ADD/Acre (gal)	ADD (gal)	ADD (gpm)	MDD** (gal)	MDD (gpm)	PHD** (gal)	PHD (gpm)
M2	**2,569,733**	**59**	**600**	**35,396**	**25**	**53,094**	**36.9**	**2,212**	**36.9**

Domestic Water Demand Calcs (Zoning Based)				
	ADD (gal)	MDD (gal)	PHD (gal)	PHD (gpm)
Total:	**104,074**	**156,112**	**6,505**	**108**

*Per City of Redmond Water Master Plan Table 2-8 Average Daily Demand for Future Non-Residential Growth: C4-A, Light Industrial, and Heavy Industrial = 600 Gallons/ Acre-day

**Per City of Redmond Water Master Plan Table 2-9 Demand Peaking Factors for Future Development- Industrial: MDD/ADD=1.5, PHD/MDD=1.00, Commercial: MDD/ADD= 1.50, PHD/MDD=1.00, Residential: MDD/ADD=2.30, PHD/MDD=2.30

Project: Redmond East Gateway
Date: 1/4/2024
Domestic Water Allocation Worksheet (Including Multi-Family Housing)
By: BAE, Know Ledge Engineering

	Area			Domestic Water Demand Calcs					
Zone	(Sq Ft)	(Acres)	ADD/Acre* (gal)	ADD (gal)	ADD (gpm)	MDD** (gal)	MDD (gpm)	PHD** (gal)	PHD (gpm)
C4-A	**1,849,554**	**42.46**	**5,788**	**245,741**	**171**	**550,781**	**382.5**	**22,946**	**382.4**

Zone	(Sq Ft)	(Acres)	ADD/Acre (gal)	ADD (gal)	ADD (gpm)	MDD** (gal)	MDD (gpm)	PHD** (gal)	PHD (gpm)
M1	**3,136,520**	**72.00**	**600**	**43,203**	**30**	**64,804**	**45.0**	**2700**	**45.0**

Zone	(Sq Ft)	(Acres)	ADD/Acre (gal)	ADD (gal)	ADD (gpm)	MDD** (gal)	MDD (gpm)	PHD** (gal)	PHD (gpm)
M2	**2,569,733**	**58.99**	**600**	**35,396**	**25**	**53,094**	**36.9**	**2,212**	**36.9**

Domestic Water Demand Calcs (Incl. Multi-Family)				
	ADD (gal)	MDD (gal)	PHD (gal)	PHD (gpm)
Total:	**324,340**	**669,354**	**27,877**	**465**

*Project estimates 75% of the commercial zone to be Mutli-Family housing at a density of 24 DU per acre with the remaining 25% to be standard commercial.
Assumed 2.61 persons per standard residential DU per the US Census (Redmond, OR, 2018-2022). Multi-Family EDU ratio of 0.8. Residential water demand: 150 gallons per person per day.

*Calculation for water Average Daily Demand (ADD) of gallons of water/acre: 24 (DU/acre) x 2.61 (persons/DU) x 0.8 (Multi-Family DU/Standard residential DU) x 150 (gallons/person) x0.75 (acres Multi-Family/ Acres total) + 600 (gallons/acre) X 0.25 (acres standard commerical/total acres)

**Future Land Use Peaking Factors per City of Redmond Water Master Plan 2.7 Future Land Use Peaking Factors Table 2-9 Demand Peaking Factors for Future Development- Industrial: MDD/ADD=1.5, PHD/MDD=1.00, Commercial: MDD/ADD= 1.50. PHD/MDD=1.00, Residential: MDD/ADD=2.30, PHD/MDD=2.30

***Non-residential water ADD: 600 gallons/acre-day per Redmond Water Master Plan Table 2-8 Average Day Demand for Future Non-Residential Growth

APPENDIX G
Technical Memorandum 2 - West Cascade Trunk Development Review Sewer System Capacity Analysis

CITY OF REDMOND

Wastewater Collection System Master Plan Update



TECHNICAL MEMORANDUM 2

West Cascade Trunk Development Review Sewer System Capacity Analysis

FINAL / January 2025

CITY OF REDMOND

Wastewater Collection System Master Plan Update

TECHNICAL MEMORANDUM 2

West Cascade Trunk Development Review Sewer System Capacity Analysis

FINAL / January 2025

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2.3 Wastewater Flow Projection 2-4
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APPENDIX 2A CITY'S WEST CASCADE TRUNK DEVELOPER SPECIFIC FLOWS

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TM 2 WEST CASCADE TRUNK DEVELOPMENT REVIEW SEWER SYSTEM CAPACITY ANALYSIS

2.1 Background and Purpose

Carollo Engineers (Carollo) is assisting Anderson Perry & Associates Inc, (AP) and the City of Redmond (City) with developing a Collection System Master Plan (CSMP) by updating the City's sanitary sewer collection system model and performing a capacity analysis of the collection system.

The City requested Carollo evaluate how proposed development in the southwest part of the City's system will affect the capacity of the West Cascade Trunk, which is shown in Figure 2.1. The City provided the developers' sewer flow assumptions that are anticipated to enter the City's collection system.

This technical memorandum compares the CSMP flow assumptions based on system-wide land use flow factors with the developer-provided assumptions, discusses the updates to the hydraulic model, and presents the resulting capacity of the City's West Cascade Trunk sewer collection system.

2.2 Evaluation Description

The assumptions and information from the City's CSMP, which is under development as this developer review analysis is performed, will be used as the basis for this analysis including the hydraulic model developed as part of that effort. For this evaluation, the combined effect of developer-specific flows from six different developments, which were provided by the City, are used in place of the land use-based flow factors developed for the CSMP based on flow meter data. For more information regarding the City's developer-specific flows, see Appendix 2A.

Figure 2.1 shows the extent of the Planning Service Area and location of the West Cascade Trunk. The location of the six developments and the manholes each is assumed to connect to is shown in Figure 2.2. The acreage and land use type of each development is shown in Table 2.1.

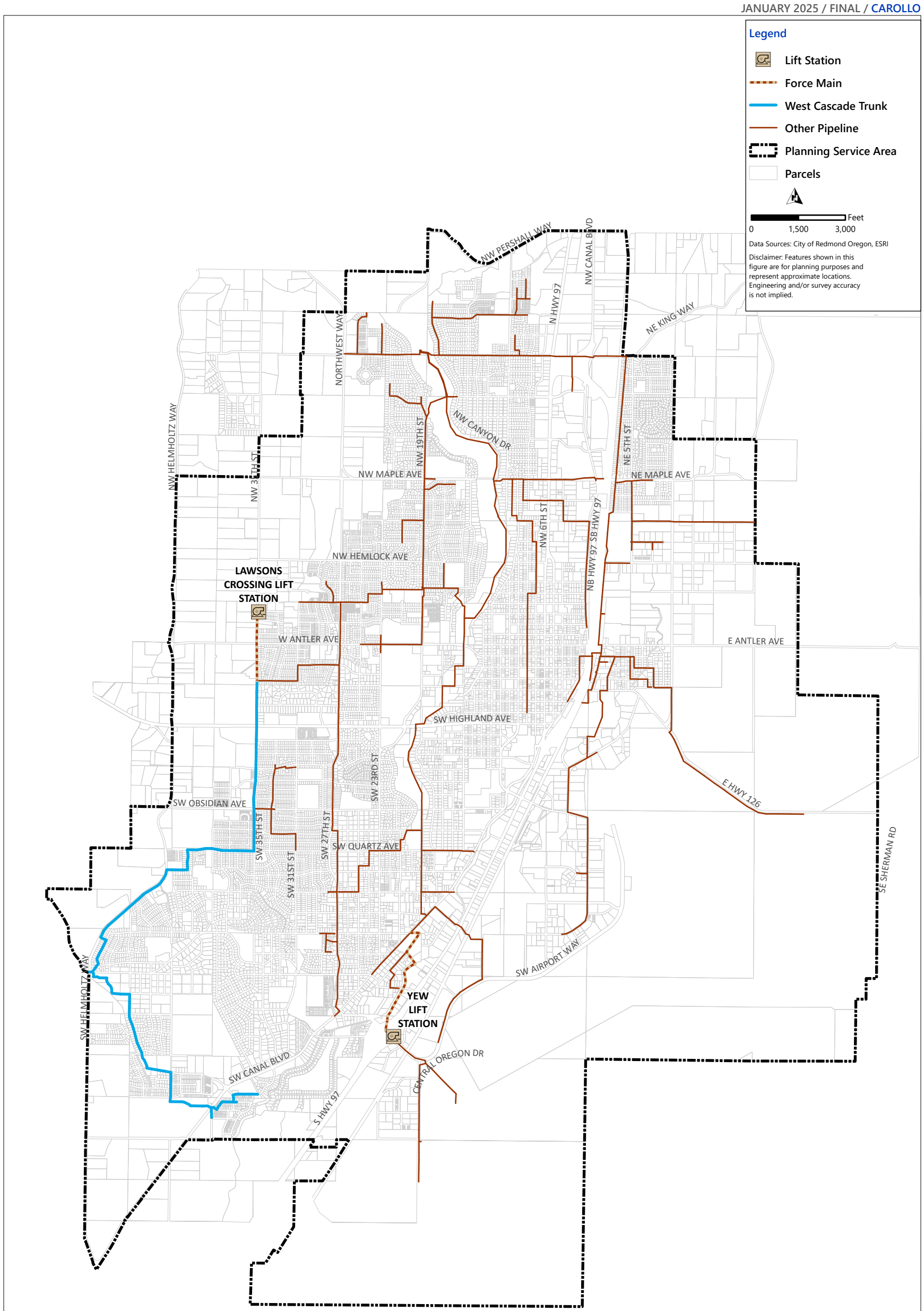


Figure 2.1 Planning Service Area and West Cascade Trunk

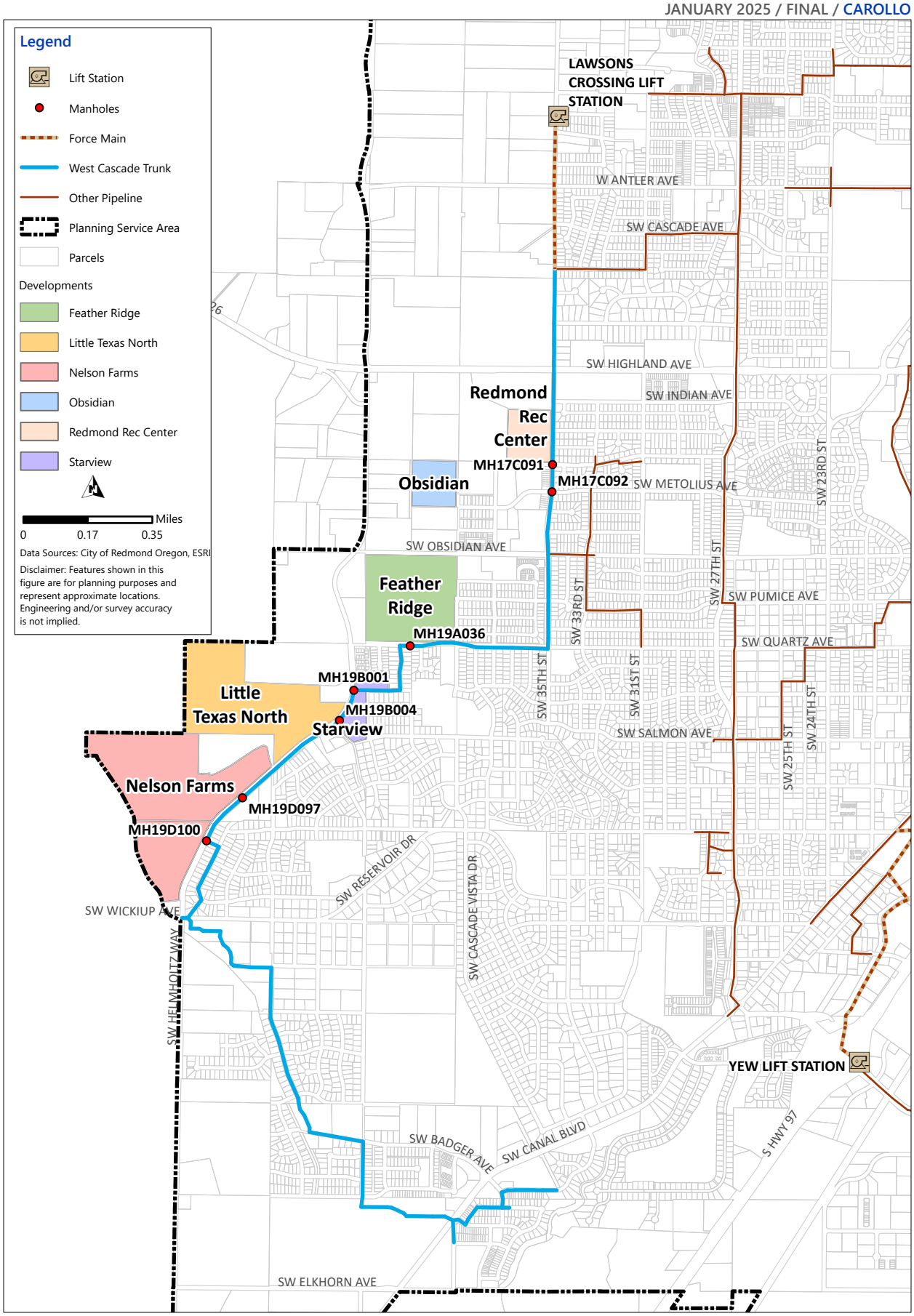


Figure 2.2 Overview Location of Developers' Manhole Flow Allocation

2.3 Wastewater Flow Projection

This section summarizes the wastewater flows developed for the CSMP and the developers' flow assumptions provided by the City.

2.3.1 Wastewater Flow Factors Development

Land use flow factors were established as part of the CSMP to estimate ADWF for the City's wastewater collection system and to project future flows within the Planning Service Area boundary. A flow factor, with units of gallons per acre per day, is developed for each land use classification using flow meter data to provide a means to translate sewered acreage into wastewater flow. The resulting flow is then input into the appropriate sewer area in the sewer system hydraulic model. For more information on how flow factors are developed, refer to the CSMP.

2.3.2 General Flow Assumptions

Wastewater flows are categorized as dry weather flows and wet weather flows:

- Dry weather flows mostly account for the City's customer wastewater production.
- Wet weather flows include some groundwater and stormwater that inevitably enters the sanitary sewer system through defects in pipes and manholes, and illicit storm drain connections. This portion of flow entering the system is called inflow and infiltration (I/I).

2.3.3 Developers' Flow Assumptions

For the proposed developments along the West Cascade Trunk, the system-wide CSMP flow factors were replaced with anticipated dry weather flow for each development, which were provided by the City. Wet weather flows and I/I are simulated in the model for the selected design storm (refer to the CSMP for more information regarding the wet weather calibration). Table 2.1 provides a detailed breakdown of flow assumptions for both the CSMP and the proposed developments.

2.4 Hydraulic Model Analysis

As part of the CSMP, Carollo developed and ran the model for a build-out scenario that included House Bill 2001 densification assumptions (Build-out with HB2001). For this evaluation, the Build-out with HB2001 scenario with the incorporation of developers' flow assumptions is run to assess the capacity in the West Cascade Trunk.

The performance criteria used to evaluate The West Cascade Trunk are the same as the criteria used in the CSMP. The maximum allowable hydraulic grade line for existing pipelines is no less than 2 feet of freeboard from the manhole rim.

As shown in Figure 2.3, the West Cascade Trunk has no modeled deficiencies triggered by the 2-foot freeboard requirement under the developer-specific flow conditions. While there is no d/D requirement for existing pipes, the results in Figure 2.3 highlight pipes with a d/D of equal to or greater than 1.0.

Note that for this analysis the model was initially run with higher developer-specific ADW flows than those presented in Table 2.1. The City later provided revised flow estimates that were lower than the original values. Since no deficiencies were identified with the higher flows, we can be sure that no deficiencies occur for the lower flows. The model was not rerun for the lower flow conditions.

Table 2.1 Flow Projection Comparison: CSMP and Developers' Assumptions

Development	Acres	Loading Manhole ID(1)	Land Use	CSMP Flow Factor (gpad)	CSMP Buildout Flow (mgd)	Developers' Average Flow Estimate (gpm)	Equivalent Developer Flow Factor (gpad)	Developers' Average Flow Estimate (mgd)	Difference Between Developer and CSMP Flow Factor
Obsidian	9.6	MH17C092	High Density Residential	920	0.009	12	1,822	0.017	198%
Redmond Rec Center(2)	10.5	MH17C091	High Density Residential	920	0.010	20	2,740	0.029	298%
Feather Ridge	36.6	MH19A036	High Density Residential	920	0.034	18	705	0.026	77%
Starview	7.5	MH19B001	High Density Residential	920	0.007	3	578	0.004	63%
Nelson Farms	18.8	MH19D100	Medium Density Residential	790	0.015	9.49	727	0.014	92%
Nelson Farms	49.5	MH19D097	Medium Density Residential	790	0.039	24	698	0.035	88%
Little Texas North	48.7	MH19B004	High Density Residential	920	0.045	26	754	0.037	82%

Notes:
(1) The anticipated flow values for developers' flow assumptions for each development were assigned at the nearest manhole in the collection system.
(2) The General Plan land use used for the flow development for the CSMP is high density residential though the proposed project does not correspond to this land use.
gpad - gallons per acre-day; gpm - gallons per minute; ID - identification; mgd - million gallons per day.

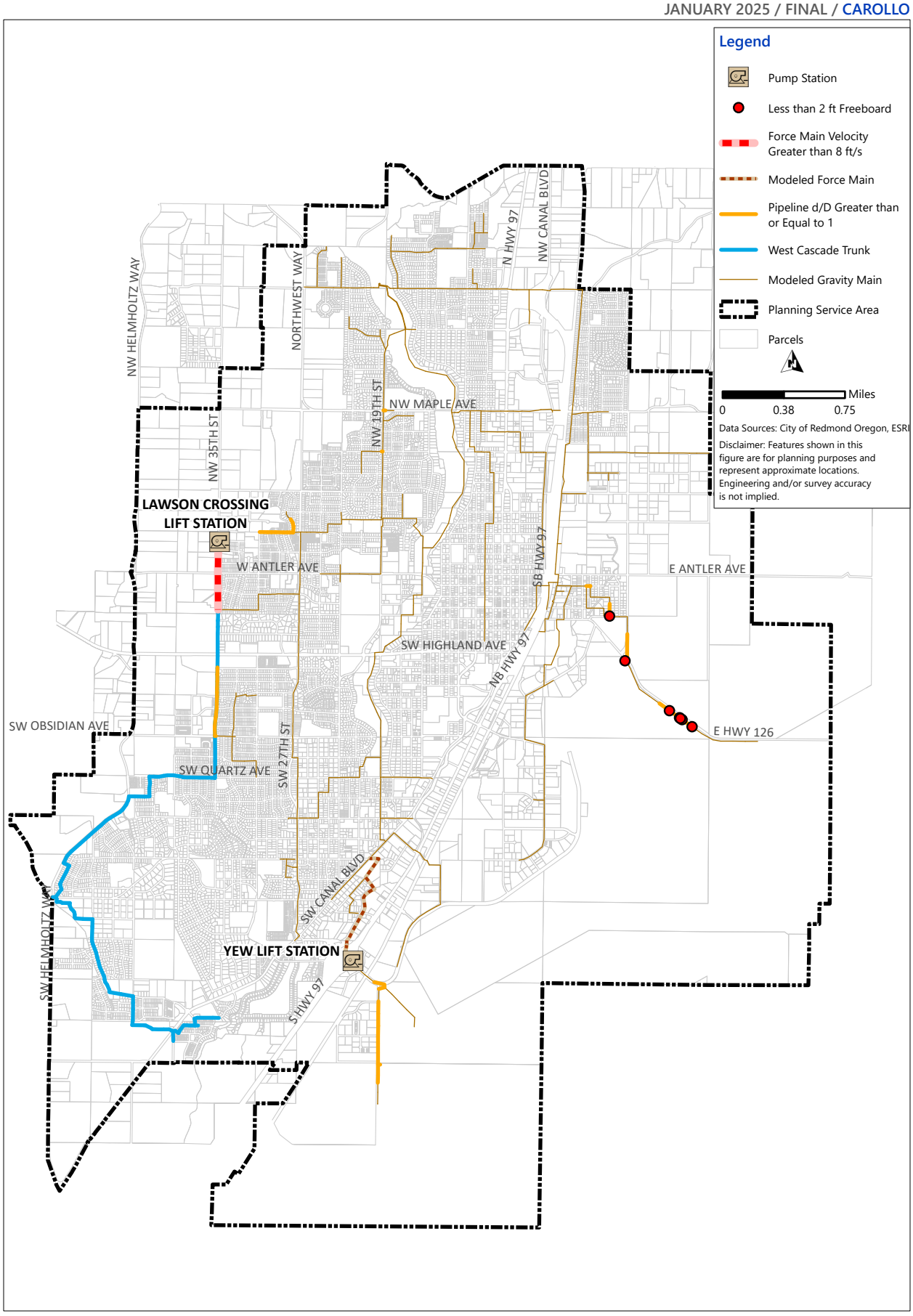


Figure 2.3 Build-out with HB 2001 Incorporating Developers' Flow Assumption Results

APPENDIX 2A

CITY'S WEST CASCADE TRUNK DEVELOPER SPECIFIC FLOWS

Katherine Sun

From: Jill Kjellsson
Sent: Wednesday, February 14, 2024 2:18 PM
To: Katherine Sun
Subject: FW: Slides from Tuesday's meeting

Follow Up Flag: Follow up
Flag Status: Flagged

Jill Kjellsson, PE
925-977-3049
carollo.com

From: Josh Robertson <jrobertson@andersonperry.com>
Sent: Wednesday, February 14, 2024 10:10 AM
To: Alena Thurman <AThurman@carollo.com>; Jill Kjellsson <JKjellsson@carollo.com>
Subject: FW: Slides from Tuesday's meeting

CAUTION: This email originated from outside Carollo Engineers. Do not open attachments or click links unless you recognize the sender.

EST. 1975

Joshua Robertson, PE
Senior Engineer
Anderson Perry & Associates, Inc
3818 SW 21st Street, Suite 302
Redmond, OR 97756
541-362-8682(Office)
541-408-6514(Cell/Text)

Web Facebook LinkedIn

From: Jessica MacClanahan <jessica.macclanahan@redmondoregon.gov>
Sent: Tuesday, February 13, 2024 4:24 PM
To: Evan Malone <evan.malone@redmondoregon.gov>; Josh Robertson <jrobertson@andersonperry.com>; Suzanne Price <sprice@andersonperry.com>
Cc: Lindsey Cromsigt <lindsey.cromsigt@redmondoregon.gov>
Subject: RE: Slides from Tuesday's meeting

This email contains an attachment from outside of the organization.
Please exercise caution when opening this attachment.

Thanks, Evan.

Josh – please let us know if you need anything else. I personally think this is an easier summary than a dozen word files that you have to read through to find the info in the table.

Thanks,

Jessica MacClanahan, P.E. | City of Redmond
Director of Public Works / City Engineer

Phone 541.504.2011
Mobile 503.544.7321
Email jessica.macclanahan@redmondoregon.gov

243 E. Antler Ave. Redmond, Oregon 97756

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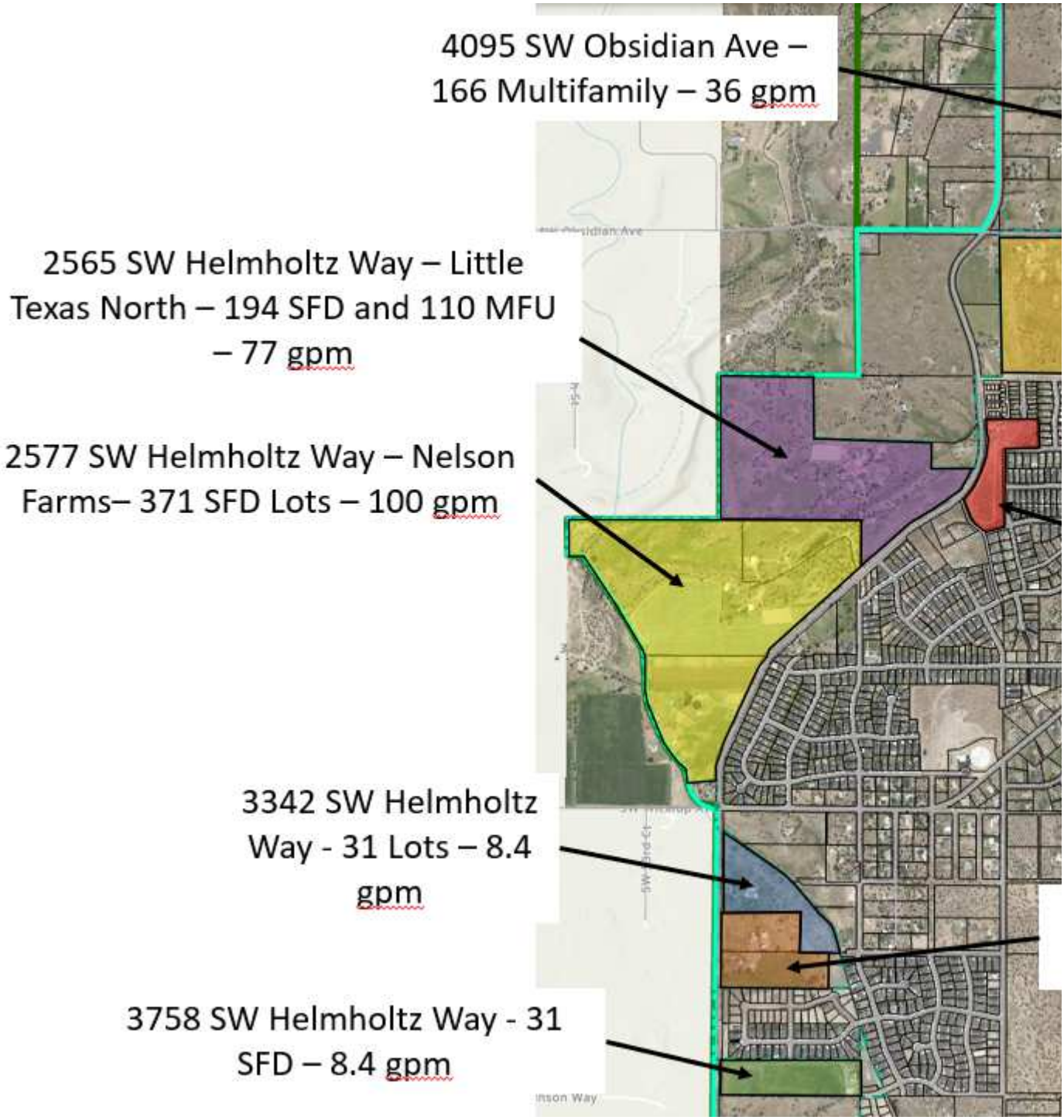
DISCLOSURE NOTICE:
Messages to and from this email address may be subject to Oregon Public Records Law.

From: Evan Malone <evan.malone@redmondoregon.gov>
Sent: Tuesday, February 13, 2024 3:17 PM
To: Jessica MacClanahan <jessica.macclanahan@redmondoregon.gov>; Josh Robertson <jrobertson@andersonperry.com>; Suzanne Price <sprice@andersonperry.com>
Cc: Lindsey Cromsigt <lindsey.cromsigt@redmondoregon.gov>
Subject: RE: Slides from Tuesday's meeting

Jessica,

Below is a table and a map of the developments that will be going into line D.

Development/Address	SFD	MFU	Average (GPD)	Average (GPM)	Peak (GPM)
Rec Center	-	-		20	300
4095 SW Obsidian Ave.	-	166	17430	12.10	36.31
Feather Ridge	198	-	25740	17.88	53.63
Starview	33	-	4290	2.98	8.94
Little Texas North	194	110	36770	25.53	76.60
Nelson Farms	371	-	48230	33.49	100.48
3758 SW Helmholtz Way	31	-	4030	2.80	8.40
3342 SW Helmholtz Way	31	-	4030	2.80	8.40
3498 and 3530 SW Helmholtz Way	30	-	3900	2.71	8.13



I am still working on the language for each of the allocation memos but below is the general language that will be used in the memos. The Interim Pump station language will be used for the Little Texas North, Nelson Farms, 4095 Obsidian Ave., and Feather Ridge developments.

"The property would temporarily contribute flows to Sewer Line D which was recently reviewed as part of the City of Redmond Collection System Master Plan. To do so, we used our sewer model to analyze current flows, buildout flows and added flows from your proposed development which is outside the Line D sewer basin. The analysis showed that there is available capacity for the proposed development in Sewer Line D south of SW Highland Avenue.

This property is located in the Far West Sewer Interceptor (FWSI) sewer basin and will be dependent on an interim sewer pump station to temporarily flow to Sewer Line D. The requirements of the interim pump station and connecting into sewer line D will be the following:

- The location of the interim pump station will need to be located near the proposed location of FWSI and the low point of the development.
- The interim pump station must be sized for the 198 SFD development.
- The development must show a concept of the FWSI that is on the property's frontage and demonstrate how the development will connect once the Lift Station is decommissioned. The developer will be required to make a payment in lieu. No SDC credits are available for the interim pump stations.
- The interim pump station and force main must meet City of Redmond and DEQ standards."

Please let me know if you have any questions or need anything else.

Thanks,

Evan Malone, PE | City of Redmond
Project Engineer

phone 541.504.2038
mobile 541.208.2781
email evan.malone@redmondoregon.gov

243 E Antler Ave Redmond, Oregon 97756

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From: Jessica MacClanahan <jessica.macclanahan@redmondoregon.gov>
Sent: Tuesday, February 13, 2024 8:43 AM
To: Josh Robertson <jrobertson@andersonperry.com>; Suzanne Price <sprice@andersonperry.com>; Evan Malone <evan.malone@redmondoregon.gov>
Cc: Lindsey Cromsigt <lindsey.cromsigt@redmondoregon.gov>
Subject: RE: Slides from Tuesday's meeting

Thanks, Josh. Evan, Lindsay and I have been working on memorializing the infrastructure analysis for each of the properties modeled.

Evan – will you please reply to this email with all of the memos (and potentially a quick table/map summary of the lots), including Starview and Rec Center that went out last week?

Thanks!

Jessica MacClanahan, P.E. | City of Redmond
Director of Public Works / City Engineer

Phone 541.504.2011
Mobile 503.544.7321
Email jessica.macclanahan@redmondoregon.gov

243 E. Antler Ave. Redmond, Oregon 97756

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From: Josh Robertson <jrobertson@andersonperry.com>
Sent: Tuesday, February 13, 2024 7:51 AM
To: Jessica MacClanahan <jessica.macclanahan@redmondoregon.gov>; Suzanne Price <sprice@andersonperry.com>
Cc: Lindsey Cromsigt <lindsey.cromsigt@redmondoregon.gov>
Subject: RE: Slides from Tuesday's meeting

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Jessica,

I'm sure we can find an easy way to display/quantify the capacity for you. Also, please pass along the flow calcs when Tom has them done.

Thanks,

Joshua Robertson, PE
Senior Engineer
Anderson Perry & Associates, Inc
3818 SW 21st Street, Suite 302
Redmond, OR 97756
541-362-8682(Office)
541-408-6514(Cell/Text)

Web Facebook LinkedIn

From: Jessica MacClanahan <jessica.macclanahan@redmondoregon.gov>
Sent: Monday, February 12, 2024 4:23 PM
To: Suzanne Price <sprice@andersonperry.com>; Josh Robertson <jrobertson@andersonperry.com>
Cc: Lindsey Cromsigt <lindsey.cromsigt@redmondoregon.gov>
Subject: RE: Slides from Tuesday's meeting

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Please exercise caution when opening this attachment.

Hi Suzanne – thanks for sharing!

Josh – I know we talked about getting a tech memo from Carollo summarizing the findings (and fixing the peaked flowrates in the SW part of town). As part of the tech memo, can you please provide the actual available capacity (in gpm) so that we can monitor against future development requests? For example, the 'Build-out + HB 2001' maps shows failing manholes on the east side of town, however Engineering staff doesn't understand when that failure will be triggered prior to the complete build-out. We'd like to be able to keep a running tab on remaining capacity based on what we are adding to the existing scenario on critical lines.

Please let me know if that is doable and when you think the tech memo will be available.

Thanks,

Jessica MacClanahan, P.E. | City of Redmond
Director of Public Works / City Engineer

Phone 541.504.2011
Mobile 503.544.7321
Email jessica.macclanahan@redmondoregon.gov

243 E. Antler Ave. Redmond, Oregon 97756

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From: Suzanne Price <sprice@andersonperry.com>
Sent: Friday, February 9, 2024 12:44 PM
To: Jessica MacClanahan <jessica.macclanahan@redmondoregon.gov>
Cc: Josh Robertson <jrobertson@andersonperry.com>
Subject: Slides from Tuesday's meeting

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Hi Jessica! Below is the link to the slides from Tuesday's meeting.
Let me know if you have questions or any trouble opening it.

Development Capacity Results 020624 .pdf

ENGINEERING • SURVEYING • NATURAL RESOURCES • CULTURAL RESOURCES • GIS

Suzanne Price | *Project Assistant*
541-362-8682 office | 541-288-3905 cell/text

APPENDIX H
Electronic Capital Improvement Plan Tool

City of Redmond
2024 Sewer Collection System Master Plan
Capital Improvement Program

General Description:
This workbook summarizes all capital projects recommended in the 2024 Sewer Collection System Plan for the planning period of **2025 to 2040.** The projects are grouped into the following categories:

Lift Station "LS"
Pipeline "P"
General Programmatic "G"

Each project is also assigned to one or more of the following project types to help the City determine the appropriate funding sources:

Expansion	Funded by SDC's.
Improvements	Funded by user rates.

Each project is assigned to one of the following periods of project implementation timing:

Short-term	(2025-2030)
2025	(Short-term)
2026	(Short-term)
2027	(Short-term)
2028	(Short-term)
2029	(Short-term)
2030	(Short-term)
Medium-term	(2031-2035)
2030	(Medium-term)
2031	(Medium-term)
2032	(Medium-term)
2033	(Medium-term)
Long-term	(2036-2045)

The projects are summarized on individual worksheets where project data is input including project identification, cost, and timing. Project costs on the project worksheets link to the "Assumptions" worksheet for unit cost assumptions. The "CIP at a Glance" and "CIP Summary Table" worksheets summarize the total and annual CIP costs by linking to the individual project worksheets.

Making Changes:
Blue cells indicate values that can be changed to automatically update the entire CIP tool. This includes the project implementation timing options above on this worksheet. Other inputs that can be changed include the unit costs and contingencies on the "Assumptions" worksheet, the project ID number, title, and size or length of each project element on the individual project worksheets, and the project timing on the individual project worksheets.

Non-blue cells are protected (locked for editing). The password to unprotect any worksheet is: **CIP**

Adding a Project:
Copy the "New Project Template" worksheet to add a new project to the CIP. Rename the worksheet (tab) as the project ID number. Fill in blue cells. On the "CIP Summary Table" worksheet, add a new row within the section to which the project belongs. Unlock the worksheet by going to Review, UnProtect Sheet. Use the password above to unlock the sheet. Copy the formulas in a populated row to the new row. Fill in the first column of the new row with the project ID number. The rest of the row including project costs and timing will automatically be populated from the project worksheet. Verify that total sums include the new row. Add the new project to the CIP Projects list within the "CIP at a Glance" worksheet by linking to the ID and title in the CIP Summary Table worksheet.

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

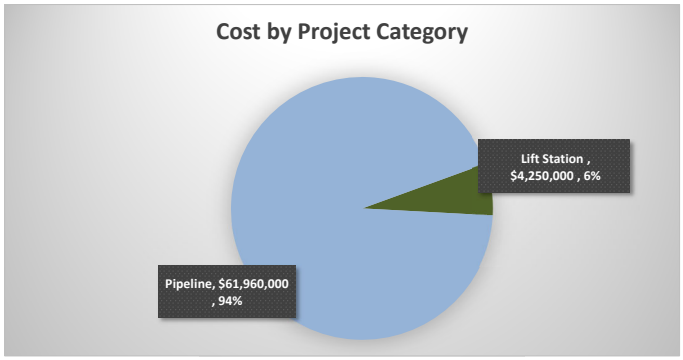
Unprotect password: CIP

Capital Improvements Plan Summary (Current Dollars)

Project Type	CIP Phasing			Total CIP Cost Estimate
	Short-term (2025-2030)	Medium-term (2031-2035)	Long-term (2036-2045)	
Expansion	$ -	$ 42,750,000	$ 18,920,000	$ 61,670,000
Improvement	$ 2,130,000	$ 2,410,000	$ -	$ 4,540,000
General Programmatic	$ -	$ -	$ -	$ -
Total Cost	**$ 2,130,000**	**$ 45,160,000**	**$ 18,920,000**	**$ 66,210,000**
Annual Cost	**$ 355,000**	**$ 11,290,000**	**$ 1,892,000**	**$ 3,311,000**

Capital Improvement Projects

Project ID	Project Name	
Lift Station		
LS-01	Yew Avenue Pump Station Pump Upgrade	
LS-02	Yew Avenue Pump Station Upgrade	
LS-03	Wrap Lift Station	
Pipeline		
P-01	Black Butte Trunk Sanitary Sewer Main Replacement	
P-02	East Spruce Interceptor (Yew Avenue Alternative 2)	
P-03	Obsidian Interceptor	0
P-04	Wrap Collector	0
P-05	West Spruce Interceptor (2007 Far West Interceptor)	0

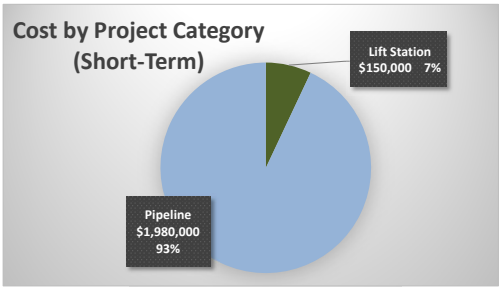


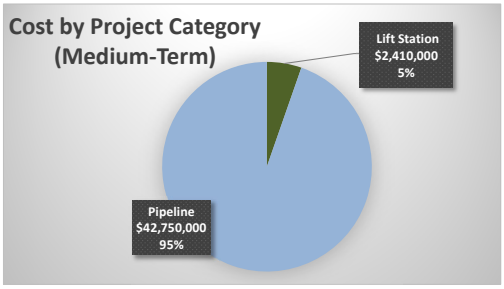
Lift Station	*$4,250,000*	*6%*
Pipeline	*$61,960,000*	*94%*
General	*$0*	*0%*
Total	$66,210,000	100%

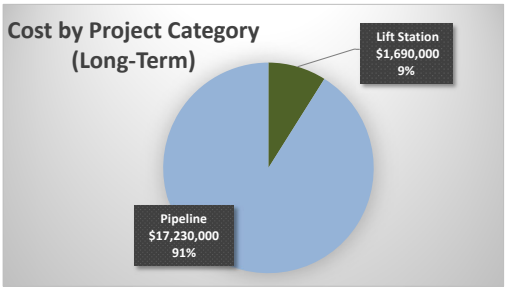
Short-Term		
Lift Station	*$150,000*	*7%*
Pipeline	*$1,980,000*	*93%*
General	*$0*	*0%*
Total	$2,130,000	100%

Medium-Term		
Lift Station	*$2,410,000*	*5%*
Pipeline	*$42,750,000*	*95%*
General	*$0*	*0%*
Total	$45,160,000	100%

Long-Term		
Lift Station	*$1,690,000*	*9%*
Pipeline	*$17,230,000*	*91%*
General	*$0*	*0%*
Total	$18,920,000	100%







City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan (Current Dollars)

Capital Improvements Plan Summary (Current Dollars)

Project		Total CIP Cost Estimate	CIP Phasing (Current Dollars)										Short-term	Medium-term	Long-term	Developer Share	Project Type		
Enter Cost Type Here: Current Dollars			2025	2026	2027	2028	2029	2030	2030	2031	2032	2033	(2025-2030)	(2031-2035)	(2036-2045)		Expansion	Improvement	General Programmatic
Lift Stations		$4,250,000	$150,000	$0	$0	$0	$0	$0	$0	$2,410,000	$0	$0	$150,000	$2,410,000	$1,690,000				
LS-01	Yew Avenue Pump Station Pump Upgrade	$150,000	$150,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$150,000	$0	$0	0%	0%	100%	0%
LS-02	Yew Avenue Pump Station Upgrade	$2,410,000	$0	$0	$0	$0	$0	$0	$0	$2,410,000	$0	$0	$0	$2,410,000	$0	0%	0%	100%	0%
LS-03	Wrap Lift Station	$1,690,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,690,000	0%	100%	0%	0%
Pipelines		$61,960,000	$1,980,000	$0	$0	$0	$0	$0	$0	$42,750,000	$0	$0	$1,980,000	$42,750,000	$17,230,000				
P-01	Black Butte Trunk Sanitary Sewer Main Replacement	$1,980,000	$1,980,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,980,000	$0	$0	0%	0%	100%	0%
P-02	East Spruce Interceptor (Yew Avenue Alternative 2)	$11,930,000	$0	$0	$0	$0	$0	$0	$0	$11,930,000	$0	$0	$0	$11,930,000	$0	0%	100%	0%	0%
P-03	Obsidian Interceptor	$30,820,000	$0	$0	$0	$0	$0	$0	$0	$30,820,000	$0	$0	$0	$30,820,000	$0	0%	100%	0%	0%
P-04	Wrap Collector	$8,180,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$8,180,000	0%	100%	0%	0%
P-05	West Spruce Interceptor (2007 Far West Interceptor)	$9,050,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$9,050,000	0%	100%	0%	0%
CIP Total (Current Dollars)		$66,210,000	$2,130,000	$0	$0	$0	$0	$0	$0	$45,160,000	$0	$0	$2,130,000	$45,160,000	$18,920,000		$61,670,000	$4,540,000	$0
Annual Cost (Current Dollars)		$3,311,000	$2,130,000	$0	$0	$0	$0	$0	$0	$45,160,000	$0	$0	$355,000	$11,290,000	$1,892,000		$3,246,000	$239,000	$0

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	LS-01	**Project Cost (Current Dollars):**	$ 148,000	
Project Name:	Yew Avenue Pump Station Pump Upgrade	**Project Cost (Future Dollars):**	$ 152,440	
Facility Type:	Lift Station	**Project Timing:**	2025 to 2025	
Developer Share:		**Inflation Rate:**	3%	

Go to CIP Summary

Project Description:

This project will increase the pumping capacity of the existing Yew Avenue Pump Station to handle future service needs. The existing pump station capacity is 434 gallons per minute (GPM). Installing new 14 horsepower pumps will increase capacity to 560 GPM. This pump upgrade will provide the required 390 GPM capacity that the City is obligated to reserve for DSL per an annexation agreement.

Project Cost Estimate (Current Dollars):

Project Element	Quantity	Unit	Unit Cost (Dollars/Unit)	Subtotal	City Admin	Constuction	Engineering	Scope Contingency	Total Cost (Current Dollars)
					20%	25%	20%	20%	
14 Hp Pump	2	EA	$ 40,000	$ 80,000	$ 16,000	$ 20,000	$ 16,000	$ 16,000	$ 148,000

Total Project Cost (Current Dollars)	**$ 148,000**

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	LS-01	**Project Cost (Current Dollars):**	$ 148,000
Project Name:	Yew Avenue Pump Station Pump Upgrade	**Project Cost (Future Dollars):**	$ 152,440
Facility Type:	Lift Station	**Project Timing:**	2025 to 2025
Developer Share:	0	**Inflation Rate:**	3%

Go to CIP Summary

Cost Allocation:

Project Type	Percent	Cost
Expansion:	0%	$ -
Improvement:	100%	$ 148,000
General Programmatic	0%	$ -
Total Project Cost	100%	$ 148,000

Project Timing:

Project Element	Timing	Project Cost (Current Dollars)	Project Cost (Future Dollars)
14 Hp Pump	2025	$ 148,000	$ 152,440
		$ -	$ -
		$ -	$ -
Total Project Cost		**$ 148,000**	**$ 152,440**

Project Location:



Notes:

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	LS-02	**Project Cost (Current Dollars):**	$ 2,405,000
Project Name:	Yew Avenue Pump Station Upgrade	**Project Cost (Future Dollars):**	$ 2,957,847
Facility Type:	Lift Station	**Project Timing:**	2031 to 2031
Developer Share:		**Inflation Rate:**	3%

Go to CIP Summary

Project Description:

This project will increase the firm capacity to 2.1 million gallons per day and improve the reliability of the Yew Avenue Pump Station to handle future service needs. The project focuses on upsizing the capacity at the station without having to modify the existing forcemain. This upgrade includes an entirely new lift station (wetwell, pumps, and control panel). Other projects are associated with the overall eastside capacity improvements, including P-02. This will help balance the overall network and limit flows directed to the Yew Avenue Lift Station, and reduce impacts on the downstream system.

Project Cost Estimate (Current Dollars):

Project Element	Quantity	Unit	Unit Cost (Dollars/Unit)	Subtotal	City Admin	Constuction	Engineering	Scope Contingency	Total Cost (Current Dollars)
					20%	25%	20%	20%	
Yew Avenue Lift Station Upgrade	1	LS	$ 1,300,000	$ 1,300,000	$ 260,000	$ 325,000	$ 260,000	$ 260,000	$ 2,405,000

Total Project Cost (Current Dollars)	**$ 2,405,000**

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	LS-02	**Project Cost (Current Dollars):**	$ 2,405,000
Project Name:	Yew Avenue Pump Station Upgrade	**Project Cost (Future Dollars):**	$ 2,957,847
Facility Type:	Lift Station	**Project Timing:**	2031 to 2031
Developer Share:	0	**Inflation Rate:**	3%

Go to CIP Summary

Cost Allocation:

Project Type	Percent	Cost
Expansion:	0%	$ -
Improvement:	100%	$ 2,405,000
General Programmatic	0%	$ -
Total Project Cost	100%	$ 2,405,000

Project Timing:

Project Element	Timing	Project Cost (Current Dollars)	Project Cost (Future Dollars)
Yew Avenue Lift Station Upgrade	2031	$ 2,405,000	$ 2,957,847
		$ -	$ -
		$ -	$ -
Total Project Cost		**$ 2,405,000**	**$ 2,957,847**

Project Location:



Notes:

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	LS-03	**Project Cost (Current Dollars):**	$ 1,692,750
Project Name:	Wrap Lift Station	**Project Cost (Future Dollars):**	$ 2,637,249
Facility Type:	Lift Station	**Project Timing:**	Long-term
Developer Share:		**Inflation Rate:**	3%

Go to CIP Summary

Project Description:

The West Redmond Area Plan (WRAP) Pump Station will convey flows from the lowest point of the WRAP area to the existing 19th Street Interceptor at the intersection of N.W. 27th Street and N.W. Elm Avenue. The needed firm capacity of the pump station was determined by using the contributing drainage area of approximately 475 acres (including the new Feather Ridge development) and the flow factor for Medium Density Residential of 790 gallons per acre per day. Finally, based on City standards for flows less than 1 million gallons per day, a peak hourly flow factor of 3.0 was used. With this criteria, the pump station firm capacity of approximately 800 gallons per minute is determined. To convey the estimated flow, an 8-inch forcemain will be needed. The firm capacity should be re-evaluated once a more comprehensive regional master plan for the area is developed per the proposed land use type and associated area.

Project Cost Estimate (Current Dollars):

Project Element	Quantity	Unit	Unit Cost (Dollars/Unit)	Subtotal	City Admin	Constuction	Engineering	Scope Contingency	Total Cost (Current Dollars)
					20%	25%	20%	20%	
Wrap Lift Station Upgrade	1	LS	$ 915,000	$ 915,000	$ 183,000	$ 228,750	$ 183,000	$ 183,000	$ 1,692,750

Total Project Cost (Current Dollars)	**$ 1,692,750**

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	LS-03	**Project Cost (Current Dollars):**	$ 1,692,750
Project Name:	Wrap Lift Station	**Project Cost (Future Dollars):**	$ 2,637,249
Facility Type:	Lift Station	**Project Timing:**	Long-term
Developer Share:	0	**Inflation Rate:**	3%

Go to CIP Summary

Cost Allocation:

Project Type	Percent	Cost
Expansion:	100%	$ 1,692,750
Improvement:	0%	$ -
General Programmatic	0%	$ -
Total Project Cost	100%	$ 1,692,750

Project Timing:

Project Element	Timing	Project Cost (Current Dollars)	Project Cost (Future Dollars)
Wrap Lift Station Upgrade	Long-term	$ 1,692,750	$ 2,637,249
		$ -	$ -
		$ -	$ -
Total Project Cost		**$ 1,692,750**	**$ 2,637,249**

Project Location:



Notes:

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-01	**Project Cost (Current Dollars):**	$ 1,979,500
Project Name:	Black Butte Trunk Sanitary Sewer Main Replacement	**Project Cost (Future Dollars):**	$ 2,038,885
Facility Type:	Pipe	**Project Timing:**	2025 to 2025
Developer Share:		**Inflation Rate:**	3%

Go to CIP Summary

Project Description:

This project will replace the Black Butte sewer main to help serve anticipated growth in the area. The existing pipeline will be upgraded to a larger diameter main to increase capacity and ensure reliable wastewater conveyance. The existing 12-inch pipe has a capacity of 1.2 million gallons per day (MGD), and surcharging that exceeds the City's criteria is experienced at 1.6 MGD. The City will complete flow monitoring at MH0295 to monitor the timing of this project.

Project Cost Estimate (Current Dollars):

Project Element	Quantity	Unit	Unit Cost (Dollars/Unit)	Subtotal	City Admin	Constuction	Engineering	Scope Contingency	Total Cost (Current Dollars)
					20%	25%	20%	20%	
1-2, Replace 12" to new 15" SS 5'-10' deep	800	LF	$ 350	$ 280,000	$ 56,000	$ 70,000	$ 56,000	$ 56,000	$ 518,000
3-4, Replace 12" to new 15" SS 5'-10' deep in ROW	600	LF	$ 425	$ 255,000	$ 51,000	$ 63,750	$ 51,000	$ 51,000	$ 471,750
4-5, Replace 12" to new 15" SS 10'-15' deep in ROW	400	LF	$ 700	$ 280,000	$ 56,000	$ 70,000	$ 56,000	$ 56,000	$ 518,000
6-7, Replace 12" to new 15" SS 5'-10' deep in ROW	600	LF	$ 425	$ 255,000	$ 51,000	$ 63,750	$ 51,000	$ 51,000	$ 471,750
Total Project Cost (Current Dollars)									**$ 1,979,500**

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-01	**Project Cost (Current Dollars):**	$	1,979,500	**Go to CIP Summary**
Project Name:	Black Butte Trunk Sanitary Sewer Main Replacement	**Project Cost (Future Dollars):**	$	2,038,885	
Facility Type:	Pipe	**Project Timing:**	2025 to 2025		
Developer Share:	0	**Inflation Rate:**		3%	

Cost Allocation:

Project Type	Percent	Cost
Expansion:	0%	$ -
Improvement:	100%	$ 1,979,500
General Programmatic	0%	$ -
Total Project Cost	100%	**$ 1,979,500**

Project Timing:

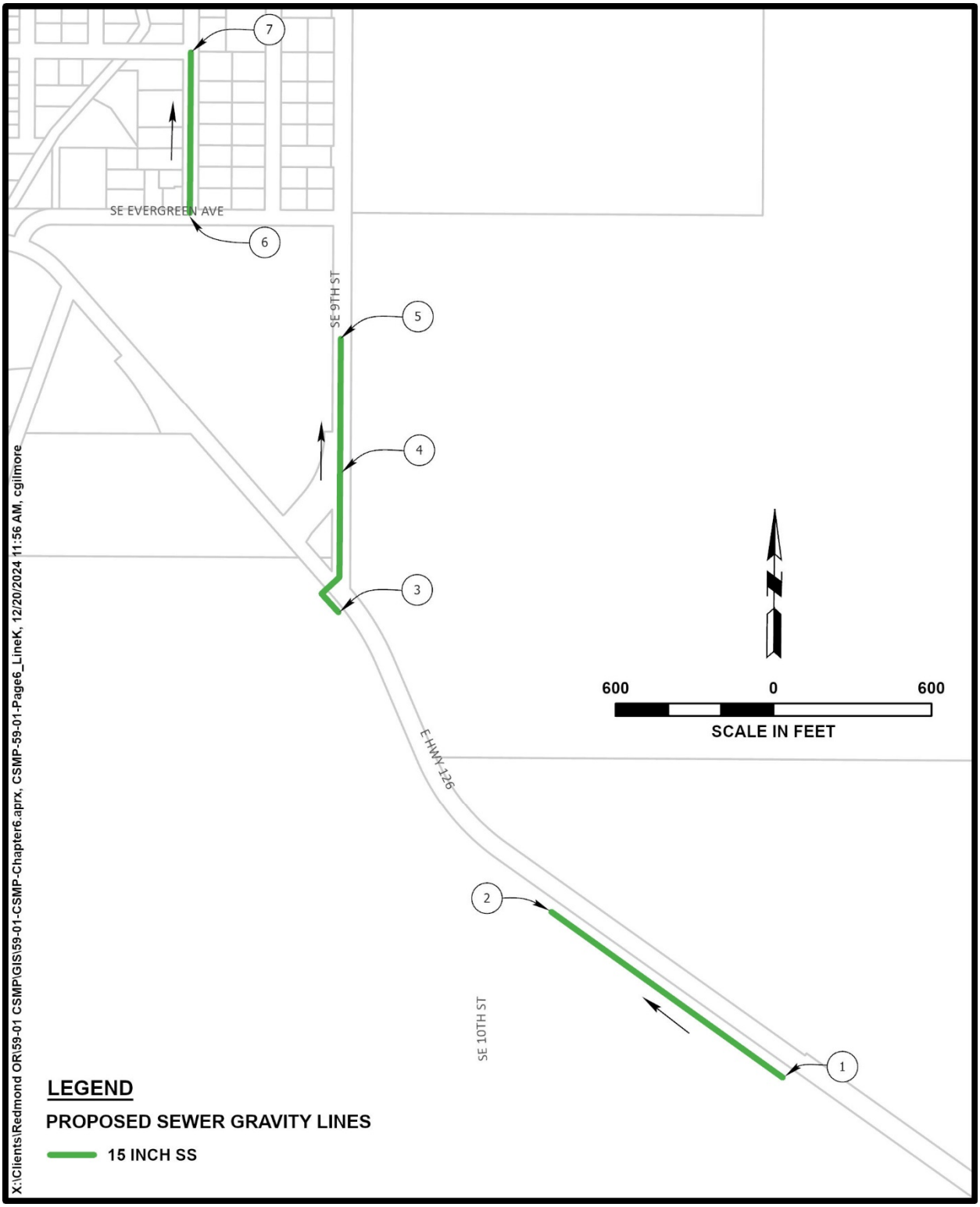
Project Element	Timing	Project Cost	Project Cost
1-2, Replace 12" to new 15" SS 5'-10' deep	2025	$ 518,000	$ 533,540
3-4, Replace 12" to new 15" SS 5'-10' deep in ROW	2025	$ 471,750	$ 485,903
4-5, Replace 12" to new 15" SS 10'-15' deep in ROW	2025	$ 518,000	$ 533,540
6-7, Replace 12" to new 15" SS 5'-10' deep in ROW	2025	$ 471,750	$ 485,903
Total Project Cost		**$ 1,979,500**	**$ 2,038,885**

Project Location:



Notes:

See attached map.



P-01 Project Location

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-02	**Project Cost (Current Dollars):**	$ 11,927,875
Project Name:	East Spruce Interceptor (Yew Avenue Alternative 2)	**Project Cost (Future Dollars):**	$ 14,669,782
Facility Type:	Pipe	**Project Timing:**	2031 to 2031
Developer Share:		**Inflation Rate:**	3%

Go to CIP Summary

Project Description:

The East Spruce Interceptor project is designed to handle increased flow from future growth in the southeast part of the service area. This new interceptor will accommodate flows diverted from the Yew Avenue Pump Station as part of a broader system improvement effort. By constructing the East Spuce Interceptor, capacity projects in the existing system downstream of Yew Avenue Lift Station are avoided. The East Spruce Interceptor is a critical step in ensuring the wastewater system can meet the demands of a growing community while maintaining reliable service.

Project Cost Estimate (Current Dollars):

Project Element	Quantity	Unit	Unit Cost (Dollars/Unit)	Subtotal	City Admin	Constuction	Engineering	Scope Contingency	Total Cost (Current Dollars)
					20%	25%	20%	20%	
1-2, New 15" SS 5'-10' deep in ROW	10,650	LF	$ 450	$ 4,792,500	$ 958,500	$ 1,198,125	$ 958,500	$ 958,500	$ 8,866,125
2-3, New 18" SS 5'-10' deep in ROW	1,560	LF	$ 525	$ 819,000	$ 163,800	$ 204,750	$ 163,800	$ 163,800	$ 1,515,150
3-4, New 21" SS 5'-10' deep in ROW	1,200	LF	$ 600	$ 720,000	$ 144,000	$ 180,000	$ 144,000	$ 144,000	$ 1,332,000
4-end, New 24" SS 5'-10' deep in ROW	160	LF	$ 725	$ 116,000	$ 23,200	$ 29,000	$ 23,200	$ 23,200	$ 214,600
Total Project Cost (Current Dollars)									**$ 11,927,875**

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-02	**Project Cost (Current Dollars):**	$ 11,927,875	**Go to CIP Summary**
Project Name:	East Spruce Interceptor (Yew Avenue Alternative 2)	**Project Cost (Future Dollars):**	$ 14,669,782	
Facility Type:	Pipe	**Project Timing:**	2031 to 2031	
Developer Share:	0	**Inflation Rate:**	3%	

Cost Allocation:

Project Type	Percent	Cost
Expansion:	100%	$ 11,927,875
Improvement:	0%	$ -
General Programmatic	0%	$ -
Total Project Cost	100%	**$ 11,927,875**

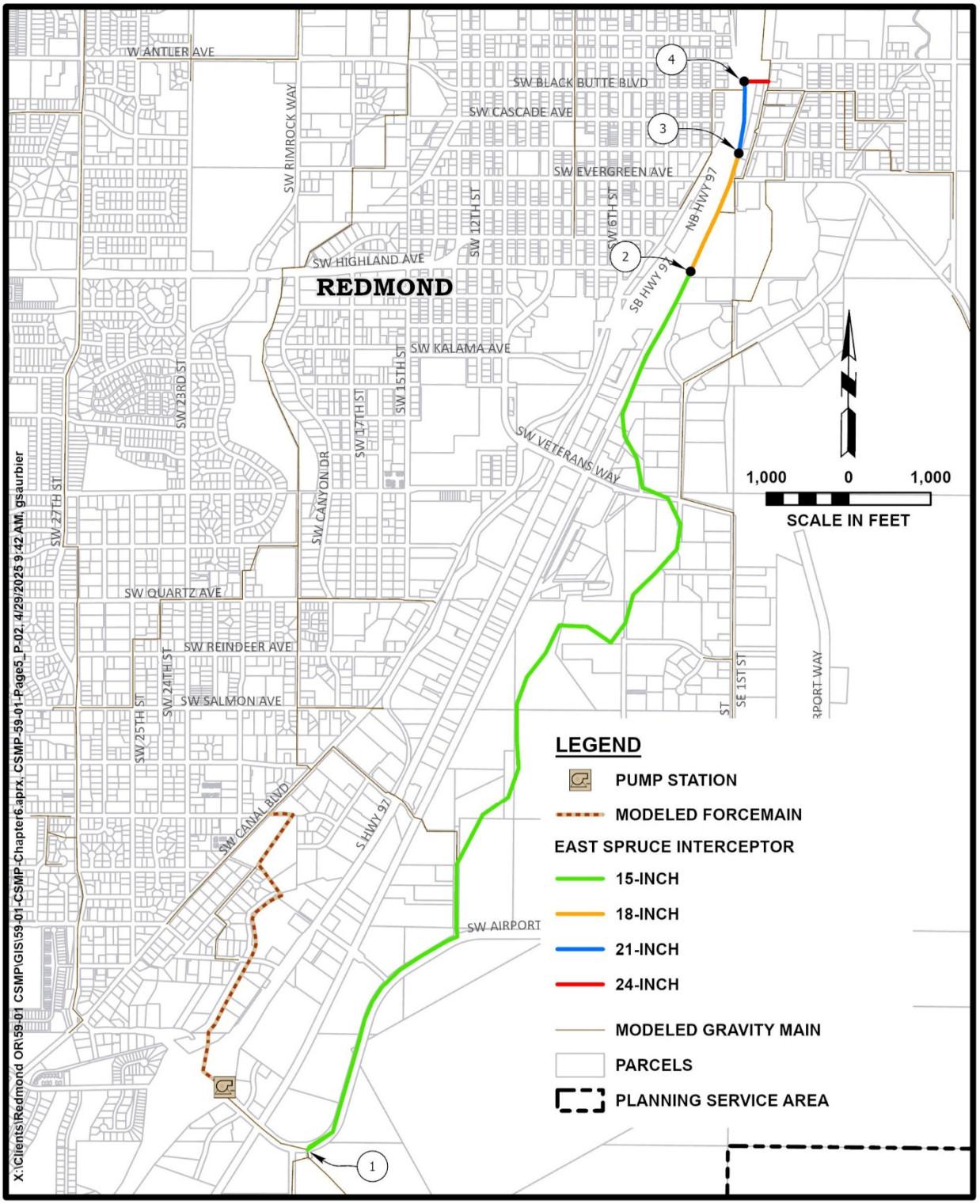
Project Timing:

Project Element	Timing	Project Cost (Current Dollars)	Project Cost (Future Dollars)
1-2, New 15" SS 5'-10' deep in ROW	2031	$ 8,866,125	$ 10,904,215
2-3, New 18" SS 5'-10' deep in ROW	2031	$ 1,515,150	$ 1,863,443
3-4, New 21" SS 5'-10' deep in ROW	2031	$ 1,332,000	$ 1,638,192
4-end, New 24" SS 5'-10' deep in ROW	2031	$ 214,600	$ 263,931
Total Project Cost		**$ 11,927,875**	**$ 14,669,782**

Project Location:

Notes:

See attached map.



P-02 Project Location

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-03	**Project Cost (Current Dollars):**	$ 30,816,375
Project Name:	Obsidian Interceptor	**Project Cost (Future Dollars):**	$ 37,900,254
Facility Type:	Pipe	**Project Timing:**	2031 to 2031
Developer Share:		**Inflation Rate:**	3%

Go to CIP Summary

Project Description:

The Obsidian Interceptor will convey flows from the southwest area of the system to the existing Cascade Trunk at the intersection of S.W. Obsidian Avenue and S.W. 35th Street. The proposed interceptor will provide gravity sewer to most areas within the southwest service area, except for the new Feather Ridge development.
Just upstream of S.W. Obsidian Avenue, the collector sewer follows the UGB. Along S.W. Obsidian Avenue, the interceptor will be constructed within the road embankment and in some areas higher than the adjacent grade beyond the road embankment. This is necessary to connect to the existing system due to the invert elevation of the existing manhole on the Cascade Trunk. It should be noted that the Obsidian Interceptor along S.W. Obsidian Avenue will be shallow in places and may require either controlled density fill or the raising of S.W. Obsidian Avenue embankment where the minimum pipe cover cannot be met under the existing grades. There may also be conflicts with existing culverts that must be addressed prior to design and implementation of the interceptor sewer.

Project Cost Estimate (Current Dollars):

Project Element	Quantity	Unit	Unit Cost ($/Unit)	Subtotal	City Admin	Constuction	Engineering	Scope Contingency	Total Cost (Current Dollars)
					20%	25%	20%	20%	
1-2, New 15" SS >20' deep in ROW	3,900	LF	$ 1,375	$ 5,362,500	$ 1,072,500	$ 1,340,625	$ 1,072,500	$ 1,072,500	$ 9,920,625
2-3, New 15" SS 10'-15' deep	1,400	LF	$ 600	$ 840,000	$ 168,000	$ 210,000	$ 168,000	$ 168,000	$ 1,554,000
3-4, New 15" SS 5'-10' deep	5,400	LF	$ 400	$ 2,160,000	$ 432,000	$ 540,000	$ 432,000	$ 432,000	$ 3,996,000
4-5, New 12" SS 15'-20' deep in ROW	2,100	LF	$ 925	$ 1,942,500	$ 388,500	$ 485,625	$ 388,500	$ 388,500	$ 3,593,625
5-6, New 12" SS 15'-20' deep in ROW	2,200	LF	$ 925	$ 2,035,000	$ 407,000	$ 508,750	$ 407,000	$ 407,000	$ 3,764,750
6-7, New 12" SS 15'-20' deep	3,200	LF	$ 775	$ 2,480,000	$ 496,000	$ 620,000	$ 496,000	$ 496,000	$ 4,588,000
7-8, New 10" SS 15'-20' deep in ROW	2,100	LF	$ 875	$ 1,837,500	$ 367,500	$ 459,375	$ 367,500	$ 367,500	$ 3,399,375
Total Project Cost (Current Dollars)									**$ 30,816,375**

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-03	**Project Cost (Current Dollars):**	$ 30,816,375	**Go to CIP Summary**
Project Name:	Obsidian Interceptor	**Project Cost (Future Dollars):**	$ 37,900,254	
Facility Type:	Pipe	**Project Timing:**	2031 to 2031	
Developer Share:	0	**Inflation Rate:**	3%	

Cost Allocation:

Project Type	Percent	Cost
Expansion:	100%	$ 30,816,375
Improvement:	0%	$ -
General Programmatic	0%	$ -
Total Project Cost	100%	**$ 30,816,375**

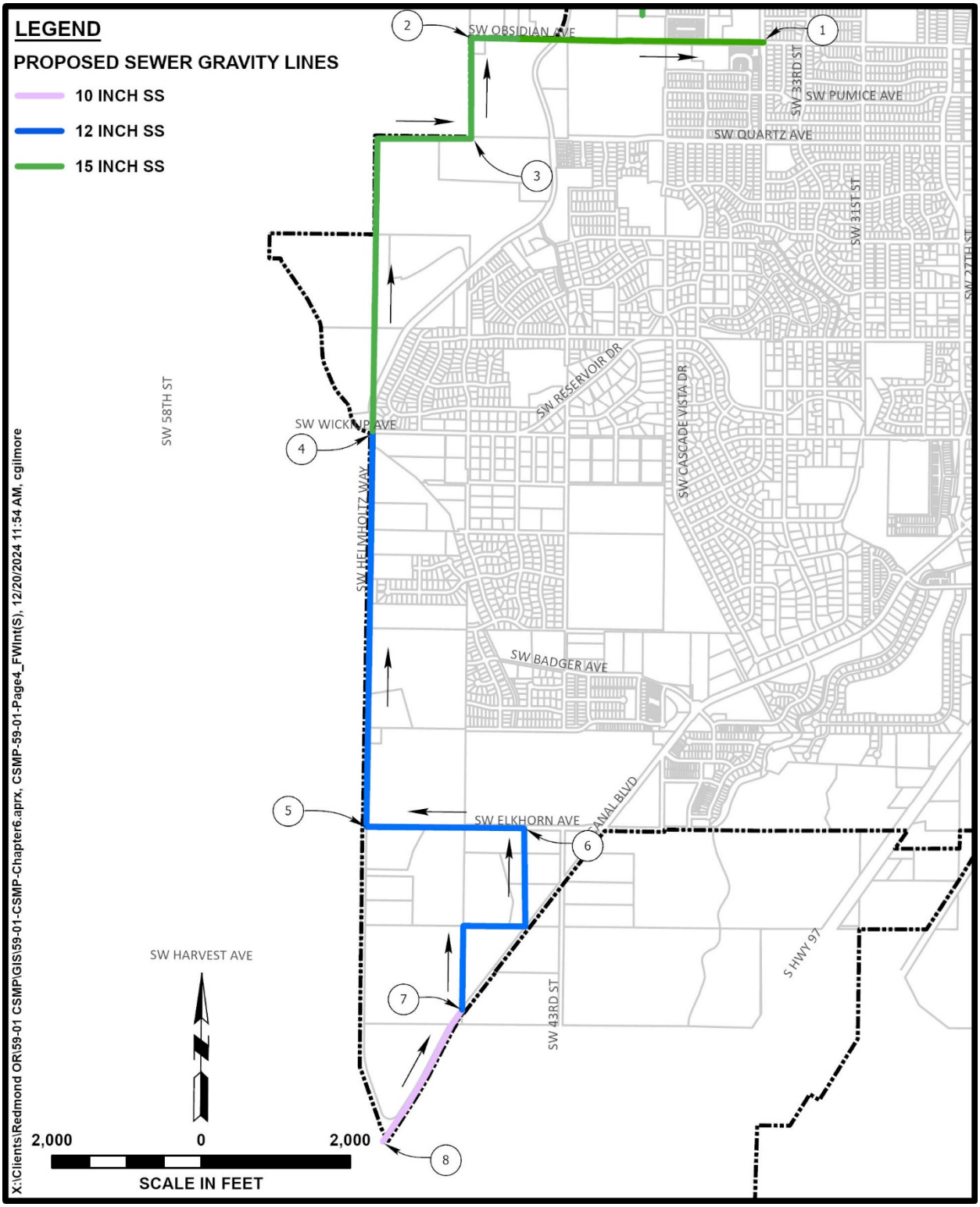
Project Timing:

Project Element	Timing	Project Cost (Current $)	Project Cost (Future $)
1-2, New 15" SS >20' deep in ROW	2031	$ 9,920,625	$ 12,201,117
2-3, New 15" SS 10'-15' deep	2031	$ 1,554,000	$ 1,911,224
3-4, New 15" SS 5'-10' deep	2031	$ 3,996,000	$ 4,914,576
4-5, New 12" SS 15'-20' deep in ROW	2031	$ 3,593,625	$ 4,419,705
5-6, New 12" SS 15'-20' deep in ROW	2031	$ 3,764,750	$ 4,630,168
6-7, New 12" SS 15'-20' deep	2031	$ 4,588,000	$ 5,642,661
7-8, New 10" SS 15'-20' deep in ROW	2031	$ 3,399,375	$ 4,180,802
Total Project Cost		**$ 30,816,375**	**$ 37,900,254**

Project Location:



Notes:
See attached map.



P-03 Project Location

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-04	**Project Cost (Current Dollars):**	$ 8,182,781
Project Name:	Wrap Collector	**Project Cost (Future Dollars):**	$ 12,748,507
Facility Type:	Pipe	**Project Timing:**	Long-term
Developer Share:		**Inflation Rate:**	3%

Go to CIP Summary

Project Description:

The West Redmond Area Plan (WRAP) Collector will convey flows from the Feather Ridge development (under construction when this Wastewater Collection System Master Plan was developed) and the WRAP area to the proposed WRAP Pump Station. The WRAP Collector alignment will follow a low-lying canyon through the area. While the alignment will be close to the center of the WRAP area, with respect to east to west, the alignment deviates from the center of the WRAP to remain within the natural low point of the area and avoid excessively deep sewer lines. For the proposed collector to be in the center of the WRAP area, excessive earthwork and/or excessively deep sewer lines would be needed, which would be cost-prohibitive.

Project Cost Estimate (Current Dollars):

Project Element	Quantity	Unit	Unit Cost (Dollars/Unit)	Subtotal	City Admin	Constuction	Engineering	Scope Contingency	Total Cost (Current Dollars)
					20%	25%	20%	20%	
1-5, New 8" PS 5'-10' deep	3,750	LF	$ 175	$ 656,250	$ 131,250	$ 164,063	$ 131,250	$ 131,250	$ 1,214,063
5-6, New 8" PS 5'-10' deep	1,350	LF	$ 175	$ 236,250	$ 47,250	$ 59,063	$ 47,250	$ 47,250	$ 437,063
1-2, New 18" SS 5'-10' deep	2,925	LF	$ 450	$ 1,316,250	$ 263,250	$ 329,063	$ 263,250	$ 263,250	$ 2,435,063
2-3, New 15" SS 5'-10' deep	2,700	LF	$ 400	$ 1,080,000	$ 216,000	$ 270,000	$ 216,000	$ 216,000	$ 1,998,000
3-4, New 12" SS 5'-10' deep	3,025	LF	$ 375	$ 1,134,375	$ 226,875	$ 283,594	$ 226,875	$ 226,875	$ 2,098,594
Total Project Cost (Current Dollars)									**$ 8,182,781**

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-04	**Project Cost (Current Dollars):**	$ 8,182,781
Project Name:	Wrap Collector	**Project Cost (Future Dollars):**	$ 12,748,507
Facility Type:	Pipe	**Project Timing:**	Long-term
Developer Share:	0	**Inflation Rate:**	3%

Go to CIP Summary

Cost Allocation:

Project Type	Percent	Cost
Expansion:	100%	$ 8,182,781
Improvement:	0%	$ -
General Programmatic	0%	$ -
Total Project Cost	100%	**$ 8,182,781**

Project Timing:

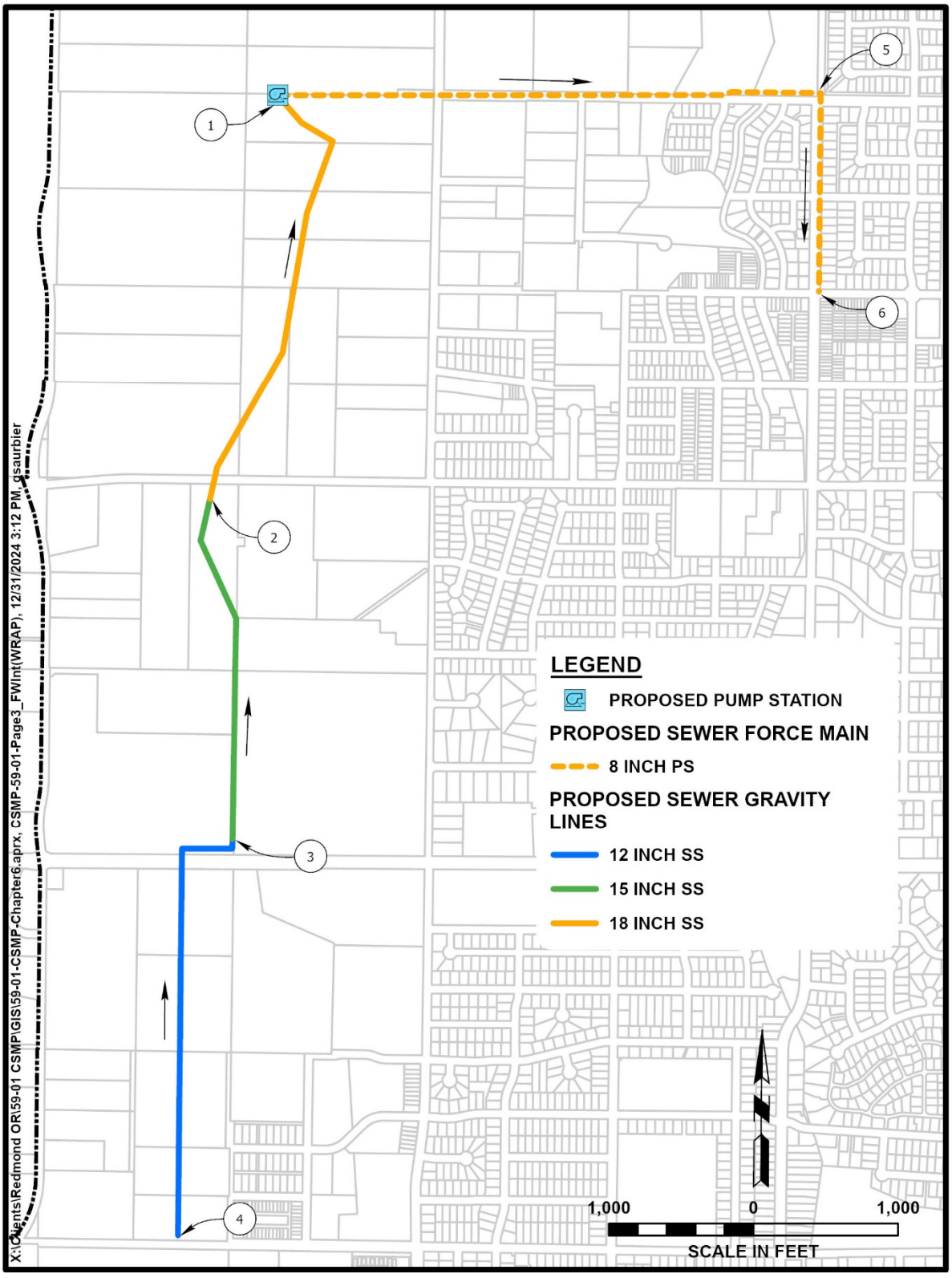
Project Element	Timing	Project Cost (Current Dollars)	Project Cost (Future Dollars)
1-5, New 8" PS 5'-10' deep	Long-term	$ 1,214,063	$ 1,891,470
5-6, New 8" PS 5'-10' deep	Long-term	$ 437,063	$ 680,929
1-2, New 18" SS 5'-10' deep	Long-term	$ 2,435,063	$ 3,793,748
2-3, New 15" SS 5'-10' deep	Long-term	$ 1,998,000	$ 3,112,819
3-4, New 12" SS 5'-10' deep	Long-term	$ 2,098,594	$ 3,269,541
Total Project Cost		**$ 8,182,781**	**$ 12,748,507**

Project Location:



Notes:

See attached map.



P-04 Project Location

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-05	**Project Cost (Current Dollars):**	$ 9,052,281
Project Name:	West Spruce Interceptor (2007 Far West Interceptor)	**Project Cost (Future Dollars):**	$ 14,103,159
Facility Type:	Pipe	**Project Timing:**	Long-term
Developer Share:		**Inflation Rate:**	3%

Go to CIP Summary

Project Description:

The West Spruce Interceptor project will convey flows from the northwest area of the service area and connect to the existing West Spruce Interceptor. The alignment aims to maximize the service area without resulting in an excessively deep sewer (greater than 25 feet deep). Generally, the West Spruce Interceptor will only provide service to those areas located southeast of the pipe alignment. As the natural topography along the West Spruce Interceptor is to the northwest, the majority of those areas northwest of the alignment are too low in elevation to be served by the West Spruce Interceptor. Individual grinder pump stations or a regional pump station would be required in this area if the service area were expanded.

Project Cost Estimate (Current Dollars):

Project Element	Quantity	Unit	Unit Cost (Dollars/Unit)	Subtotal	City Admin	Constuction	Engineering	Scope Contingency	Total Cost (Current Dollars)
					20%	25%	20%	20%	
1-2, New 18" SS 10'-15' deep in ROW	1,300	LF	$ 725	$ 942,500	$ 188,500	$ 235,625	$ 188,500	$ 188,500	$ 1,743,625
2-3, New 18" SS 15'-20' deep in ROW	675	LF	$ 925	$ 624,375	$ 124,875	$ 156,094	$ 124,875	$ 124,875	$ 1,155,094
3-4, New 18" SS 5'-10' deep in ROW	950	LF	$ 450	$ 427,500	$ 85,500	$ 106,875	$ 85,500	$ 85,500	$ 790,875
4-5, New 15" SS 10'-15' deep in ROW	1,500	LF	$ 600	$ 900,000	$ 180,000	$ 225,000	$ 180,000	$ 180,000	$ 1,665,000
5-6, New 15" SS 5'-10' deep in ROW	450	LF	$ 450	$ 202,500	$ 40,500	$ 50,625	$ 40,500	$ 40,500	$ 374,625
6-7, New 15" SS 5'-10' deep in ROW	1,325	LF	$ 450	$ 596,250	$ 119,250	$ 149,063	$ 119,250	$ 119,250	$ 1,103,063
7-8, New 12" SS 10'-15' deep in ROW	2,000	LF	$ 600	$ 1,200,000	$ 240,000	$ 300,000	$ 240,000	$ 240,000	$ 2,220,000
Total Project Cost (Current Dollars)									**$ 9,052,281**

City of Redmond
2024 Wastewater Collection System Master Plan
Capital Improvement Plan

Project ID:	P-05	**Project Cost (Current Dollars):**	$ 9,052,281	**Go to CIP Summary**
Project Name:	West Spruce Interceptor (2007 Far West Interceptor)	**Project Cost (Future Dollars):**	$ 14,103,159	
Facility Type:	Pipe	**Project Timing:**	Long-term	
Developer Share:	0	**Inflation Rate:**	3%	

Cost Allocation:

Project Type	Percent	Cost
Expansion:	100%	$ 9,052,281
Improvement:	0%	$ -
General Programmatic	0%	$ -
Total Project Cost	100%	**$ 9,052,281**

Project Timing:

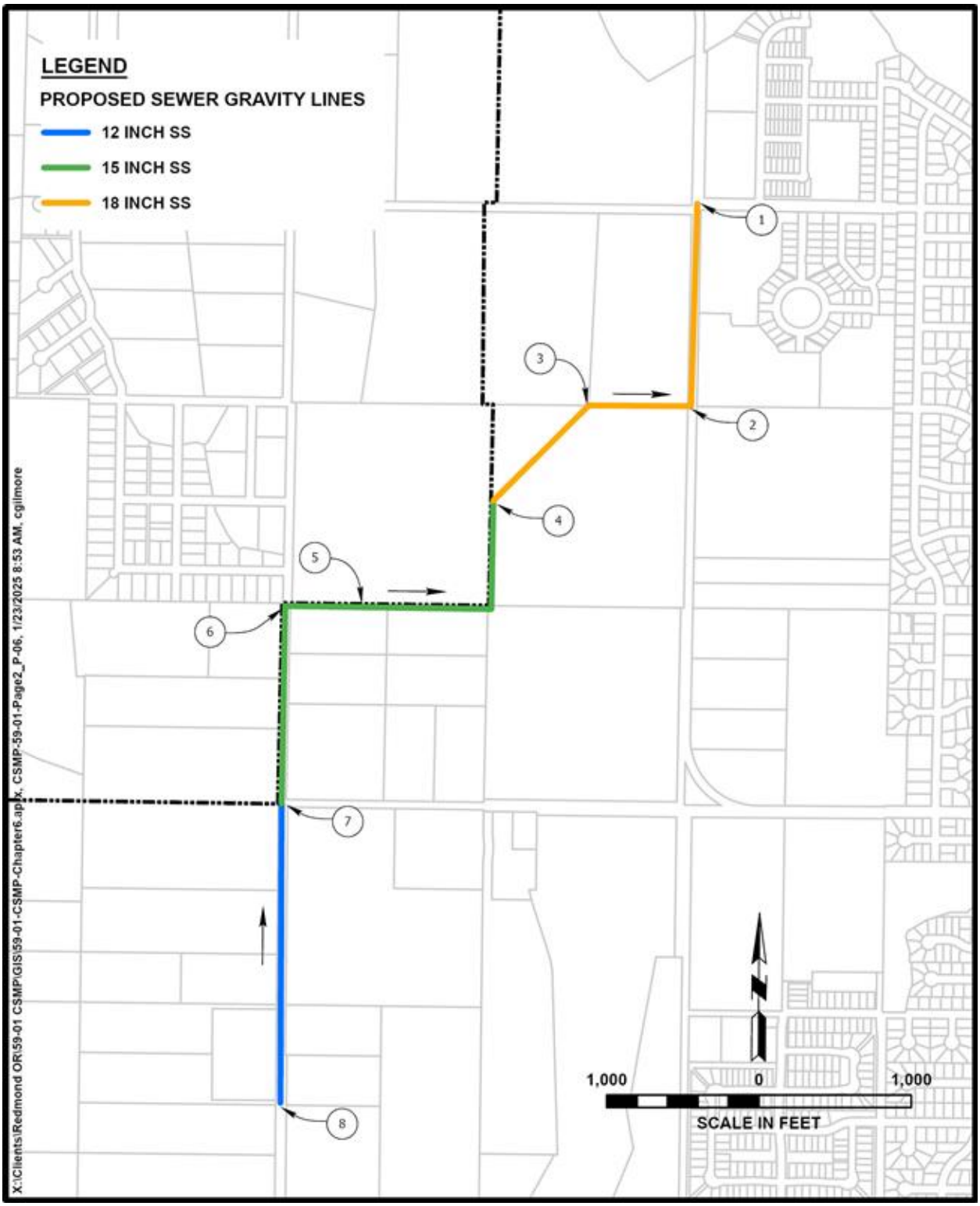
Project Element	Timing	Project Cost (Current $)	Project Cost (Future $)
1-2, New 18" SS 10'-15' deep in ROW	Long-term	$ 1,743,625	$ 2,716,511
2-3, New 18" SS 15'-20' deep in ROW	Long-term	$ 1,155,094	$ 1,799,598
3-4, New 18" SS 5'-10' deep in ROW	Long-term	$ 790,875	$ 1,232,157
4-5, New 15" SS 10'-15' deep in ROW	Long-term	$ 1,665,000	$ 2,594,016
5-6, New 15" SS 5'-10' deep in ROW	Long-term	$ 374,625	$ 583,654
6-7, New 15" SS 5'-10' deep in ROW	Long-term	$ 1,103,063	$ 1,718,535
7-8, New 12" SS 10'-15' deep in ROW	Long-term	$ 2,220,000	$ 3,458,688
Total Project Cost		**$ 9,052,281**	**$ 14,103,159**

Project Location:



Notes:

See attached map.



P-05 - Project Location

EXHIBIT B

No public comments received as of publication of agenda packet (7/3/2025)