REEDSPORT RAIL CROSSING STUDY

ADOPTED FINAL

APRIL 1, 2024

REEDSPORT
Est. 1919
PROUD PAST, PROMISING FUTURE

OREGON DEPARTMENT OF TRANSPORTATION

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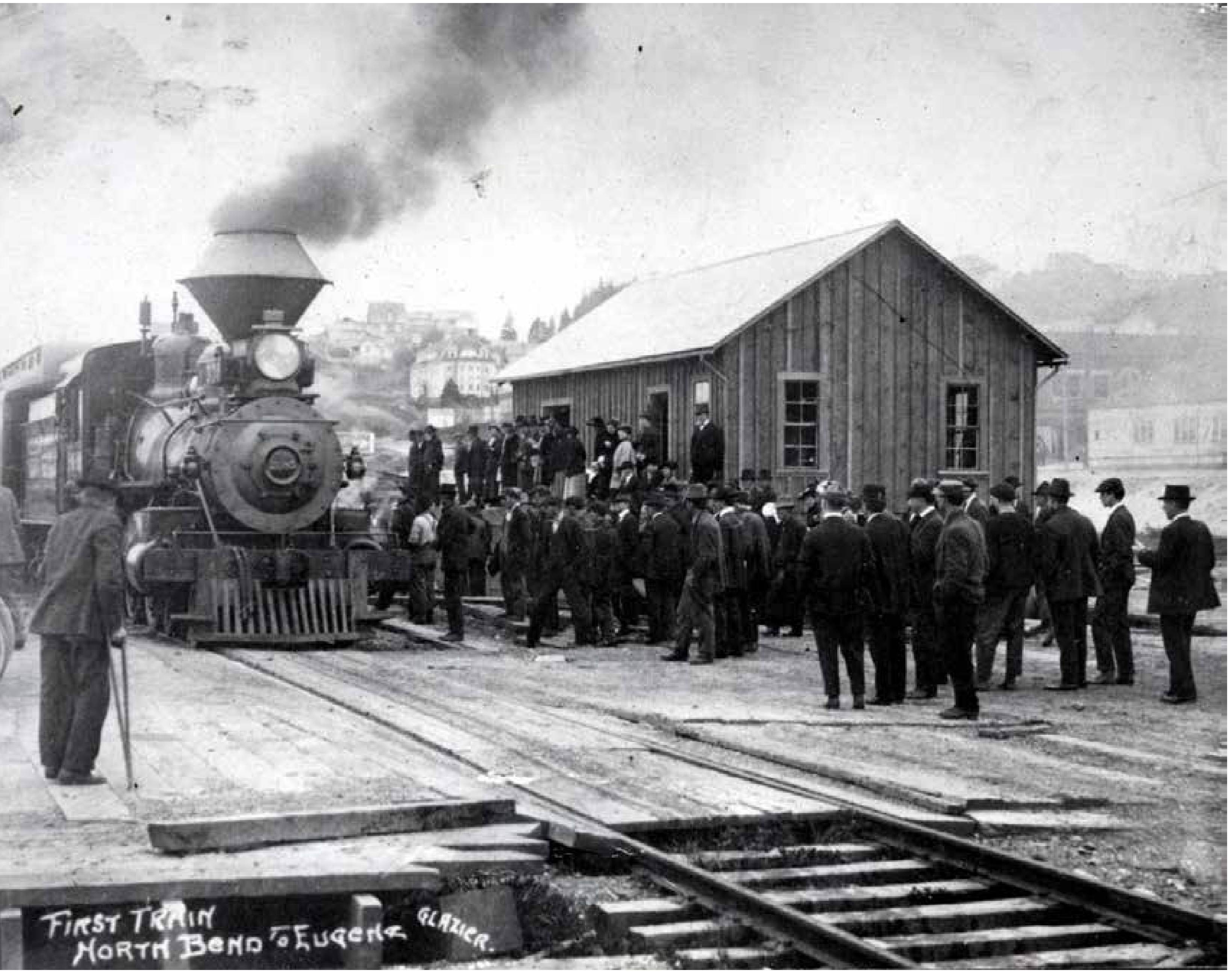
CONTENTS



The first Southern Pacific train from North Bend to Eugene leaves the station. Originally completed in 1916 as part of the Southern Pacific Railroad between Eugene and Powers, Oregon, the Coos Bay Branch was purchased in 2009 by the Port of Coos Bay and reopened in 2011 after repairs were made to the aging tunnels that led to the line's closure in 2007.

Image source: Port of Coos Bay, used by permission.

INTRODUCTION

Keeping ahead of change

The Coos Bay Rail Line is a vital economic engine in our region, moving over $460 million worth of freight annually from the Oregon International Port of Coos Bay.

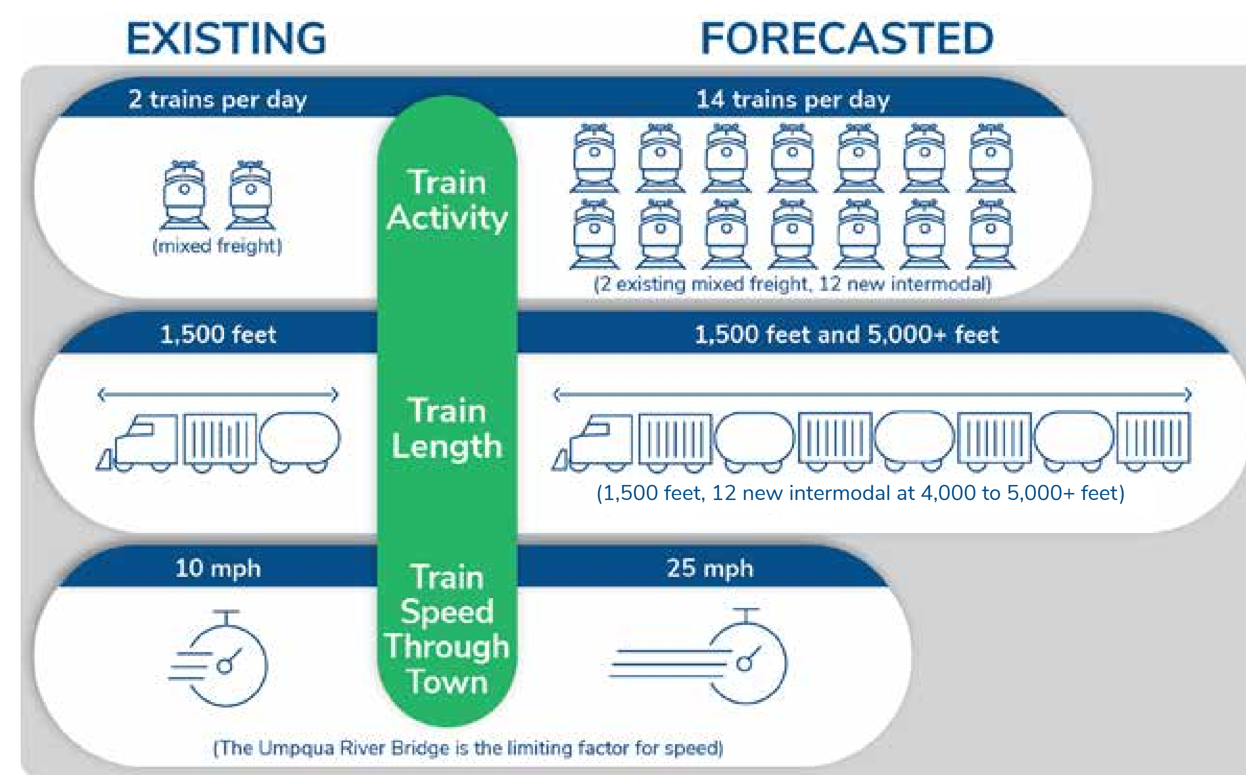
The railroad bisects downtown Reedsport and crosses both Winchester Avenue and Oregon Route 38 (OR 38, also known as Umpqua Highway) at grade rail crossings. Two trains pass through Reedsport each day.

The Port of Coos Bay plans to construct a new container terminal facility—the Pacific Coast Intermodal Port—on the North Spit in Coos Bay. It will be the first carbon-free marine terminal in the United States, and the only deep-water port between Astoria and San Francisco.

Activity at the new terminal is expected to increase the number and length of freight trains passing through Reedsport each day. It is also expected to increase jobs and economic development in the region.

The City of Reedsport and Oregon Department of Transportation (ODOT) are taking action now to stay ahead of this expected increase in freight rail traffic. The Reedsport Rail Crossing Study evaluated the potential impacts to the transportation system and improvements needed to keep people and commerce moving on OR 38 and US 101 (Oregon Coast).

Reedsport rail traffic



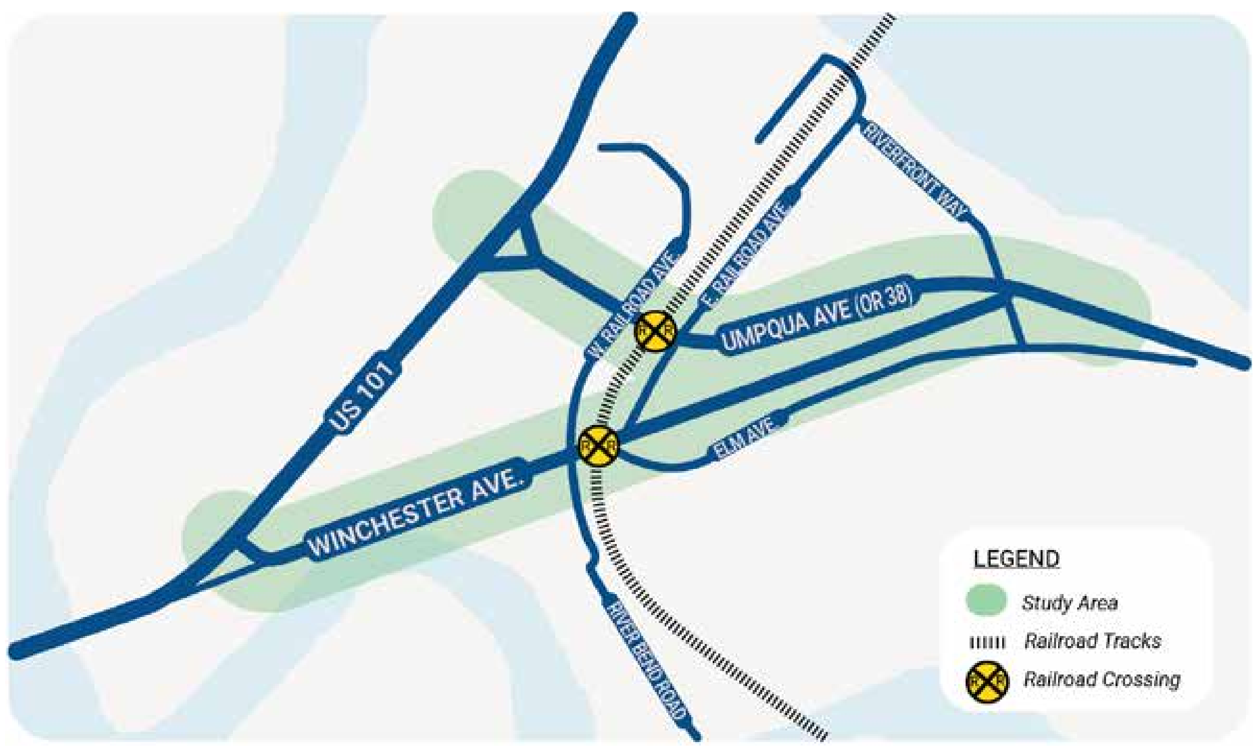
The study

The Reedsport Rail Crossing Study identified potential improvements to the existing at-grade railroad crossings at OR 38 and Winchester Avenue to help improve traffic flow, provide safe conditions for all roadway users, reduce train warning horn noise, and maintain safe operations for emergency services and stormwater controls.

The project team considered a variety of solutions to improve the railroad crossings, such as potential new crossings, converting existing at-grade roadway crossings to grade-separated overpass/underpass crossings, and upgrades to pedestrian and bicycle facilities. Some physical upgrades will enable further strategies, such as a “no-horn” quiet zone ordinance, to address the impact of increased train travel while protecting livability in Reedsport.

The project team consulted members of the public, emergency services, local business owners, the freight community, and the City of Reedsport Planning Commission and City Council for input on the improvement options. The selected improvement package responded most closely to everyone’s feedback while meeting the study’s identified Purpose and Need Statement (see page 9). This report provides details on the range of alternatives considered (page 25) and the preferred improvements (Page 33).

The study area



The study area is in eastern Reedsport, bordered by the Umpqua River to the north, Scholfield Creek to the west and south, and the OR 38/Riverfront Way and Winchester Avenue/Riverfront Way intersections to the east.

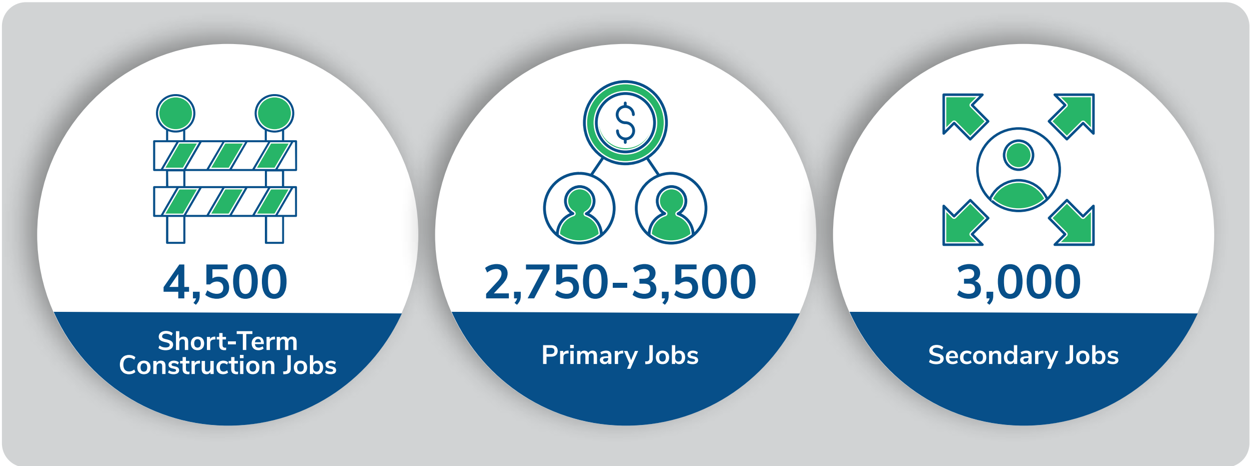
What happens next?

The Reedsport Rail Crossing Study (Study) will be adopted into the City’s Transportation System Plan (TSP) and amended into the Oregon Highway Plan (OHP) as a facility plan. The proposed projects in the study will be considered for construction if the planned container terminal receives funding to move forward. It’s anticipated that the Reedsport railroad improvements and the new terminal will be constructed simultaneously.

For a complete overview of the implementation process, see the Next Steps chapter starting on page 41.

The CBRE rail line

Jobs that the Port’s expansion is expected to create



Source: A'eron Blackman, CC BY 3.0, Wikimedia Commons

PURPOSE AND NEED

Purpose

The purpose of the study was to evaluate the impacts of the anticipated increase in rail activity on traffic operations and safety in Reedsport, and to identify potential solutions at the OR 38 and Winchester Avenue rail crossings. The study identified enhancements to the existing rail crossings, as well as other potential crossing locations, including grade separation (e.g., a roadway overpass above the rail line).

The proposed rail crossing projects will be supported by local circulation improvements to roadways, bicycle and pedestrian facilities, rail, and transit. They will also address, at a minimum, access management, access to and response times from emergency services, and stormwater controls in the study area. These projects will be adequate to support the Oregon International Port of Coos Bay container facility's development and the linked increase in activity on the Coos Bay Rail Line.

Need

The study team identified the following deficiencies based on the projected increase in traffic demand and train activity associated with the new Port facility; the existing and future conditions analysis; and feedback from the Project Advisory Committee, Project Management Team, community member interviews, and online open houses:

1 / **Rail crossing delays and access/ circulation barriers**—A 4,100-foot train traveling at 10 mph through downtown Reedsport during 30th highest hour traffic conditions will create the following operational and/or safety-related deficiencies:

- a / Eastbound vehicular queues on OR 38 will spill back into the OR 38/ US 101 intersection.
- b / Multiple cycles will be required at the OR 38/US 101 intersection to recover from the train event.
- c / Simultaneous delays of 5.5 minutes or greater will occur at the OR 38 and Winchester Avenue rail crossings. The delays will increase response times for emergency service vehicles (fire, ambulance, and police).
- d / Local circulation and access delays exceeding 60 seconds will occur at cross streets to OR 38 (i.e., Myrtle Avenue, Laurel Avenue, W Railroad Avenue, E Railroad Avenue, Fir Avenue, N 6th Street, and N 5th Street) and Winchester Avenue (i.e., N 10th Street, W Railroad Avenue-River Bend Road, Elm Avenue, E Railroad Avenue, and N 7th Street).
- e / Traffic volumes will increase on the vertically- and horizontally-restricted Port Dock Road rail undercrossing, as well as E Railroad Avenue, W Railroad Avenue, and Riverfront Way.

2 / **Increased train activity**—The forecasted increase from two to 14 trains per day is anticipated to create the following potential issues:

a / Increased probability of delays in emergency service (fire, ambulance, and police) response time to areas east and west of the rail line. The police station and downtown fire station are located east of the rail line. The hospital and Turner Fire Station (Reedsport's main fire station) are located west of the rail line, uptown.

b / Increased train horn use during school or nighttime hours, leading to quality of life concerns from nearby residents and businesses.

c / Increased pedestrian-train conflicts due to the lack of sidewalk gates on OR 38 and lack of sidewalks on Winchester Avenue.

d / Peak hour queues on OR 38 and Winchester Avenue that create local circulation and access delays at cross streets, including W Railroad Avenue, River Bend Road, Elm Avenue, and E Railroad Avenue.

e / Increased use of the Port Dock Road undercrossing and related increases in cut-through traffic on local streets that will create issues at the undercrossing as well as the OR 38/Riverfront Way-2nd Street and OR 38/US 101 intersections.

3 / **OR 38/US 101 operations**—The signalized intersection is forecasted to operate at capacity (a volume-to-capacity [v/c] ratio of 1.0) and exceed the Oregon Highway Plan mobility standard of 0.85 in Year 2045. These operations will result in decreased mobility for motorists and freight and long delays during conditions exceeding the 30th highest peak hour.

The study team focused on identifying the point at which the transportation system does not function effectively (i.e., a 4,100-foot train at 10 mph) nor meet the goals of the City of Reedsport's comprehensive plan, making mitigation necessary. The specific timing of the identified mitigation measures will be driven primarily by funding availability and the ramp up of rail operations at the proposed intermodal facility.

The factors shown in the figure at the right, "Factors that could increase or reduce needs," may further increase or reduce the needs identified above.

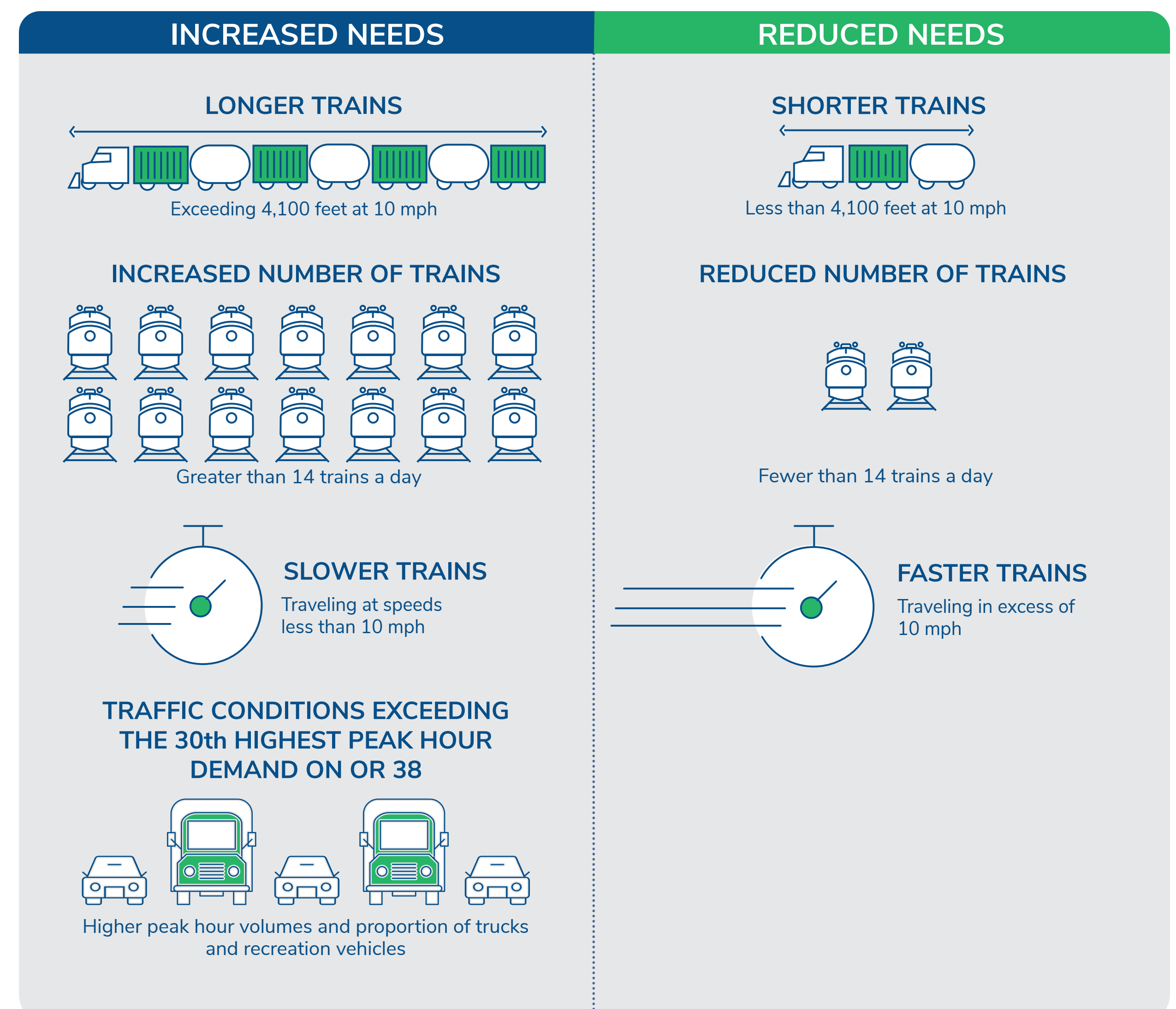
Other considerations and study assumptions:

- **Train length**—Ports and railroads are generally incentivized to transport containers via fewer and longer trains. There are operational and physical limitations to the maximum train length permitted along any railroad line. Operational limitations include the grade and horizontal curvature of the railroad alignment, which are directly related to the number and position of the locomotives required to move the train over the line segment. Additional limitations to train length are typically physical constraints such as port/dock rail capacity, upstream/downstream switching yard capacity, and rail siding lengths. **The study assumed trains will be between 4,000 and 5,000 feet in length and potentially longer.**

  The study found that a 4,100-foot (or longer) train traveling at 10 mph through downtown Reedsport will create impactive motor vehicle queues (i.e., eastbound queues that spillback into US 101), crossing delays, emergency vehicle response times, access delays, and traffic volumes on the local street system.

Source: A'eron Blackman, CC BY 3.0, Wikimedia Commons

Factors that could increase or reduce needs



Source: A'eron Blackman, CC BY 3.0, Wikimedia Commons

- **Potential for moving containers by truck versus. train**—Port facilities are generally set up to transport containers by train, truck, or a mix of modes depending on their location and proximity to population centers, and availability of trucks to support the required transit. The Port of Coos Bay's remote nature (i.e., an 80-mile drive over the Coastal Mountain Range to access the Interstate Highway System) will make it similar to the Port of Prince Rupert in British Columbia, Canada, which is primarily serviced by trains. Given the location, efficiency of rail versus truck for longer hauls, likely destination of containerized goods, and existing highway infrastructure capacity, nearly all containers will be transported by rail. **The study assumed that significant increased truck traffic through Reedsport via OR 38 and US 101 is not anticipated based on the study team's understanding of the proposed Pacific Coast Intermodal Port project**.
- **Train speed**—Due to the existing condition of and needed upgrade to the Umpqua Bridge, horizontal curvature in the rail line both upstream and downstream of Reedsport, and magnitude of funding likely needed to improve existing rail tunnels and bridges, **the study assumed that future train speeds through Reedsport are anticipated to remain in the 10 to 25 mph range**.
- **Forecasted traffic growth on OR 38 and peak season conditions**—The traffic forecasts used in the existing and future conditions analysis represent the 30th highest peak hour conditions that typically occur on an average weekday in August. The future forecasted Year 2045 traffic volumes are based on a 1 percent growth rate (23 percent total growth in traffic). While the vehicular queues and blockage delays at the OR 38 and Winchester Avenue rail crossings are primarily driven by train length and speed, traffic volumes and vehicle types play a lesser role in the overall associated delay and queuing-related impacts to the community.

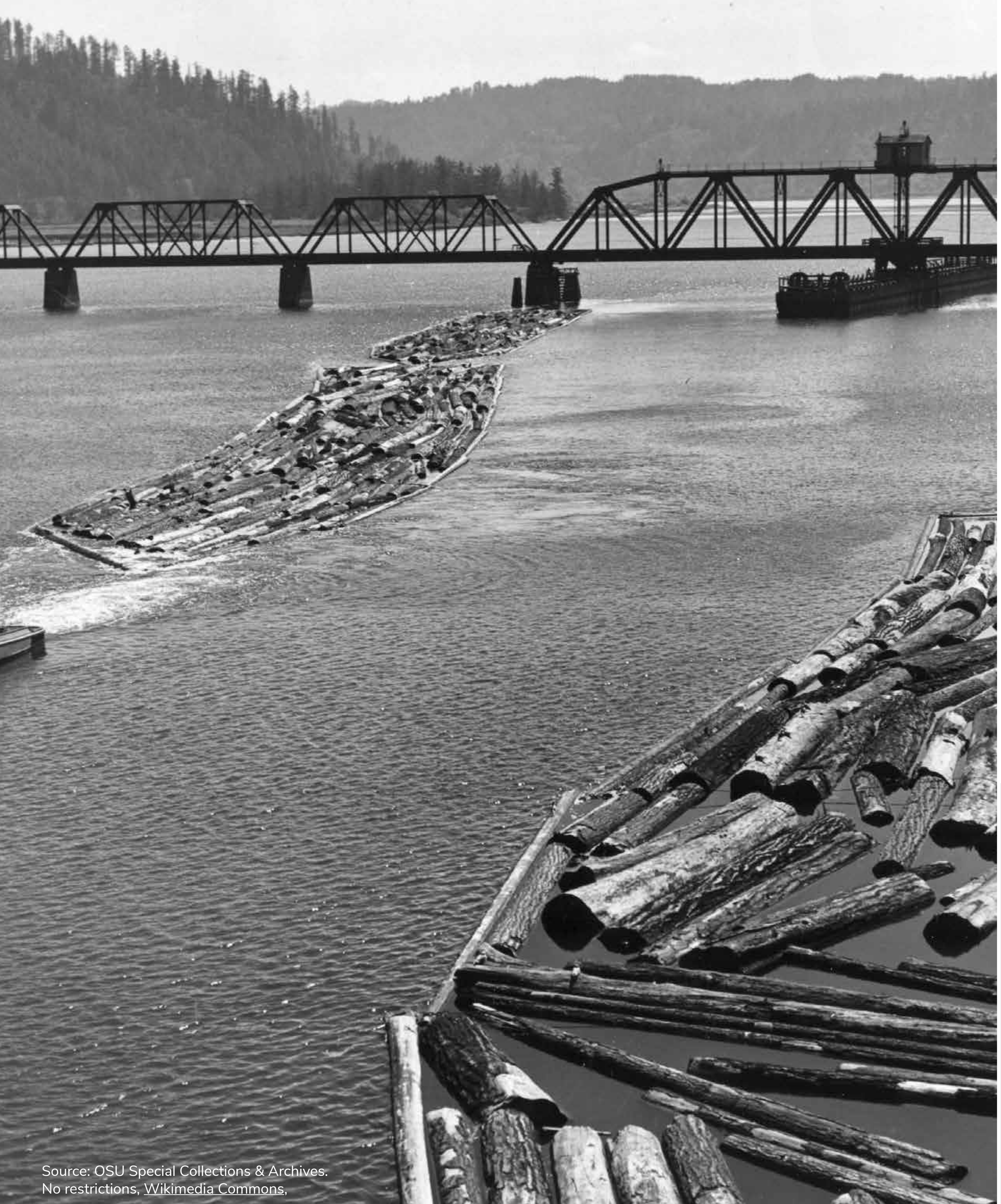
Goals and objectives

The study was guided by a set of goals and objectives based on the goals and policies in the Reedsport Comprehensive Plan and TSP, which reflect the City's vision for transportation needs over the next 20 years. Objectives associated with each goal can be found in Technical Memorandum #2 (see below).

- **Goal #1**: Develop a transportation system to enhance Reedsport's livability and meet federal, state, and local requirements.
- **Goal #2**: Create a balanced transportation system.
- **Goal #3**: Improve the safety of the transportation system.
- **Goal #4**: Develop an efficient transportation system that will handle future traffic growth.
- **Goal #5**: Provide a transportation system that is accessible to all members of the community.
- **Goal #6**: Develop a transportation system to provide for efficient freight movement.
- **Goal #7**: Create a funding system to implement the recommended transportation system improvement projects.

Want more details?

See Technical Memorandum #2: Purpose & Need, Goals, Objectives and Evaluation Criteria and Technical Memorandum #6: Alternatives Analysis



Source: OSU Special Collections & Archives.
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ENGAGING THE PUBLIC

Community voices informed every step of the study process, from initial fact-finding to selection of the set of proposed improvements and adoption of the plan by the City of Reedsport and the Oregon Transportation Commission.

Who is in the Reedsport community?

Population

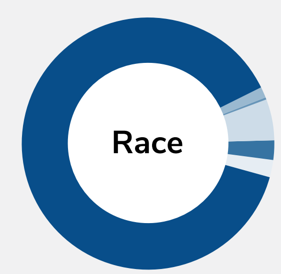
4,254

Median income

$42,340

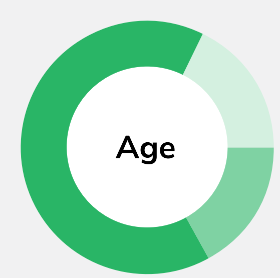
Oregon median income

$69,653



- **94%** White
- **0.1%** Black
- **1.4%** American Indian/ Native American
- **0.3%** Asian
- **5.7%** Hispanic
- **2.6%** Two or more races
- **2.2%** Other

- **47.1%** Under 18 years
- **16.6%** 18 to 64
- **8.8%** 65 years and over



- **17.1%** Children 14 and under
- **65.2%** Adults 15 to 64
- **17.7%** 65 years and over

- **95.2%** English
- **4.1%** Spanish
- **0.7%** Other

Demographic data for the City of Reedsport from the U.S. Census Bureau 2021 American Community Survey.

Key themes that emerged in discussions with community members

Among community outreach participants, there was a general familiarity and overall support for the Port's new container terminal project, specifically for the region's economic benefits. Several key themes emerged in discussions about how to prepare for this significant change.

LIVABILITY

Factors that affect community livability include noise, access, views, connectivity, and ease of use. Participants supported the proposed freight train traffic for economic development but expressed concern about the potential impacts on nearby residential areas and quality of life. The study considered potential solutions to reduce local congestion during the summertime and noise. Both of these issues will become increasingly important with any rail capacity increases.

RURAL INFRASTRUCTURE AND ROADWAY MAINTENANCE

Road conditions and maintenance are priorities for the Reedsport community. The study found that the current rail infrastructure has noticeable damage that requires upgrades for existing capacity.

ALTERNATIVE ROUTES AND VEHICLE SIZE

The study found that there are limited alternative routes to avoid the two rail crossings at OR 38 and Winchester Avenue in Reedsport. The primary alternative, Port Dock Road, is narrow and impractical for large vehicles such as emergency services, motorhomes, and recreational vehicles during seasonal traffic.

EMERGENCY SERVICES

Concern for safety and lack of alternative routes are recurring issues for emergency service vehicles such as ambulances, fire trucks, and police vehicles. The fire department detailed its strategic planning around the railroad and vehicle challenges to navigate emergency scenes around the city efficiently.

SEASONAL TRAFFIC

Reedsport experiences the highest traffic volume and congestion issues during the summer tourist season. Traffic concerns related to tourist travel in the summer include increased wait times for trains, the size of large recreational vehicles, and local congestion after the recent lane reconfiguration work on US 101.

Who participated?

110 Online open house participants

11 Survey responses

38 In-person open house

8 Local organizations interviewed

THE PROJECT ADVISORY COMMITTEE (PAC)

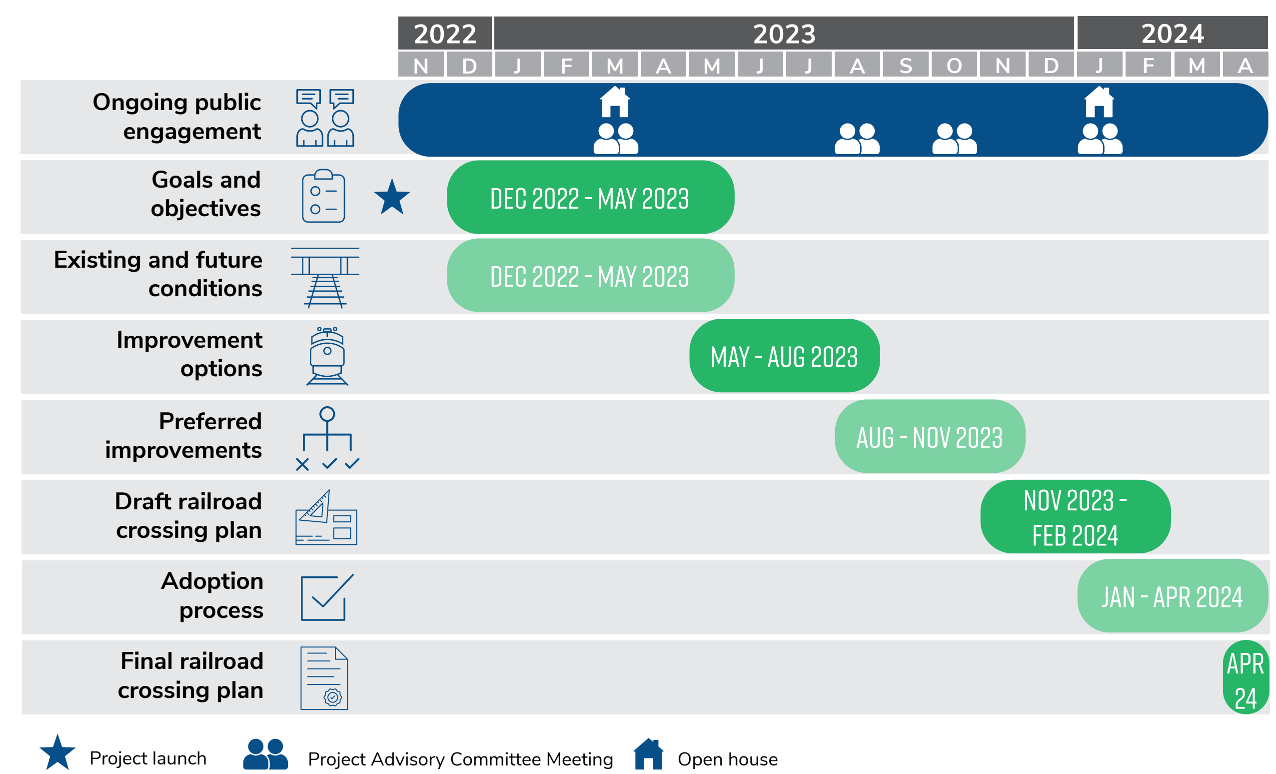
The Project Advisory Committee (PAC) provided technical and policy guidance and a local community and agency perspective on the preferred outcomes of the study. Members included representatives from the City of Reedsport; ODOT; the Oregon Department of Land Conservation and Development; the Confederated Tribes of Siletz; the Confederated Tribes of Coos; Lower Umpqua; and Siuslaw Indians; community groups; local businesses; the local school district; and the freight and railroad industry. A full list of the Project Advisory Committee members can be found at the beginning of this study report in the Acknowledgments section. The committee met four times during the study at key milestones.

KEY COMMUNITY REPRESENTATIVES

In March 2023, the project team interviewed key community representatives and officials to gauge awareness of the Port of Coos Bay's planned expansion and its expected impacts on freight train activity. The interviews also identified current community priorities and challenges, associated with the transportation system in Reedsport, including its railroad crossings. The interviews discussed local needs, challenges and opportunities associated with railroad crossings in Reedsport.

The project team used input from the interviews and early research to inform further engagement later in the study.

Study schedule



WE HEARD YOU!

We received feedback from community members through a community survey, community representative interviews, and virtual open house. Here's what people had to say:

INCREASED RAIL ACTIVITY SHOULD BRING GROWTH TO THE CITY, WHICH IS EXCITING.

Emergency vehicles require planning around railroad crossings. Being stuck at the crossing is rare, but more traffic could present more challenges.

IMPACTS PRIMARILY OCCUR DURING THE TOURIST SEASON WHEN **BIG RVS AND MOTORHOMES** TRAVEL THROUGH THE COMMUNITY.

A no-horn ordinance would improve livability of the city and nearby residential area.

An underpass of traffic is not an option as there is not enough room to allow for only a 1.5% to 2.0% grade to accommodate the distance from the top of the grade at OR 38 to the bridge.

THE POTENTIAL INCREASE TO 14 TRAINS IS A LOT FOR ANYONE, ESPECIALLY IN A SMALL TOWN LIKE REEDSPORT.

MANY PEOPLE HERE WALK, AND THEY WILL COMPLAIN WHEN THEY DO NOT HAVE THEIR PATHS. NOISE WILL ALSO BE A SIGNIFICANT FACTOR.

There is strong support for an overpass for current capacity and the proposed train increase.

SCHOOL BUSES HAVE TO DEAL WITH THE RAILROAD CROSSINGS TO PICK UP STUDENTS. IN TOWN, ONE BRIDGE SEPARATES THE UPPER AND LOWER PARTS OF THE TOWN. **IF PEOPLE DO NOT USE THE BRIDGE TO CROSS TOWN, DRIVING TO ROSEBURG THREE HOURS AWAY IS THE ALTERNATIVE.**

Summertime brings high traffic, which is a significant issue without an alternative route around the railroad crossing.

If the swing bridge could be improved to handle a speed of 15 mph that would mean a traffic delay of only 4.5 minutes. If the bridge could be improved to allow 20 to 25 mph it would only require a delay of 3+ minutes, well within the accepted wait time.

Want more details?

See the Public Involvement Plan

Source: Oregon International Port of Coos Bay

EXISTING AND FUTURE CONDITIONS

It was important to understand the context and conditions of the multimodal transportation system surrounding the rail crossings in the study area and the potential impacts of failing to take timely action to improve them.

Land use and demographics

The study found that there are a mix of different land uses surrounding the study area, including industrial, commercial, mixed-use, and single- and multi-family housing. Activity centers near the study intersections include the Reedsport downtown core, City Hall, the police station/downtown fire station, library, Triangle Park, and the post office.

There is a higher percentage of people living below the federal poverty level, older adults, people with disabilities, and zero-vehicle households within the study area than Reedsport as a whole, Douglas County, or Oregon. Notably, there are more people living at 200 percent below poverty level than within the comparison groups.

Demographic	Study area block group 1	Reedsport	Douglas County	Oregon
Zero-car households	8.6%	14%	5%	2.7%
People living at 200% below poverty	51.4%	44.4%	35.5%	28.7%
People living with a disability	*	23.1%	35.5%	15.1%
People with low English proficiency	*	1.3%	1.3%	2.3%

*Data unavailable at the block group level

Demographic data for the City of Reedsport from the U.S. Census Bureau 2021 American Community Survey.

Environment

The study area has natural and cultural resources that must be considered as the project moves toward design and construction. It falls within a big game overlay as identified by the Oregon Department of Fish and Wildlife (ODFW) and contains several acres of wetlands that could be impacted by improvements to the railroad crossings at OR 38 and Winchester Avenue. The study found that there are multiple known hazardous material spills and two cultural resources that may fall within the area: the Umpqua River Bridge and the Umpqua-Eden archaeological site.

The study found that all study intersections are located within the Reedsport levee system, which protects the area from riverine flooding from the Umpqua River and Scholfield Creek. The area is expected to be protected from flooding up to the 200-year event, but a larger event could overtop the levees. Levees and floodwalls are provided along and within the study area.

Traffic volumes and operations

Today, the study intersections meet the community's needs, even during evening rush hour—the peak traffic hour of the day. The study forecasted that by the year 2045, the OR 38/US 101 intersection will be at capacity during the evening rush hour (30th highest hour) and above capacity during several summertime weekends and local events with or without traffic generated by the proposed Pacific Coast Intermodal Port project.

Safety and emergency services

The study found that a total of 15 crashes, including two at OR 38/Myrtle Avenue, were reported between 2016 and 2020 at the study intersections. Seven resulted in injury and eight caused only property damage. None of the reported crashes involved bicyclists or pedestrians. There are no sites listed in the top 15 percent of ODOT's Safety Priority Index System (SPIS) within the study area.

Emergency service providers within Reedsport include the Reedsport Volunteer Fire Department, Reedsport Police Department, and Lower Umpqua Hospital.

The Reedsport Volunteer Fire Department operates out of two stations, including Station 1 (Downtown) on the north side of Winchester Avenue at 4th Street and Station 2 (Turner Fire Station) on the north side of Frontage Avenue between Ranch Road and 22nd Street. The two stations serve the City of Reedsport specializing in firefighting, rescue, hazardous materials incidents, special assignments, mutual aid calls, and fire prevention. Train events could reduce response times to areas west of the rail line as well as increase reliance on Station 2 to serve areas that would otherwise be served by Station 1.

The Reedsport Police Department operates out of the same building as the Reedsport Volunteer Fire Department Station 1. The police department facility houses a full-time communications center and municipal jail, as well as the department's Dispatch/Records Section, which provides dispatch services for the Police Department, Reedsport Volunteer Fire Department, and Lower Umpqua Hospital Ambulance services. Train events could also reduce police response times to areas west of the rail line and along the US 101 corridor.

The Lower Umpqua Hospital is located on the west side of Ranch Road, north of Ridgeway Drive. Ranch Road connects to US 101 via Frontage Road to 22nd Street on the north side of US 101 and Longwood Drive on the south side of US 101. The study found that a train event could reduce response time to and from areas east of the rail line.

Non-motorized user experience

PUBLIC TRANSPORTATION

Coos County Area Transit (CCAT) runs intercity service between Coos Bay and Florence on Monday through Saturday with one morning and one evening run. Dial-a-Ride service is available to Reedsport seniors and people with disabilities with advance reservations for trips starting and ending within Douglas County through the Umpqua Public Transportation District's "Douglas Rides" program.

PEDESTRIAN CONNECTIVITY

The study found that sidewalks are provided in the study area on one or both sides of collector and arterial roadways, with the exception Winchester Avenue, which has no sidewalk from the Ace Hardware southern access to 12th Street. The majority of local streets lack sidewalks or have sidewalks in disrepair.

BICYCLE CONNECTIVITY

The study found that bicycle connectivity is provided in the study area through bike lanes on US 101, OR 38 from US 101 to 3rd Street, and shared roadways on Winchester Avenue and local streets.

Aerial photo of Reedsport, 1942. Source: Oregon Historical Society Research Library, 006319.

Rail activity

The study found that rail activity through Reedsport has been relatively consistent since 2011, when the Coos Bay Rail Line began operations. The Umpqua swing span bridge is kept in the open position for river traffic, closing only for rail passages as required. Train speeds are restricted to 10 mph across the bridge, which limits the speed at which trains can pass through Reedsport.

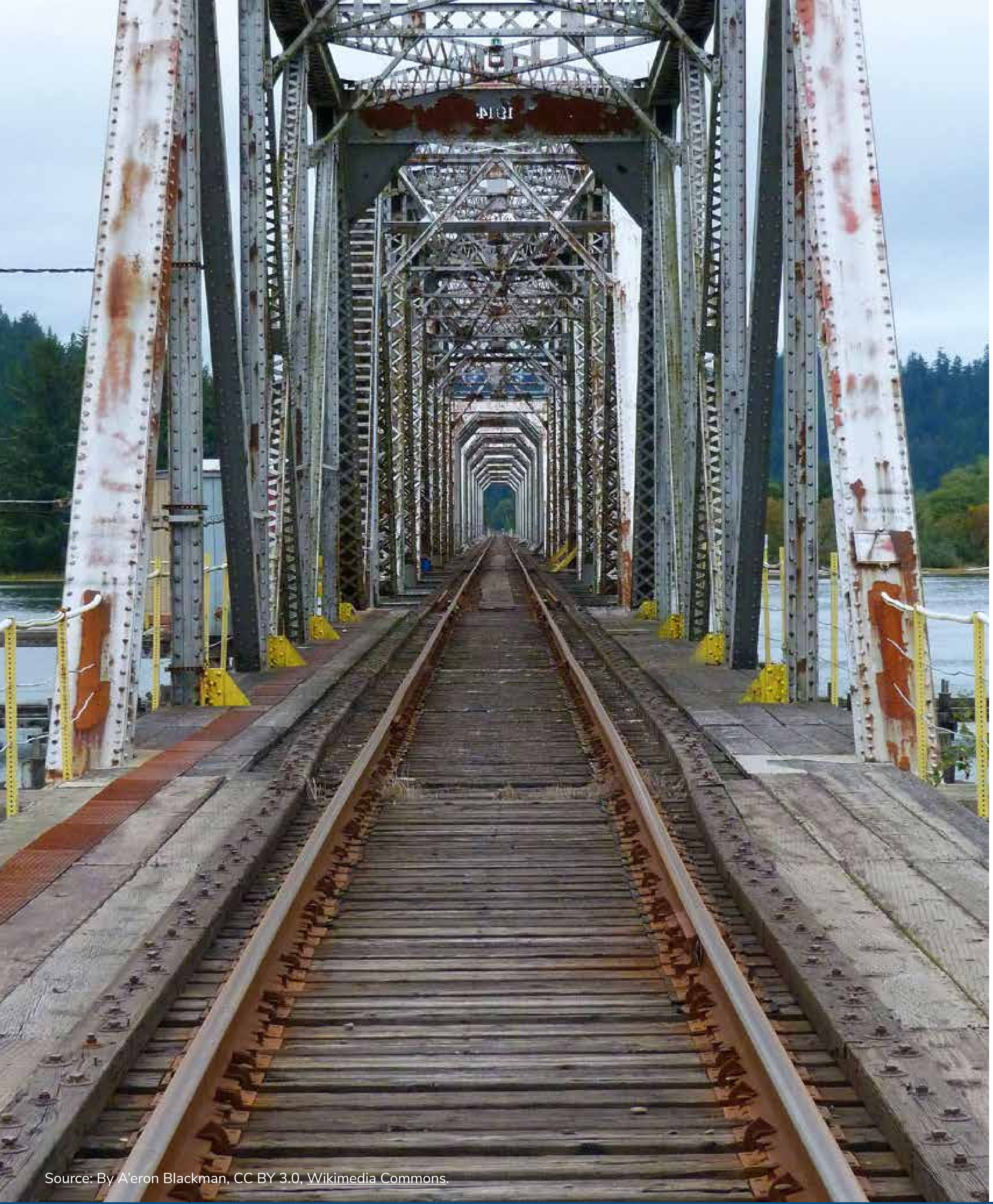
The study assumed that two trains per day pass through Reedsport at a maximum operating length of about 1,500 feet and a maximum speed of 10 mph. The rail line generally carries non-container-based freight (e.g., milled wood and chips).

The planned international container terminal at the Port of Coos Bay, designed to accommodate approximately 600,000 containers per year, is expected to increase the number of trains traveling through Reedsport to between 10 and 12 per day at 4,000 to 5,000+ feet per train. Train length will be limited by the grades and curvature along the rail line after improvements, all of which have yet to be finalized.

The study found that train events are likely to cause backups on OR 38 and Winchester Avenue. During a 4,100-foot or longer train traveling at 10 mph with current Umpqua swing span speed restrictions, traffic backups on eastbound OR 38 would be expected to extend to US 101 during the weekday p.m. peak hour.

Want more details?

See Technical Memorandum #4: Existing Transportation Conditions and Technical Memorandum #5: Future Land Use and Transportation Conditions


Source: By A'eron Blackman, CC BY 3.0, Wikimedia Commons.

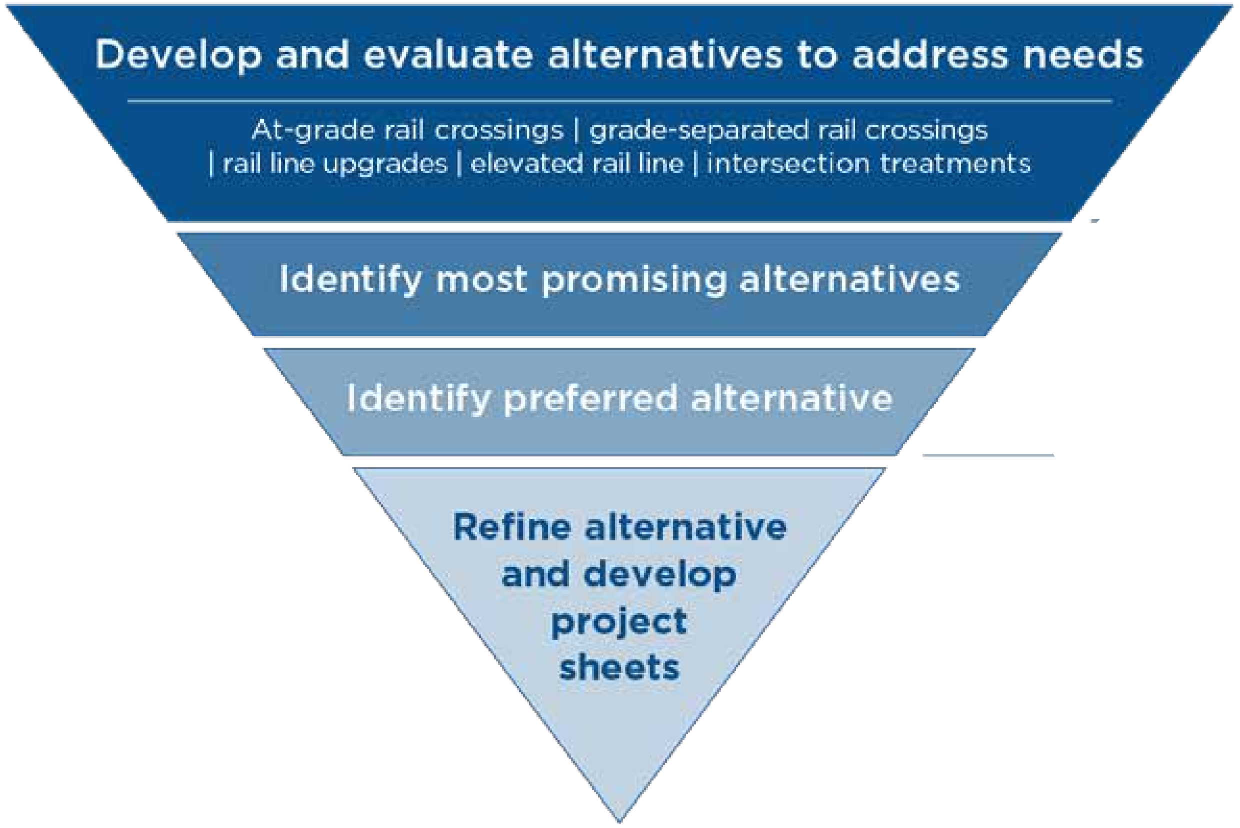
LOOKING AT THE RANGE OF ALTERNATIVES

What options did we consider?

The study followed a four-tiered process to identify and refine a preferred solution to address the projected increase in rail activity. The solutions the project team evaluated addressed transportation system needs, closing gaps, and resolving deficiencies.

The team first identified 15 projects to address study area needs. Feedback from the community, Project Advisory Committee, and Project Management Team revealed additional potential solutions. The project team then narrowed all the alternative solutions down and developed project packages. The two most promising improvement packages were presented for further consideration and refinement.

The range of alternatives



The two most promising improvement packages of alternatives

The study team ranked two improvement packages of alternatives as the most promising. Both packages maintain or enhance the community's transportation system while promoting active transportation; reduce barriers to access; improve vehicular, freight, pedestrian, bicycle, transit, and traffic mobility and safety; and minimize environmental impacts. To learn more about the process of identifying, vetting, and narrowing down alternatives, see Technical Memorandum #6: Alternatives Evaluation and Technical Memorandum #7: Preferred Improvements.

IMPROVEMENT PACKAGE 1

Alternative 1C
Four-quadrant gated rail crossing on Winchester Avenue

This component of Improvement Package 1 would provide a four-quadrant gated rail crossing on Winchester Avenue to improve the safety of the existing at-grade rail crossing. This option would also support implementing a quiet zone through downtown Reedsport, as four-quadrant gates do not require horns.

The improved at-grade crossing would include two gate arms and flashers on both sides of the rail line and in both directions. The crossing would also include gate arms and flashers across the pedestrian facilities. This type of crossing prevents motorists from driving around the lowered gates. With this type of crossing, the entry gates close before the exit gates to allow motorists to clear the rail line. The gates also lower long before the train arrives.

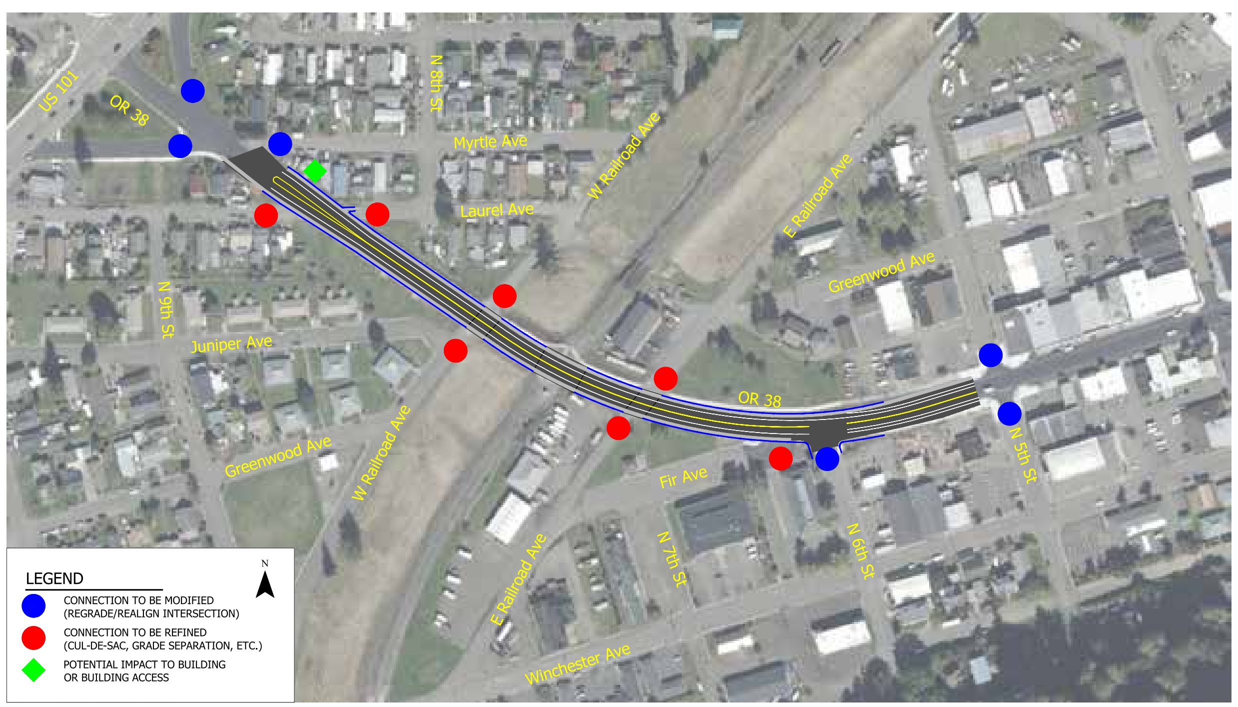
Exhibit 1. Four-quadrant gated rail crossing

Alternative 2A1
OR 38 rail overcrossing with retaining walls

This component of Improvement Package 1 calls for elevating OR 38 over the existing rail line. Retaining walls reduce the footprint of the overpass (the alternative being a sloped embankment on either side of the elevated roadway) and minimize the impacts to adjacent properties and transportation facilities. The exhibits below illustrate the OR 38 rail overcrossing with retaining walls throughout the length of the overpass. As shown, several existing street connections would need to be modified or refined and potential structures and/or property access could be impacted.

Exhibit 2. Aerial perspective

Exhibit 3. Potential impacted properties and street connections



IMPROVEMENT PACKAGE 2

Alternative 4A
Elevated rail line

The primary component of Improvement Package 2 calls for raising the entire rail line through the community and allowing OR 38 and Winchester Avenue to pass under railway bridges. Improvement Package 2 is the least preferred of the two packages because it is substantially more expensive.

Construction phasing for the embankment required to elevate the tracks would be difficult while maintaining railroad operations along the same right-of-way. The use of retaining walls would limit the base width of the embankment; however, this would add to the cost. Depending upon the final elevation of the railroad track, the use of retaining walls may be required to keep the embankment within the existing railroad right-of-way. For the planning-level costs, retaining walls were assumed throughout the elevated alignment.

The rendering above illustrates the elevated rail line alternative with retaining walls throughout the length of grade change (Umpqua River to Scholfield Creek). Regardless of the construction method, the embankment created for the railroad would practically and visually bisect downtown Reedsport and potentially detract from overall community livability.

Key performance differentiators between the top two most promising improvement packages

Key differentiators	Improvement Package 1	Improvement Package 2
OR 38 vertical clearance	No vertical constraints.	Introduces the only vertical constraint between I-5 and US 101 (via OR 38 and OR 138).
Community barrier effect	The elevated OR 38 overpass creates an approximately 800-foot partial north-south visual barrier for homes along OR 38 to the area west of the rail line.	The elevated rail line introduces an east-west visual barrier throughout the downtown area, extending from the Scholfield Creek to Umpqua River.
Winchester Rail crossing queuing and potential cut-through traffic	The upgraded at-grade crossing would still create vehicular queues and potentially cut through traffic during train events.	The grade-separated rail overcrossing would eliminate vehicular queues and potentially cut through traffic.
Design and construction cost opinions	$34.7 M (assumes retaining walls, embankment support, and three separate bridge spans) $39.9 M (assumes a viaduct between East and West Railroad Avenue)	$27.0 M (assumes retaining walls, embankment support, and bridges) $61.0 M (assumes a viaduct between Winchester Avenue and OR 38)

Environmental assessment

Improvement Package	Alternative	Section 4(f)[1]	Section 6(f)[2]	Historic Resources	Title VI[3]
Improvement Package 1	1C	No impacts	No impacts	Likely	Likely none
	1C1	No impacts	No impacts	None	Likely none
	2A1	Hahn Park	No impacts	Likely	Likely none
Improvement Package 2	4A	No impacts	No impacts	Likely	Likely none

Want more details?

See Technical Memorandum #6: Alternative Analysis and Technical Memorandum #7: Preferred Improvements

1 / Briefly, the overall purpose of Section 4(f) is preservation, where "special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites." (49 USC 303[a] and 23 USC 138[a]).
2 / Section 6(f) of the Land and Water Conservation Act requires that the conversion of lands or facilities acquired with Land and Water Conservation Act funds under the State Assistance program be coordinated with the National Park Service.
3 / Title VI of the Civil Rights Act of 1964 provides that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.

PREFERRED ALTERNATIVE

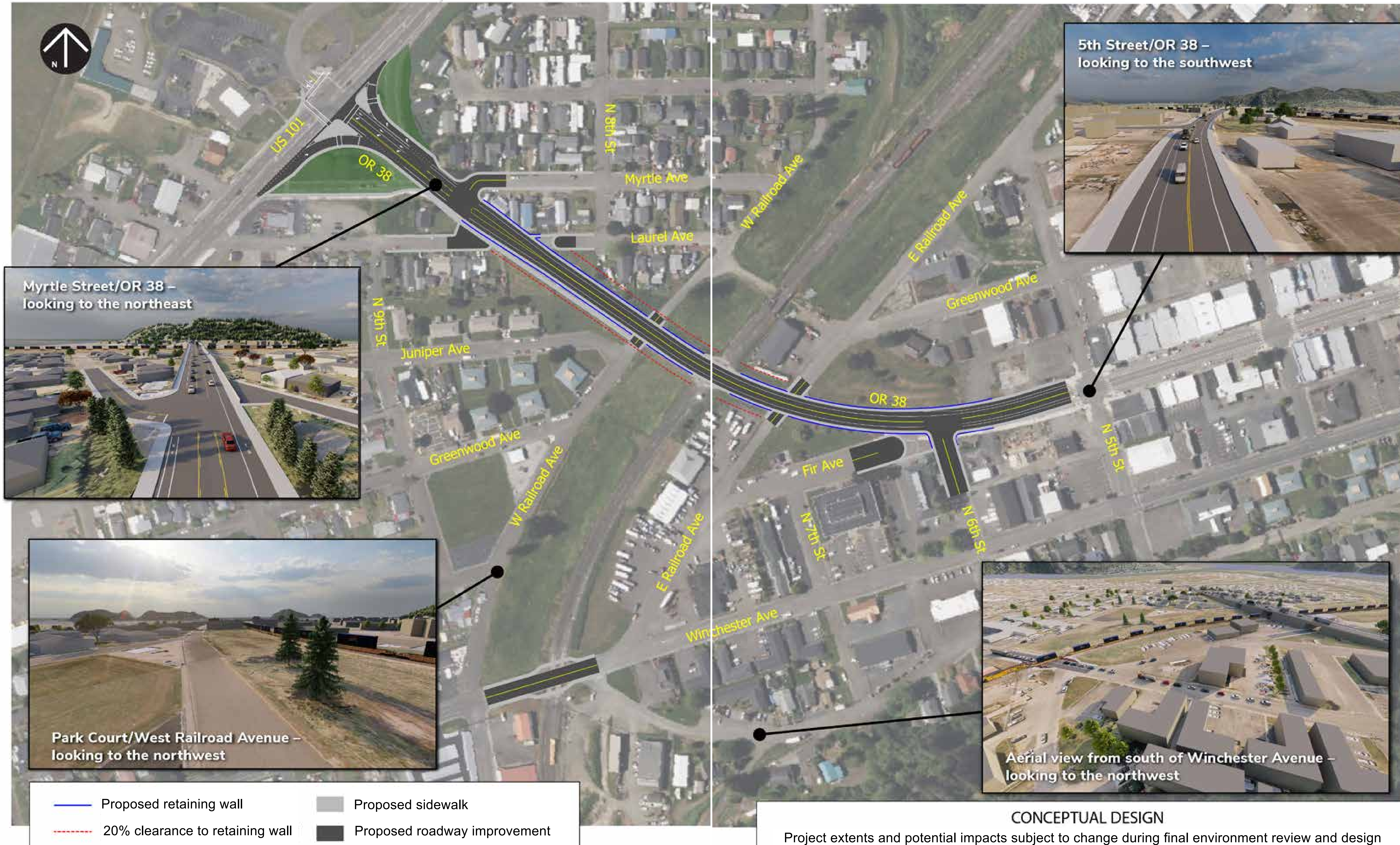
Refined Improvement Package 1 was selected as the preferred alternative based on further feedback from the Project Advisory Committee, Project Management Team,, the City of Reedsport Planning Commission and City Council, and the community as well as further assessment, refinements, and environmental review of the two most promising improvement packages.

The selected package includes the following:

- Four-Quadrant Gated Rail Crossing on Winchester Avenue (1C)
- US 101 Northbound Train Activity Warning for Train Crossings at Winchester Avenue (1C1)
- OR 38 Rail Overcrossing with Retaining Walls (2A1)

Specific project sheets are provided in Attachments A and B.

Refined Improvement Package 1 overview



CONCEPTUAL DESIGN

Project extents and potential impacts subject to change during final environment review and design

Winchester rail crossing

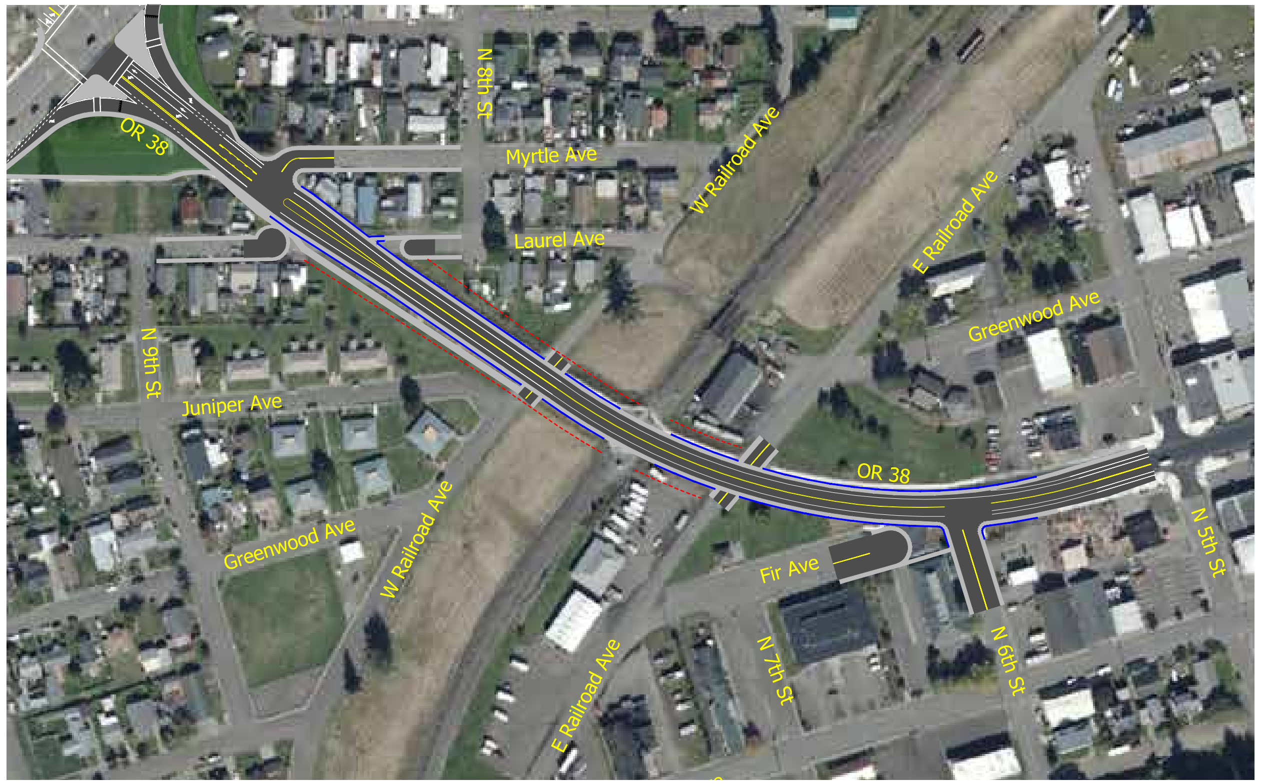
Four-quadrant gated rail crossing on Winchester Avenue (Project RRCS-1)

US 101 northbound train activity warning sign

See Attachment A for RRCS-1 Project Sheet.

OR 38 Rail overcrossing

OR 38 related improvements and proposed roadway, bicycle, and pedestrian tie-ins (Project RRCS-2)



See Attachment A for RRCS-2 Project Sheet.

Other pedestrian, bicycle, and transit enhancements

Connections to the existing and/or planned pedestrian and bicycle network that will accompany the preferred improvement package are outlined below.

Roadway	Description	Part of Package 1?	Addition to Transportation System Plan?
Myrtle Avenue	Construct northerly sidewalk to fill existing gap east of OR 38. Construct southerly sidewalk from OR 38 to N 8th Street.	Yes	Yes
Laurel Avenue (south)	Reconstruct northerly and southerly sidewalks from 9th Street to OR 38.	Yes	Yes
Laurel Avenue (north)	Construct northerly and southerly sidewalks from OR 38 to N 8th Street.	Yes	Yes
Juniper Avenue	Construct northerly sidewalks to connect the existing sidewalk to W Railroad Avenue.	No	Yes
W Railroad Avenue	Construct westerly and easterly sidewalks within the OR 38 right-of-way	Yes	Yes
E Railroad Avenue	Add a multi-use path along the west side of roadway between Winchester Avenue and OR 38.	No	Yes
E Railroad Avenue	Construct a westerly multi-use path and easterly sidewalk within the OR 38 right-of-way	Yes	Yes
E Railroad Avenue	Add a multi-use path along the west side of roadway between OR 38 and Riverfront Way.	No	Yes
Fir Avenue	Reconstruct sidewalk-only connections to OR 38 from the existing sidewalk.	Yes	NA
North 6th Street	Construct and extend westerly and easterly sidewalks to the new OR 38 intersection.	Yes	NA
OR 38 (5th to US 101)	Construct northerly and southerly sidewalks and bike lanes.	Yes	NA
Winchester Avenue	Construct northerly sidewalks between W Railroad Avenue and E Railroad Avenue.	Yes	Yes
Parallel Northerly OR 38 Multi-use Path	A multi-use path between E and W Railroad Avenue utilizing the undercrossing on the north side of OR 38 (see RRSC-4 project sheet).	No	Yes

Future studies

US101/OR 38 REFINEMENT PLAN (UMPQUA RIVER TO SCHOLFIELD CREEK)

The US 101 refinement will be adopted by the City of Reedsport as a planned project in the City's TSP. The refinement plan (either standalone or as part of the Environmental Review and Final Design process) is for US 101 from the Umpqua River to Scholfield Creek and along OR 38 from Laurel Avenue to US 101. The study should include, at a minimum, an evaluation of lane configurations and access management enhancements along US 101 and OR 38 and potential modifications to the OR 38/US 101-Port Dock Road intersection, including additional eastbound and westbound left-turn lanes at the intersection to provide additional capacity, potential removal of the existing slip lanes to/from OR 38, and future signal timing and phasing flexibility (e.g., protect-left-turn phasing, split phase). See Attachment A for the RRCS-3 project sheet.

CITY OF REEDSPORT TRANSPORTATION SYSTEM PLAN UPDATE

The City of Reedsport TSP will need to be updated to include all the elements that make up the Reedsport Rail Crossing Study and the other identified future roadway, pedestrian, and bicycle improvements (see Attachment B for TSP amendments).

Cost opinion

The study team developed scoping level cost opinions for each project within the package, including potential right-of-way, environmental, and construction staging needs and a 30 percent contingency. Based on these estimates and the potential to accommodate different bridge, retaining wall, and/or viaduct solutions between West Railroad Avenue and East Railroad Avenue, the conceptual cost opinion is $34.7M million to $39.9M million in year 2023 dollars. (see Attachment C for detailed cost calculations). The cost opinion with projected inflation is estimated to range from $42.8M to $49.2M in year 2030. The lower cost range assumes three separate bridge structures at West Railroad Avenue, Rail right-of-way, and East Railroad Avenue, while the higher range assumes a viaduct type structure from West Railroad Avenue to East Railroad Avenue.

Source: ODOT

NEXT STEPS

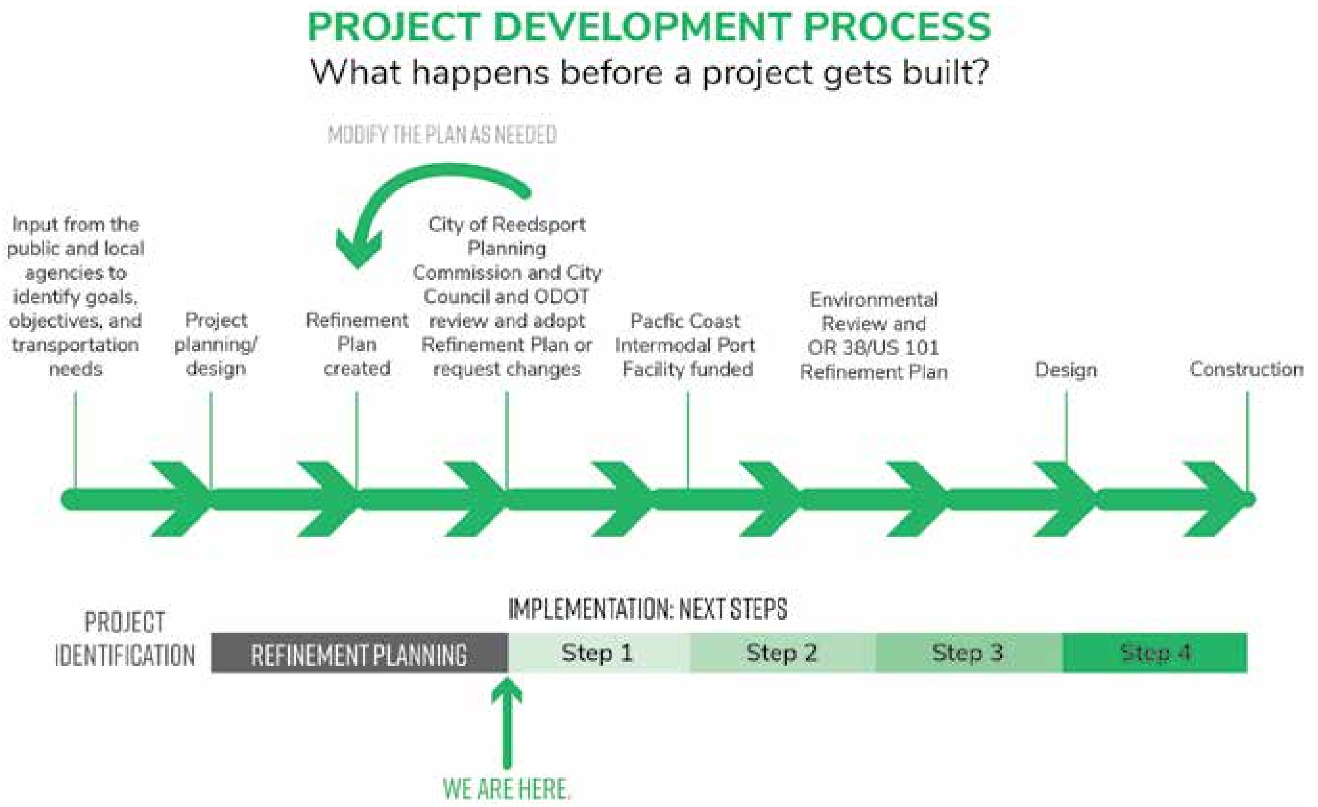
Going from vision to reality

The study's proposed projects identified here are in the early stages of development for preliminary design, environmental review, design, and construction to address the anticipated impacts of the future Pacific Coast Intermodal Port facility proposed by the Port of Coos Bay. The following is the proposed implementation plan after adoption of this study and refinement plan into the City of Reedsport Transportation System Plan and the Oregon Highway Plan.

Following adoption, the Port of Coos Bay will seek to secure funding, conduct further environmental reviews, and work collaboratively with ODOT and the City of Reedsport to design and ultimately construct the identified rail, highway, and local system multimodal improvements.

Throughout all steps of the implementation process, it is essential to continue to seek input to refine and design the preferred refined improvement package of projects in a manner that respects the cultural and historic significance of the area.

Implementation steps



STEP 1: TRANSPORTATION SYSTEM PLAN ADOPTION

The City of Reedsport Planning Commission and City Council will hold public hearings to adopt the preferred refined improvement package projects and the Reedsport Rail Crossing Study by reference into the City of Reedsport Transportation System Plan. Through this action, the City of Reedsport will:

- Confirm the need for the preferred refined improvement package of projects to mitigate potential impacts associated with the future proposed Pacific Coast Intermodal Port project.
- Preserve the right-of-way necessary to construct the proposed improvements in the future.
- Demonstrate public support for the proposed refined improvement package of projects necessary for the Port of Coos Bay to seek and secure funding to conduct the environmental review, design, and construct the rail overpass at OR 38 and quiet zone upgrades and advance warning features at the Winchester Avenue rail crossing.

Regional/state agency acknowledgment, adoption, and Transportation System Plan amendments

Following adoption of the Reedsport Rail Crossing Study and associated projects into the City of Reedsport Transportation System Plan, ODOT will also consider adopting the study and refinement plan into the Oregon Highway Plan.

STEP 2: PACIFIC COAST INTERMODAL PORT FACILITY FUNDING

The Port of Coos Bay will seek funding to construct the proposed Pacific Coast Intermodal Port facility and the associated mitigation, including rail, highway, and local transportation improvements identified in the Reedsport Rail Crossing Study ($42.8M to $49.2M in 2030 dollars).[1]

STEP 3: ENVIRONMENTAL REVIEW

ODOT along with the Federal Highway Administration will complete the following environmental review steps once funding is secured by the Port of Coos Bay for the future proposed Pacific Coast Intermodal Port facility:

- Initiate the environmental review process.
- Confirm that a Documented Categorical Exclusion classification is the appropriate National Environmental Policy Act review mechanism.
- Prepare the OR 38/US 101 Refinement Plan (Umpqua River to Scholfield Creek) if it has not been completed.
- Review identified benefits, burdens, and unknowns associated with the preferred refined improvement package to determine what has potentially changed since the adoption of the refinement plan.
- Conduct the environmental review process.
- Obtain all federal and state permits and land use approvals from the City of Reedsport.

1 / The lower number includes three separate bridge spans. The higher number includes a viaduct from East to West Railroad Avenue.

Reedsport. Source: Oregon Historical Society Research Library, 17736.

STEP 4: DESIGN AND CONSTRUCTION

After Steps 1–3, ODOT will develop the proposed projects as part of the Statewide Transportation Improvement Program (STIP) or prepare plans, specifications, and cost estimates to allow a construction contract to be advertised for competitive bids. Once the contracting mechanism is determined (e.g., traditional design, bid, and build or an alternative delivery method), the project will be advertised for construction bidding and be constructed.

Funding opportunities

Since the study's proposed projects are identified primarily to address the needs associated with the increased train activity due to the proposed Pacific Coast Intermodal Port project, it is assumed that funding for the environmental review, design, permitting, and construction will be secured by the Port of Coos Bay.

Want more details?

See Technical Memorandum #8: Amendments and Implementing Measures

Source: Kittelson & Associates, Inc.

SUPPORTING DOCUMENTS

Looking for a deeper dive? These memoranda have more information on all the subjects discussed in this report.

Document	Purpose
Public Involvement Plan	This plan documents the public involvement purpose and goals, key audiences, key messages, Project Advisory Committee, and the project team member roles and responsibilities.
Technical Memorandum #1: City of Reedsport Plan, Policy, and Code Review & Port of Coos Bay Expansion Review	This memorandum presents a review of existing plans and policies that affect transportation planning in the City of Reedsport and highlights the key issues that will factor into the Reedsport Rail Crossing Study.
Technical Memorandum #2: Purpose & Need, Goals, Objectives, and Evaluation Criteria	This memorandum provides a project background and presents the purpose and need for the Reedsport Rail Crossing Study along with the goals, objectives, and evaluation criteria.
Technical Memorandum #3: Analysis Methodology and Assumptions	This memorandum documents the methodologies and assumptions used to identify potential gaps and deficiencies in the existing transportation system and the future needs to accommodate the anticipated increase in rail activity along the Coos Bay Rail Line (CBRL).
Technical Memorandum #4: Existing Transportation Conditions	This memorandum summarizes the existing transportation system conditions, including traffic counts, vehicles and non-motorized transportation operations and safety, and environmental/topographical conditions related to the drainage system.
Technical Memorandum #5: Future Land Use and Transportation Conditions	This memorandum summarizes future (no-build) transportation system conditions within the study area, including future gaps, deficiencies, and needs to accommodate future growth.
Technical Memorandum #6: Alternatives Analysis	This memorandum provides a summary of the transportation needs (Needs Statement) introduced to the Reedsport transportation system with the development of the Port of Coos Bay Pacific Coast Intermodal Port, potential alternative solutions, and analysis to identify the top two most promising improvement packages for further consideration and refinement.
Technical Memorandum #7: Preferred Improvements	This memorandum addresses outstanding questions, provides a high-level environmental review of the two most promising improvement packages, and refines and recommends a preferred set of projects. The memo also provides the project team's opinion regarding the anticipated National Environmental Policy Act classification and a draft environmental prospectus for the preferred improvement package.
Technical Memorandum #8: Amendments and Implementing Measures	This memorandum summarizes the proposed project and study amendments to the City's Transportation System Plan to address the anticipated needs to accommodate the anticipated increase in rail activity along the Coos Bay Rail Line associated with the proposed future Pacific Coast Intermodal Port.

Study Attachments A (Project Sheets) and B (Cost Estimate)

ATTACHMENT A

Project Sheets

Reedsport Railroad Crossing Study (RRCS-1)
Four-Quadrant Gated Rail Crossing on Winchester Avenue

City of Reedsport
Transportation System Plan

Purpose	This project will improve the safety of the existing at-grade rail crossing on Winchester Avenue as well as support implementation of a quiet zone through downtown Reedsport.	
Description	This project will provide a four-quadrant gated rail crossing on Winchester Avenue. The crossing would include two gate arms and flashers on both sides of the rail line and in both directions. The crossing would also include gate arms and flashers across the pedestrian facilities (sidewalks). This type of crossing prevents motorists from driving around the lowered gates. With this type of crossing, the entry gates will close before the exit gates to allow motorists to clear the rail line. The gates also lower long before the train arrives.	
Location	Winchester Avenue at-grade rail crossing.	
Roadway Characteristics	– **Jurisdiction:** City of Reedsport – **Functional Classification:** Rural Major Collector (Federal), Arterial (City) – **Freight Route Designation:** None – **Existing AADT:** 2,111 (Source: ODOT) – **Forecast AADT:** NA	– **Posted Speed:** 25 mph – **Pavement Width:** 40’ – **Travel Lanes:** 2 (12’ each way) – **Pedestrian Facilities:** Sidewalks (5’ both sides) – **Bike Facilities:** None – **Transit Facilities:** None – **On-Street Parking:** (8’ both sides)
How Improvement Addresses Deficiencies	**Existing/Future Need**: – The existing at-grade rail crossing on Winchester Avenue is controlled by a two-quadrant gate system with flashing lights and cross buck “rail crossing” warning signs. – The Port project is expected to increase rail activity along the CBRL, including the frequency, length, and speed of trains. – The increase in rail activity will increase delays at the at-grade crossing (OR 38 and Winchester Avenue).	**With Improvement:** – Addresses noise-related Issues with train activity at Winchester Avenue by eliminating the need for train horn warnings at the crossing. – Feasible to construct with minimal to potential zero right-of-way or environmental impacts. – Economically feasible at a magnitude cost of $285,000. – Requires grade-separated improvements on OR 38 to meet all identified needs.
Additional Considerations	The City should work with ODOT to install a dynamic train activity warning sign on US 101, south of Winchester Avenue, to alert northbound motorists that a train is approaching or present at the at-grade rail crossing on Winchester Avenue allowing them to re-route to OR 38.	
Cost Opinions	$335,000	
Implementation	This project may be implemented in tandem with Railroad Crossing Study-1: OR 38 Overcrossing with Retaining Walls.	

AADT = annual average daily traffic; CBRL = Coos Bay Rail Line; ODOT = Oregon Department of Transportation.

Reedsport Railroad Crossing Study (RRCS-2)
OR 38 Rail Overcrossing with Retaining Walls

City of Reedsport
Transportation System Plan

Purpose	This project is intended to address the transportation-related impacts associated with the Port of Coos Bay's Pacific Coast Intermodal Port project and the anticipated increases in rail activity along the Coos Bay Rail Line and in downtown Reedsport.	
Description	This project will involve installation of a grade-separated rail crossing (overcrossing) with retaining walls on OR 38, reconfiguration of the US 101/OR 38-Port Dock Road intersection, as well as other intersections on OR 38 from US 101 to N 6th Street, and installation of pedestrian and bicycle facilities on OR 38 and the surrounding local street network as necessary to maintain connectivity for people walking and biking.	
Location	OR 38 from north of Laurel Street to east of N 6th Street.	
Roadway Characteristics	– **Jurisdiction:** ODOT – **Functional Classification:** Other Principal Arterial (Federal), Statewide Highway (State), Arterial (City) – **Freight Route Designation:** OHP Freight Route; Reduction Review Route – **Existing AADT:** 4,886 (Source: ODOT) – **Forecast AADT:** 5,600 (Source: ODOT)	– **Posted Speed:** 25 mph – **Pavement Width:** 34' – **Travel Lanes:** 2 (12' each way) – **Pedestrian Facilities:** Sidewalks (6' both sides) – **Bike Facilities:** Bike lanes (5' both sides) – **Transit Facilities:** None – **On-Street Parking:** None
How Improvement Addresses Deficiencies	**Existing/Future Need**: – The existing at-grade rail crossing on OR 38 is controlled by a two-quadrant gate system with flashing lights and cross buck "rail crossing" warning signs. – The Port project is expected to increase rail activity along the CBRL, including the frequency, length, and speed of trains. – The increase in rail activity will increase delays at the at-grade crossing as well as motor vehicle queues on OR 38 that block side streets and create access/ circulation issues in downtown Reedsport.	**With Improvement:** – Addresses delays and access/circulation issues. – Addresses increased train activity issues. – Addresses queuing-related impacts to upstream and downstream cross-streets on OR 38. – Partially addresses queuing-related impacts to upstream and downstream cross-streets on Winchester Avenue. – Addresses noise-related issues with increased train activity at OR 38 by eliminating the need for train horn warnings at the crossing.
Additional Considerations	Further refinements are needed to minimize potential right-of-way and/or environmental impacts, address visual impacts associated with the vertical elements of the overcrossing structures, and identify local roadway and driveway tie-ins to the modified roadway. ODOT should also consider installing a multi-use path on the south side of OR 38 from Laurel Avenue to Juniper Avenue.	
Cost Opinions	$34,215,000 (assumes retaining walls, embankment support, and bridges; $39,415,000 (assumes viaduct between east and west Railroad Avenue)	
Implementation	Implementation of this project will require closing OR 38 and re-routing traffic along Winchester Avenue during construction. Winchester Avenue will likely need to be upgraded before construction to accommodate the increase in traffic, including heavy vehicles.	

AADT = annual average daily traffic; CBRL = Coos Bay Rail Line; ODOT = Oregon Department of Transportation.

Reedsport Railroad Crossing Study (RRCS-3) | **City of Reedsport**
US 101 Refinement Plan | **Transportation System Plan**

Purpose	This project will provide further evaluation of intersection improvements along US 101 from the Umpqua River to Scholfield Creek and access management improvements along OR 38 from Laurel Avenue to US 101.	
Description	The project will involve a refinement plan for US 101 from the Umpqua River to Scholfield Creek. The study should include an evaluation of access management and, at a minimum, potential modifications to the US 101/OR 38-Port Dock Road intersection, including additional lanes at the intersection to provide additional capacity and future signal timing and phasing flexibility.	
Location	US 101 from Umpqua River to Scholfield Creek and OR 38 from Laurel Avenue to US 101	
Roadway Characteristics	– **Jurisdiction:** ODOT – **Functional Classification:** Other Principal Arterial (Federal), Statewide Highway (State), Arterial (City) – **Freight Route Designation:** OHP Freight Route; Reduction Review Route – **Existing AADT:** 13,926 (Source: ODOT) – **Forecast AADT:** 13,000 (Source: ODOT)	– **Posted Speed:** 25 mph – **Pavement Width:** 71' – **Travel Lanes:** 5 (12' travel lane, 12'median) – **Ped Facilities:** Sidewalks (5' east side, 6' west) – **Bike Facilities:** Bike lanes (5' east side, 6' west) – **Transit Facilities:** Yes – **On-Street Parking:** None
How Improvement Addresses Deficiencies	**Existing/Future Need:** – The US 101/OR 38-Port Dock Road intersection currently experiences congestion during the summer peak weekend and is anticipated to worsen over time. – The westbound left/through queue on OR 38 is also projected to extend past the right-turn slip lane at the west approach. – There are multiple access points along OR 38 from Laurel Avenue to US 101	**With Project:** – Further evaluation of intersection operations and safety at the US 101/OR 38-Port Dock Road intersection and identification of preferred improvements for implementation. – Further evaluation of access management opportunities along OR 38 and identification oof a preferred strategy for implementation.
Additional Considerations	None	
Cost Opinions	$150,000	
Implementation	This project may be implemented at any time.	

AADT = annual average daily traffic; ODOT = Oregon Department of Transportation.

Reedsport Railroad Crossing Study (RRCS-4) Greenwood Avenue Multi-use Path	City of Reedsport Transportation System Plan

Purpose	This project is needed to maintain pedestrian and bicycle connectivity between areas north and south of the Coos Bay Rail Line with implementation of the OR 38 rail overcrossing.	
Description	This project will involve installation of a multi-use path north of OR 38 and between E and W Railroad Avenues and upgrades to the existing rail bridge if the City can acquire the necessary right-of-way and rail crossing order. The multi-use path will follow the former Greenwood Avenue right-of-way and utilize the existing northerly OR 38 rail undercrossing. Multi-use paths are typically 10 to 12-feet wide paved surfaces separated from motor vehicle traffic by an open space or barrier, either within the roadway right-of-way or within an independent right-of-way.	
Location	The multi-use path will be located north of OR 38 and between E and W Railroad Avenues.	
Roadway Characteristics	– **Jurisdiction:** N/A – **Functional Classification:** N/A – **Freight Route Designation:** N/A – **Existing AADT:** 0 – **Forecast AADT:** 0	– **Posted Speed:** N/A – **Pavement Width:** 0' – **Travel Lanes:** 0 – **Ped Facilities:** None – **Bike Facilities:** None – **Transit Facilities:** None – **On-Street Parking:** None
How Improvement Addresses Deficiencies	**Existing/Future Need:** – Currently, pedestrians and bicyclists may use OR 38 to travel between E and W Railroad Avenues and between areas north and south of the Coos Bay Rail Line – Implementation of the OR 38 rail overcrossing will grade-separate OR 38 and require pedestrians and bicyclists traveling between areas north and south to travel up and over the overcrossing.	**With Project:** – The Multi-use path will maintain pedestrian and bicycle connectivity between E and W Railroad Avenue and between areas north and south of the Coos Bay Rail Line.
Additional Considerations	The portion of the Greenwood Avenue right-of way which crossed the track was abandoned by the City and the rail crossing was closed. Implementation of the project would require acquiring the right-of-way and gaining approval from the rail line to install the crossing.	
Cost Opinions	$85,000	
Implementation	This project may be implemented at any time.	

AADT = annual average daily traffic; ODOT = Oregon Department of Transportation.

ATTACHMENT B

Cost Estimates

Reedsport Rail Crossing Study
OR38 Overcrossing Alt 2B - Single Bridge
Oregon Department of Transportation

KITTELSON & ASSOCIATES

Engineer's Conceptual Estimate

Prepared By: Jon Gerlach		*Date: 1/11/2024*		
Reviewed By: Darren Hippenstiel				
This Estimate has a Rating of:		**2B**	*(See rating scale guide below.)*	
ITEM	**UNIT**	**TOTAL QUANTITY**	**UNIT PRICE**	**TOTAL COST**
Mobilization	LS	ALL	$1,973,000.00	$1,973,000
Traffic Control	LS	ALL	$1,581,000.00	$1,581,000
Erosion Control	AC	3.8	$10,000.00	$38,000
Removal of Structures and Obstructions	LS	ALL	$195,000.00	$195,000
Clearing and Grubbing	LS	ALL	$98,000.00	$98,000
General Earthworks	CY	28,920	$40.00	$1,156,793
Asphalt Roadway - Full Depth (8" ACP over 16" compacted subgrade)	SF	119,000	$9.20	$1,094,800
Asphalt Roadway - Full Depth (6" ACP over 12" compacted subgrade)	SF	72,000	$6.90	$496,800
Asphalt Roadway - Grind & Inlay (2" Depth)	SF	108,000	$3.10	$334,800
Subgrade Geotextile	SY	13,223	$1.50	$19,835
Concrete Curbs - Standard Curb	LF	3,200	$30.90	$98,880
Concrete Walks	SF	40,850	$8.40	$343,140
Detectable Warnings	EA	22	$500.00	$11,000
Pedestrian Ramps	EA	22	$7,500.00	$165,000
Extra for Pedestrian Ramps	EA	22	$1,500.00	$33,000
Residential Driveway Reconstruction	EA	11	$1,500.00	$16,500
Commercial Driveway Reconstruction	EA	5	$3,000.00	$15,000
Retaining Walls, MSE	SF	24,330	$90.00	$2,189,700
Bridge Structure, Complete	SF	20,900	$470.00	$9,823,000
Storm Water Conveyance System, Complete	LS	ALL	$2,065,000.00	$2,065,000
Regional Water Quality and Hydromodification System, Complete	SF	16,500	$28.00	$462,000
Pavement Markings, Complete	LS	ALL	$38,000.00	$38,000
Signage, Complete	LS	ALL	$57,000.00	$57,000
Illumination System, Complete	LS	ALL	$225,300.00	$225,300
Traffic Signal System, Complete	LS	ALL	$500,000.00	$500,000
Four-Quadrant Gated Rail Crossing on Winchester Avenue	LS	ALL	$285,000.00	$285,000
			TOTAL CONSTRUCTION COST	**$23,316,000**
RIGHT-OF-WAY COSTS				
Residential Right-of-Way Acquisition (ODOT Estimate)	LS	ALL	$2,750,000.00	$2,750,000
RIGHT-OF-WAY SUBTOTAL				**$2,750,000**
ENGINEERING SUPPORT				
Engineering & Construction Management	LS	ALL	$4,664,000.00	$4,664,000
ENGINEERING SUPPORT SUBTOTAL				**$4,664,000**
			TOTAL PROJECT SUBTOTAL	**$30,730,000**
			30% Contingency	**$9,219,000**
			TOTAL ESTIMATED PROJECT COST	**$39,900,000**

Reedsport Rail Crossing Study
OR38 Overcrossing Alt 2B - Single Bridge
Oregon Department of Transportation

Engineer's Conceptual Estimate

Prepared By: Jon Gerlach		*Date: 1/11/2024*		
Reviewed By: Darren Hippenstiel				
This Estimate has a Rating of:		**2B** *(See rating scale guide below.)*		
ITEM	**UNIT**	**TOTAL QUANTITY**	**UNIT PRICE**	**TOTAL COST**

Unit Costs Note:
The associated product and material costs are based upon the most recent available cost data. Due to the current volatility of the construction market, we cannot guarantee these costs for any duration of time.

Assumptions:
- The assumed roadway section on OR38 is 8 inches ACP over 16 inches of compacted aggregate base.
- The assumed roadway section for all other locations is 6 inches ACP over 12 inches of compacted aggregate base.
- Due to the separated bicycle facility the assumed storm inlet spacing is 50 feet.
- All overhead utilities will be relocated and remain above ground.
- No sound walls are required for this project.
-

Scope Accuracy:

Level 1: Project scope well understood and well defined.

Level 2: Project scope conceptual. Scope lacks detail due to potential permit requirements; Unknown project conditions; limited knowledge of external impacts.

Level 3: Project scope is a "vision" with limited detail.

Engineering Effort:

Level A: Preliminary engineering performed. Technical information is available, engineering calculations have been performed; clear understanding of the materials size and quantities needed to execute job. Schedule understood; staff and permitting is fairly clear, (however this element may still need refining). Project Development & Construction Contingencies ranges between 10%-20%.

Level B: Conceptual engineering performed. Technical information is available, rough engineering calculations may have been performed, or similar information from previous similar work is compared and used. Project Development Contingencies ranges between 15% to 25% and Construction Contingencies ranges between 20% to 30%.

Level C: No engineering performed. Educated guesstimating. Limited technical information available and/or analysis performed. Project Development and Construction Contingencies should be selected appropriately by Project Manager. Contingency may range up to 60% based on risk.

Reedsport Rail Crossing Study

OR38 Overcrossing Alt 2A - Three Bridges

Oregon Department of Transportation

Engineer's Conceptual Estimate

Prepared By: Jon Gerlach		*Date: 1/11/2024*		
Reviewed By: Darren Hippenstiel				
This Estimate has a Rating of:		**2B**	*(See rating scale guide below.)*	
ITEM	**UNIT**	**TOTAL QUANTITY**	**UNIT PRICE**	**TOTAL COST**
Mobilization	LS	ALL	$1,692,000.00	$1,692,000
Traffic Control	LS	ALL	$1,355,000.00	$1,355,000
Erosion Control	AC	2.3	$10,000.00	$23,000
Removal of Structures and Obstructions	LS	ALL	$167,000.00	$167,000
Clearing and Grubbing	LS	ALL	$84,000.00	$84,000
General Earthworks	CY	34,600	$40.00	$1,384,000
Asphalt Roadway - Full Depth (8" ACP over 16" compacted subgrade)	SF	119,000	$9.20	$1,094,800
Asphalt Roadway - Full Depth (6" ACP over 12" compacted subgrade)	SF	76,200	$6.90	$525,780
Asphalt Roadway - Grind & Inlay (2" Depth)	SF	180,000	$3.10	$558,000
Subgrade Geotextile	SY	13,223	$1.50	$19,835
Concrete Curbs - Standard Curb	LF	3,200	$30.90	$98,880
Concrete Walks	SF	40,850	$8.40	$343,140
Detectable Warnings	EA	22	$500.00	$11,000
Pedestrian Ramps	EA	22	$7,500.00	$165,000
Extra for Pedestrian Ramps	EA	22	$1,500.00	$33,000
Residential Driveway Reconstruction	EA	11	$1,500.00	$16,500
Commercial Driveway Reconstruction	EA	5	$3,000.00	$15,000
Retaining Walls, MSE	SF	40,900	$90.00	$3,681,000
Bridge Structure, Complete	SF	9,350	$530.00	$4,955,500
Storm Water Conveyance System, Complete	LS	ALL	$2,329,000.00	$2,329,000
Regional Water Quality and Hydromodification System, Complete	SF	10,100	$28.00	$282,800
Pavement Markings, Complete	LS	ALL	$43,000.00	$43,000
Signage, Complete	LS	ALL	$64,000.00	$64,000
Illumination System, Complete	LS	ALL	$254,100.00	$254,100
Traffic Signal System, Complete	LS	ALL	$500,000.00	$500,000
Four-Quadrant Gated Rail Crossing on Winchester Avenue	LS	ALL	$285,000.00	$285,000
			TOTAL CONSTRUCTION COST	**$19,981,000**
RIGHT-OF-WAY COSTS				
Residential Right-of-Way Acquisition (ODOT Estimate)	LS	ALL	$2,750,000.00	$2,750,000
RIGHT-OF-WAY SUBTOTAL				**$2,750,000**
ENGINEERING SUPPORT				
Engineering & Construction Management	LS	ALL	$3,997,000.00	$3,997,000
ENGINEERING SUPPORT SUBTOTAL				**$3,997,000**
			TOTAL PROJECT SUBTOTAL	**$26,728,000**
			30% Contingency	**$8,019,000**
			TOTAL ESTIMATED PROJECT COST	**$34,700,000**

Reedsport Rail Crossing Study

OR38 Overcrossing Alt 2A - Three Bridges

Oregon Department of Transportation

Engineer's Conceptual Estimate

Prepared By: Jon Gerlach		*Date: 1/11/2024*		
Reviewed By: Darren Hippenstiel				
This Estimate has a Rating of:		**2B**	*(See rating scale guide below.)*	
ITEM	**UNIT**	**TOTAL QUANTITY**	**UNIT PRICE**	**TOTAL COST**

Unit Costs Note:

The associated product and material costs are based upon the most recent available cost data. Due to the current volatility of the construction market, we cannot guarantee these costs for any duration of time.

Assumptions:

- The assumed roadway section on OR38 is 8 inches ACP over 16 inches of compacted aggregate base.
- The assumed roadway section for all other locations is 6 inches ACP over 12 inches of compacted aggregate base.
- Due to the separated bicycle facility the assumed storm inlet spacing is 50 feet.
- All overhead utilities will be relocated and remain above ground.
- No sound walls are required for this project.
-

Scope Accuracy:

Level 1: Project scope well understood and well defined.

Level 2: Project scope conceptual. Scope lacks detail due to potential permit requirements; Unknown project conditions; limited knowledge of external impacts.

Level 3: Project scope is a "vision" with limited detail.

Engineering Effort:

Level A: Preliminary engineering performed. Technical information is available, engineering calculations have been performed; clear understanding of the materials size and quantities needed to execute job. Schedule understood; staff and permitting is fairly clear, (however this element may still need refining). Project Development & Construction Contingencies ranges between 10%-20%.

Level B: Conceptual engineering performed. Technical information is available, rough engineering calculations may have been performed, or similar information from previous similar work is compared and used. Project Development Contingencies ranges between 15% to 25% and Construction Contingencies ranges between 20% to 30%.

Level C: No engineering performed. Educated guesstimating. Limited technical information available and/or analysis performed. Project Development and Construction Contingencies should be selected appropriately by Project Manager. Contingency may range up to 60% based on risk.

ATTACHMENT C

Final Technical Memoranda

TECHNICAL MEMORANDUM #1

Plan and Policy Review

KITTELSON & ASSOCIATES
851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

Technical Memorandum

February 23, 2023 Project# 27003.011

To: Thomas Guevara, *Oregon Department of Transportation*
Deanna Shafer and Kim Clardy, *City of Reedsport*

From: Matt Bell, Allison Woodworth, and Marc Butorac, PE, PTOE

Project: City of Reedsport Rail Crossing Study and Refinement Plan

Subject: Tech Memo #1: City of Reedsport Plan, Policy, Code Review & Port of Coos Bay Expansion Review

OVERVIEW

This memorandum presents a review of existing plans and policies that affect transportation planning in the City of Reedsport. The review explains the relationship between the documents and the current planning process, identifying key issues that will factor into the Reedsport Rail Crossing Study. The following documents were reviewed:

Statewide Planning Documents

Oregon Transportation Plan (2006)

The Oregon Transportation Plan (OTP) is the state's long-range multi-modal transportation plan that addresses the future transportation needs of the State of Oregon through the year 2030. The primary function of the OTP is to establish goals, policies, strategies, and initiatives that are translated into a series of modal plans, such as the Oregon Highway Plan. The OTP considers all modes of Oregon's transportation system, including Oregon's airports, bicycle and pedestrian facilities, highways and roadways, pipelines, ports and waterway facilities, public transportation, and railroads. It assesses state, regional, and local public and private transportation facilities. In addition, the OTP provides the framework for prioritizing transportation improvements based on varied future revenue conditions, but it does not identify specific projects for development.

The OTP provides broad policy guidance and sets seven overarching goals for the state.[1] Through these goals and associated policies and strategies, the OTP emphasizes:

- Maintaining and maximizing the assets in place.
- Optimizing the performance of the existing system through technology.
- Integrating transportation, land use, economic development, and the environment.
- Integrating the transportation system across jurisdictions, ownerships, and modes.
- Creating sustainable funding.
- Investing in strategic capacity enhancements.

The Implementation Framework section of the OTP describes the implementation process and how state multimodal, modal/topic plans, regional and local transportation system plans (TSPs), and master plans will further refine the OTP's broad policies and investment levels. Local TSPs can further OTP implementation by defining standards, instituting performance measures, and requiring that operational strategies be developed.

The last chapter of the OTP provides implementation and investment frameworks and key initiatives to be consulted in developing TSP projects and implementation measures.

> **Project Relevance:** The OTP's key initiatives will guide the development of the Reedsport Rail Crossing Study and Refinement Plan, specifically in the areas of system management, maximizing performance of the existing transportation system using technology and creative design solutions, pursuing sustainable funding sources, and investing strategically in capacity projects. Consistent with a central OTP policy, the Reedsport Rail Crossing Study and Refinement Plan will seek to maximize the performance of the existing local transportation system by the use of technology and system management before considering larger and costlier additions to the system.

Oregon Highway Plan (1999)

The Oregon Highway Plan (OHP) is a modal plan of the OTP that guides planning, operations, and financing for the Oregon Department of Transportation (ODOT) Highway Division. Policies in the OHP emphasize the efficient management of the highway system to increase safety and to extend highway capacity, to establish partnerships with other agencies and local governments, and to use new techniques

[1] The seven goals are Goal 1 – Mobility and Accessibility; Goal 2 – Management of the System; Goal 3 – Economic Vitality; Goal 4 – Sustainability; Goal 5 – Safety and Security; Goal 6 – Funding the Transportation System; and Goal 7 – Coordination, Communication, and Cooperation.

to improve road safety and capacity. These policies also link land use and transportation; set standards for highway performance and access management; and emphasize the relationship between state highways and local road, bicycle, pedestrian, transit, rail, and air systems. The following policies are relevant to the Reedsport Rail Crossing Study and Refinement Plan process.

Policy 1A: State Highway Classification System

The OHP classifies the state highway system into four levels of importance: Interstate, Statewide, Regional, and District. ODOT uses this classification system to guide management and investment decisions regarding state highway facilities. The system guides the development of the facility plans, as well as ODOT's review of local plan and zoning amendments, highway project selection, design and development, and facility management decisions including road approach permits.

The Oregon Coast Highway (US 101) and the Umpqua Highway (OR 38) are classified as statewide highways in the state classification system. The purpose and management objectives of these highways are provided in Policy 1A and summarized below.

- Statewide Highways typically provide inter-urban and inter-regional mobility and provide connections to larger urban areas, ports, and major recreation areas that are not directly served by Interstate Highways. A secondary function is to provide connections for intra-urban and intra-regional trips. The management objective is to provide safe and efficient, high-speed, continuous-flow operation. In constrained and urban areas, interruptions to flow should be minimal.

Policy 1C: State Highway Freight System

The primary purpose of the State Highway Freight System is to facilitate efficient and reliable interstate, intrastate, and regional truck movement through a designated freight system. This freight system, which is made up of the Interstate highways and select Statewide, Regional, and District highways, includes routes that carry significant tonnage of freight by truck and that serve as the primary Interstate and intrastate highway freight connection to ports, intermodal terminals, and urban areas. Highways included in this designation have higher highway mobility standards than other Statewide highways. US 101 and OR 38 are designated freight routes in Reedsport.

Policy 1F: Highway Mobility Standards Access Management Policy

Policy 1F sets mobility standards for ensuring a reliable and acceptable level of mobility on the state highway system. The standards are used to assess system needs as part of long-range, comprehensive planning for transportation projects, during development review, and to demonstrate compliance with the Transportation Planning Rule. Significant amendments to Policy 1F were adopted in 2011 to address concerns that state transportation policy and requirements have led to unintended consequences and inhibited economic development. Policy 1F now provides a clearer policy framework for considering measures other than volume-to-capacity (v/c) ratios for evaluating mobility performance.

Table 1 presents mobility targets for the state facilities in the project area. As indicated above, US 101 and OR 38 are classified as Statewide highways and designated freight routes within the Reedsport urban growth boundary. The posted speed limits on US 101 and OR 38 vary significantly throughout the project area, so the v/c ratios will also vary. It is important to note that achieving the v/c ratios in Table 1 for the state highway approaches to unsignalized intersection indicates that state mobility targets are being met. However, to maintain safe operations, non-state highway approaches are expected to achieve the v/c ratios for district/local interest roads.

Table 1. V/C Ratio Targets for Peak Hour Operating Conditions (OHP Table 6)

VOLUME TO CAPACITY RATIO TARGETS OUTSIDE METRO[17A, B, C, D]							
Highway Category	**Inside Urban Growth Boundary**					**Outside Urban Growth Boundary**	
	STA[E]	**MPO**	**Non-MPO Outside of STAs where non-freeway posted speed <= 35 mph, or a Designated UBA**	**Non-MPO outside of STAs where non-freeway speed > 35 mph but < 45 mph**	**Non-MPO where non-freeway speed limit >= 45 mph**	**Unincorporated Communities[F]**	**Rural Lands**
Interstate Highways	N/A	0.85	N/A	N/A	0.80	0.70	0.70
Statewide Expressways	N/A	0.85	0.85	0.80	0.80	0.70	0.70
Freight Route on a Statewide Highway	0.90	0.85	0.85	0.80	0.80	0.70	0.70
Statewide (not a Freight Route)	0.95	0.90	0.90	0.85	0.80	0.75	0.70
Freight Route on a regional or District Highway	0.95	0.90	0.90	0.85	0.85	0.75	0.70
Expressway on a Regional or District Highway	N/A	0.90	N/A	0.85	0.85	0.75	0.70
Regional Highways	1.0	0.95	0.90	0.85	0.85	0.75	0.70
District/Local Interest Roads	1.0	0.95	0.95	0.90	0.90	0.80	0.75

[A] Unless the Oregon Transportation Commission has adopted an alternative mobility target for the impacted facility, the mobility targets in Tables 6 are considered standards for purposes of determining compliance with OAR 660-012, the Transportation Planning Rule.

[B] For the purposes of this policy, the peak hour shall be the 30th highest annual hour. This approximates weekday peak hour traffic in larger urban areas. Alternatives to the 30th highest annual hour may be considered and established through alternative mobility target processes.

[C] Highway design requirements are addressed in the Highway Design Manual (HDM).

[D] See Action 1F.1 for additional technical details.

[E] Interstates and Expressways shall not be identified as Special Transportation Areas.

[F] For unincorporated communities inside MPO boundaries, MPO mobility targets shall apply.

Policy 1G: Major Improvements

This policy requires maintaining performance and improving safety on the highway system by improving efficiency and management on the existing roadway network before adding capacity. The state's highest priority is to preserve the functionality of the existing highway system. Tools that are employed to improve the function of the state highway system include access management, transportation demand management, traffic operations modifications, and changes to local land use designations or development regulations.

After existing system preservation, the second priority is to make minor improvements to existing highway facilities, such making improvements to the local street network to minimize local trips on the state facility. The third priority is to make major roadway improvements such as adding lanes to increase capacity on existing roadways. As part of this process, ODOT will work with the City of Reedsport and other stakeholders to determine appropriate strategies and tools that can be implemented at the local level that are consistent with this policy.

Policy 2B: Off-System Improvements

This policy recognizes that the state may provide financial assistance to local jurisdictions to make improvements to local transportation systems if the improvements would provide a cost-effective means of improving the operations of the state highway system. As part of this process, ODOT will work with the City of Reedsport and other stakeholders to identify improvements to the local road system that support the planned increases in rail activity and that will help preserve capacity and ensure the long-term efficient and effective operation of high functional class facilities.

Policy 2G: Rail and Highway Compatibility

This policy seeks to increase safety and transportation efficiency through the reduction and prevention of conflicts between railroad and highway users. Actions include eliminating crossings at grade wherever possible; designing highway projects to avoid or reduce rail crossings at grade; cooperating with railroads and local governments to target resources that increase safety through automated devices and enforcement at specific crossings; coordinating highway design, construction, resurfacing and traffic signals affecting rail crossings with the ODOT Rail Division and the railroads; and addressing pedestrian and bicycle access issues and design concerns when designing grade-separated crossings.

Policy 3A: Classification and Spacing Standards

This policy seeks to manage the location, spacing, and type of road intersections on state highways in a manner that ensures the safe and efficient operation of state highways consistent with their highway classification. Action 3A.2 calls for spacing standards to be established for state highways based on highway classification, type of area, and posted speed. Tables in OHP Appendix C present access spacing standards that consider urban and rural highway classification, traffic volumes, speed, safety, and operational needs. The access management spacing standards established in the OHP are implemented by OAR 734, Division 51, and are addressed later in this technical memorandum.

Policy 4A: Efficiency of Freight Movement

This policy emphasizes the need to maintain and improve the efficiency of freight movement on the state highway system. It seeks to balance the needs of long distance and through-freight movements with local transportation needs on highway facilities in both urban and rural areas. As indicated above, US 101 and OR 38 are designated freight routes.

> **Project Relevance:** OHP policies provide guidance related to the accessibility, mobility, and function of state highways. The Reedsport Rail Crossing Study and Refinement Plan will consider policies in the OHP to guide proposed improvements, modifications, or local policies that could affect any of the state facilities in the city. The Refinement Plan is being developed in coordination with ODOT so that projects, policies, and regulations proposed as part of the Plan will be consistent with the standards and targets established in the OHP related to safety, access, and mobility.

Oregon Rail Plan (2020)

The Oregon State Rail Plan is a state modal plan under the OTP that addresses long-term freight and passenger rail planning in Oregon. The plan provides a comprehensive assessment of the state's rail planning, freight rail, and passenger rail systems. It identifies specific policies concerning rail in the state; establishes a system of integration between freight and passenger elements into the land use and transportation planning process; and calls for cooperation between state, regional, and local jurisdictions in planning for rail.

The Coos Bay Rail (CBR) Line travels through the eastern portion of Reedsport, crossing Winchester Avenue and OR 38. Both crossings are at-grade and include signs, pavement markings, flashing lights, and gates. There are also two over-crossings in Reedsport, one north of OR 38 and the other adjacent to the Umpqua River. The CBR Line is classified as a Non-Class I freight line and provides no passenger service.

> **Project Relevance:** The Reedsport Rail Crossing Study and Refinement Plan will focus on the needs of the freight and modal connections to the rail system within the project area while developing recommended policies and projects related to improving safety, mobility, and freight efficiency.

Oregon Freight Plan (2017)

The Oregon Freight Plan (OFP) is the modal plan that guides the movement of goods and commodities on the state highway system. Its purpose statement identifies the intent to "improve freight connections to local, Native American, state, regional, national and global markets in order to increase trade-related jobs and income for workers and businesses." The objectives of the plan include prioritizing and facilitating investments in freight facilities (including rail, marine, air, and pipeline infrastructure) and adopting strategies to maintain and improve the freight transportation system.

The plan defines a statewide strategic freight network. US 101 and OR 38 are designated as strategic corridors among the Western Corridor Freight Facilities in the OFP. The following policy and strategic direction provided in the OFP prioritizes preservation of strategic corridors. It also prioritizes improvements to the supply chain through the coordination of freight and system management planning.

- Strategy 1.2: Support freight access to the Strategic Freight System. This includes proactively protecting and preserving corridors designated as strategic.
- Action 1.2.1: Preserve freight facilities included as part of the Strategic Freight System from changes that would significantly reduce the ability of these facilities to operate as efficient components of the freight system unless alternate facilities are identified or a safety-related need arises.
- Strategy 2.4: Coordinate freight improvements and system management plans on corridors comprising the Strategic Freight System with the intent to improve supply chain performance.

The OFP is currently undergoing an update, with amendments anticipated for adoption in 2023.

> **Project Relevance:** Maintaining and enhancing efficiency of the truck freight system in the project area will be an objective of the plan. The project advisory committee will include members that represent freight interests.

Oregon Revised Statute 366.215

Oregon Revised Statute (ORS) 366.215 identifies the Oregon Transportation Commission's (OTC's) authority to build and modify state highways. The statute states that the Commission may not permanently reduce the "vehicle-carrying capacity" of an identified freight route (a.k.a. Reduction Review Route) unless safety or access considerations require the reduction, or a local government requests an exemption, and the Commission determines it is in the best interest of the state and freight movement is not unreasonably impeded.

In the context of this statute, "vehicle-carrying capacity" refers to the vertical and horizontal clearance of a highway section that can physically carry motor vehicles. A reduction of vehicle-carrying capacity means a permanent reduction in the horizontal or vertical clearance of a highway section, by a permanent physical obstruction to motor vehicles located on useable right-of-way subject to OTC jurisdiction, unless such changes are supported by the Stakeholder Forum.

Examples of permanent structures that can result in a reduction in vehicle-carrying capacity could include bridge structures, traffic signals, signposts, stationary bollards, curbs, bulb-outs, trees, raised or depressed medians, pedestrian refuge islands, traffic separators, roundabouts, streetlights, and overhead wiring. Street markings such as bike lane striping or on-street parking are not considered reductions of vehicle-carrying capacity.

> **Project Relevance:** US 101 and OR 38 are Reduction Review Routes. Therefore, any features included in the final plan that could reduce vehicle-carrying capacity must comply with the statute. Where necessary for safety or access considerations, the plan may identify a need to obtain approval for proposed future actions by following the ORS 366.215 Review Process.

ODOT Blueprint for Urban Design

The ODOT Blueprint for Urban Design (BUD) was a bridging document that established the criteria to be used when designing urban projects on the state highway system. The BUD follows federal guidelines and principles utilizing a performance based, context sensitive, practical design approach to provide flexibility where warranted to produce appropriate designs to accommodate all modes of transportation affecting all urban roadway users. Tradeoffs between design elements in urban cross-sections are inevitable when working within the built environment. The BUD provides information and criteria to aid project teams to make appropriate choices when developing final project designs to meet established project goals and create the expected outcomes. Every urban project has unique opportunities and the six urban contexts portrayed in the BUD, along with their respective design criteria, allow project teams to better align ODOTs transportation needs with local community aspirations. The BUD was recently incorporated into the ODOT Highway Design Manual (HDM) as described below.

> **Project Relevance:** While the BUD was recently incorporated into the HDM, the BUD includes some unique criteria such as designating the roadway's classification at the end of the 20-year planning period. This is important for roadways that are in transition from rural to urban fringe to urban, and therefore will be considered in identifying the context and developing the alternatives for the Reedsport Rail Crossing Study and Refinement Plan.

ODOT Highway Design Manual

The HDM provides ODOT with uniform standards and procedures for planning studies and project development for the state's roadways. It is intended to provide guidance for the design of all projects on the state's highways.[2] It generally agrees with the American Association of State Highway and Transportation Officials *(*AASHTO) Policy on Geometric Design of Highways and Streets (2018) but anticipates that sound engineering judgment will continue to be a vital part of applying the design criteria to individual projects. The flexibility contained in the 2023 HDM supports the use of Performance-based Practical Design concepts and Context Sensitive Design practices.

State and local planners use the manual to determine design requirements as they relate to the state highways in Transportation System Plans, Corridor Plans, and Refinement Plans. Some projects under ODOT

[2] National Highway System or Federal-aid projects on roadways that are under the jurisdiction of cities or counties will typically use the 2018 AASHTO design standards or ODOT 3R design standards. Use of the 2023 Highway Design Manual is required on all projects with the Plans, Specifications, and Estimates (PS&E) milestone on and after January 1, 2023.

roadway jurisdiction traverse across local agency boundaries; for such facilities, local agencies may have adopted design standards and guidelines that differ from ODOT design standards. Although the appropriate ODOT design standards are to be applied on ODOT roadway jurisdiction facilities, local agency publications and design practices can also provide additional guidance, concepts, and strategies related to roadway design. When determining the appropriate design standard for use in project development, work types can be divided into the categories listed in Table 2. Funding may come from a number of programs, but it is the type of work that determines the design standard to use.

Table 2. Potential Applicable Design Standards (HDM Table 100-2)

	Roadway Project Types			
Work Type	**1R Resurfacing**	**3R Resurfacing, Restoration, and Rehabilitation**	**4R Resurfacing, Restoration, Rehabilitation, and Reconstruction**	**AASHTO**
Modernization			✓	
Preservation: Resurfacing	✓	✓		
Preservation: Interstate Maintenance	✓	✓		
Safety Improvements		✓	✓	
Operations		✓	✓	
Maintenance	✓	✓	✓	
Misc./Special Programs: Grant Project			✓	✓
Misc./Special Programs: Project Development Permit Projects		✓	✓	
Misc./Special Programs: Emergency/Natural Disaster		✓*		
Local Programs			✓**	✓

* Emergency/Natural Disaster projects may not be required to comply with all 3R design standards, as the main goal of these projects is to reopen compromised sections of highway, and projects are often designed to, at a minimum, meet design standards of the pre-emergency condition. However, it is important that permanent repairs should incorporate current design standards that do not materially change the function or character of the facility.
**On or along the state highway.

AASHTO = American Association of State Highway and Transportation Officials.

The HDM includes mobility standards related to project development and design that are applicable to all modernization projects, except for development review projects (see Table 3). The v/c ratios in the HDM are different than those shown in the Oregon Highway Plan (OHP). The v/c ratio values in the OHP are used to assist in the planning phase to identify future system deficiencies; the HDM v/c ratio values provide a mobility solution that corrects those previously identified deficiencies and provides the best investment for the state over a 20-year design life.

Table 3. 20-Year Design Mobility Standards (Volume/Capacity [V/C] Ratio) (HDM Table 1200-1)

Highway Category	Land Use Type/Speed Limits					
	Inside Urban Growth Boundary				Outside Urban Growth Boundary	
	STAs	MPO	Non-MPO Outside of STAs Where Non-freeway Speed Limit <45 MPH	Non-MPO Where Non-freeway Speed Limit ≥45 MPH	Unincorporated Communities	Rural Lands
Interstate Highways and Statewide (NHS) Expressways	N/A	0.75	0.70	0.65	0.60	0.60
Statewide (NHS) Freight Routes	0.85	0.75	0.70	0.70	0.60	0.60
Statewide (NHS) Non-Freight Routes and Regional or District Expressways	0.90	0.80	0.75	0.70	0.60	0.60
Regional Highways	0.95	0.85	0.75	0.75	0.70	0.65
District/Local Interest Roads	0.95	0.85	0.80	0.75	0.75	0.70

MPO = Metropolitan Planning Organization; N/A = not applicable; NHS = National Highway System; STA = Special Transportation Area.

Originally developed in 2020 as a standalone document, the Blueprint for Urban Design, or BUD, has now been incorporated into the HDM. The HDM now includes the six urban contexts that were established to provide design flexibility. The key concepts introduced by the BUD are that urban design:

- includes urban context in addition to the existing highway classification;
- highlights and provides flexibility;
- introduces performance concepts with practical design as performance-based, practical design;
- starts at the highest level of protection for pedestrians, bicyclists, and other users of the pedestrian and transition cross-section realms; and
- provides a focused design documentation process.

Urban contexts as defined in the HDM are based on existing and future land use characteristics, development patterns, roadway classification and connectivity, along with overall community goals and aspirations. The HDM describes ODOT's Urban Design Initiative, which provides principles and guidance that can be used for both planners and engineers "to allow flexibility to meet the modal needs of the users in urban communities."

> **Project Relevance:** The ODOT HDM and BUD provide design standards and guidance applicable to US 101 and OR 38. Proposed improvements on these state facilities will be informed by the HDM.

Local Plans and Ordinances

Reedsport Comprehensive Plan

The Reedsport Comprehensive Plan presents the goals and policies that guide development within the city. The plan includes elements related to citizen involvement, natural features, community services, economic development, housing and population, land use and urbanization, and coastal resources. The community services element includes the goals and policies for public facilities, including the following goals for transportation.

- Goal #1: Develop a transportation system to enhance Reedsport's livability and meet federal, state, and local requirements.
- Goal #2: Create a balanced transportation system.
- Goal #3: Improve the safety of the transportation system.
- Goal #4: Develop an efficient transportation system that will handle future traffic growth.
- Goal #5: Provide a transportation system that is accessible to all members of the community.
- Goal #6: Develop a transportation system to provide for efficient freight movement.
- Goal #7: Create a funding system to implement the recommended transportation system improvement projects.

These goals, and their related policies and action items, are generally consist with those shown in the Reedsport Transportation System Plan (TSP; see below). The only exception is Goal #7 in the Comprehensive Plan above, which includes an additional policy related to the funding and implementation recommendations in the Reedsport Waterfront and Downtown Plan.

Project Relevance: The goals and policies of the Comprehensive Plan will be used to guide the development of goals and policies for the Reedsport Rail Crossing Study and Refinement Plan.

Reedsport Zoning and Land Division Code

The Reedsport Zoning Map shows that most property within the study area is zoned residential, commercial, and industrial, with some public/semi-public land and urban conservation land. The residential uses include a mix of rural suburban, single-family, and multi-family properties and are generally located behind the commercial uses. The commercial uses include a mix of transitional, commercial, and water-related properties and are generally located along US 101, OR 38, and Winchester Avenue. The industrial uses include a mix of light, heavy, and water-dependent properties and are generally located along the Coos Bay Rail Line and the west bank of the Umpqua River. Exhibit 1 illustrates a subset of the zoning map for the study area. Table 4 summarizes the zoning designations and descriptions for study area property.

Exhibit 1. Subset of City Zoning Map

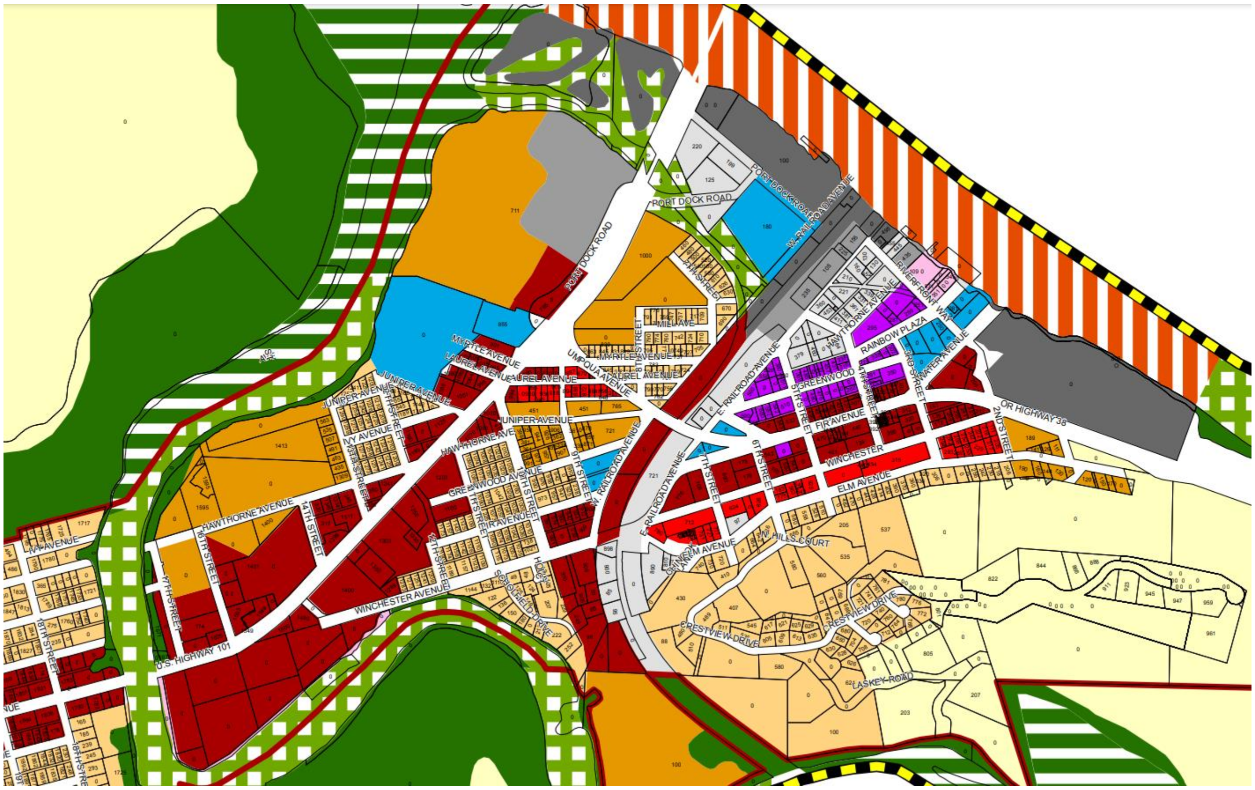


Table 4. Zoning Designation and Descriptions

Zoning Designation	Zoning Code	Description
Rural Suburban (Low-Density)	R-A	To provide low-density larger suburban-type residential developments.
Single Family Residential (Medium Density)	R-1	To provide a quality environment for medium-density single family residences, duplexes, and other compatible land uses determined to be desirable and/or necessary.
Multi-Family Residential (High Density)	R-2	To provide suitable high-density residential developments while preserving the residential character of the area.
Commercial Transitional	C-1	To provide a desirable mixing of residential land uses with limited commercial land uses in close proximity to adjacent residential districts. The zone is also intended to serve local neighborhood needs rather than provide a full commercial area for an entire community. The limited commercial uses allowed in this district are selected for their compatibility to meet frequently recurring needs of the neighborhood.
Commercial	C-2	To provide areas suitable and desirable within which a wide range of retail sales and business may occur.
Marine Commercial (Water-Related)	C-3	To provide shoreland areas suitable and desirable for water-dependent, water-related/oriented retail business activities. Intended to provide areas for attractive development of tourist, lodging, restaurants, and related facilities.
Light Industrial	M-1	To provide areas suitable and desirable for secondary manufacturing and related establishments and more intense commercial use with limited external impact.

Industrial	M-2	To provide areas suitable and desirable for medium and heavy industrial development and uses free from conflict with commercial, residential, and other noncompatible land uses.
Marine Industrial Zone (Water-Dependent)	M-3	To provide shoreland areas suitable for water-dependent manufacturing, industrial, and other compatible land uses.

Project Relevance: Property located within the vicinity of US 101, OR 38, and/or Winchester Avenue will likely be impacted by recommendations identified in the Reedsport Rail Crossing Study and Refinement Plan. The zoning designation of the property will be considered when developing the recommendations along with the review procedures and approval process for potential land divisions.

Reedsport Transportation System Plan (2006, Amended 2015)

The Reedsport TSP identifies projects and programs needed to support growth over a 20-year period. The TSP presents the investments and priorities for the pedestrian, bicycle, and motor vehicle systems along with new transportation programs to correct existing shortfalls and enhance critical services. For each travel mode, a master plan project map and list are identified to support the City's transportation goals and policies. The most critical elements of these master plans are referred to as "action plans." The final chapter of the TSP identifies the estimated plan costs and makes recommendations about potential new funding sources to support the plan.

The TSP includes a summary of existing conditions and future needs within the project area. The TSP projects emphasize pedestrian, bicycle, and safety improvements along US 101 and OR 38. The following summarizes projects that could influence the development of the plan:

- Fill in sidewalk gaps on both sides of US 101, OR 38, and Winchester Avenue – many of the gaps on US 101 and OR 38 have been filled since adoption of the TSP.
- Install enhanced pedestrian crossings on US 101 at Juniper Avenue, OR 38 at Railroad Avenue and Riverfront Way, and Winchester Avenue at 4th Street.
- Install a multi-use path from OR 38 to the Coho RV Marina along the waterfront.
- Provide bike lanes on both sides of OR 38, west of 6th Street, and on US 101, west of 13th Street – the bike lanes on OR 38 are largely complete.
- Provide shared roadway along Winchester Avenue from US 101 to OR 38 – there are currently wide shoulders on both sides of Winchester Avenue that are used for on-street parking; however, there are no signs or pavement marking that indicate it is a shared street.
- Develop an access management plan for US 101 and OR 38 to increase safety and mobility as properties are redeveloped.

Project Relevance: The project team will consider and incorporate information from the TSP on existing conditions and future needs within the project area. The team will also consider the projects identified for US 101, OR 38, and Winchester Avenue.

Reedsport Waterfront and Downtown Plan

The Reedsport Waterfront and Downtown Plan defines the desired character of the waterfront and downtown areas with an overall vision supported by a future development strategy. The plan recommends specific land use changes and transportation improvements for downtown revitalization and waterfront development. The plan includes streetscape plans for five roadway segments within the study area, including Port Dock Road in the Scholfield Slough Area, Umpqua Avenue (OR 38) in the Central Area, East Railroad Avenue in the Old Town/Waterfront Area, Umpqua Avenue (OR 38) in the Old Town/Waterfront

Area, and River Front Way in the Old Town/Waterfront Area. The streetscape plans are intended to create streets that safely accommodate motor vehicles, pedestrians, and bicyclists, while making the downtown more attractive to visitors, residents, businesses, and potential investors. The plan also includes a transportation plan that identifies transportation improvements needed to support land use changes in the study area, including:

1. Laurel Avenue traffic calming
2. Levee Loop Trail: bike/pedestrian path along levee and connecting multiple streets
3. OR 38/Winchester Avenue traffic signal or similar capacity improvement
4. Railroad landscape buffer
5. OR 38 from 6th Avenue to US 101 – full improvements per ODOT plans
6. Gateways (three landscape features)
7. Bulb-outs (five standard and one with Rectangular Rapid Flash Beacon (RRFB) or similar device at OR 38 and 3rd)
8. Disconnect 2nd Street from Winchester
9. New OR 38 eastern access at Knife River/Gate 6 as right in/right out
10. Realign Elm at Winchester at a right angle
11. OR 38 wayfinding and street furniture
12. East Railroad Avenue from OR 38 to River Front Avenue (full local street with sidewalks)
13. Riverfront boardwalk extension: Umpqua Discovery Center west to the railroad and east to the Knife River site
14. US 101/OR 38 intersection improvements
15. Realign 2nd Street north into the Knife River site
16. Connect Elm to OR 38 at Gate 6
17. Extend River Front Way to Gate 6
18. Install a multi-use path under railroad at Laurel

> **Project Relevance:** The project team will consider and incorporate information from the Reedsport Waterfront and Downtown plan in the Reedsport Rail Crossing Study and Refinement Plan, particularly elements of the streetscape plans and transportation improvement projects.

Port of Coos Bay New Multi-modal Container Facility

Draft Program

The Oregon International Port of Coos Bay is proposing to design, permit, and construct a new multi-modal container facility on the North Spit in Coos County. The container facility will be designed to accommodate 1 million in-bound and 1 million out-bound containers per year. These containers will be received in the first carbon-free marine terminal in the United States, as well as one of the only direct ship-to-rail container facilities in the United States. The Port expects six unit trains emanating from the container terminal daily, with the same number returning. The unit trains will travel from the Eco Port on the North Spit to Eugene and back. The unit trains will travel through the eastern part of Reedsport, crossing OR 38 (Umpqua Highway) and Winchester Avenue.

> **Project Relance:** The increase in train activity is expected to impact traffic operations and safety on OR 38 and Winchester Avenue as well as throughout the eastern part of the city. The Reedsport Rail Crossing Study and Refinement Plan will evaluate the impacts and identify improvements to the transportation system to mitigate the impacts.

Rail and Truck Program

The proposed container facility will be one of the only ship-to-rail container facilities in the United States and the only fully ship-to-rail facility on the west coast. By removing trucks from the equation, the proposed container facility will provide additional port capacity without a corresponding increase in greenhouse gas emissions. Using the Coos Bay Rail Line to transportation containers instead of trucks will reduce overall emissions generated by the port by up to 75%.

> **Project Relevance:** The Reedsport Rail Crossing Analysis and Refinement Plan will focus on the impacts associated with increased rail activity on traffic operations and safety within Reedsport. Given the reliance on rail, the analysis will not address potential increases in truck traffic.

Other Applicable Documents

Manual on Uniform Traffic Control Devices Part 8 (Traffic Control for Railroad and Light Trail Transit Grade Crossings)

Part 8 of the Manual on Uniform Traffic Control Devices (MUTCD – Reference 1) describes the traffic control devices that are used at railroad grade crossings, including all signs, signals, markings, other warning devices, and their supports along highways approaching and at grade crossings. The function of the traffic control devices is to promote safety and provide effective operation of rail and highway traffic at grade crossings. The highway agency or authority with jurisdiction and the regulatory agency with statutory authority, if applicable, jointly determine the need and selection of devices at grade crossings.

In Part 8, the combination of devices selected or installed at a specific grade crossing is referred to as a "traffic control system." Per the MUTCD, the appropriate traffic control system to be used at a grade crossing should be determined by an engineering study involving both the highway agency and the railroad company. Also, before any traffic control system is installed or before modifications are made to an existing system, approval shall be obtained from the highway agency with the jurisdictional and/or statutory authority, and from the railroad company. The traffic control devices, systems, and practices described in the MUTCD shall be used at all grade crossings open to public travel, consistent with federal, state, and local laws and regulations.

> **Project Relevance:** Part 8 of the MUTCD contains four sections with information on general provisions, signs and pavement markings, flashing lights, gates, traffic signals, and pathways. This information will be used to identify the types of traffic control devices needed at the grade crossings.

TECHNICAL MEMORANDUM #2

Purpose and Need

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Technical Memorandum

June 6, 2023 Project# 27003.011

To: Thomas Guevara, *Oregon Department of Transportation*
Deanna Shafer and Kim Clardy, *City of Reedsport*

From: Matt Bell, Allison Woodworth, and Marc Butorac, PE, PTOE, *PMP*

Project: City of Reedsport Rail Crossing Study and Refinement Plan

Subject: Tech Memo #2: Purpose & Need, Goals, Objectives, and Evaluation Criteria

OVERVIEW

This memorandum provides a background and presents the purpose and need for the Reedsport Rail Crossing Study and Refinement Plan along with the goals, objectives, and evaluation criteria. The goals and objectives will help ensure key issues are addressed throughout the planning process while the evaluation criteria will be used to select and prioritize preferred transportation system improvements. The goals, objectives, and evaluation criteria may also inform recommendations for policy language that will serve as guidance for future development of the transportation system.

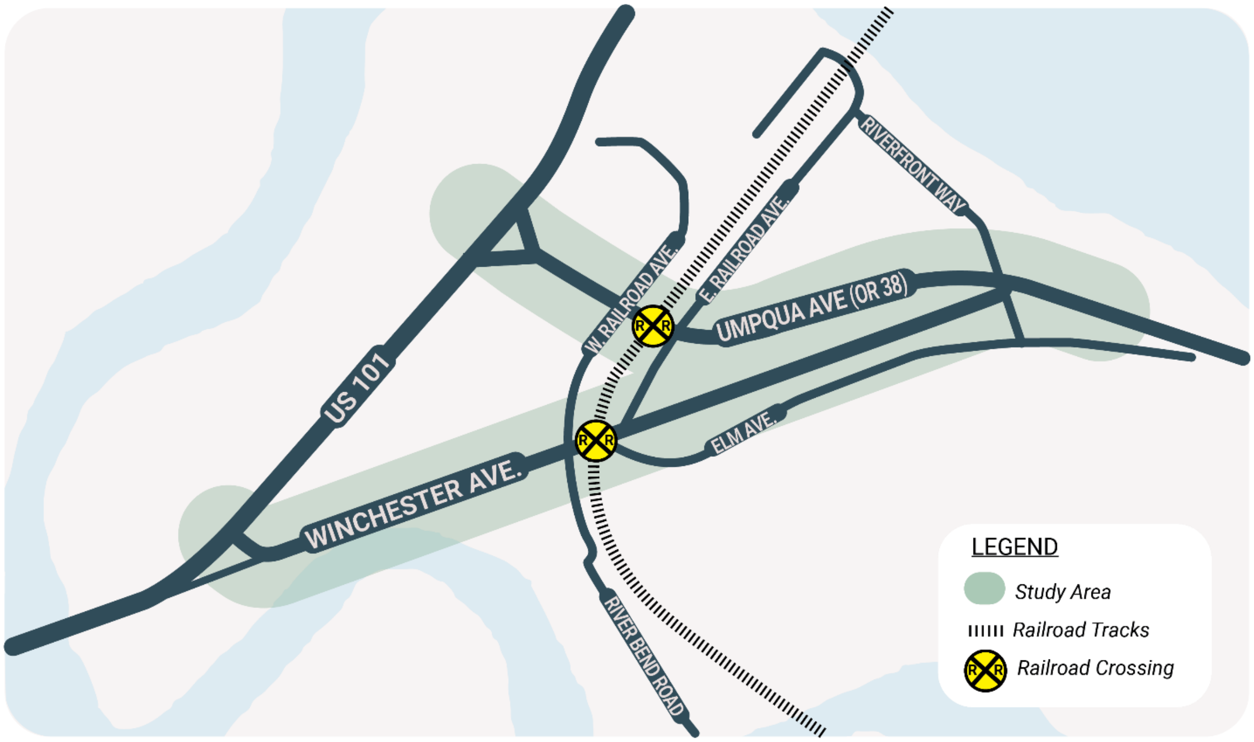
Background

The Oregon International Port of Coos Bay is proposing to design, permit, and construct a new multi-modal container facility on the North Spit in Coos County. The container facility will be designed to accommodate 1 million in-bound and 1 million out-bound containers per year. These containers will be received in the first carbon-free marine terminal in the United States, as well as one of the only direct ship-to-rail container facilities in the United States. The Port expects six unit trains emanating from the container terminal daily, with the same number returning. The unit trains will travel from the Eco Port on the North Spit to Eugene and back. The unit trains will travel through the eastern part of Reedsport, crossing OR 38 (Umpqua Highway) and Winchester Avenue. The increase in train activity at these crossings is expected to impact traffic operations and safety on OR 38 and Winchester Avenue as well as throughout the eastern part of the city.

Study Area

The study area includes the land located within the eastern part of Reedsport and is bordered by the Umpqua River to the north, Scholfield Creek to the west and south, and the OR 38/Riverfront Way and Winchester Avenue/Riverfront Way intersections to the east. The rail crossing on OR 38 is located within the study area and is bordered on the west by W Railroad Avenue and bordered on the east by E Railroad Avenue. The rail crossing on Winchester Avenue is also located within the study area and is bordered on the west by River Bend Road and bordered on the east by Elm Avenue. Figure 1 illustrates the study area.

Figure 1. Study Area



Purpose

The purpose of this project is to prepare a Railroad Crossing Study and Refinement Plan to evaluate the impacts of the anticipated increase in rail activity on traffic operations and safety in Reedsport and to identify potential solutions at the OR 38 and Winchester Avenue rail crossings. The solutions are expected to include enhancements to the existing rail crossings, as well as other potential crossing locations, including grade-separation (e.g., a roadway overpass above the rail line). The solutions will be supported by local circulation improvements, including roadway, bicycle, pedestrian, rail, and transit improvements. They will also consider at a minimum access management, access to and response times from emergency services, and stormwater controls within the study area. The solutions will be adequate to support development of the Oregon International Port of Coos Bay container facility and the increase in rail activity on the Coos Bay Rail Line.

Need

This project is needed to help the Oregon Department of Transportation (ODOT) and the City of Reedsport (City) prepare for the increase in rail activity on the Coos Bay Rail Line. The Railroad Crossing Study and Refinement Plan is likely to include recommendation for new and changes to existing transportation facilities that support access and circulation within the eastern part of Reedsport. These facilities need to be approved and incorporated into state and local plans, such as the Reedsport Transportation System Plan (TSP), and accounted for in local funding programs. In addition, the Port plans to complete construction of the container facility and begin operations within a 5-year timeframe, which increases the need to complete this project soon to start planning for the future.

NEPA Approach

Transportation improvements identified in the Reedsport Rail Crossing Study and Refinement Plan will likely move forward to a Federal Highway Administration (FHWA)-led National Environmental Policy Act (NEPA) documentation and decision process, and a Project Design Acceptable Package (DAP) milestone. The Reedsport Rail Crossing Study and Refinement Plan will include the assessment of rail crossing solutions sets necessary for the NEPA process and DAP.

Goals and Objectives

This section summarizes the proposed goals and objectives for the Reedsport Rail Crossing Study and Refinement Plan. The proposed goals and objectives are based on the goals and policies in the Reedsport Comprehensive Plan and TSP, which were developed as part of the last TSP update to guide the City's 20-year vision of transportation system needs. The proposed goals and objectives reflect the unique nature of this project as well as guidance from the project management team. The proposed goals and objectives will be revised based on input from the project advisory committee, the transportation users, and the community.

Proposed Goals and Objectives

The proposed goals and objectives are summarized below. The objectives shown in grey are applicable to the overall transportation system but will not impact the development of the Reedsport Rail Crossing Study and Refinement Plan. The objectives shown in **bold** are new relative to the Comprehensive Plan and TSP.

Goal #1: Develop a transportation system to enhance Reedsport's livability and meet federal, state, and local requirements.

Objectives:

1.a Maintain the livability of Reedsport through proper location and design of transportation facilities.
1.b Consider noise impacts in the design, redesign, and reconstruction of arterial streets immediately adjacent to residential neighborhoods.
1.c Protect neighborhoods from excessive through traffic and travel speeds while providing reasonable access to and from residential areas. Build streets to minimize speeding.
1.d New commercial and industrial development shall prepare traffic plans to minimize cut-through traffic on residential streets.
1.e Cooperate with ODOT to maintain and improve US 101 and OR 38 consistent with the Oregon Highway Plan (OHP).
1.f Ensure that transportation improvements minimize impacts to storm drainage, particularly in the City's downtown, which is located in a basin and surrounded by a levee.

Goal #2: Create a balanced transportation system.

Objectives:

2.a Implement street design standards that recognize the multi-purpose nature of the street right-of-way for utility, pedestrian, bicycle, truck, and vehicle traffic.
2.b Provide connectivity to each area of Reedsport to ensure pedestrian, bicycle, and vehicle access to schools, parks, employment, and recreational areas.

2.c Develop neighborhood and local connections to provide adequate circulation into and out of neighborhoods.
2.d Develop a pedestrian system of sidewalks and pathways to provide safe, attractive, efficient, and accessible routes that allows pedestrians to travel from residential areas to schools, parks, commercial areas, and major employment centers. All new streets shall have sidewalks.
2.e Develop a bikeway system of bike lanes, shared roadways, and multi-use paths that allows pedestrians to travel from residential areas to schools, parks, commercial areas, and major employment centers.
2.f **Ensure that local connections are maintained or enhanced through redevelopment to minimize reliance on major street connections.**
2.g Improve roadway connectivity and parallel routes on the local transportation network to redistribute local traffic volumes and reduce traffic demand on state facilities.

Goal #3: Improve the safety of the transportation system.

Objectives:

3.a Improve traffic safety through a comprehensive program of engineering, education, and enforcement.
3.b Where on-street pedestrian and bicycle facilities cannot reasonably be provided on highways and arterials, identify parallel routes that comply with state and City planning and design standards.
3.c Enhance safety by prioritizing and improving high accident locations within the city.
3.d Designate safe routes from residential areas to schools.
3.e Maintain access management standards for streets to reduce conflicts between vehicles and trucks, and between vehicles and bicycles and pedestrians.
3.f Ensure that adequate access for emergency services vehicles is provided throughout the city.
3.g Meet federal and state safety standards for rail crossings.
3.h Provide safe routing of hazardous materials consistent with federal guidelines

Goal #4: Develop an efficient transportation system that will handle future traffic growth.

Objectives:

4.a Designate roadway functional classifications that reflect the desired function and characteristics of different roadways.
4.b Adopt land use development standards to reduce travel demand and encourage all modes of transportation.
4.c Encourage development that effectively mixes land uses to reduce reliance on vehicles.
4.d Implement the bicycle, pedestrian, and vehicle improvements to create a multi-modal transportation system.
4.e Maintain levels of service consistent with the Oregon Transportation Plan. Reduce traffic congestion and enhance traffic flow through such measures as intersection improvements, intelligent transportation systems, signal synchronization, and other similar measures.
4.f Require comprehensive plan amendments and zone changes to demonstrate that the proposed changes will not significantly affect the transportation system and are consistent with the identified function, capacity, and performance standards of the transportation facility.
4.g **Consider fluctuations in traffic volumes on weekends, holidays, and during the summer season when developing transportation improvements.**

Goal #5: Provide a transportation system that is accessible to all members of the community.

Objectives:

5.a Construct transportation facilities to meet the requirements of the Americans with Disabilities Act.
5.b Support service to respond to the transportation needs of disadvantaged individuals.

Goal #6: Develop a transportation system to provide for efficient freight movement.

Objectives

6.a Truck routes and highway access are essential for efficient movement of goods. Design these facilities and adjacent land uses to reflect the needs of freight movement.
6.b Consider the impact on railroad facilities in land use decisions.
6.c Protect the function of rail facilities and develop and implement strategies that minimize conflicts with other travel modes and adjacent land uses, including strategies that support a "No Horn Ordinance."

Goal #7: Create a funding system to implement the recommended transportation system improvement projects.

Objectives

7.a Partner with ODOT and other jurisdictions to develop a long-range financial strategy to make needed improvements to the transportation system and support operational and maintenance requirements.
7.b Coordinate transportation projects, policy issues, and development actions with all affected governmental units in the area. Key agencies for coordination include Douglas County and ODOT.
7.c Provide adequate funding for maintenance of transportation facilities.
7.d Develop a funding program to pay for transportation improvements related to development impacts.
7.e Establish rights-of-way at the time of site development and, where appropriate, officially secure them by dedication of property.
7.f Monitor and update the Transportation System Plan so that issues and opportunities are addressed in a timely manner. Maintain a current capital improvement program that establishes the City's construction and improvement priorities, and allocate the appropriate level of funding.
7.g Consider the funding and implementation recommendations of the Reedsport Waterfront and Downtown Plan in prioritizing and implementing the City's capital improvement program.
7.h **Ensure that the Transportation System Plan is consistent with other state and local plans and that it reflects the City's overall development plan.**

Evaluation Criteria

This section summarizes the proposed evaluation criteria for the Reedsport Rail Crossing Study and Refinement Plan. Given the unique nature of this project, the proposed evaluation criteria reflect only the goals and objectives that will result in a meaningful difference in the evaluation.

Proposed Evaluation Criteria

The proposed evaluation criteria are summarized below. A qualitative process using the evaluation criteria will be used to consider potential solutions and prioritize projects developed through the planning process. The rating method used to evaluate the solutions is described below.

Most Desirable: The concept addresses the criterion and/or makes substantial improvements in the criteria category. (+2)

Desirable: The concept addresses the criterion and/or makes improvements in the criteria category. (+1)

No Effect: The criterion does not apply to the concept or the concept has no influence on the criteria. (0)

Less Desirable: The concept does not support the intent of and/or negatively impacts the criteria category. (-1)

Least Desirable: The concept substantially negatively impacts the criteria category. (-2)

At this level of screening, the criteria will not be weighted; the ratings will be used to inform discussions about the benefits and tradeoffs of each solution. Table 1 presents the evaluation criteria that will be used to qualitatively evaluate the potential solutions developed through the planning process.

Table 1. Reedsport Rail Crossing Evaluation Criteria

Objective	Evaluation Criteria	Evaluation Score
Goal #1: Develop a transportation system to enhance Reedsport's livability and meet federal, state, and local requirements.		
Objective 1.a	Concept maintains the livability of Reedsport through proper location and design of transportation facilities.	(-2 to +2)
Objective 1.b	Concept consider noise impacts in the design, redesign, and reconstruction of arterial streets immediately adjacent to residential neighborhoods.	(-2 to +2)
Objective 1.c	Concept protects neighborhoods from excessive through traffic and travel speeds while providing reasonable access to and from residential areas.	(-2 to +2)
Objective 1.e	Concept cooperates with ODOT to maintain and improve US 101 and OR 38 consistent with the Oregon Highway Plan (OHP).	(-2 to +2)
Objective 1.f	Concept ensures that transportation improvements minimize impacts to storm drainage, particularly in the City's downtown.	(-2 to +2)
Goal #2: Create a balanced transportation system		
Objective 2.b	Concept provides connectivity to each area of Reedsport to ensure pedestrian, bicycle, and vehicle access to schools, parks, employment, and recreational areas.	(-2 to +2)
Objective 2.c	Concept develops neighborhood and local connections to provide adequate circulation into and out of neighborhoods.	(-2 to +2)
Objective 2.f	Concept ensures that local connections are maintained or enhanced to minimize reliance on major street connections	(-2 to +2)
Objective 2.g	Concept improves roadway connectivity and/or parallel routes on the location transportation network.	(-2 to +2)
Goal #3: Improve the safety of the transportation system		
Objective 3.e	Concept maintains access management standards for streets to reduce conflicts between vehicles and trucks, and between vehicles and bicycles and pedestrians.	(-2 to +2)

Objective 3.f	Concept ensures that adequate access for emergency services vehicles is provided throughout the city.	(-2 to +2)
Objective 3.g	Concept meets federal and state safety standards for rail crossings.	(-2 to +2)
Goal #4: Develop an efficient transportation system that will handle future traffic growth		
Objective 4.d	Concept implements the bicycle, pedestrian, and vehicle improvements to create a multi-modal transportation system.	(-2 to +2)
Objective 4.e	Concept maintains levels of service consistent with the Oregon Transportation Plan.	(-2 to +2)
Objective 4.g	Concept considers fluctuations in traffic volumes on weekends, holidays, and during the summer season when developing transportation improvements.	(-2 to +2)
Goal #5: Provide a transportation system that is accessible to all members of the community.		
Objective 5.a	Concept constructs transportation facilities to meet the requirements of the Americans with Disabilities Act.	(-2 to +2)
Objective 5.b	Concept supports service to respond to the transportation needs of disadvantaged individuals.	(-2 to +2)
Goal #6: Develop a transportation system to provide for efficient freight movement.		
Objective 6.a	Truck routes and highway access are essential for efficient movement of goods. Concept designs these facilities and adjacent land uses to reflect the needs of freight movement.	(-2 to +2)
Objective 6.b	Concept considers the impact on railroad facilities in land use decisions.	(-2 to +2)
Objective 6.c	Concept protects the function of rail facilities and develop and implement strategies that minimize conflicts with other travel modes and adjacent land uses, including strategies that support a "No Horn Ordinance."	(-2 to +2)
Goal #7: Create a funding system to implement the recommended transportation system improvement projects.		
Objective 7.a	Concept partners with ODOT and other jurisdictions to develop a long-range financial strategy to make needed improvements to the transportation system and support operational and maintenance requirements.	(-2 to +2)
Objective 7.b	Concept is coordinated with transportation projects, policy issues, and development actions with all affected governmental units in the area. Key agencies for coordination include Douglas County and ODOT.	(-2 to +2)
Objective 7.h	Concept ensures that the Transportation System Plan is consistent with other state and local plans and that it reflects the City's overall development plan.	(-2 to +2)

TECHNICAL MEMORANDUM #3

Analysis Methodology and Assumptions

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Technical Memorandum

June 6, 2023 Project# 27003.011

To: Thomas Guevara, *Oregon Department of Transportation*
Deanna Schafer and Kim Clardy, *City of Reedsport*

From: Michael Ruiz-Leon, Allison Woodworth, Matt Bell, and Marc Butorac, PE, PTOE

Project: City of Reedsport Rail Crossing Study and Refinement Plan

RE: Tech Memo #3: Analysis Methodology and Assumptions

TABLE OF CONTENTS

INTRODUCTION

This memorandum documents the methodologies and assumptions associated with the existing and future transportation system operations analyses for the City of Reedsport Rail Crossing Study and Refinement Plan (Plan). The methodologies and assumptions included in this memorandum are based on guidance provided in the Oregon Department of Transportation (ODOT) Analysis Procedures Manual (APM – Reference 1), and direction provided by City of Reedsport (City) and ODOT staff. The methodologies and assumptions described in this memorandum will help identify potential gaps and deficiencies in the existing transportation system and the future needs to accommodate the anticipated increase in rail activity along the Coos Bay Rail Line (CBRL) through the City of Reedsport.

STUDY AREA AND BACKGROUND

The study area is the land located within the City limits bordered by the Umpqua River to the north; Scholfield Creek to the west and south; and the OR 38/Riverfront Way/Winchester intersection to the east. The rail crossing on OR 38 is located within the study area and is bordered on the west by W Railroad Avenue and bordered on the east by E Railroad Avenue. The rail crossing on Winchester Avenue is also located within the study area and is bordered on the west by River Bend Road and bordered on the east by Elm Avenue. Figure 1 illustrates the study area.

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STUDY INTERSECTIONS

Within the study area, there are 10 study intersections located along state and local facilities, including two signalized and eight unsignalized intersections. The study intersections for the City of Reedsport Rail Crossing Study and Refinement Plan were determined by the City in coordination with ODOT. Safety and capacity analysis at these locations will inform the determination of project-impacts within the study area. Figure 1 illustrates the location of the study intersections.

State Facilities

1. US 101/OR 38 (signalized)
2. W Railroad Avenue/OR 38
3. E Railroad Avenue/OR 38
4. OR 38/Riverfront Way-Winchester Avenue
5. North 6th Street/OR 38
6. US 101/Winchester Avenue (signalized)

Local Facilities

7. W Railroad Avenue/Winchester Avenue
8. Elm Avenue/Winchester Avenue
9. E Railroad Avenue/Winchester Avenue
10. South 6th Street/Winchester Avenue

VOLUME DEVELOPMENT

Traffic Counts

Turning movement counts were conducted at the study intersections in August 2022. The counts were conducted on a typical mid-week day during the peak summer months. The counts conducted at the signalized intersections were conducted over a 16-hour period (6:00 AM to 10:00 PM) while the counts conducted at the unsignalized intersections were conducted over a 4-hour period (2:00 to 6:00 PM). All the counts include the total number of pedestrians, bicyclists, and motor vehicles that entered the study intersections in 15-minute intervals. Table 1 summarizes the traffic count information. *The traffic count worksheets are provided in Attachment A.*

Table 1. Traffic Count Summary

Map ID	Intersection	Count Date	Count Type	Duration
1	US 101/OR 38 (signalized)	8/15/22	16-hour	6 AM to 10 PM
2	W Railroad Avenue/OR 38	8/15/22	4-hour	2 PM to 6 PM
3	E Railroad Avenue/OR 38	8/15/22	4-hour	2 PM to 6 PM
4	OR 38/Riverfront Way-Winchester Avenue	8/17/22	4-hour	2 PM to 6 PM

5	N 6th Street/OR 38	8/17/22	4-hour	2 PM to 6 PM
6	US 101/Winchester Avenue (signalized)	8/15/22	16-hour	6 AM to 10 PM
7	W Railroad Avenue/Winchester Avenue	8/17/22	4-hour	2 PM to 6 PM
8	Elm Avenue/Winchester Avenue	8/15/22	4-hour	2 PM to 6 PM
9	E Railroad Avenue/Winchester Avenue	8/15/22	4-hour	2 PM to 6 PM
10	South 6th Street/Winchester Avenue	8/17/22	4-hour	2 PM to 6 PM

Peak Hour Development

The traffic counts were reviewed to identify a system-wide peak hour and/or individual peak hours for the operational analysis. A system-wide peak hour was found to occur from 2:00 to 3:00 PM while individual intersection peak hours were found to occur at different times throughout the day.

Table 2 summarizes the individual intersection peak hours at the study intersections, the total entering volume (TEV) during the individual intersection peak hours, and the percent difference between the TEV during the individual intersection peak hours and the system-wide peak hour. As shown, the percent difference is greater than five percent at the US 101/OR 38 and US 101/Winchester Avenue intersections, where the individual intersection peak hours were observed at 12:00 to 1:00 PM and differences in TEV is primarily driven by northbound and southbound through volumes along US 101. The percent difference is also greater than five percent at the OR 38/Riverfront Way/Winchester Avenue intersection, but the TEV is relatively low.

Table 2. Study Intersection Peak Hours

Map ID	Intersection	Individual Intersection Peak Hour	Individual Intersection Peak Hour Total Entering Volume (TEV)	System-wide Peak Hour TEV	Percent Difference in TEV
1	US 101/ OR 38 (signalized)	12:00 PM to 1:00 PM	1,284	1,123	-14%
2	W Railroad Avenue/ OR 38	3:30 PM to 4:30 PM	575	554	-4%
3	E Railroad Avenue/ OR 38	3:30 PM to 4:30 PM	576	546	-5%
4	N 6th Street/ OR 38	2:15 PM to 3:15 PM	616	597	-3%
5	OR 38/Riverfront Way-Winchester Avenue	2:15 PM to 3:15 PM	567	518	-9%
6	US 101/Winchester Avenue (signalized)	12:00 PM to 1:00 PM	1,609	1,391	-16%
7	W Railroad Avenue/ Winchester Avenue	3:15 PM to 4:15 PM	238	223	-7%
8	Elm Avenue/ Winchester Avenue	2:00 PM to 3:00 PM	220	220	0%
9	E Railroad Avenue/ Winchester Avenue	2:00 PM to 3:00 PM	223	223	0%
10	South 6th Street/ Winchester Avenue	2:45 PM to 3:45 PM	172	162	-6%

Seasonal Adjustment Factor

30th Hour Volumes (30 HV) will be developed based on the traffic counts collected at the study intersections and the application of seasonal adjustment factors consistent with the methodologies identified in the APM. The APM identifies three methods for developing seasonal adjustment factors for highway traffic volumes. All three methods utilize information provided by Automatic Traffic Recorders (ATRs) in select locations throughout the state highway system. The ATRs collect traffic data 24 hours a day, 365 days a year. Each method was evaluated to determine the most appropriate one for the study intersections. Based on these evaluations, the ATR Characteristic Table Method was used to develop seasonal adjustment factors for the study intersections on US 101 and OR 38. The results of the evaluations and proposed seasonal adjustment factors are summarized below.

ATR Characteristic Table

The ATR Characteristic Table is an Excel spreadsheet that provides general information on ATRs in Oregon. The table is filtered from left to right to find ATRs that share similar characteristics with roadways in the study area. Based on information provided in the 2021 ATR Characteristics Table, one ATR was found that shares similar characteristics with US 101, and two ATRs were found that share similar characteristics with OR 38.

US 101

The Astoria Bridge ATR (#04-004) is located on US 101 approximately 0.01 mile north of the Lower Columbia River Highway (US 30). This segment of US 101 has a coastal destination seasonal traffic trend and a weekend traffic trend, is in a small urban area, and has three travel lanes. The average annual daily traffic (AADT) at the ATR is within 10 percent of the AADT on US 101 in Reedsport. The ATR was installed in September 1995 and has traffic count data for the last 26 years.

Based on data provided by the ATR, the peak month generally occurs in August. Table 3 summarizes the five most recent years of data available from the ATR for the peak month and compares it to the five most recent years of data available for the count month.

Table 3. Astoria Bridge ATR (#04-004) Seasonal Adjustment Factor (ATR Characteristic Table Method)

Year	2017	2018	2019	2020	2021	Average	Seasonal Adjustment
Peak Month (August)	136%*	130%	133%	139%	129%*	133%	N/A
Count Month (August)	136%*	130%	133%	139%	129%*	133%	1.00

*Indicates values that were discarded from the average as indicated in the APM.

Per Table 3, a seasonal adjustment factor of 1.00 will be applied to the study intersections along US 101.

OR 38

The Scottsburg ATR (#10-003) is located on OR 38 approximately 7.08 miles east of Scottsburg West Road. This segment of OR 38 has a coastal destination seasonal traffic trend and a weekend traffic trend, is in a rural area, and has two travel lanes. The AADT at the ATR is within 10 percent of the AADT on OR 38 in Reedsport. The ATR was installed in December 1956 and has traffic count data for the last 65 years.

Based on data provided by the ATR, the peak month generally occurs in August. Table 4 summarizes the five most recent years of data available from the ATR for the peak month and compares it to the five most recent years of data available for the count month.

Table 4. Scottsburg ATR (#10-003) Seasonal Adjustment Factor (ATR Characteristic Table Method)

Year	2017	2018	2019	2020	2021	Average	Seasonal Adjustment
Peak Month (August)	140%	139%	140%	148%*	139%*	140%	N/A
Count Month (August)	140%	139%	140%	148%*	134%*	140%	1.00

*Indicates values that were discarded from the average as indicated in the APM.

Per Table 4, a seasonal adjustment factor of 1.00 will be applied to the study intersections along OR 38.

Future Year Volumes

Forecast traffic volumes will be developed for the study intersections based on the existing traffic volumes and information provided in the Statewide Integrated Model (SWIM). SWIM provides base and forecast year traffic volume projections that reflect anticipated land use changes and planned transportation improvements. This model is up-to-date and readily available with base year 2019 and future year 2045 traffic volume projections.

Forecast traffic volumes will be developed by applying the post-processing methodology identified in the National Cooperative Highway Research Program (NCHRP) Report 765, *Analytical Travel Forecasting Approaches for Project-Level Planning and Design* (Reference 2), which is the update to NCHRP Report 255, *Highway Traffic Data for Urbanized Area Project Planning and Design*. The methodology derives forecast traffic volumes based on the existing traffic volumes and base and future year traffic volume projections in the model. Forecasting traffic volumes will also include engineering judgment and knowledge of the project study area.

TRAFFIC ANALYSIS

This section documents the mobility standards and targets that will be used to evaluate the performance of the study intersections and to identify potential alternatives to address operational issues on ODOT and City facilities.

ODOT Facilities

ODOT uses volume-to-capacity (v/c) ratios to assess intersection operations. Table 6 of the Oregon Highway Plan (OHP – Reference 3) and Table 1200-1 of the Oregon Highway Design Manual (HDM – Reference 4) provide maximum v/c ratios for all signalized and unsignalized intersections located outside the Portland metropolitan area. The OHP ratios are used to evaluate existing and future no-build conditions, while the HDM ratios are used in the creation of future alternatives that involve projects along state highways. The following summarizes the factors that determine the OHP and HDM ratios at the ODOT-controlled intersections within the study area, which are located along US 101 and OR 38.

- US 101 is classified as a Statewide highway and is a designated freight route in the study area. All study intersections on US 101 are located inside the Reedsport urban growth boundary (UGB). US 101 has a posted speed limit of 30 miles per hour (mph) at the study intersections.
- OR 38 is classified as a statewide highway and is a designated freight route in the study area. All study intersections on OR 38 are located inside the Reedsport UGB. OR 38 has a posted speed limit of 25 mph at the study intersections.

Table 5 summarizes the v/c ratios that will be used to identify existing and projected future traffic conditions at the ODOT study intersections.

Table 5. ODOT Mobility Targets

Map ID	Intersection	Traffic Control[1]	Oregon Highway Plan Mobility Target[2]	Highway Design Manual Standard
1	US 101/OR 38	Signalized	V/C = 0.85	V/C = 0.70
2	W Railroad Avenue/OR 38	TWSC	V/C = 0.85 / 0.95	V/C = 0.75
3	E Railroad Avenue/OR 38	TWSC	V/C = 0.85 / 0.95	V/C = 0.75
4	OR 38/ Riverfront Way-Winchester Avenue	TWSC	V/C = 0.85 / 0.95	V/C = 0.75
5	N 6th Street/OR 38	TWSC	V/C = 0.85 / 0.95	V/C = 0.75
6	US 101/Winchester Avenue	Signalized	V/C = 0.85	V/C = 0.70

1. TWSC = Two-Way Stop Control.
2. State highway v/c ratio / side-street v/c ratio

Local Facilities

The City of Reedsport uses the level of service (LOS) to assess intersection operations. Per Section 10.76.026 (Transportation Standards) of the Reedsport Municipal Code, street intersections shall maintain LOS D during the PM peak hour of the day. A lesser standard may be accepted for local street intersections or driveway access points that intersect with collector or arterial streets if these intersections are found to operate safety. Table 6 summarizes the City performance standards that will be used to evaluate existing and projected future traffic conditions at City study intersections.

Table 6. City Performance Standards

Map ID	Intersection	Traffic Control[1]	Performance Standards[2]
7	W Railroad Avenue/Winchester Avenue	TWSC	LOS D
8	Elm Avenue/Winchester Avenue	TWSC	LOS D
9	E Railroad Avenue/Winchester Avenue	TWSC	LOS D
10	S 6th Street/Winchester Avenue	TWSC	LOS D

1. TWSC = Two-Way Stop Control.
2. LOS = level of service.

TRAFFIC ANALYSIS PARAMETERS

The following identifies the specific sources of data and methodologies proposed to conduct the operational analyses. Analyses of all state facilities will be conducted according to the APM, unless otherwise agreed upon by the City and ODOT.

- Intersection/Roadway Geometry data (lane numbers and arrangements, cross-section elements, signal phasing, etc.) will be collected through aerial photography and confirmed through a site visit. Available as-built data may also be used to verify existing roadway geometry. The analysis models will be built on scaled roadway line work from GIS or aerial photography.
- Operational data (posted speeds, intersection control, parking, transit stops, rail crossings, right-turn on red, etc.) will be collected through a site visit.
- Peak Hour Factor (PHF) data will be calculated for each intersection and applied to the existing conditions analyses. Default PHFs from the APM may be used for the future conditions analysis if they are greater than the existing PHFs. However, if the existing PHFs are greater than the default PHFs, then the existing PHFs will be applied.
  - Since the federal functional classification of both US 101 and OR 38 is principal arterial, the US 101/OR 38 and US 101/Winchester Avenue intersection may use a PHF of 0.95, and all other intersections on US 101 and OR 38 may use a PHF of 0.92.
  - Since the federal functional classification of all other major roadways in the City (Winchester Avenue) is collector, all other intersections may use a PHF of 0.85.
- Signal Timing data will be requested from ODOT for use in the existing conditions analysis. Signal parameters such as Flash Don't Walk, Walk, and Minimum Times will be retained in the forecast analysis with the signal splits optimized to better serve the future traffic volume patterns. Optimized signal cycle lengths may range between 60 and 120 seconds.
- Traffic Operations data
  - The methodologies identified in the Highway Capacity Manual, 7th Edition (HCM – Reference 5) will be used to analyze traffic operations at the study intersections.
  - PTV Vistro 2022 (Vistro) will be used to conduct the traffic operations analyses. Vistro is a software tool designed to assist with operations analyses in accordance with HCM methodologies. The analysis results will be reported for the overall intersection at signalized intersections and the critical movement at unsignalized intersections.
  - Vistro will be used to conduct a queuing analysis at the signalized study intersections. The 95th percentile queue lengths will be reported for all separate left- and right-turn movements and compared to available striped storage lengths. The 95th percentile queue and storage lengths will be rounded to the nearest 25 feet. Microsimulation is not proposed as part of this long-range planning effort.
  - Train Event Analysis will be conducted by applying a Poisson distribution to the expected number of vehicle arrivals during a typical train event period and summing the associated probability for each number of arrivals, starting at zero vehicles, until a total probability of 95 percent is attained.

Traffic Analysis Software and Input Assumptions

Vistro will be used to evaluate intersection performance under the conditions and assumptions detailed in Table 7.

Table 7. Operations Parameters/Assumptions

Intersection Parameters	Existing Conditions
Peak Hour Factor	From traffic counts
Conflicting Bikes and Pedestrian per Hour	From traffic counts, as available
Signal Timing Data	From ODOT or City of Reedsport
Ideal Saturation Flow Rate (for all movements)	1,750 passenger cars per hour per lane
Lane Width	12 feet unless field observations suggest otherwise
Percent Heavy Vehicles	From traffic counts by movement
Percent Grade	Estimated based on field observations
95th Percentile Vehicle Queues	Vistro summary output

CRASH ANALYSIS

The six most recent years of complete crash data available will be obtained from ODOT's crash database and reviewed at the study intersections and along study area roadways consistent with the methodologies outlined in Chapter 4 of the APM. Currently, complete crash data is available for the period from January 1, 2015, through December 31, 2020.[1] The crash data will be analyzed for number, type, severity, and location to identify potential crash patterns.

Crash rates and critical crash rates will be developed for the study intersections and roadway segments as applicable. Intersection crash rates will be compared to the 90th percentile crash rates in Table 4.1 of the APM, and segment crash rates will be compared to Table II in the current ODOT State Highway Crash Rate Tables. In addition, ODOT's Safety Priority Index System (SPIS) will be reviewed to identify sites in the top 5 percent and 10 percent, as appropriate. Potential countermeasures (and resulting crash percentage reductions) will be taken from the All Roads Transportation Safety (ARTS) Crash Reduction Factors (CRF) listing, the CRF Appendix, or the Crash Modification Factor (CMF) Clearinghouse; CMFs from the Clearinghouse will be three stars or better.

MULTIMODAL ANALYSIS

The multimodal analysis will be performed in accordance with the methodologies identified in Chapter 14 of the APM and identify the needs associated with pedestrian, bicycle, and public transportation facilities and service. The pedestrian and bicycle analyses will follow the Pedestrian Level of Traffic Stress (PLTS) and Bicycle Level of Traffic Stress (BLTS) analysis methodologies outlined in the APM. Both PLTS and BLTS methods group facilities into four different stress levels for segments, intersection approaches, and intersection crossings. Facilities with an LTS 1 rating have little to no traffic stress, require less attention, and are suitable for all users. Facilities with an LTS 2 rating have little traffic stress, but require more attention and therefore, may or may not be suitable for small children. Facilities with an LTS 3 rating have moderate traffic stress and are suitable for adults. Facilities with an LTS 4 rating have high traffic stress and are suitable only for able-bodied adults with limited options. The transit analysis will follow the qualitative multimodal assessment (QMA) methodology outlined in the APM. Transit QMA provides a qualitative "good," "fair," or "poor"

[1] Typically, this analysis is done over 5 years of data. However, travel patterns in the most recent year of available data (2020) were affected by the COVID-19 pandemic. Thus, crash analysis will cover all 6 years but also retain the ability to compare trends for 5 full years of "regular" traffic patterns.

rating for transit service based on hours of service, service frequency, and service coverage. The multimodal analysis will be conducted for the study area segments of US 101, OR 38, and Winchester Avenue.

RAIL CROSSING ANALYSIS

The existing operations of the CBRL provides freight service to industrial customers in and around Coos Bay and Coquille via interchange connections with the Union Pacific Railroad in Eugene, approximately 120 railroad miles to the north and east. Based upon data obtained from the existing crossing inventories within Reedsport and input from Coos Bay Railroad staff, the current train service on the line through Reedsport consists of a maximum of two trains per day, a maximum operating length of about 1,500 feet, with a maximum train speed of 10 mph though town. The 10 mph speed restriction in place on the Umpqua swing span at the east side of town is the limiting feature along the rail line.

The frequency of operation of the swing span was not provided by the CBRL; however, it was described as infrequent, with vessel passages described as weekly rather than daily, though it was noted to be seasonal, with passages in correlation with the fishing seasons along the Oregon Coast. The current operation of the swing span favors watercraft, with the bridge remaining open until train passage requires closure. CRBL staff reported that efforts are underway to petition the U.S. Coast Guard to allow the bridge to remain closed, with openings for watercraft on a scheduled or on-call basis. This would favor railroad operations, providing the CBRL with the ability to coordinate opening with rail traffic, thus lessening the potential delays incurred by train traffic waiting for bridge openings.

Future operations on the CBRL would increase rail traffic through Reedsport by way of containerized rail traffic moving to/from an international container port that is being planned within Coos Bay. The container terminal is stated to have a target capacity of 1.2 million Twenty-foot Equivalent Unit (TEU) per year, which equates to approximately 600,000 containers per year (e.g., 300,000 inbound, 300,000 outbound) with 40 foot being the predominate container length within the international shipping trade. Based upon double stack operations, 365 day per year operations would provide for movement of approximately 1,643 containers per day by rail. With an average rail car length of 57 feet per paired container, that results in 46,826 train feet per day net to be moved in both directions. Depending upon the operational length of trains on the CBRL, the number of trains could vary from 10 to 12 intermodal trains per day (4,000 to 5,000 feet per train respectively). The operational length of the trains will be limited largely by the grades and curvature along the rail line after improvements, all of which have yet to be finalized. Based upon these findings, Kittelson recommends using a typical intermodal train length of 4,000 feet, with a frequency of 12 trains per day (e.g., 6 in, 6 out), plus two trains per day (1 in, 1 out) of mixed freight traffic at 1,500 feet of operating train length.

The goal for operational speeds for the improved rail line was stated by CBRL as 40 mph; however, it is quite possible that the Umpqua swing span could still present an operational speed restriction within Reedsport even after capital improvements. Based upon this, Kittelson recommends using an operational speed of 25 mph within Reedsport for a conservative approach with respect to grade crossing blockages by passing trains.

Train characteristics provided by CBRL are summarized in Table 8.

Table 8. Intermodal Train Analysis Assumptions

Operational Attribute	Assumptions
Containers Per Year	600,000 (1,200,000 twenty-foot equivalent units per year x 20 feet per unit / 40 feet per container = 600,000 containers per year)
Containers Per Day	1,643 (600,000 containers per year / 365 days per year = 1,643 containers per day)
Train Feet Per Day	46,826 (57 train feet per forty foot container x 1,643 containers per day) / (double stacked containers) = 46,826 train feet per day)
Operating Train Length	4,000 to 5,000 Feet[1]
Trains Per Day	10 to 12 (46,826 train feet per day / 5,000 feet = 10 trains per day; 46,826 train feet per day / 4,000 feet = 12 trains per day)
Train Speeds	CBRL goal of 40 mph. However, the Umpqua swing span is likely to result in operational speed restrictions and necessitate a conservative speed estimate with respect to grade crossing blockages by passing trains.

[1] The operational length of trains will ultimately be determined by curvature and grade of improved rail line. These elements have yet to be finalized.

Based on CBRL train characteristics and potential operational speed restrictions within Reedsport, recommended train analysis assumptions are summarized in Table 9.

Table 9. Train Analysis Recommendations

Operational Attribute	Recommendation
Train Length (intermodal)	4,000 Feet
Train Frequency (intermodal)	12 Trains / Day
Train Length (mixed freight traffic)	1,500 Feet
Train Frequency (mixed freight traffic)	2 Trains / Day
Train Speeds	25 mph

REFERENCES

1. Oregon Department of Transportation. *Analysis Procedures Manual*, 2018.
2. Transportation Research Board. *NCHRP Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design*, 2014.
3. Oregon Department of Transportation. *Oregon Highway Plan*, 2015.
4. Oregon Department of Transportation. *Highway Design Manual*, 2023.
5. Transportation Research Board. *Highway Capacity Manual, 7th Edition*, 2022.

ATTACHMENTS

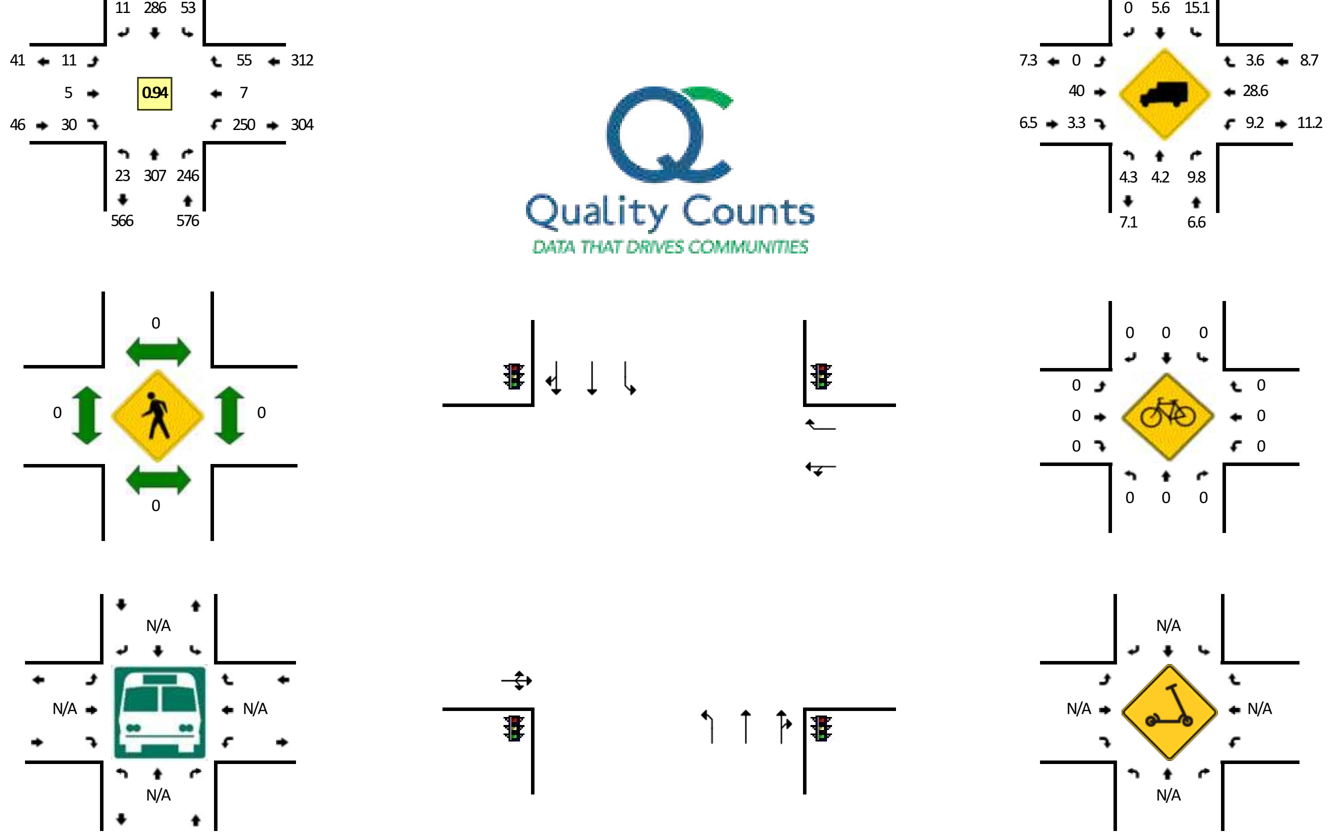
A. Traffic Counts – the traffic counts that will be used to evaluate traffic operations for the Reedsport Railroad Crossing Study were conducted by ODOT and post-processed by Quality Counts, LLC. The traffic count worksheets included in Attachment A summarize the traffic count information. The images in the worksheets reflect the intersection peak hour and include (from top to bottom and left to right) the total of number of motor vehicles, heavy vehicle percentages, pedestrians, bicyclists, buses, and scooters that entered the study intersections during the peak hour. The Tabular summaries in the worksheets include all motor vehicle movements during the count period, as well as all movements during the peak 15 minutes of traffic at the intersection. The peak 15-minute flow rates are multiplied by 4 to extrapolate the effect of the peak 15 minutes over the whole hour.

Attachment A: Traffic Counts

Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

LOCATION: Oregon Coast Hwy -- Port Dock Rd/Umpqua Hwy — **QC JOB #:** 16062101
CITY/STATE: Reedsport, OR — **DATE:** Mon, Aug 15 2022

Peak-Hour: 12:00 PM -- 1:00 PM
Peak 15-Min: 12:00 PM -- 12:15 PM



15-Min Count Period Beginning At	Oregon Coast Hwy (Northbound) Left	Thru	Right	U	Oregon Coast Hwy (Southbound) Left	Thru	Right	U	Port Dock Rd/Umpqua Hwy (Eastbound) Left	Thru	Right	U	Port Dock Rd/Umpqua Hwy (Westbound) Left	Thru	Right	U	Total	Hourly Totals
6:00 AM	0	18	20	0	3	6	0	0	0	1	0	0	9	0	2	0	59	
6:15 AM	2	30	12	0	7	12	0	0	0	0	2	0	11	1	2	0	79	
6:30 AM	3	35	24	0	5	14	0	0	0	0	0	0	19	0	6	0	106	
6:45 AM	2	17	21	0	5	13	1	0	0	0	0	0	13	1	4	0	77	321
7:00 AM	6	30	21	0	1	14	2	0	0	0	2	0	29	4	7	0	116	378
7:15 AM	5	36	31	0	5	21	3	0	1	4	3	0	37	2	11	0	159	458
7:30 AM	2	53	22	0	4	22	1	0	2	1	2	0	36	3	7	0	155	507
7:45 AM	5	45	33	0	4	26	3	0	0	0	0	0	26	1	12	0	155	585
8:00 AM	4	33	33	0	4	26	6	0	1	0	7	0	31	2	8	0	155	624
8:15 AM	4	46	26	0	5	20	2	0	2	0	3	0	24	0	7	0	139	604
8:30 AM	2	29	23	0	6	32	2	0	0	0	4	0	28	1	11	0	138	587
8:45 AM	5	45	44	0	10	38	2	0	1	1	4	0	40	2	9	0	201	633
9:00 AM	3	31	47	0	6	45	1	0	3	2	4	0	31	0	10	0	183	661
9:15 AM	7	36	42	0	14	34	3	0	2	2	6	0	35	1	8	0	190	712
9:30 AM	4	33	50	0	12	44	3	0	1	1	7	0	41	1	5	0	202	776
9:45 AM	4	50	58	0	13	43	0	0	4	1	9	0	41	1	16	0	240	815
10:00 AM	6	50	77	0	8	50	1	0	1	1	3	0	39	1	11	0	248	880
10:15 AM	2	61	59	0	10	43	1	0	0	1	4	0	46	2	7	0	236	926
10:30 AM	3	49	64	0	13	47	1	0	3	1	4	0	53	1	12	0	251	975
10:45 AM	6	51	59	0	8	49	3	0	5	2	8	0	60	3	4	0	258	993
11:00 AM	4	66	58	0	7	30	2	0	1	0	8	0	45	2	15	0	238	983
11:15 AM	6	63	56	0	9	40	3	0	4	2	5	0	54	3	13	0	258	1005
11:30 AM	4	77	64	0	9	51	2	0	1	2	7	0	60	3	16	0	296	1050
11:45 AM	7	71	60	0	11	70	4	0	1	5	12	0	42	4	20	0	307	1099
12:00 PM	11	86	53	0	15	81	2	0	1	3	7	0	59	3	19	0	340	1201
12:15 PM	4	93	69	0	7	73	2	0	2	0	9	0	56	0	12	0	327	1270
12:30 PM	5	62	56	0	15	70	2	0	4	1	9	0	58	0	9	0	291	1265
12:45 PM	3	66	68	0	16	62	5	0	4	1	5	0	77	4	15	0	326	1284
1:00 PM	2	75	63	0	11	47	0	0	3	2	6	0	69	1	13	0	292	1236
1:15 PM	4	55	59	0	22	63	5	0	1	0	5	0	83	3	12	0	312	1221
1:30 PM	4	67	45	0	4	41	4	0	2	2	6	0	54	2	13	0	244	1174
1:45 PM	7	47	56	0	11	54	3	0	2	4	4	0	58	3	16	0	265	1113
2:00 PM	4	54	60	0	13	77	4	0	6	4	6	0	48	2	8	0	286	1107
2:15 PM	2	62	48	0	8	67	4	0	2	2	10	0	54	1	7	0	267	1062
2:30 PM	7	75	50	0	15	61	3	0	2	0	7	0	67	2	9	0	298	1116
2:45 PM	4	46	52	0	5	66	3	0	3	2	4	0	65	0	22	0	272	1123
3:00 PM	4	37	48	0	12	72	3	0	3	2	6	0	51	2	15	0	255	1092
3:15 PM	4	62	40	0	10	69	1	0	3	1	8	0	48	0	8	0	254	1079

15-Min Count Period Beginning At	Oregon Coast Hwy (Northbound)				Oregon Coast Hwy (Southbound)				Port Dock Rd/Umpqua Hwy (Eastbound)				Port Dock Rd/Umpqua Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	4	59	53	0	12	72	4	0	2	2	6	0	64	0	10	0	288	1069
3:45 PM	5	46	59	0	12	69	4	0	0	0	6	0	73	0	8	0	282	1079
4:00 PM	2	57	56	0	11	80	4	0	5	3	9	0	58	3	16	0	304	1128
4:15 PM	3	45	52	0	10	65	1	0	3	2	3	0	68	0	8	0	260	1134
4:30 PM	8	63	42	0	7	99	2	0	2	2	9	0	53	0	12	0	299	1145
4:45 PM	1	43	58	0	17	92	2	0	2	1	3	0	39	0	4	0	262	1125
5:00 PM	5	49	52	0	6	56	2	0	4	3	7	0	46	0	16	0	246	1067
5:15 PM	0	45	44	0	7	74	0	0	2	1	2	0	30	2	13	0	220	1027
5:30 PM	1	39	38	0	5	58	1	0	2	0	4	0	53	0	14	0	215	943
5:45 PM	1	42	39	0	10	91	0	0	0	0	1	0	21	0	12	0	217	898
6:00 PM	5	41	29	0	11	43	0	0	1	0	7	0	32	0	4	0	173	825
6:15 PM	1	33	30	0	8	55	0	0	1	0	1	0	31	0	7	0	167	772
6:30 PM	2	34	18	0	11	46	1	0	1	1	0	0	25	0	6	0	145	702
6:45 PM	2	37	35	0	2	37	2	0	1	0	4	0	29	0	7	0	156	641
7:00 PM	9	18	21	0	7	29	0	0	2	1	2	0	18	1	8	0	116	584
7:15 PM	1	26	15	0	2	25	1	0	0	1	2	0	26	1	7	0	107	524
7:30 PM	2	20	21	0	5	37	0	0	0	1	1	0	33	0	2	0	122	501
7:45 PM	2	20	20	0	5	28	0	0	1	3	1	0	14	0	2	0	96	441
8:00 PM	1	19	21	0	2	22	0	0	0	0	0	0	18	0	3	0	86	411
8:15 PM	0	16	18	0	2	26	0	0	1	0	1	0	23	0	3	0	90	394
8:30 PM	1	13	9	0	4	15	0	0	0	0	0	0	15	0	3	0	60	332
8:45 PM	0	10	16	0	1	21	0	0	0	1	5	0	12	0	4	0	70	306
9:00 PM	0	13	7	0	0	15	0	0	0	0	2	0	21	0	1	0	59	279
9:15 PM	0	11	10	0	1	24	0	0	0	0	0	0	11	0	1	0	58	247
9:30 PM	2	8	10	0	3	14	0	0	0	0	2	0	23	0	1	0	63	250
9:45 PM	0	3	7	0	0	5	0	0	0	0	0	0	7	1	0	0	23	203

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	44	344	212	0	60	324	8	0	4	12	28	0	236	12	76	0	1360
Heavy Trucks	4	20	12		0	4	0		0	4	0		20	8	4		76
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

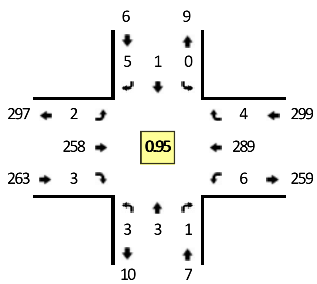
Report generated on 1/12/2023 8:56 AM

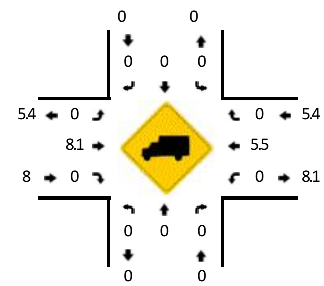
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

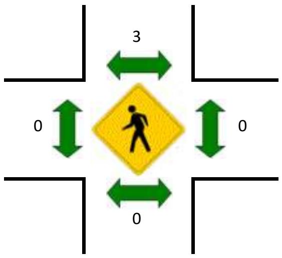
LOCATION: W Railroad Ave -- Umpqua Hwy
CITY/STATE: Reedsport, OR

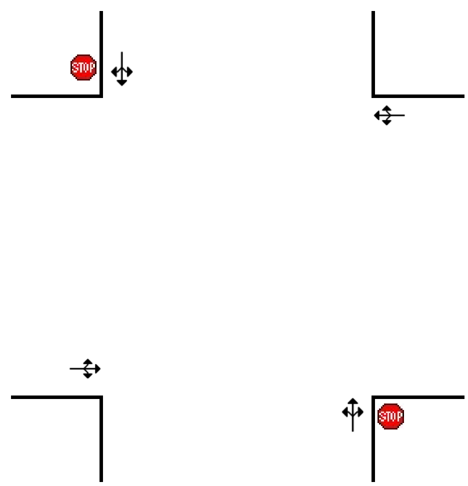
QC JOB #: 16062109
DATE: Mon, Aug 15 2022

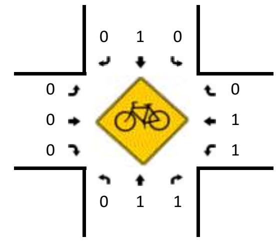
Peak-Hour: 3:30 PM -- 4:30 PM
Peak 15-Min: 3:30 PM -- 3:45 PM

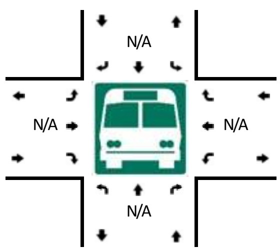


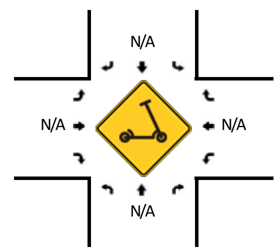










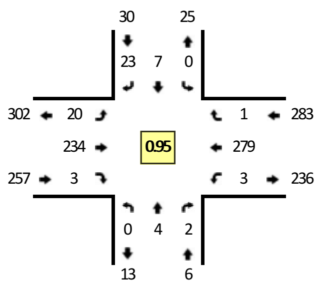


15-Min Count Period Beginning At	W Railroad Ave (Northbound)				W Railroad Ave (Southbound)				Umpqua Hwy (Eastbound)				Umpqua Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	0	0	0	0	0	0	1	0	2	73	0	0	1	59	0	0	136	
2:15 PM	1	0	1	0	0	0	2	0	0	56	2	0	0	65	1	0	128	
2:30 PM	3	1	1	0	0	1	1	0	1	62	2	0	0	68	2	0	142	
2:45 PM	0	2	0	0	0	0	0	0	1	57	0	0	4	84	0	0	148	554
3:00 PM	4	0	1	0	2	0	2	0	1	55	2	0	0	65	0	0	132	550
3:15 PM	0	0	0	0	2	0	1	0	0	46	0	0	1	54	1	0	105	527
3:30 PM	0	0	0	0	0	0	2	0	1	66	0	0	1	80	1	0	151	536
3:45 PM	0	1	0	0	0	1	1	0	1	63	0	0	1	77	0	0	145	533
4:00 PM	1	0	1	0	0	0	1	0	0	65	2	0	3	72	0	0	145	546
4:15 PM	2	2	0	0	0	0	1	0	0	64	1	0	1	60	3	0	134	575
4:30 PM	2	1	1	0	0	0	0	0	3	44	0	0	0	55	0	0	106	530
4:45 PM	0	0	2	0	0	0	0	0	0	63	1	0	0	43	0	0	109	494
5:00 PM	1	0	0	0	0	0	2	0	0	54	1	0	0	56	0	0	114	463
5:15 PM	1	0	1	0	0	0	1	0	0	47	0	0	0	43	0	0	93	422
5:30 PM	3	0	0	0	0	0	0	0	0	39	1	0	1	62	0	0	106	422
5:45 PM	0	0	0	0	1	0	0	0	1	38	1	0	0	32	1	0	74	387

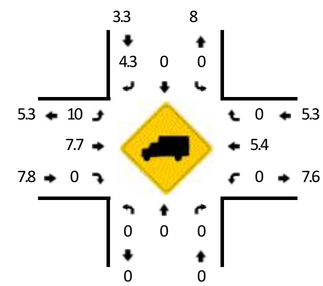
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	0	0	8	0	4	264	0	0	4	320	4	0	604
Heavy Trucks	0	0	0		0	0	0		0	24	0		0	16	0		40
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	4	0		0	0	0		0	0	0		4
Scooters																	

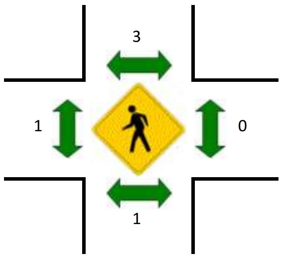
Comments:

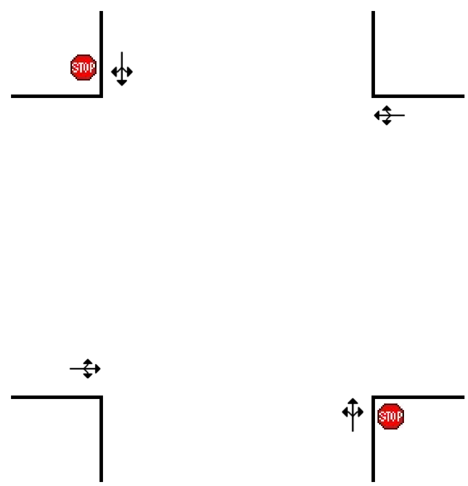
LOCATION: E Railroad Ave -- Umpqua Hwy **QC JOB #:** 16062106
CITY/STATE: Reedsport, OR **DATE:** Mon, Aug 15 2022

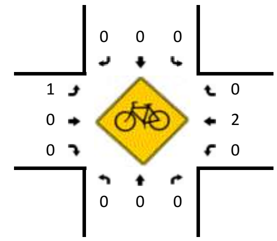


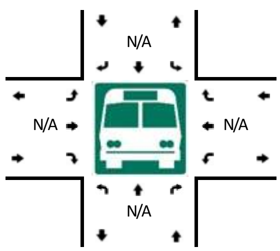
Peak-Hour: 3:30 PM -- 4:30 PM
Peak 15-Min: 3:30 PM -- 3:45 PM

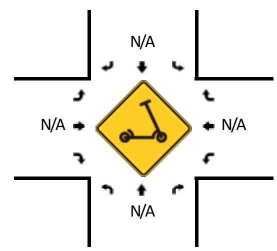












15-Min Count Period Beginning At	E Railroad Ave (Northbound) Left	Thru	Right	U	E Railroad Ave (Southbound) Left	Thru	Right	U	Umpqua Hwy (Eastbound) Left	Thru	Right	U	Umpqua Hwy (Westbound) Left	Thru	Right	U	Total	Hourly Totals
2:00 PM	0	2	1	0	0	1	2	0	3	69	0	0	0	58	0	0	136	
2:15 PM	0	1	0	0	0	0	2	0	7	51	1	0	0	64	0	0	126	
2:30 PM	0	0	1	0	0	0	7	0	6	53	2	0	0	66	1	0	136	
2:45 PM	0	0	1	0	0	1	6	0	4	53	2	0	1	80	0	0	148	546
3:00 PM	3	0	0	0	0	2	4	0	6	51	0	0	1	58	0	0	125	535
3:15 PM	0	1	0	0	0	1	0	0	3	46	0	0	1	55	3	0	110	519
3:30 PM	0	1	0	0	0	2	6	0	2	61	1	0	1	77	1	0	152	535
3:45 PM	0	1	1	0	0	1	8	0	3	60	0	0	1	69	0	0	144	531
4:00 PM	0	0	0	0	0	1	4	0	9	54	2	0	0	73	0	0	143	549
4:15 PM	0	2	1	0	0	3	5	0	6	59	0	0	1	60	0	0	137	576
4:30 PM	2	0	0	0	0	2	8	0	2	42	2	0	0	42	0	0	100	524
4:45 PM	0	1	0	0	0	0	2	0	8	56	1	0	0	42	0	0	110	490
5:00 PM	1	3	0	0	0	0	5	0	3	51	0	0	0	49	0	0	112	459
5:15 PM	0	1	0	0	0	3	6	0	3	42	1	0	0	37	0	0	93	415
5:30 PM	0	1	0	0	1	0	1	0	2	40	0	0	0	62	0	0	107	422
5:45 PM	0	0	1	0	0	3	1	0	3	35	1	0	0	32	0	0	76	388

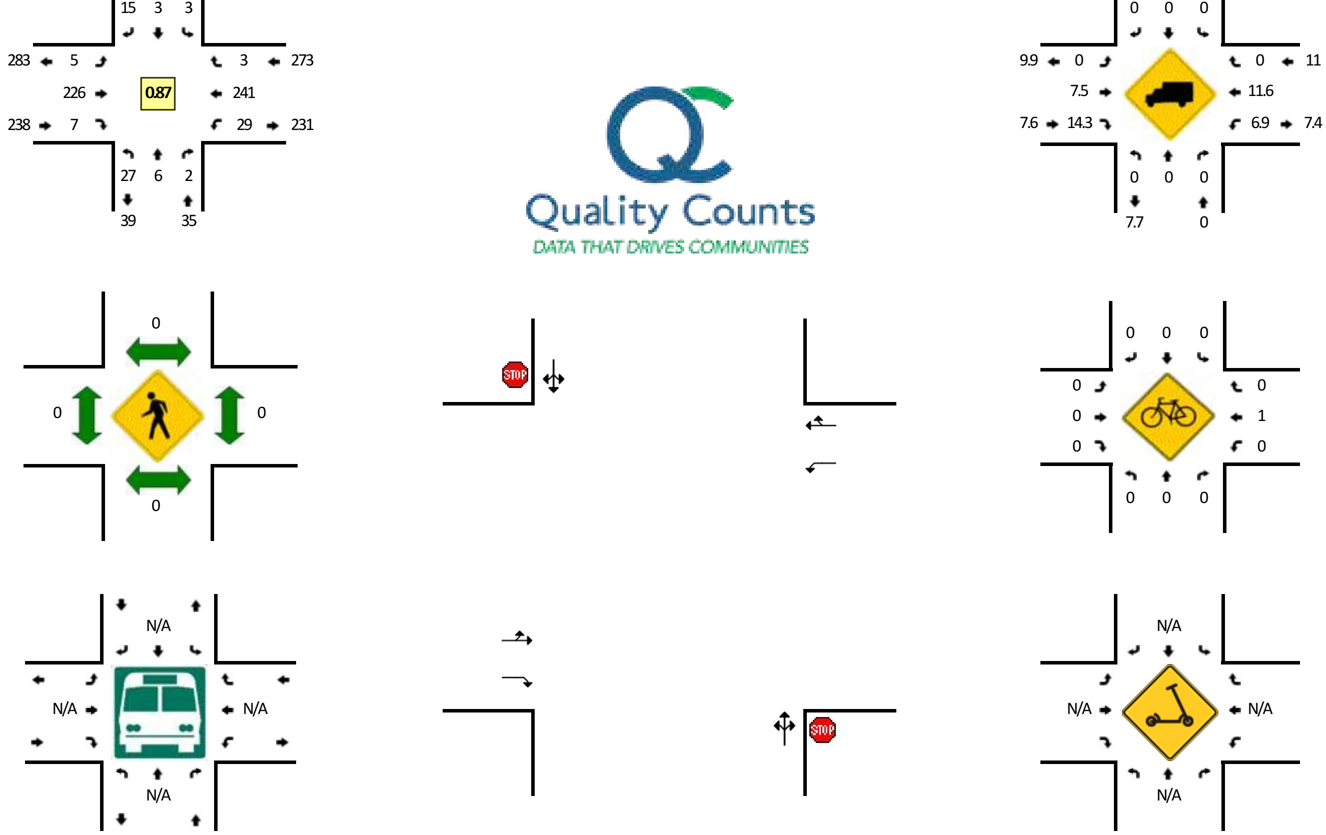
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	4	0	0	0	8	24	0	8	244	4	0	4	308	4	0	608
Heavy Trucks	0	0	0		0	0	0		0	20	0		0	12	0		32
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

LOCATION: Riverfront Way/Winchester Ave -- Umpqua Hwy — **QC JOB #:** 16062108
CITY/STATE: Reedsport, OR — **DATE:** Wed, Aug 17 2022

Peak-Hour: 2:15 PM -- 3:15 PM
Peak 15-Min: 2:45 PM -- 3:00 PM



15-Min Count Period Beginning At	Riverfront Way/Winchester Ave (Northbound)				Riverfront Way/Winchester Ave (Southbound)				Umpqua Hwy (Eastbound)				Umpqua Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	7	1	0	0	1	0	1	0	2	54	1	0	6	27	3	0	103	
2:15 PM	5	1	1	0	0	1	6	0	3	46	2	0	11	59	3	0	138	
2:30 PM	6	0	0	0	1	1	3	0	0	52	1	0	5	45	0	0	114	
2:45 PM	10	4	0	0	1	0	5	0	0	62	1	0	3	77	0	0	163	518
3:00 PM	6	1	1	0	1	1	1	0	2	66	3	0	10	60	0	0	152	567
3:15 PM	7	1	2	0	1	0	2	0	1	40	3	0	16	63	2	0	138	567
3:30 PM	8	1	0	0	3	2	2	0	1	38	3	0	9	46	0	0	113	566
3:45 PM	5	0	0	0	2	1	4	0	3	48	4	0	6	49	1	0	123	526
4:00 PM	9	1	2	0	3	1	2	0	0	48	0	0	3	50	0	0	119	493
4:15 PM	6	0	1	0	1	0	1	0	0	46	0	0	7	41	0	0	103	458
4:30 PM	13	0	0	0	0	1	2	0	0	58	3	0	4	42	0	0	123	468
4:45 PM	10	0	0	0	0	0	2	0	0	36	1	0	8	33	0	0	90	435
5:00 PM	12	0	0	0	1	0	1	0	2	44	0	0	4	44	0	0	108	424
5:15 PM	8	0	0	0	1	0	0	0	1	40	0	0	3	36	0	0	89	410
5:30 PM	11	0	6	0	0	2	2	0	5	38	1	0	3	27	1	0	96	383
5:45 PM	3	0	0	0	1	1	1	0	0	30	1	0	11	28	2	0	78	371

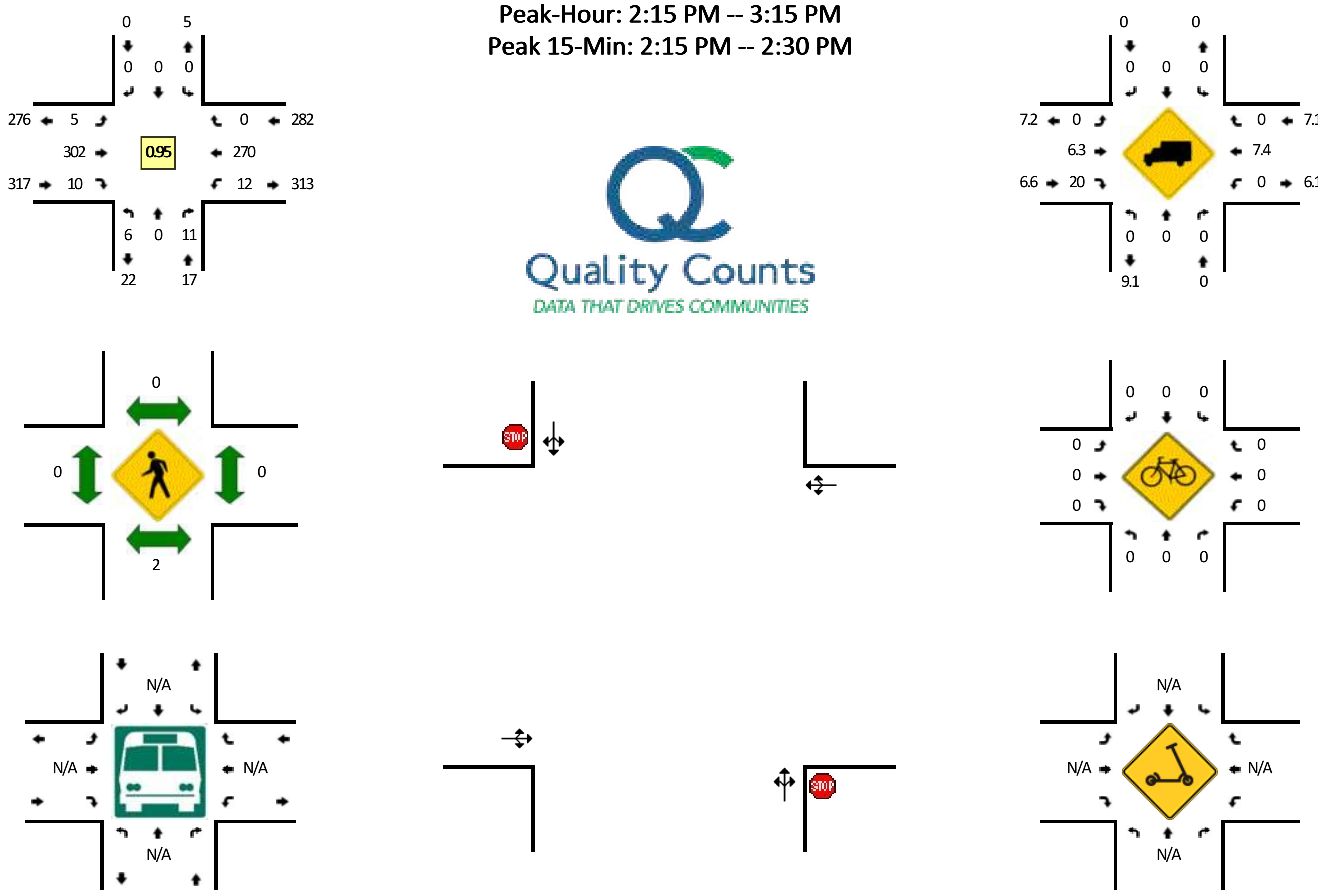
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	40	16	0	0	4	0	20	0	0	248	4	0	12	308	0	0	652
Heavy Trucks	0	0	0		0	0	0		0	12	0		0	52	0		64
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 1/12/2023 8:56 AM — SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

LOCATION: N 6th St/Fir Ave -- Umpqua Hwy **QC JOB #:** 16062103
CITY/STATE: Reedsport, OR **DATE:** Wed, Aug 17 2022

Peak-Hour: 2:15 PM -- 3:15 PM
Peak 15-Min: 2:15 PM -- 2:30 PM



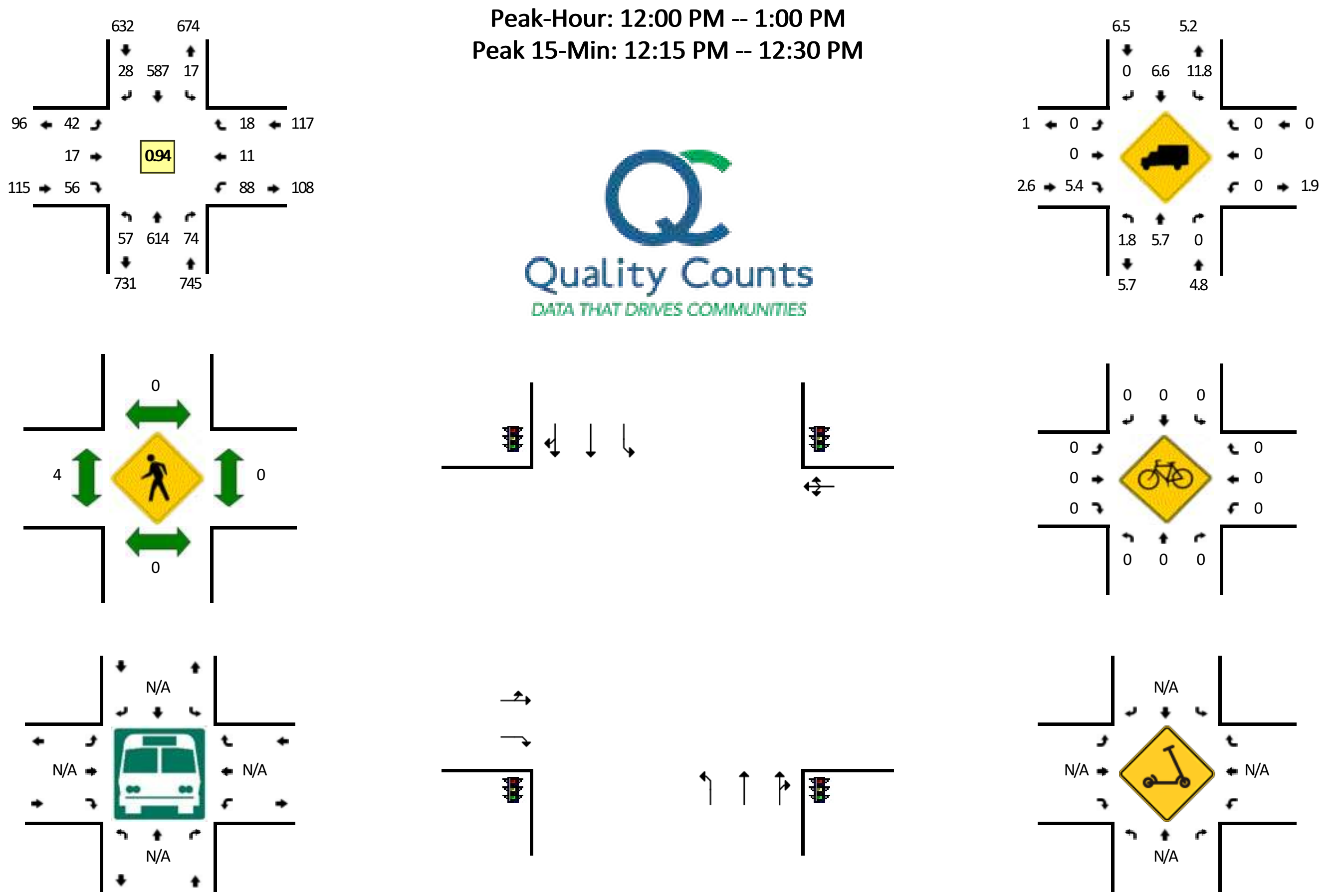
15-Min Count Period Beginning At	N 6th St/Fir Ave (Northbound)				N 6th St/Fir Ave (Southbound)				Umpqua Hwy (Eastbound)				Umpqua Hwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	1	0	1	0	0	0	0	0	1	65	5	0	1	69	0	0	143	
2:15 PM	0	0	3	0	0	0	0	0	2	81	3	0	1	72	0	0	162	
2:30 PM	1	0	3	0	0	0	0	0	2	69	1	0	4	55	0	0	135	
2:45 PM	3	0	1	0	0	0	0	0	1	72	4	0	3	73	0	0	157	597
3:00 PM	2	0	4	0	0	0	0	0	0	80	2	0	4	70	0	0	162	616
3:15 PM	0	0	3	0	0	0	0	0	1	73	4	0	3	51	0	0	135	589
3:30 PM	3	0	4	0	0	0	0	0	0	71	5	0	6	51	0	0	140	594
3:45 PM	3	0	1	0	0	0	0	0	1	67	3	0	3	59	0	0	137	574
4:00 PM	0	0	3	0	0	0	0	0	0	60	3	0	0	55	0	0	121	533
4:15 PM	3	0	3	0	0	0	0	0	0	47	3	0	2	55	0	0	113	511
4:30 PM	2	0	1	0	0	0	0	0	0	54	0	0	5	68	0	0	130	501
4:45 PM	3	0	0	0	0	0	0	0	1	51	2	0	1	47	0	0	105	469
5:00 PM	0	0	0	0	0	0	0	0	0	51	0	0	1	48	0	0	100	448
5:15 PM	2	0	0	0	0	0	0	0	0	44	0	0	3	50	0	0	99	434
5:30 PM	2	0	1	0	0	0	0	0	0	43	0	0	2	47	0	0	95	399
5:45 PM	2	0	1	0	0	0	0	0	0	37	1	0	3	36	0	0	80	374

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	12	0	0	0	0	0	8	324	12	0	4	288	0	0	648
Heavy Trucks	0	0	0		0	0	0		0	28	0		0	28	0		56
Buses																	
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

LOCATION: Oregon Coast Hwy -- Winchester Ave | **QC JOB #:** 16062102
CITY/STATE: Reedsport, OR | **DATE:** Mon, Aug 15 2022



15-Min Count Period Beginning At	Oregon Coast Hwy (Northbound)				Oregon Coast Hwy (Southbound)				Winchester Ave (Eastbound)				Winchester Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	2	34	2	0	1	17	0	0	0	0	0	0	3	0	1	0	60	
6:15 AM	3	45	2	0	0	31	0	0	1	0	0	0	5	0	0	0	87	
6:30 AM	2	69	6	0	1	34	1	0	1	0	0	0	8	0	0	0	122	
6:45 AM	3	42	10	0	0	37	3	0	0	0	0	0	8	0	0	0	103	372
7:00 AM	6	60	9	0	0	36	2	0	4	0	2	0	10	2	0	0	131	443
7:15 AM	1	68	14	0	2	38	2	0	4	3	1	0	7	1	0	0	141	497
7:30 AM	4	85	9	0	2	50	2	0	2	0	4	0	11	1	1	0	171	546
7:45 AM	2	92	12	0	0	60	0	0	9	4	3	0	10	2	0	0	194	637
8:00 AM	6	64	7	0	2	77	2	0	4	1	2	0	9	1	2	0	177	683
8:15 AM	3	71	18	0	0	44	5	0	5	1	2	0	9	3	0	0	161	703
8:30 AM	4	69	8	0	2	73	3	0	2	5	6	0	13	2	2	0	189	721
8:45 AM	4	107	14	0	0	76	4	0	7	3	10	0	13	7	2	0	247	774
9:00 AM	8	98	17	0	1	81	6	0	3	4	6	0	11	2	1	0	238	835
9:15 AM	8	38	12	0	1	77	4	0	3	1	6	0	23	1	2	0	176	850
9:30 AM	4	102	23	0	2	91	4	0	8	5	9	0	21	4	3	0	276	937
9:45 AM	13	116	24	0	4	89	7	0	9	2	11	0	28	4	3	0	310	1000
10:00 AM	13	134	11	0	1	91	10	0	13	1	7	0	14	2	5	0	302	1064
10:15 AM	9	137	21	0	4	100	5	0	7	2	13	0	19	2	4	0	323	1211
10:30 AM	13	125	17	0	1	102	6	0	12	4	5	0	16	4	2	0	307	1242
10:45 AM	18	125	24	0	0	123	6	0	12	1	17	0	25	3	2	0	356	1288
11:00 AM	14	126	16	0	2	113	8	0	8	3	19	0	24	2	4	0	339	1325
11:15 AM	13	145	22	0	3	92	8	0	8	3	11	0	20	3	4	0	332	1334
11:30 AM	15	145	14	0	3	118	3	0	4	2	17	0	18	6	1	0	346	1373
11:45 AM	11	135	19	0	6	126	3	0	13	2	10	0	14	3	4	0	346	1363
12:00 PM	8	157	15	0	5	146	7	0	8	2	13	0	27	3	7	0	398	1422
12:15 PM	18	169	25	0	6	145	5	0	12	5	15	0	20	4	4	0	428	1518
12:30 PM	15	143	14	0	1	156	6	0	12	6	17	0	24	3	3	0	400	1572
12:45 PM	16	145	20	0	5	140	10	0	10	4	11	0	17	1	4	0	383	1609
1:00 PM	9	142	15	0	2	153	7	0	10	4	18	0	23	3	7	0	393	1604
1:15 PM	11	111	14	0	4	131	6	0	8	3	13	0	26	3	1	0	331	1507
1:30 PM	12	118	13	0	1	132	4	0	18	4	11	0	21	2	3	0	339	1446
1:45 PM	4	127	17	0	1	119	8	0	8	2	18	0	12	5	2	0	323	1386
2:00 PM	10	141	25	0	2	132	10	0	8	1	14	0	20	5	5	0	373	1366
2:15 PM	10	124	24	0	5	154	3	0	4	0	11	0	25	5	2	0	367	1402
2:30 PM	12	127	13	0	2	131	6	0	6	2	14	0	14	3	6	0	336	1399
2:45 PM	15	97	18	0	4	128	4	0	6	2	17	0	19	3	2	0	315	1391
3:00 PM	10	109	17	0	3	147	7	0	7	3	9	0	31	1	6	0	350	1368
3:15 PM	8	119	9	0	3	140	8	0	7	2	18	0	20	3	2	0	339	1340

15-Min Count Period Beginning At	Oregon Coast Hwy (Northbound)				Oregon Coast Hwy (Southbound)				Winchester Ave (Eastbound)				Winchester Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	9	123	19	0	1	148	4	0	9	4	15	0	19	4	6	0	361	1365
3:45 PM	13	109	14	0	4	136	9	0	8	2	11	0	20	2	2	0	330	1380
4:00 PM	7	128	28	0	2	138	3	0	13	3	18	0	16	1	2	0	359	1389
4:15 PM	4	129	18	0	2	154	14	0	5	2	12	0	20	4	1	0	365	1415
4:30 PM	15	113	22	0	5	149	8	0	7	0	17	0	26	4	1	0	367	1421
4:45 PM	12	84	23	0	5	141	7	0	8	3	13	0	20	4	4	0	324	1415
5:00 PM	11	115	18	0	1	122	2	0	8	3	18	0	30	6	0	0	334	1390
5:15 PM	9	102	16	0	2	113	6	0	10	4	9	0	15	4	2	0	292	1317
5:30 PM	12	94	9	0	3	124	11	0	4	0	16	0	21	5	0	0	299	1249
5:45 PM	12	84	7	0	0	124	5	0	8	5	14	0	19	1	6	0	285	1210
6:00 PM	7	80	15	0	1	86	4	0	9	3	15	0	15	2	2	0	239	1115
6:15 PM	9	55	14	0	1	99	3	0	3	4	13	0	9	1	1	0	212	1035
6:30 PM	10	66	9	0	1	66	6	0	2	4	11	0	7	2	2	0	186	922
6:45 PM	4	60	11	0	0	64	3	0	5	3	8	0	12	2	0	0	172	809
7:00 PM	8	64	11	0	1	61	2	0	3	4	11	0	11	1	7	0	184	754
7:15 PM	2	54	8	0	0	61	2	0	2	1	2	0	13	1	1	0	147	689
7:30 PM	4	42	7	0	2	68	1	0	2	1	5	0	9	1	1	0	143	646
7:45 PM	7	46	8	0	2	51	1	0	1	1	7	0	10	2	0	0	136	610
8:00 PM	3	49	6	0	0	50	1	0	0	3	7	0	10	0	2	0	131	557
8:15 PM	4	32	3	0	0	52	2	0	2	1	1	0	8	1	1	0	107	517
8:30 PM	1	30	5	0	1	36	3	0	5	2	5	0	4	0	2	0	94	468
8:45 PM	1	24	7	0	0	39	1	0	0	0	4	0	1	1	1	0	79	411
9:00 PM	5	22	2	0	0	46	1	0	2	0	7	0	6	2	0	0	93	373
9:15 PM	4	27	1	0	0	36	2	0	0	0	3	0	5	0	3	0	81	347
9:30 PM	3	17	1	0	1	36	1	0	2	0	2	0	2	0	1	0	66	319
9:45 PM	3	8	1	0	0	17	1	0	0	0	1	0	2	0	0	0	33	273

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	72	676	100	0	24	580	20	0	48	20	60	0	80	16	16	0	1712
Heavy Trucks	4	36	0		4	52	0		0	0	4		0	0	0		100
Buses																	
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 1/12/2023 8:56 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: W Railroad Ave -- Winchester Ave

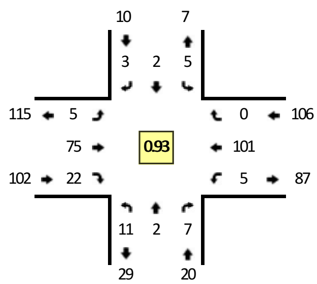
QC JOB #: 16062110

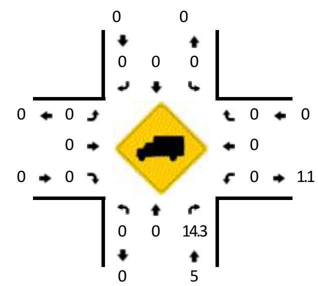
CITY/STATE: Reedsport, OR

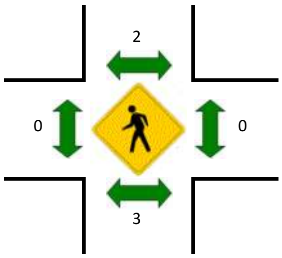
DATE: Wed, Aug 17 2022

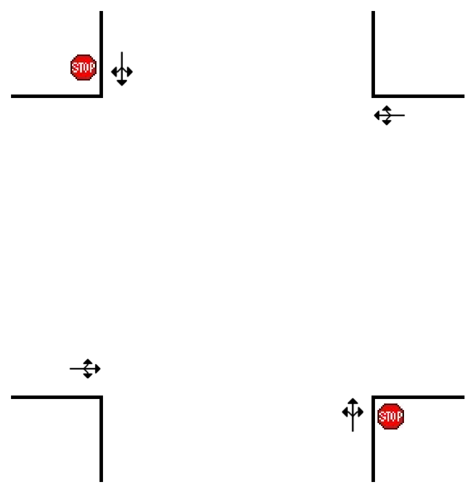
Peak-Hour: 3:15 PM -- 4:15 PM

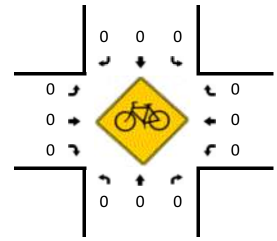
Peak 15-Min: 3:30 PM -- 3:45 PM

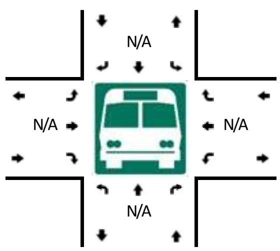


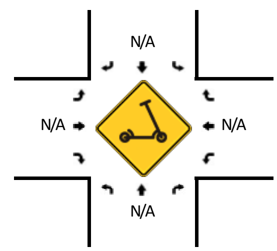












15-Min Count Period Beginning At	W Railroad Ave (Northbound)				W Railroad Ave (Southbound)				Winchester Ave (Eastbound)				Winchester Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	6	0	1	0	1	1	1	0	0	19	7	0	0	20	0	0	56	
2:15 PM	1	0	0	0	1	0	2	0	1	23	5	0	0	27	0	0	60	
2:30 PM	3	0	1	0	0	0	1	0	0	25	5	0	1	17	0	0	53	
2:45 PM	2	0	2	0	0	0	0	0	0	25	4	0	2	19	0	0	54	223
3:00 PM	5	1	1	0	0	0	0	0	0	20	3	0	3	12	0	0	45	212
3:15 PM	2	1	1	0	1	1	1	0	0	19	8	0	1	28	0	0	63	215
3:30 PM	5	0	3	0	2	0	1	0	1	20	3	0	2	27	0	0	64	226
3:45 PM	3	1	2	0	1	1	1	0	2	14	6	0	0	24	0	0	55	227
4:00 PM	1	0	1	0	1	0	0	0	2	22	5	0	2	22	0	0	56	238
4:15 PM	0	0	1	0	1	1	2	0	2	18	1	0	2	21	0	0	49	224
4:30 PM	4	0	1	0	1	0	2	0	2	16	6	0	2	18	0	0	52	212
4:45 PM	4	1	0	0	1	0	2	0	0	29	1	0	2	20	0	0	60	217
5:00 PM	4	0	0	0	1	1	0	0	1	19	4	0	0	24	0	0	54	215
5:15 PM	2	0	1	0	0	0	0	0	0	19	5	0	1	15	0	0	43	209
5:30 PM	2	0	0	0	0	0	0	0	0	19	5	0	1	10	0	0	37	194
5:45 PM	4	0	0	0	0	0	1	0	0	11	1	0	1	20	1	0	39	173

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	20	0	12	0	8	0	4	0	4	80	12	0	8	108	0	0	256
Heavy Trucks	0	0	4		0	0	0		0	0	0		0	0	0		4
Buses																	
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 1/12/2023 8:56 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

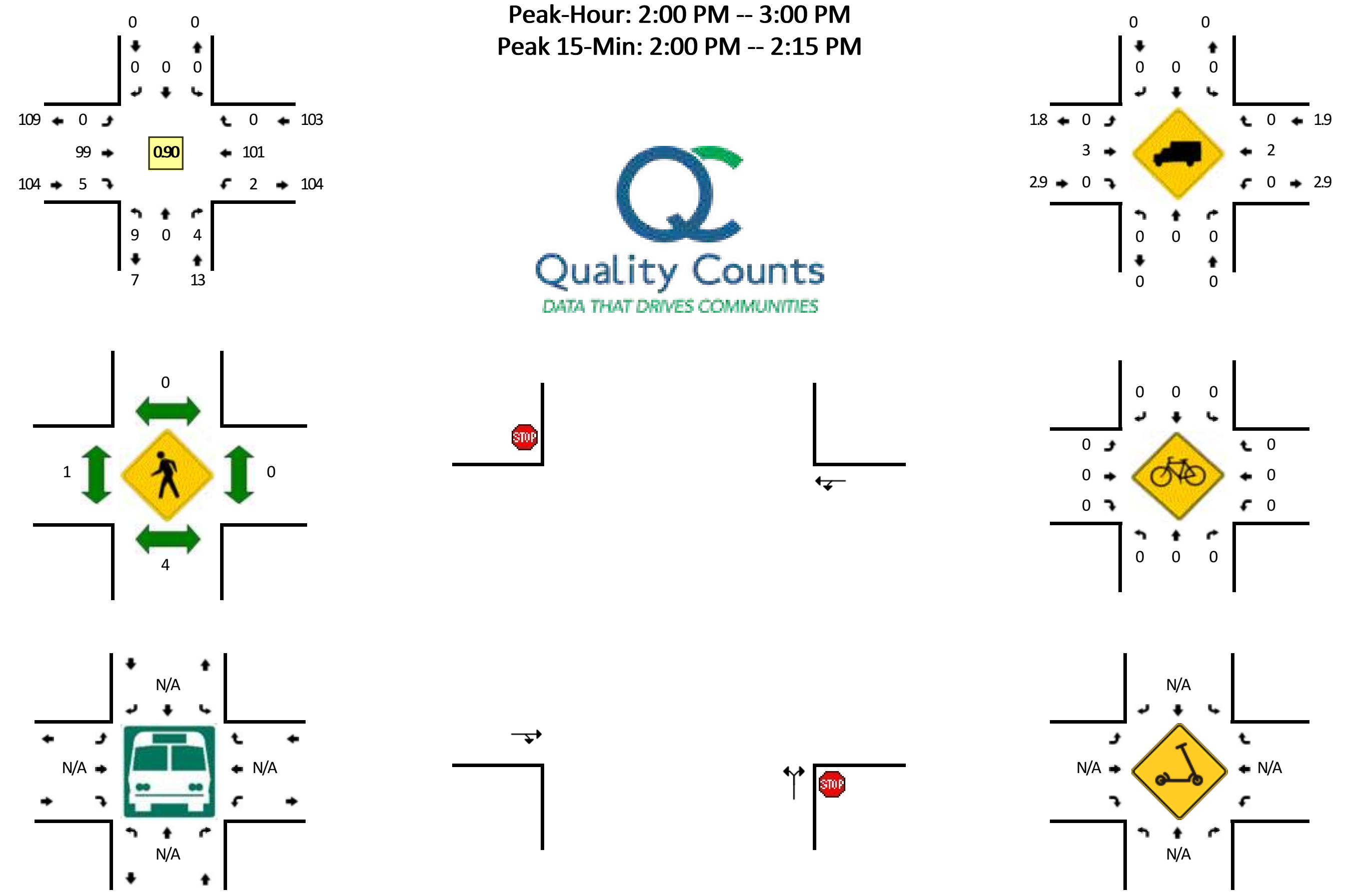
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

LOCATION: E Elm Ave -- Winchester Ave — **QC JOB #:** 16062105

CITY/STATE: Reedsport, OR — **DATE:** Mon, Aug 15 2022

Peak-Hour: 2:00 PM -- 3:00 PM

Peak 15-Min: 2:00 PM -- 2:15 PM



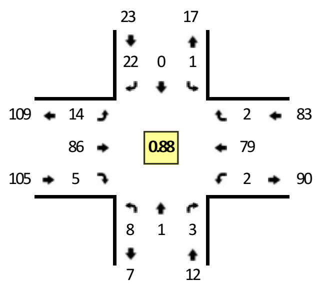
15-Min Count Period Beginning At	E Elm Ave (Northbound) Left	Thru	Right	U	E Elm Ave (Southbound) Left	Thru	Right	U	Winchester Ave (Eastbound) Left	Thru	Right	U	Winchester Ave (Westbound) Left	Thru	Right	U	Total	Hourly Totals
2:00 PM	3	0	1	1	0	0	0	0	0	27	2	0	0	27	0	0	61	
2:15 PM	3	0	1	0	0	0	0	0	0	26	2	0	1	27	0	0	60	
2:30 PM	0	0	1	0	0	0	0	0	0	22	1	0	0	13	0	1	38	
2:45 PM	2	0	1	0	0	0	0	0	0	24	0	0	0	34	0	0	61	220
3:00 PM	0	0	0	0	0	0	0	0	0	16	0	0	1	23	0	0	40	199
3:15 PM	3	0	0	0	0	0	0	0	0	11	1	0	1	21	0	0	37	176
3:30 PM	0	0	0	0	0	0	0	0	0	21	4	0	0	21	0	0	46	184
3:45 PM	2	0	1	0	0	0	0	0	0	17	0	0	1	23	0	0	44	167
4:00 PM	1	0	0	0	0	0	0	0	0	23	3	0	2	21	0	0	50	177
4:15 PM	2	0	0	0	0	0	0	0	0	22	1	0	0	23	0	0	48	188
4:30 PM	2	0	2	0	0	0	0	0	0	17	1	0	1	23	0	0	46	188
4:45 PM	4	0	0	0	0	0	0	0	0	25	3	0	0	15	0	0	47	191
5:00 PM	4	0	0	0	0	0	0	0	0	21	2	0	0	41	0	0	68	209
5:15 PM	0	0	0	0	0	0	0	0	0	20	1	0	0	22	0	0	43	204
5:30 PM	0	0	0	0	0	0	0	0	0	9	0	0	0	24	0	0	33	191
5:45 PM	0	0	0	0	0	0	0	0	0	10	0	0	0	18	0	0	28	172

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	12	0	4	4	0	0	0	0	0	108	8	0	0	108	0	0	244
Heavy Trucks	0	0	0		0	0	0		0	4	0		0	8	0		12
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

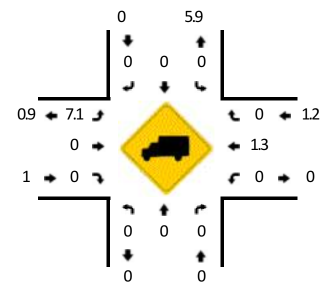
Comments:

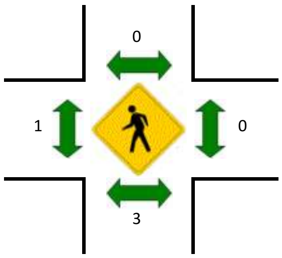
Report generated on 1/12/2023 8:56 AM — SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

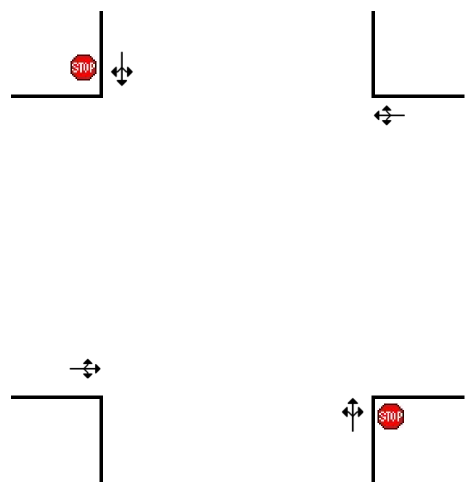
LOCATION: E Railroad Ave -- Winchester Ave | **QC JOB #:** 16062107
CITY/STATE: Reedsport, OR | **DATE:** Wed, Aug 17 2022

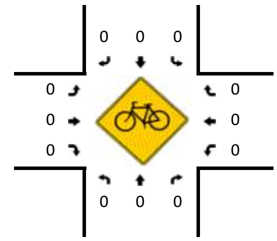


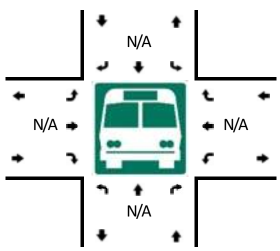
Peak-Hour: 2:00 PM -- 3:00 PM
Peak 15-Min: 2:15 PM -- 2:30 PM

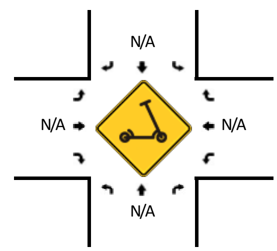












15-Min Count Period Beginning At	E Railroad Ave (Northbound)				E Railroad Ave (Southbound)				Winchester Ave (Eastbound)				Winchester Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	3	1	0	0	0	0	2	0	5	22	2	0	0	25	0	0	60	
2:15 PM	3	0	1	0	0	0	6	0	3	24	2	0	2	21	1	0	63	
2:30 PM	0	0	1	0	1	0	2	0	4	18	1	0	0	11	1	0	39	
2:45 PM	2	0	1	0	0	0	12	0	2	22	0	0	0	22	0	0	61	223
3:00 PM	0	0	0	0	1	1	8	0	2	14	0	0	0	15	1	0	42	205
3:15 PM	3	0	0	0	1	0	2	0	0	11	1	0	1	19	0	0	38	180
3:30 PM	1	0	0	0	0	1	2	0	3	17	4	0	0	18	0	0	46	187
3:45 PM	2	1	0	0	1	1	4	0	0	17	0	0	1	19	1	0	47	173
4:00 PM	2	0	0	0	0	1	1	0	1	21	3	0	1	19	0	0	49	180
4:15 PM	2	0	0	0	2	0	3	0	2	20	1	0	0	20	0	0	50	192
4:30 PM	2	2	0	0	1	1	1	0	3	16	1	0	0	22	0	0	49	195
4:45 PM	4	0	0	0	0	0	1	0	0	24	3	0	0	14	1	0	47	195
5:00 PM	5	0	0	0	0	0	2	0	4	17	2	0	0	23	0	0	53	199
5:15 PM	1	0	0	0	1	0	4	0	2	18	1	0	0	17	0	0	44	193
5:30 PM	0	0	0	0	0	0	2	0	1	8	0	0	0	22	0	0	33	177
5:45 PM	0	0	0	0	0	0	4	0	0	10	0	0	0	14	0	0	28	158

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	12	0	4	0	0	0	24	0	12	96	8	0	8	84	4	0	252
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

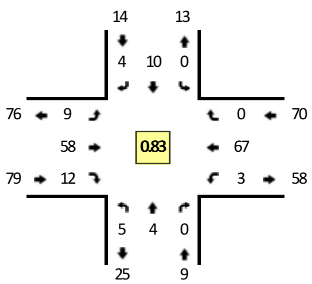
Report generated on 1/12/2023 8:56 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

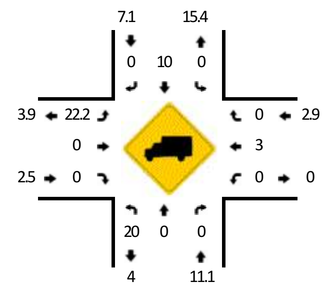
LOCATION: N 6th St -- Winchester Ave | **QC JOB #:** 16062104

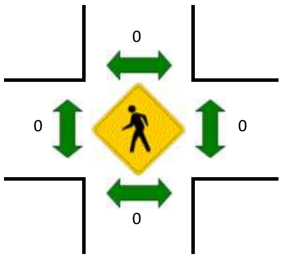
CITY/STATE: Reedsport, OR | **DATE:** Wed, Aug 17 2022

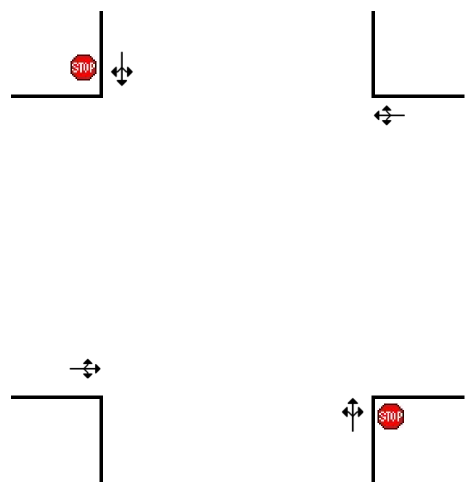


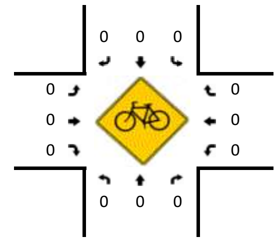
Peak-Hour: 2:45 PM -- 3:45 PM

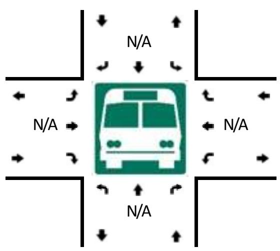
Peak 15-Min: 3:30 PM -- 3:45 PM

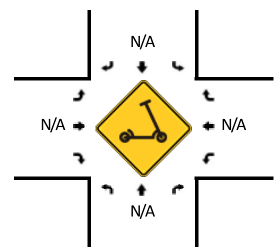












15-Min Count Period Beginning At	N 6th St (Northbound)				N 6th St (Southbound)				Winchester Ave (Eastbound)				Winchester Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
2:00 PM	2	0	0	0	0	0	2	0	0	13	2	0	0	17	0	0	36	
2:15 PM	0	1	1	0	0	0	3	0	2	15	3	0	0	16	0	0	41	
2:30 PM	1	1	0	0	1	3	1	0	2	19	3	0	0	10	0	0	41	
2:45 PM	3	1	0	0	0	3	1	0	1	19	3	0	0	13	0	0	44	162
3:00 PM	0	2	0	0	0	1	0	0	4	12	3	0	0	15	0	0	37	163
3:15 PM	0	0	0	0	0	2	1	0	2	11	1	0	1	21	0	0	39	161
3:30 PM	2	1	0	0	0	4	2	0	2	16	5	0	2	18	0	0	52	172
3:45 PM	2	1	1	0	1	3	0	0	1	8	0	0	0	18	0	0	35	163
4:00 PM	7	0	1	0	0	0	0	0	0	18	2	0	0	12	0	0	40	166
4:15 PM	2	0	0	0	0	1	1	0	1	11	0	0	0	15	0	0	31	158
4:30 PM	0	0	0	0	0	3	0	0	1	11	1	0	0	12	0	0	28	134
4:45 PM	3	3	0	0	0	1	2	0	1	18	5	0	0	14	0	0	47	146
5:00 PM	0	0	0	0	1	0	1	0	0	17	2	0	0	11	0	0	32	138
5:15 PM	1	0	1	0	0	2	1	0	0	13	5	0	0	7	1	0	31	138
5:30 PM	3	2	2	0	0	0	2	0	0	12	2	0	1	9	0	0	33	143
5:45 PM	0	1	0	0	0	2	2	0	1	7	2	0	2	18	0	0	35	131

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	8	4	0	0	0	16	8	0	8	64	20	0	8	72	0	0	208
Heavy Trucks	0	0	0		0	4	0		4	0	0		0	0	0		8
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 1/12/2023 8:56 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

TECHNICAL MEMORANDUM #4

Existing Conditions

KITTELSON & ASSOCIATES
851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

Technical Memorandum

June 9, 2023

Project# 27003.011

To: Thomas Guevara, *Oregon Department of Transportation*
Deanna Schafer and Kim Clardy, *City of Reedsport*

From: Michael Ruiz-Leon, Allison Woodworth, Cedomir Jesic, Matt Bell, and Marc Butorac, PE, PTOE. (Kittelson); Chad Hewitt (HDR)

Project: City of Reedsport Rail Crossing Study and Refinement Plan

Subject: Tech Memo #4: Existing Transportation Conditions

TABLE OF CONTENTS

INTRODUCTION

The City of Reedsport (City) and the Oregon Department of Transportation (ODOT) have embarked on a Rail Crossing Study and Refinement Plan (Study) to determine the impacts of potential increased rail activity on the Coos Bay Rail Line to Umpqua Highway (OR 38), Winchester Avenue, and the greater Reedsport transportation system. This memorandum summarizes information related to existing transportation system conditions in the City of Reedsport relevant to the Study. This memorandum also includes information on traffic counts conducted at the Study intersections, analyzes transportation conditions affecting vehicles and non-motorized transportation, and provides environmental/topographical conditions related to the drainage system. The information within this memorandum will serve as the basis for the development and evaluation of transportation improvements to address identified transportation needs as a result of the potential increased rail activity.

PROJECT BACKGROUND AND STUDY AREA

The Oregon International Port of Coos Bay is proposing to design, permit, and construct a new multi-modal container facility on the North Spit in Coos County, Oregon, in the future. The container facility will be designed to accommodate 1,200,000 inbound and 1,200,000 outbound containers per year. The City and ODOT have commissioned a study to evaluate the impacts to at the Umpqua Highway (OR 38) and

Winchester Avenue railroad crossings resulting from increased rail activity when the container facility is constructed and begins operations.

Study Area

The study area, as shown in Figure 1, is the land located within the City limits bordered by the Umpqua River to the north; Schofield Creek to the west and south; and the OR 38/Riverfront Way/Winchester Avenue intersection to the east. The rail crossing on OR38 is located within the study area and is bordered on the west by W. Railroad Avenue and on the east by E. Railroad Avenue. The rail crossing on Winchester Avenue is also located within the study area and is bordered on the west by River Bend Road and on the east by Elm Avenue.

LAND USE INVENTORY

This section presents a review of current land uses for the Reedsport Rail Crossing study area. Information presented in this section includes a description of existing land use designations and land uses in the study area. This review is intended to identify the demands that existing and allowed land uses place upon the rail crossing and surrounding transportation system, as well as identify specific transportation needs of existing and potential future land uses.

Comprehensive Plan Designations

The comprehensive plan designations established in City of Reedsport Comprehensive Plan are shown in Figure 2. Within the Reedsport Rail Crossing Study area, the area has a mix of residential, commercial, industrial, and public/semipublic land designations. The land designations at the OR 38 and Winchester Avenue crossings are industrial with commercial designations to the east. All comprehensive plan designations in the Study area are consistent with the current zoning designations (see descriptions of zoning designations in the Zoning Districts section below).

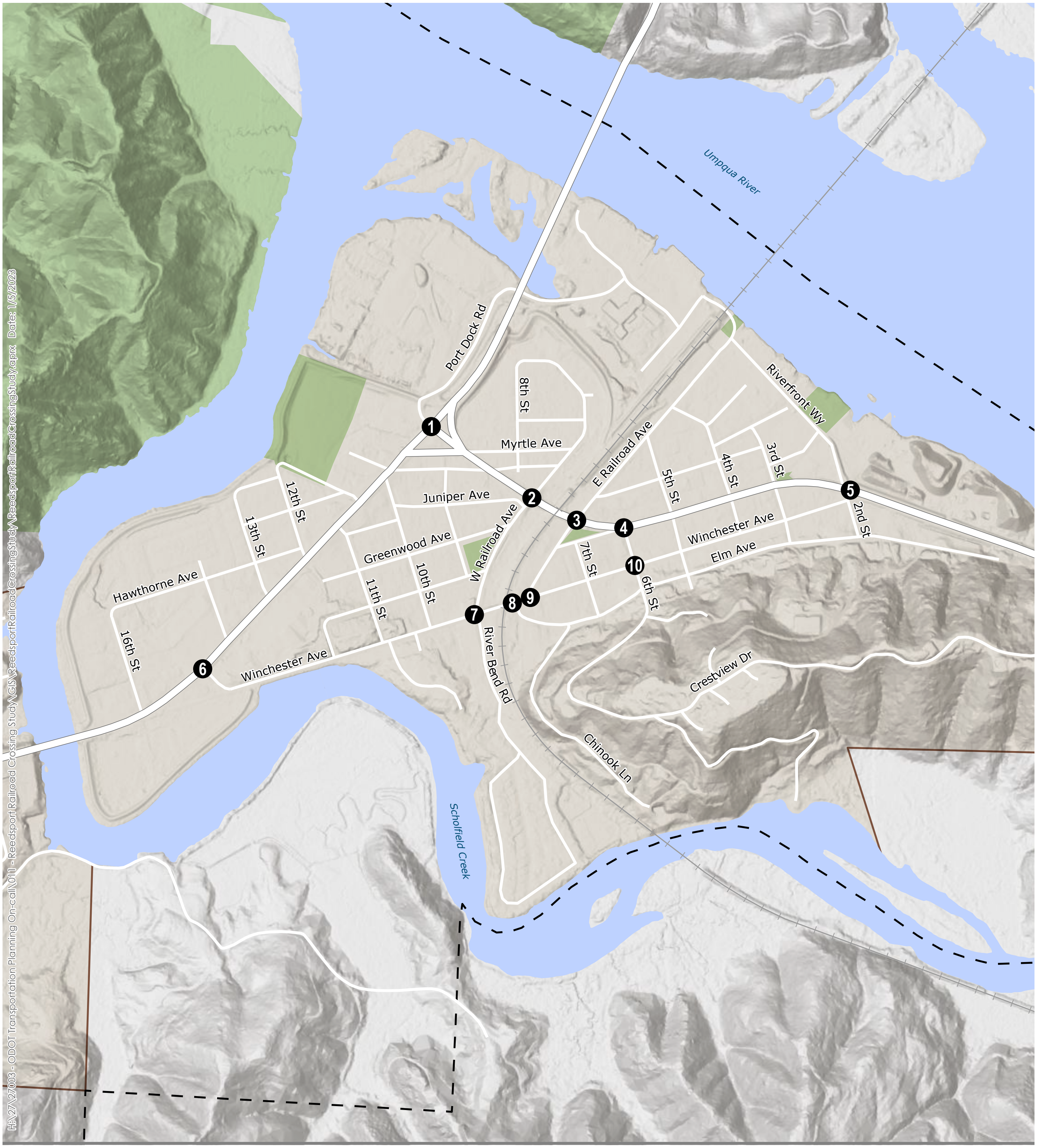
Zoning Districts

Future development and redevelopment in the study area will be subject to the regulations associated with City land use designations. Knowing the designations and permitted uses provides an idea of the type and intensity of traffic to be expected in the study area.

Zoning in the study area is shown on Figure 3. Generally, zoning is consistent with the comprehensive plan designations for the study area. Zoning adjacent to the rail crossings are industrial zones to the east and commercial zones to the west. With commercial, transitional commercial, and commercial mixed-use zoning to the east and single and multi-family housing to the west of the OR 38 and Winchester Avenue crossings.

Zoning adjacent to US 101 within the study area includes a mix of commercial and multi-family residential zones. The multi-family residential zoning is located to the northeast of the US 101/OR 38 intersection. Zoning adjacent to OR 38 within the study area is primarily commercial resource zones and single and multi-family housing to northwest of the West Railroad Avenue/OR 38 intersection. Zoning adjacent to Winchester Avenue is a mix of commercial and industrial.

Activity centers near Study intersections include the Reedsport downtown core, City Hall, library, Triangle Park, and post office.



Study Intersection
City Boundary
Urban Growth Boundary
National Forest or Park
Railroad

0 1,000 Feet

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Figure 1

Study Area and Study Intersections
Reedsport, Oregon

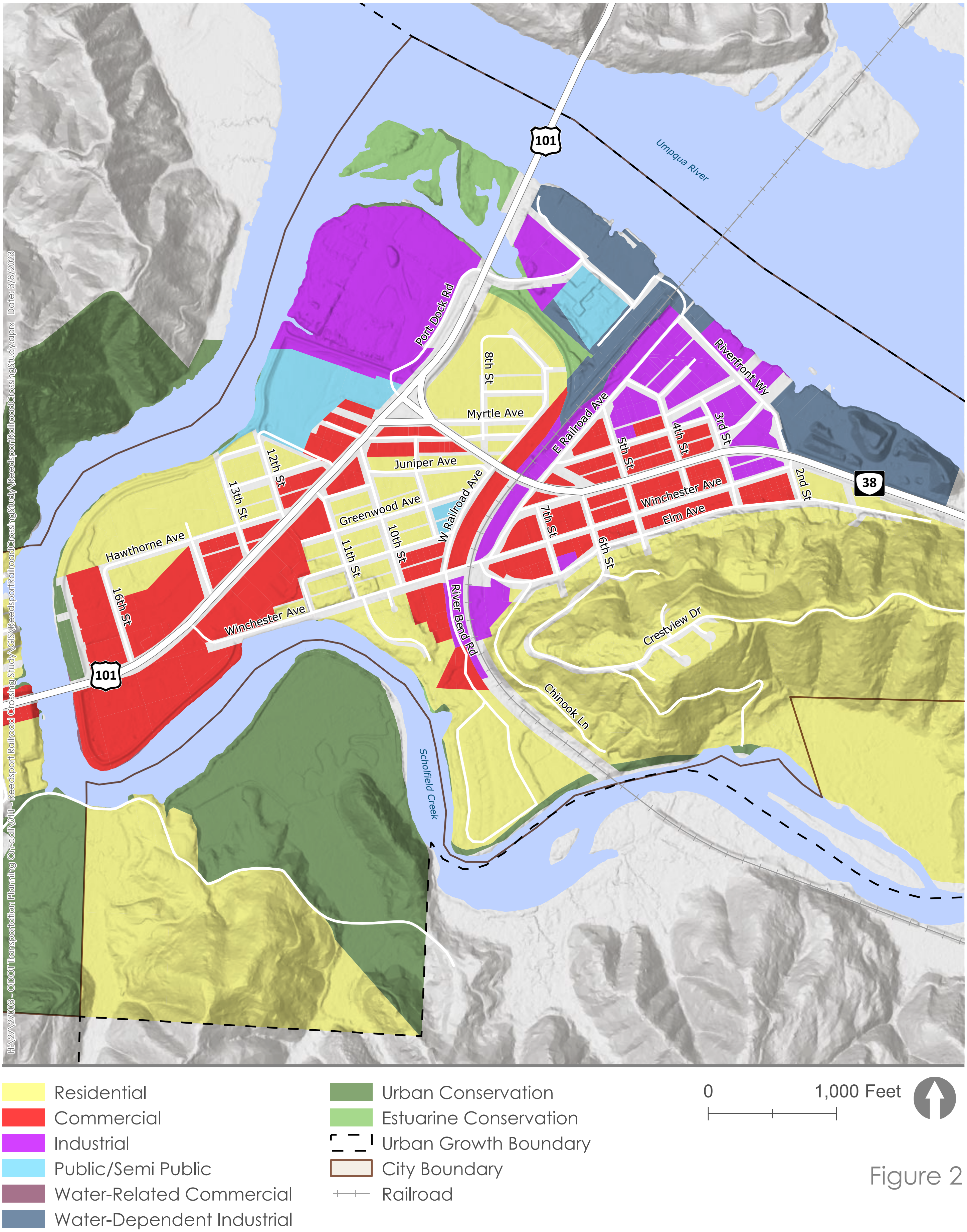

Figure 2

Comprehensive Plan
Reedsport, Oregon

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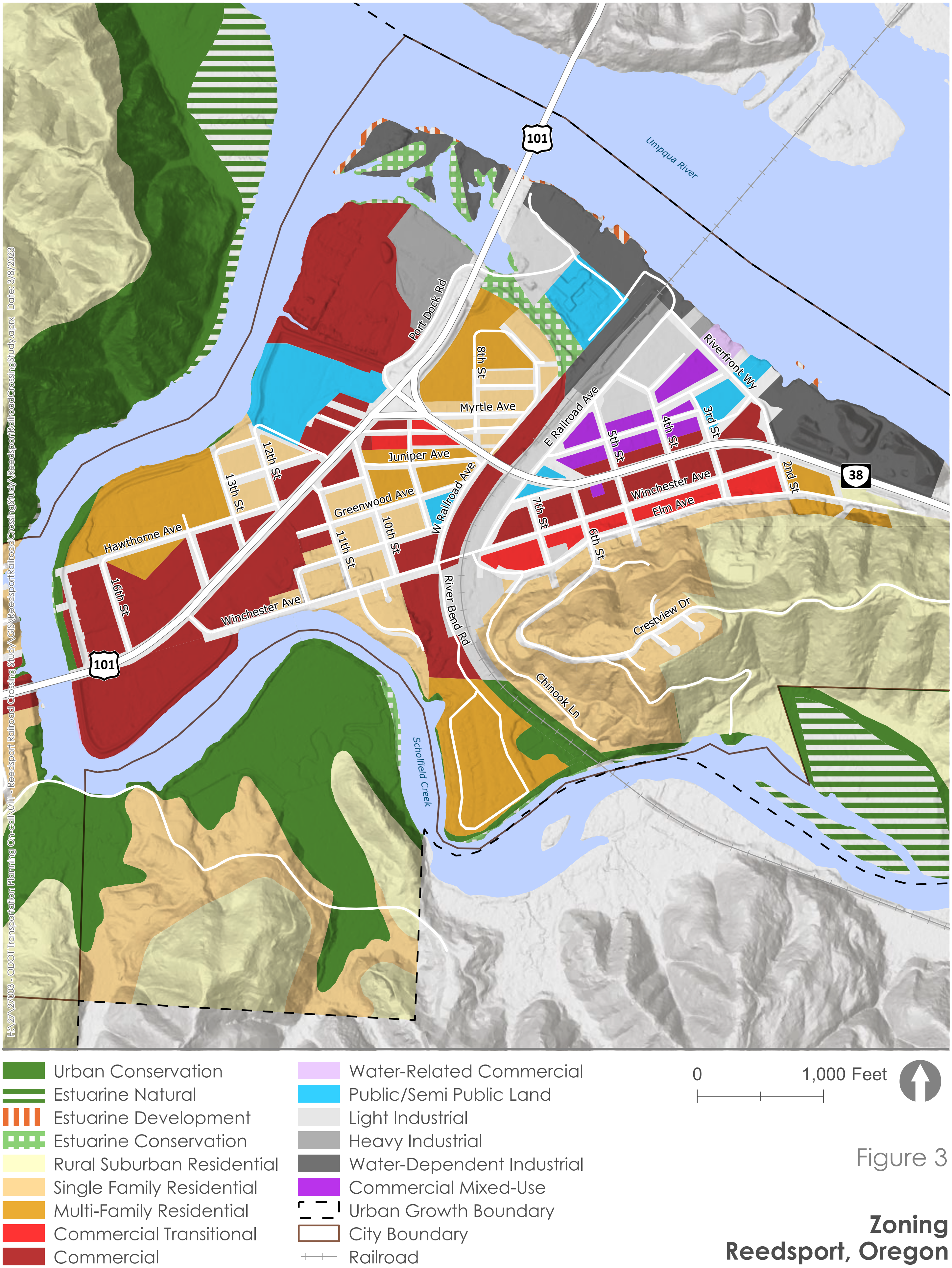


Figure 3

Zoning
Reedsport, Oregon

Demographics Inventory

This section identifies transportation-disadvantaged populations and evaluates their access to transit. Data were obtained from the U.S. Census American Community Survey 5-year estimates for 2017–2021.

Title VI of the Civil Rights Act of 1964 prohibits discrimination in the provision of federally supported benefits and services, including public transportation service. The Title VI analysis presents information about poverty status, age (youth ages 5-17 and seniors ages 65 and older), racial/ethnic composition, English proficiency, and proportion of people with disabilities.

. These same groups—where data was available—are a higher proportion of the population than the State for the study area block group with the addition of American Indian or Alaskan Natives. Data for low English proficiency and persons with a disability is not provided at the block group level. The study area has a notably higher percentage of people living at 200% below poverty level than the comparison groups.

Table 1 summarizes these Title VI metrics for the State of Oregon, Douglas County, the City of Reedsport, and the block group, which contains the study area. Figure 4 illustrates the location and size of block group in relation to the study area and the rest of the city. Population characteristics not provided at the block group level are noted as "not available" within Table 1. Title VI and Transportation-Disadvantaged Populations

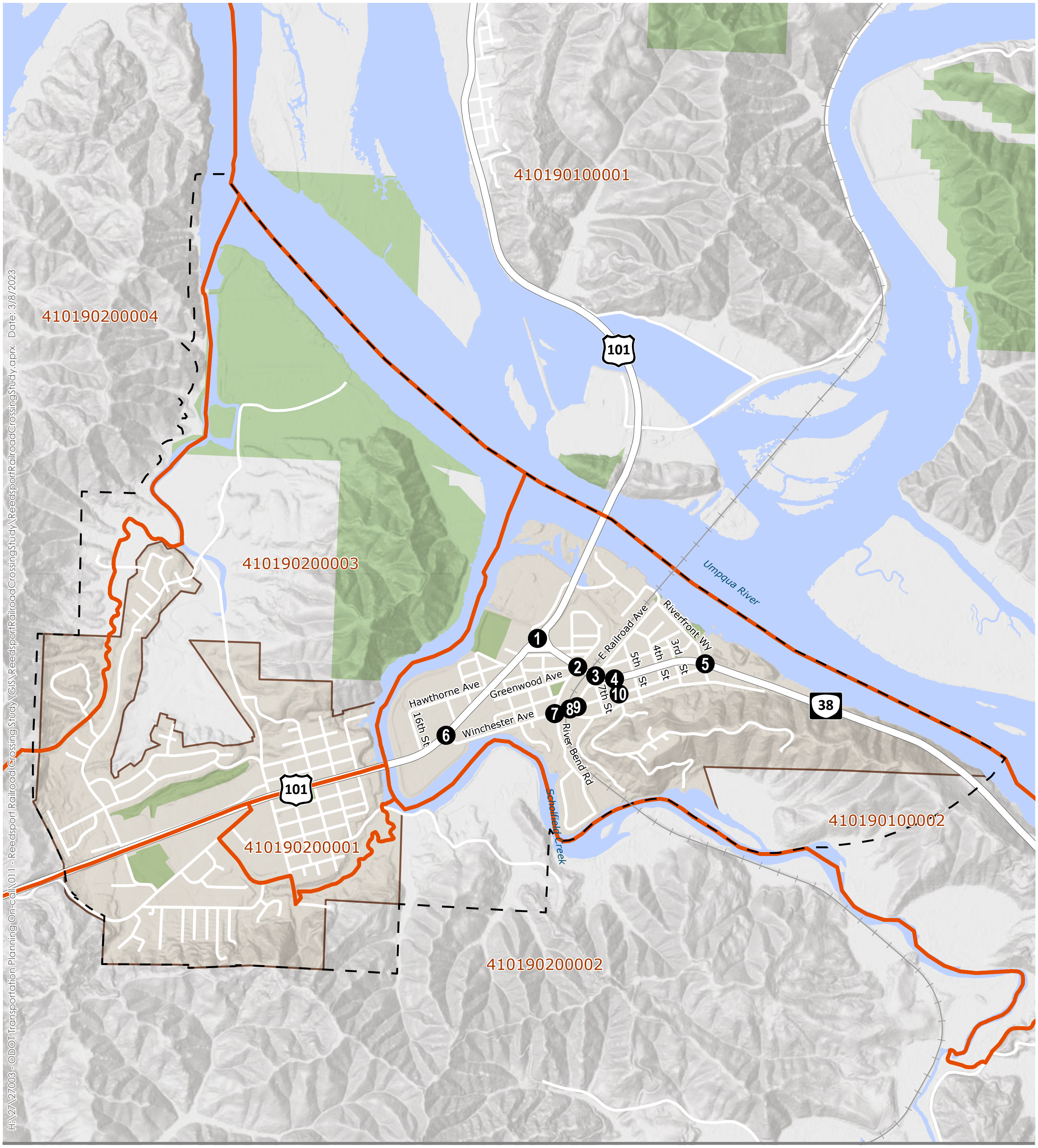
County averages are provided for comparison, with local values higher than the County average in **bold**. This analysis provides information about transportation-disadvantaged populations that have been historically underrepresented in planning processes. As shown, Reedsport has a higher percentage of people below the federal poverty level, older adults, people with disabilities, and zero vehicle households. These same groups—where data was available—are a higher proportion of the population than the State for the study area block group with the addition of American Indian or Alaskan Natives. Data for low English proficiency and persons with a disability is not provided at the block group level. The study area has a notably higher percentage of people living at 200% below poverty level than the comparison groups.

Table 1. Title VI and Transportation-Disadvantaged Populations

		Oregon	Douglas County	Reedsport	Study Area Block Group[1]
Total population		4,128,333	109,312	4,254	1,558
Total households		1,702,599	45,663	1,872	734
Income	Below 100% poverty	12.1%	13.8%	20.4%	**28.8%**
	Below 200% poverty	28.7%	35.5%	44.4%	**51.4%**
Age	Youth	15.4%	14.5%	13.1%	11.3%
	Older adults	17.8%	25.5%	30.5%	**34.7%**
Race or Ethnicity	White	80.8%	86.3%	90.0%	84.9%
	Black	1.8%	0.3%	0.1%	0.0%
	American Indian or Alaskan Native	1.1%	0.9%	1.1%	**1.7%**

	Asian	4.4%	0.9%	0.3%	0.5%
	Hawaiian or Pacific Islander	0.4%	0.1%	0.0%	0.0%
	Some other race alone	3.8%	0.4%	0.4%	0.0%
	Two or more races	7.7%	5.0%	2.4%	0.9%
	Hispanic or Latino of any race	13.5%	6.2%	5.7%	**12.0%**
Persons with low English proficiency		2.3%	0.4%	1.3%	N/A[2]
Persons with disability		15.1%	23.2%	23.1%	N/A[2]
Zero vehicle households[3]		2.7%	5.0%	14.0%	8.6%

Source: American Community Survey 2017–2021 5-Year Estimates; Tables B01003; B11016; S1602, C17002, B03002, B25044, and B01001.
[1] 2020 Census Tract 100, Block Group 2, Douglas County, Oregon.
[2] Data not available at the block group level.
[3] A percent of households. All other proportions calculated as a percent of the total population.



Census Block Group Boundary
Urban Growth Boundary
City Boundary
Railroad

0 2,000 Feet

Figure 4

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Census Block Groups
Reedsport, Oregon

Natural Resources

This section identifies natural resources based on City of Reedsport and Douglas County resources. An inventory of natural resources located in the study area is provided in Table 2.

Table 2. Natural Resources

<table>
<tr><th>Resources</th><th>Description</th></tr>
<tr><td>Goal 5 Resources</td><td>Goal 5 resources in Douglas County are maintained by the Douglas County planning department and Oregon Department of Fish and Wildlife (ODF&W). The study area is within the Reedsport Urban Growth Boundary. Below are the Goal 5 resources that are present outside the study area:
Big game habitat overlay area (impacted)
There are no documented historic and cultural resources present in the study area.
Source: Douglas County GIS: https://douglascounty-oregon.us/DocumentCenter/View/3021/Map-E-Goal-5-Inventory-Areas-PDF</td></tr>
<tr><td>Cultural Resources</td><td>The National Register of Historic Places is the official list of the Nation's historic places worthy of preservation maintained by the National Park Service. The National Register of Historic Places list two resources potentially within the Study Area:
Umpqua River Bridge No. 01822
Umpqua-Eden Site – Archaeological site with an undisclosed location
Source: https://www.nps.gov/subjects/nationalregister/database-research.htm</td></tr>
<tr><td>Wetlands</td><td>Per the National Wetland Inventory (NWI) database, there are several wetlands located within the study area, primarily in the areas adjacent to the OR 38 and Winchester Avenue rail crossings. Acres of wetland (by type) in the study are as follows:
Freshwater emergent wetland: 4.05 acres (currently vacant land west of the railroad crossings from Greenwood Avenue to Winchester Avenue and north of Greenwood Avenue to N. 4th Street)
Freshwater forested/shrub wetland: 0.16 acres (southwest corner of the Elm Avenue/Winchester Avenue intersection)
Source: https://www.fws.gov/wetlands/data/data-download.html</td></tr>
<tr><td>Known Hazardous Material Spill Locations</td><td>Per the State of Oregon Department of Environmental Quality (DEQ) Environmental Cleanup Site (ECSI) database, there are five known environmental cleanup sites within the study area (listed below).
Dean Creek Nursery Inc., 1313 Highway 101 S; no further State action required.
Unocal Service Station #3259 (former), 1241 Highway Ave.; no further State action required.
Dry Dock Road, Umpqua River Navigation Dry Dock; remedial design.
155 E. Railroad Ave., Unocal Bulk Plant; site investigation recommended.
Fred Wahl Marine, 1000 Port Dock Rd.; no further state action required
Source: https://www.deq.state.or.us/lq/ECSI/ecsiquery.asp?listtype=lis&listtitle=Environmental+Cleanup+Site%20Information+Database
The State of Oregon DEQ Leaking Underground Storage Tank (LUST) Cleanup List is a listing of all sites with known groundwater contamination from spills and releases from regulated underground storage tanks. There are 22 LUST sites (https://www.deq.state.or.us/lq/tanks/lust/LustPublicLookup.asp) within the study area:
Reedsport Mobil, 532 Fir Ave.
State of Oregon Highway Department, Highway 101 and 11th
Unocal 3259, 1241 Highway Ave.
101 Service, 985 Highway Ave.
F & M Fuel/Former 101 Service, 985 Highway Ave.
R & L Garage & Towing, 542 Fir Ave.
One Stop Market, 1625 Highway 101 S
Scholfield's Market, 1625 Highway 101 S
Gte - Reedsport Central Office (6110-B01), 534 Winchester Ave.
Reedsport, City Of (Shops), 451 Winchester Ave.</td></tr>
</table>

- Douglas County Shop-Reedsport #6, 680 Fir Ave. PO Box 31
- Truax Corporation #93, 1030 Highway 101
- Oregon Dunes National Recreation Area, 855 Highway Ave.
- Ron's Oil #6- Reedsport, 1070 Highway 101
- Ron's Oil Co #6, 1070 Highway 101
- Migas Automotive Service, 1199 Highway Ave.
- Chevron USA Inc., 1399 Highway 101
- Coast Auto Electric, 543 Fir Ave.
- Reedsport 5th St. Sewer Line, 5th St. between 270 Fir and 532 Fir Ave.
- The Connection, 470 Fir Ave.
- Unocal Bulk Plant #0639, 155 E. Railroad
- Heating Oil Tank, 575 Greenwood Ave.

The State of Oregon DEQ Underground Storage Tank (UST) Cleanup List provides a summary of all sites with reported releases of petroleum projects from regulated underground storage tanks, unregulated underground storage tanks, and home heating oil tanks. There are 22 UST sites (https://www.oregon.gov/deq/tanks/Pages/Tank-Lists.aspx) within the study area:

- Unocal 3259, 1241 Highway Ave.
- State Of Oregon Highway Department, Highway 101 and 11th
- Chevron USA, Inc., 1399 Highway 101
- Unocal Bulk Plant #0639, 155 E. Railroad
- Reedsport, City Of (Shops), 451 Winchester Ave.
- Migas Automotive Service, 1199 Highway Ave.
- Oregon Dunes National Recreation Area, 855 Highway Ave.
- Gte - Reedsport Central Office (6110-B01), 534 Winchester Ave.
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- Truax Corporation #93, 1030 Highway 101
- Coast Auto Electric, 543 Fir Ave.
- The Connection, 470 Fir Ave.
- Scholfield's Market, 1625 Highway 101 S
- Ron's Oil #6- Reedsport, 1070 Highway 101
- F & M Fuel/Former 101 Service, 985 Highway Ave.

TRAFFIC COUNTS

The study intersections for the City of Reedsport Rail Crossing Study and Refinement Plan were determined by the City and ODOT. There are 10 study intersections located along state and local facilities, including two signalized intersections (intersections 1 and 6) and eight unsignalized intersections. Figure 1 illustrates the location of the following study intersections.

State Facilities

1. US 101/OR 38 (signalized)
2. West Railroad Avenue/OR 38
3. East Railroad Avenue/OR 38
4. 2nd Street/OR 38
5. North 6th Street/OR 38
6. US 101/Winchester Avenue (signalized)

Local Facilities

7. West Railroad Avenue/Winchester Avenue
8. East Railroad Avenue/Winchester Avenue
9. South 6th Street/Winchester Avenue
10. Elm Avenue/Winchester Avenue

Turning movement counts were conducted at the Study intersections in August 2022. The counts were conducted on a typical mid-week day during the peak summer months. The counts conducted at the signalized intersections were conducted over a 16-hour period (6:00 AM to 10:00 PM), while the counts conducted at the unsignalized intersections were conducted over a 4-hour period (2:00 to 6:00 PM). All the counts include the total number of pedestrians, bicyclists, and motor vehicles that entered the study intersections in 15-minute intervals.

Tech Memo 3: Analysis Methodology and Assumptions Memorandum includes information related to the peak hour development, seasonal adjustment factors, and historical factors used to develop traffic volumes for the traffic operations analysis. Per the memorandum, a system-wide peak hour from 2:00 to 3:00 PM was selected as a basis for the peak hour analysis and a seasonal adjustment factor of 1.0 was applied to the counts on US 101 and OR 38 to reflect the peak season.

MOTOR VEHICLE TRANSPORTATION ANALYSIS

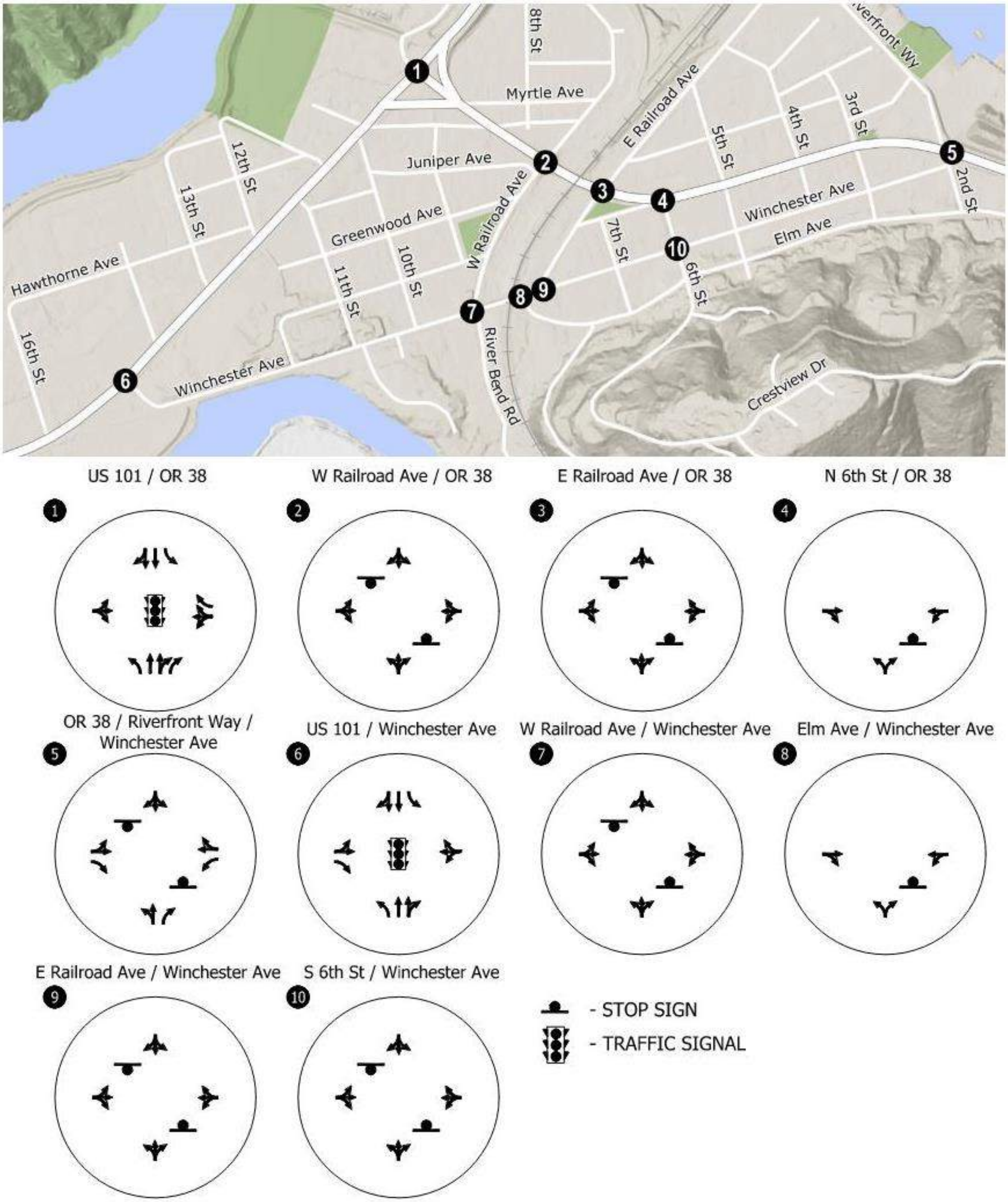
Roadway System Characteristics

Table 3 summarizes the attributes of key roadways in the motorized vehicle transportation analysis. Most Study area roadways are two lanes in nature. The study area roadways appear to be in good condition. The existing lane configurations and traffic control devices are summarized in Figure 5. Signalized intersections along US 101 are owned and maintained by ODOT.

Table 3. Existing Transportation Facilities and Roadway Designations

Roadway	Motor Vehicle Travel Lanes	Posted Speed (MPH)	Lane Width (feet)	Shoulder Width (feet)	Sidewalk	Bicycle Lane
US 101	4	30	12	3	Yes	Yes
OR 38	2	25	12	6	Partial	Yes
Winchester Avenue	2	25	13	6	Partial	None
West Railroad Avenue	2	25	12	3	Partial	None
East Railroad Avenue	2	25	12	3	None	None
Elm Avenue	2	25	11	4	None	None
North 6th Street	2	25	15	3	Yes	None
South 6th Street	2	25	11	0	Yes	None
Riverfront Way	2	25	12	0	None	None

Figure 5. Existing Lane Configurations and Traffic Control Devices



Jurisdiction

Streets within Reedsport are owned and operated by two jurisdictions: the City of Reedsport and ODOT. Each jurisdiction is responsible for determining the functional classification of the streets, defining major design and multimodal features, and approving construction and access permits. Coordination is required between the jurisdictions to ensure that the streets are planned, operated, maintained, and improved to safely meet public needs. ODOT owns and operates US 101 and OR 38. The City of Reedsport owns and operates Winchester Avenue and all other roadway facilities within the study area.

Functional Classification

A roadway's functional classification determines its role in the transportation system, as well as its width, right-of-way dedications, driveway (access) spacing requirements, and types of pedestrian and bicycle facilities provided. The functional classification is typically established by the City based on the following hierarchy:

- **Arterials** are intended to serve high volumes of traffic, particularly through traffic, at relatively high speeds. They also serve truck movements and typically emphasize traffic movement over local land access.
- **Collectors** serve traffic from the local street system and distribute it to the arterial street system. These roadways provide a balance between traffic movement and land access and should be designed as best to facilitate traffic circulation throughout the City.
- **Local streets** provide land access and carry locally generated traffic at relatively low speeds to the collector street system. Local streets should provide connectivity through neighborhoods but should be designed to discourage cut-through vehicular traffic.

ODOT Highway Classification

ODOT has a separate classification system for its highways, which guides the planning, management, and investment for state highways. ODOT's categories, from highest to lowest, are Interstate, Statewide, Regional, and District Highways. According to the Oregon Highway Plan (OHP), both US 101 and OR 38 are classified as Statewide Highways. The OHP defines Statewide Highways as follows:

- ***Statewide Highways*** *typically provide inter-urban and inter-regional mobility and provide connections to larger urban areas and recreation areas that are not directly served by Interstate Highways. A secondary function is to provide connections for intra-urban and intra-regional trips. The management objective is to provide safe, efficient, high-speed, continuous-flow operation. In constrained and urban areas, interruptions to flow should be minimal. Inside Special Transportation Areas, local access may also be a priority.*

Table 4 denotes the functional classification by jurisdiction for the roadways in the study area.

Table 4. Functional Classification Comparison by Jurisdiction

Roadway	Federal	State	City[1]
ODOT			
US 101	Rural Other Principal Arterial	Statewide Highway	Arterial
OR 38	Rural Other Principal Arterial	Statewide Highway	Arterial

City of Reedsport			
Winchester Avenue	Rural Major Collector	--	Collector
West Railroad Avenue	--	--	Local
East Railroad Avenue	--	--	Local
Elm Avenue	--	--	Local
North 6th Street	--	--	Local
South 6th Street	--	--	Local
Riverfront Way	--	--	Local

[1] Per Reedsport Transportation System Plan, Map 3-5 (Reference 1).

Intelligent Transportation Systems

Within the study area, there are two identified intelligent transportation systems (ITS). A road and weather information system (RWIS) is located along US 101 south of 11th Street. The RWIS provides road and weather updates using sensors and cameras to provide users with visual and sensor data. The RWIS can be used to help agencies determine when to apply road treatments during weather events. Additionally, a variable message sign (VMS) is located along OR 38 east of Winchester Avenue. A VMS is a traffic control device that displays a message to motorists with information about traffic conditions.

Intersection Operations Analysis

The intersection operations analysis was conducted using PTV Vistro 2022, a software tool designed to assist with operations analyses in accordance with Highway Capacity Manual (HCM) methodologies. The analysis results include level-of-service (LOS), delay (del), and volume-to-capacity (v/c) ratios at all intersections, regardless of jurisdiction. The LOS, del, and v/c ratios are reported for the overall intersection at signalized intersections and the critical movement at unsignalized intersections in accordance with the methodologies outlined in ODOT's Analysis Procedures Manual (APM).

Table 5 and Figure 6 summarize the results of the intersection operations analysis and compares the results to the applicable mobility standards and targets, which were presented in the *Analysis Methodology and Assumptions Memorandum*. Attachment A of this memorandum contains the existing traffic conditions worksheets.

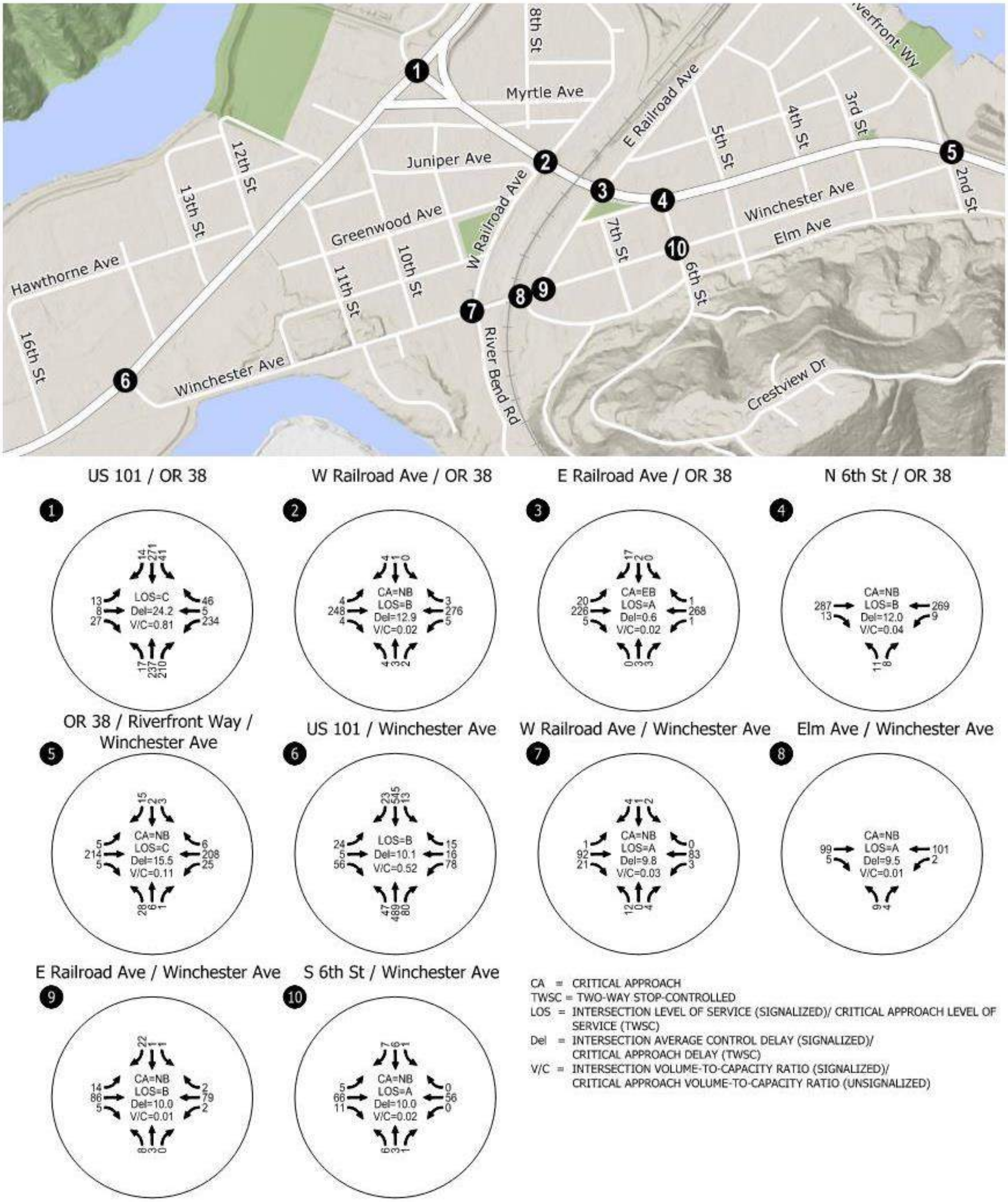
Table 5. Intersection Operations, Weekday PM Peak Hour

Map ID	Intersection	Control Type	Mobility Standard/Target[1]	Intersection Operations			
				CM	LOS[2]	Del[3]	v/c[4]
1	US 101/OR 38	Signal	v/c = 0.85	–	C	24.2	0.81
2	W. Railroad Avenue/OR 38	TWSC	v/c = 0.85 / 0.95	NB	B	12.9	0.02
3	E. Railroad Avenue/OR 38	TWSC	v/c = 0.85 / 0.95	EB	A	0.6	0.02
4	N. 6th Street/OR 38	TWSC	v/c = 0.85 / 0.95	NB	B	12.0	0.04
5	OR 38/Riverfront Way-Winchester Avenue	TWSC	v/c = 0.85 / 0.95	NB	C	15.5	0.11
6	US 101/Winchester Avenue	Signal	v/c = 0.85	–	B	10.1	0.52
7	W. Railroad Avenue/Winchester Avenue	TWSC	LOS D	NB	A	9.8	0.03

8	Elm Avenue/Winchester Avenue	TWSC	LOS D	NB	A	9.5	0.01
9	E. Railroad Avenue/Winchester Avenue	TWSC	LOS D	NB	B	10.0	0.01
10	S. 6th Street/Winchester Avenue	TWSC	LOS D	NB	A	10.0	0.02

[1] State Highway v/c ratio/side street v/c ratio.
[2] Intersection LOS (signal); CM LOS (TWSC).
[3] Intersection average vehicle delay (signal); CM vehicle delay (TWSC).
[4] Intersection v/c (signal); CM v/c (TWSC).
CM = critical movement; Del = delay; EB = eastbound; LOS = level of service; NB = northbound; TWSC = two-way stop-control; v/c = volume to capacity.

Figure 6. Existing Traffic Conditions, Weekday PM Peak Hour



CA = CRITICAL APPROACH
TWSC = TWO-WAY STOP-CONTROLLED
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/ CRITICAL APPROACH LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/ CRITICAL APPROACH DELAY (TWSC)
V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO (SIGNALIZED)/ CRITICAL APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

As shown in Table 5 and Figure 6, all study intersections currently operate acceptably during the weekday PM peak hour. Attachment contains the existing traffic conditions worksheets.

Queueing Analysis

A queuing analysis during non-train events was conducted at the signalized study intersections using PTV Vistro 2022. Table 6 summarizes the 95th percentile queues during the weekday PM peak hour and indicates if existing storage can accommodate the queues. The vehicle queue and storage lengths were rounded up to the nearest 25 feet. The storage lengths reflect the striped storage for each movement at the intersections. Unsignalized intersection queues were also analyzed and found to be less than one vehicle length during the peak hour. Attachment A contains the queuing analysis worksheets.

Table 6. Queueing Summary, Weekday PM Peak Hour

Map ID	Intersection	Movement	Storage Length (feet)	95th Percentile Queue (feet)	Adequate?
1	US 101/ OR 38	EB/T/L	200	200	Yes
		WB/T/L	250	<25	Yes
		NB/L	150	<25	Yes
		SB/L	225	25	Yes
6	US 101/ Winchester Avenue	EB/T/L	70	<25	Yes
		WB/T/L/R	175	50	Yes
		NB/L	115	<25	Yes
		SB/L	80	<25	Yes

EB = eastbound; L = left; NB = northbound; R = right; SB = southbound; T = through; WB = westbound.

As shown in Table 6, the striped storage lengths at the signalized study intersections are currently adequate to accommodate the 95th percentile queues.

Train Event Considerations

Impacts of train events at the OR 38 and Winchester Avenue rail crossings were evaluated for the existing conditions. Projected queueing outcomes during a 160-second train crossing[1] were used to estimate queueing. Queues were calculated using the crossing volumes, including the total eastbound and total westbound approaches. Train event assumptions are detailed in the *Analysis Methodology and Assumptions Memorandum*.

The 95th percentile queue lengths shown quantify the queue lengths that have a 5 percent probability of being exceeded during a 3-minute train crossing. These were calculated by applying a Poisson distribution to the expected number of vehicle arrivals during a 160-second train crossing and summing the associated probability for each number of arrivals, starting at zero vehicles, until a total probability of 95 percent was attained. The 95th percentile queue lengths are shown in Table 7 and Figure 7.

[1] Train-crossing assumes a 1,500-foot long train, a train speed of 10 mph (14.7 feet per second), and 25 seconds of gates down both before and after the train crossing for lowering and clearance. The resulting 152 seconds is rounded up to a 160-second event.

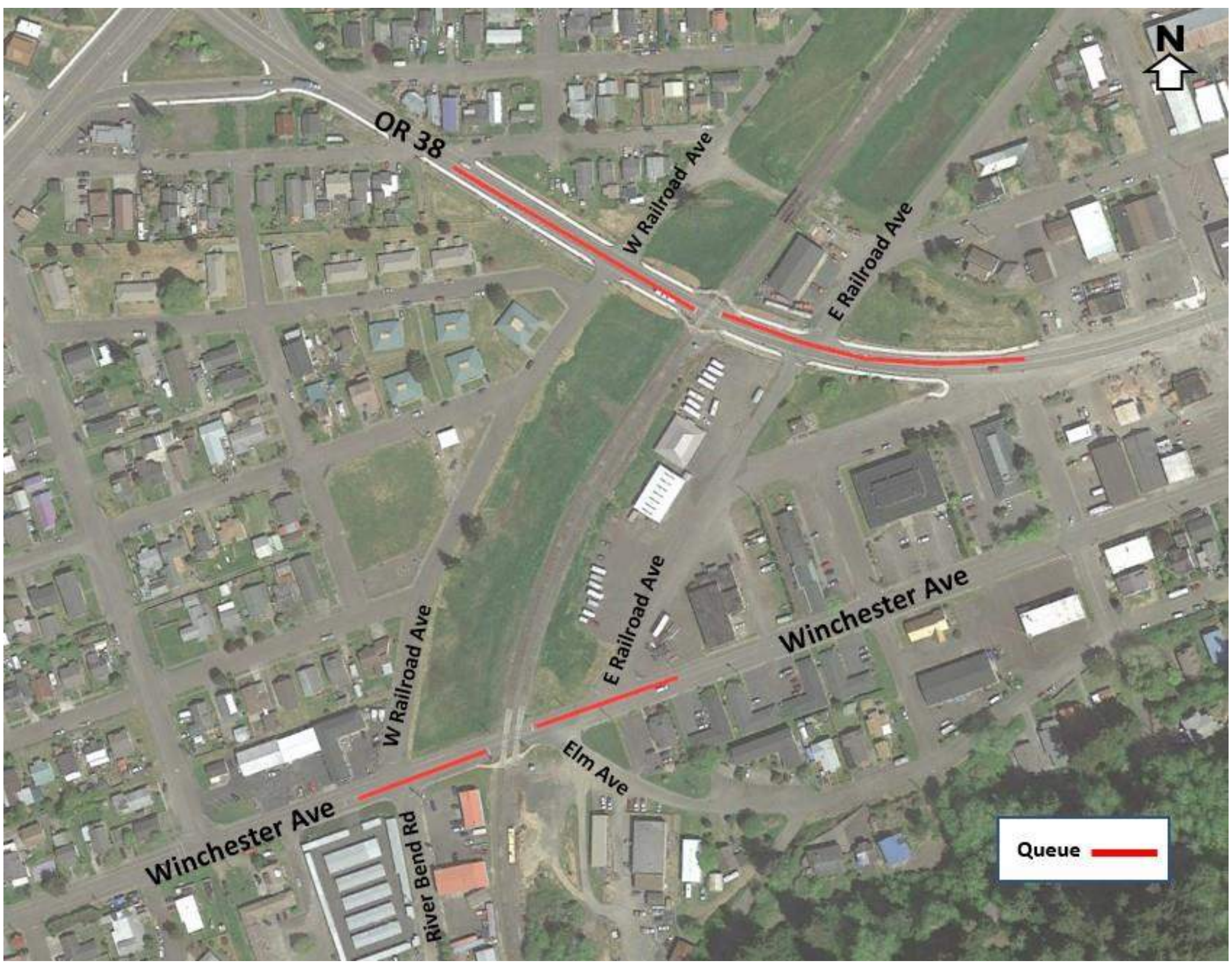
Table 7. Train Event 95th Percentile Queueing

Crossing	Approach	Storage Length (feet)	95th Percentile Queues (feet)	
			Existing	Exceeds Storage?
OR 38	Eastbound	140[1]	475	**Yes**
	Westbound	150[2]	525	**Yes**
Winchester Avenue	Eastbound	130[1]	225	**Yes**
	Westbound	100[2]	250	**Yes**

[1] Distance to W. Railroad Avenue.
[2] Distance to E. Railroad Avenue.

The 95th percentile queues lengths are within storage lengths during crossing events on Winchester Avenue for eastbound and westbound movements and are expected to exceed storage on OR 38 for those movements. During a train event, the OR 38 eastbound traffic is expected to queue west of W. Railroad Avenue and is not expected to queue past Laurel Avenue. Additionally, a train event with existing lane configurations and storage lengths would cause the westbound traffic to extend past N. 6th Street. Attachment B of this memorandum contains the train event queuing calculations.

Figure 7. Train Event Queue Lengths



Crash Analysis

Crash data was obtained from ODOT's Crash Analysis & Reporting Unit. The data includes the total number, type, and severity of crashes that occurred throughout the study area for the 5-year period from January 1, 2016, through December 31, 2020. Based on the data, a total of 15 crashes were reported at the study intersections over the 5-year period, of which seven resulted in injury and eight resulted in property-damage-only (PDO).None of the reported crashes involved bicycles or pedestrians. The following sections summarize the results of the intersection and segment crash analysis based on the 5 years of crash data. Figure 8 shows the reported crashes from 2016 to 2020.

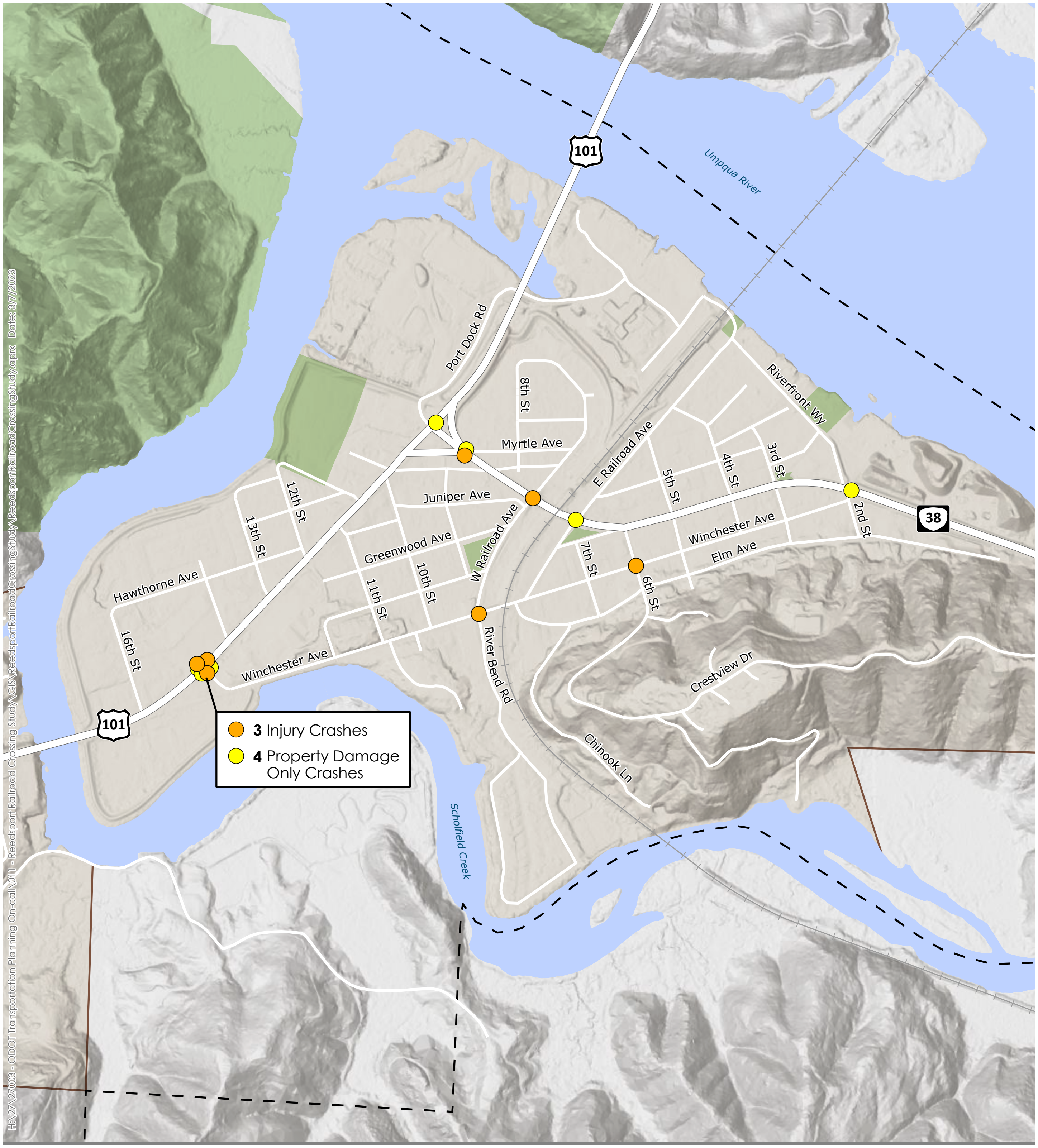
Intersection Crash Analysis

The intersection crash analysis includes an evaluation of intersection crash rates, critical crash rates, and excess proportion of specific crash types. The intersection crash analysis identifies the study intersections where existing safety issues may exist and may require mitigation. There were no reported crashes at three study intersections. Table 8 summarizes the collision type and crash severity for all reported crashes at the study intersections.

Table 8. Intersection Crash History (January 1, 2016, to December 31, 2020)

Map ID	Intersection	Collision Type					Crash Severity			Total
		Angle	Head-On	Turn	Rear-End	Other	Fatal/ Severe	Injury	PDO	
1	US 101/OR 38[1]	-	-	-	3	-	-	1	2	3
2	W Railroad Avenue/ OR 38	1	-	-	-	-	-	1		1
3	E Railroad Avenue/ OR 38	-	-	-	1	-	-	-	1	1
4	OR 38/Riverfront Way-Winchester Avenue	-	-	-	-	-	-	-	-	0
5	N 6th Street/OR 38	-	-	1	-	-	-	-	1	1
6	US 101/ Winchester Avenue	3	-	3	1			3	4	7
7	W. Railroad Avenue/ Winchester Avenue	1	-	-	-	-	-	1	-	1
8	Elm Avenue/ Winchester Avenue	-	-	-	-	-	-	-	-	0
9	E. Railroad Avenue/ Winchester Avenue	-	-	-	-	-	-	-	-	0
10	South 6th Street/ Winchester Avenue	-	-	-	1	-	-	1	-	1

[1] Initial data received from ODOT crash team indicated that no crashes occurred at this intersection. Further inspection of the ODOT TransGIS crash database determined that three crashes were within 250 feet of US 101/ OR 38 and were considered intersection-related for the purpose of this safety analysis. Two crashes occurred on the eastern leg within the vicinity of the US 101/ OR 38 northbound channelized right-turn exit and one crash occurred on the northern leg of US 101.



Injury Crash

Property Damage Only Crash

City Boundary

Urban Growth Boundary

National Forest or Park

Railroad

0 1,000 Feet

Figure 8

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Reported Crashes
Reedsport, Oregon

Intersection Crash Rates

Intersection crash rates were developed for the study intersections based on the total number of crashes reported at the intersections over the 5-year period and the total entering volume, or million entering vehicles (MEV). Intersection crash rates were compared to 90th percentile crash rates developed by ODOT and documented in Table 4-1 of the ODOT APM. Table 9 summarizes the total number of crashes reported at the study intersections over the 5-year period, the intersection crash rates, and the corresponding 90th percentile crash rates as identified in the APM. Attachment C of this memorandum contains crash data from 2016-2020.

Table 9. Intersection Crash Rates vs. ODOT 90th Percentile Rates

Map ID	Intersection	Total Crashes	Intersection Crash Rate	90th Percentile Rate	Exceeds 90th Percentile Rate?
1	US 101/OR 381	3	0.15	0.86	No
2	W. Railroad Avenue/OR 38	1	0.10	0.41	No
3	E. Railroad Avenue/OR 38	1	0.10	0.41	No
4	OR 38/Riverfront Way-Winchester Avenue	0	0.00	0.29	No
5	N. 6th Street/OR 38	1	0.11	0.41	No
6	US 101/Winchester Avenue	7	0.28	0.86	No
7	W. Railroad Avenue/Winchester Avenue	1	0.25	0.41	No
8	Elm Avenue/Winchester Avenue	0	0.00	0.29	No
9	E. Railroad Avenue/Winchester Avenue	0	0.00	0.29	No
10	South 6th Street/Winchester Avenue	1	0.34	0.41	No

As shown in Table 9, none of the study intersections experience crash rates that exceed the 90th percentile. Attachment D contains the intersection crash rate analysis worksheet.

Critical Crash Rates

Critical crash rates were developed for the study intersections with sufficient reference populations based on the total number of crashes reported at the intersections over the 5-year period, the intersection type, and the total entering volume or average annual daily traffic (AADT). This method is only applicable where at least five to 10 intersections are available with similar characteristics (e.g., traffic control and legs/approaches). Otherwise, the critical crash rate defaults to the 90th percentile crash rates outlined in Table 9. Critical crash rates were calculated for the study intersections using ODOT's Critical Crash Rate Calculator tool. Table 10 summarizes the total number of crashes reported at the study intersections over the 5-year period, the intersection crash rates, and the corresponding critical crash rates. None of the study intersections currently exceed their corresponding critical crash rates. Attachment D contains the critical crash rate analysis worksheet.

Table 10. Intersection Crash Rates vs. Critical Crash Rates

Map ID	Intersection	Total Crashes	Intersection Crash Rate	Critical Crash Rate	Exceeds Critical Crash Rate?
1	US 101/OR 381	3	0.15	0.56	No
2	W. Railroad Avenue/OR 38	1	0.10	0.82	No
3	E. Railroad Avenue/OR 38	1	0.10	0.83	No
4	OR 38/Riverfront Way-Winchester Avenue	0	0.00	0.46	No
5	N. 6th Street/OR 38	1	0.11	0.84	No
6	US 101/Winchester Avenue	7	0.28	0.53	No
7	W. Railroad Avenue/Winchester Avenue	1	0.25	1.09	No
8	Elm Avenue/Winchester Avenue	0	0.00	0.68	No
9	E. Railroad Avenue/Winchester Avenue	0	0.00	0.68	No
10	South 6th Street/Winchester Avenue	1	0.34	1.23	No

Excess Proportion of Specific Crash Types

The Excess Proportion of Specific Crash Types analysis method quantifies the extent to which a specific crash type is overrepresented at an intersection when compared to the average representation within a reference population (five or more intersections with the same configuration). The analysis method does not consider the overall frequency or rate of crashes; instead, it considers only the types of crashes observed. It is useful for identifying locations that may benefit from targeted countermeasures. This method is best used in conjunction with the Critical Crash Rate analysis described above, as the two methods have complementary strengths and weaknesses.

Table 11 summarizes the intersections with a high probability (over 90 percent) that the long-term expected proportion of specific crash types will be greater than the long-term expected proportion of specific crash types of other intersections in the reference population. The table shows the study intersection, intersection type/reference population, collision type in excess, probability of future occurrences, and proportion of benefit or likelihood that the intersection will benefit from a countermeasure targeted at the specific crash type. Attachment D contains the excess proportion of specific crash types analysis worksheet.

Table 11. Excess Proportion of Specific Crash Rates

Map ID	Intersection	Intersection Type / Reference Population	Collision Type in Excess	Probability of Future Occurrence	Proportion of Benefit
1	US 101/OR 381	4 SG	Rear-End	100%	N/A
2	W. Railroad Avenue/OR 38	4 ST	N/A	N/A	N/A
3	E. Railroad Avenue/OR 38	4 ST	N/A	N/A	N/A
4	OR 38/Riverfront Way-Winchester Avenue	3 ST	N/A	N/A	N/A
5	N. 6th Street/OR 38	4 ST	N/A	N/A	N/A

6	US 101/Winchester Avenue	4 SG	Turn	43%	N/A
7	W. Railroad Avenue/Winchester Avenue	4 ST	N/A	N/A	N/A
8	Elm Avenue/Winchester Avenue	3 ST	N/A	N/A	N/A
9	E. Railroad Avenue/Winchester Avenue	3 ST	N/A	N/A	N/A
10	South 6th Street/Winchester Avenue	4 ST	N/A	N/A	N/A

3 = 3-legged intersection, 4 = 4-legged intersection, SG = traffic signal controlled, ST = stop controlled.

Safety Priority Index System

The Safety Priority Index System (SPIS) was developed by ODOT to identify sites along state and local roads where potential safety issues warrant further investigation. The SPIS compares the total number of crashes reported on city streets, county roads, and state highways and generates a list of sites (intersections and roadway segments) with calculated SPIS scores. The scores are based on crash frequency, crash rate, and crash severity. SPIS sites with scores in the top 5 percent are investigated by ODOT staff and reported to the Federal Highway Administration (FHWA). Per the most recent SPIS list (2020), there are no sites within study area in the top 15 percent of SPIS sites.

Parking Analysis

On-Street Parking Supply

OR 38: On street parallel parking is permitted on both sides of the street on the two blocks of commercial uses between N. 5th Street and N. 3rd Street. This amounts to roughly 1,130 feet of curb (45 vehicles).[2]

Winchester Avenue: Curbside street parking is permitted on both sides of the street within the shoulder between 2nd Street and US-101.

Off-Street Parking Supply

OR 38: The commercial properties on OR 38 between N. 6th Avenue and N. 5th Street have dedicated private parking lots. While there is on-street parking to serve the businesses between N. 5th and N. 3rd, there are two large dedicated off-street parking lots with entrances on the south side of OR 38 serving those businesses. Off-street parking is provided behind the post office, which fronts the north side of OR 38.

Winchester Avenue: A mixture of residential and non-residential land uses front Winchester Avenue within the study area. Off-street parking lots for the non-residential entities are available throughout the corridor between US 101 and 2nd Street.

[2] Assuming 25 feet per parking space.

Emergency Service Providers

Emergency service providers within Reedsport include the Reedsport Volunteer Fire Department, the Reedsport Police Department, and the Lower Umpqua Hospital. Information on these providers is summarized below.

- The **Reedsport Volunteer Fire Department** operates out of two stations, including Station 1 on the north side of Winchester Avenue at 4th Street and Station 2 on the north side of Frontage Avenue between Ranch Road and 22nd Street. The two stations serve the City of Reedsport specializing in fire fighting, rescue, hazardous materials incidents, special assignments, mutual aid calls, and fire prevention. Train events along the CBRL could reduce response times to areas north of the rail line as well as increase reliance on Station 2 to serve areas that would otherwise be served by Station 1.
- The **Reedsport Police Department** operates out of the same building as the Reedsport Volunteer Fire Department Station 1. The police department facility houses a full-time communications center and municipal jail, as well as the department's Dispatch/Records Section, which provides dispatch services for the Police Department, the Reedsport Volunteer Fire Department, and the Lower Umpqua Hospital Ambulance services. Like Station 1, train events along the CBRL could reduce response times to areas north of the rail line, as well as areas west of Scholfield Creek.
- The **Lower Umpqua Hospital** is located on the west side of Ranch Road, north of Ridgeway Drive. Ranch Road connects to US 101 via Frontage Road-22nd Street on the north side of US 101 and Longwood Drive on the south side of US 101. A train event along the CBRL could reduce response time to and from areas south of the CBRL.

NON-MOTORIZED TRANSPORTATION INVENTORY

Public Transportation

Regional Service

The study area is located within ODOT Region 3, which includes Coos, Curry, Douglas, Jackson, and Josephine counties. Coos County Area Transit (CCAT) runs intercity service between Coos Bay and Florence on Monday through Saturday with one morning and one evening run. Route deviations are available upon request. The northbound and southbound Reedsport stops for the CCAT's Florence Express within the study area are located on the south side of the US 101/13th Street intersection.

On-Demand / Dial-a-Ride

Dial-a-Ride service is available to Reedsport seniors and people with disabilities with advance reservations for trips starting and ending within Douglas County through the Umpqua Public Transportation District's "Douglas Rides" program.

Pedestrians

Within the City of Reedsport study area, existing pedestrian facilities were inventoried and compared to the Reedsport TSP.

OR 38

Partial sidewalks are provided on the south side of OR 38 from Myrtle Avenue to Laurel Avenue, and whole sidewalks are provided on both sides along OR 38 from Laurel Avenue to N. 3rd Street. There is currently no sidewalk east of 3rd Street. The TSP has identified a future pedestrian crossing crosswalk on OR 38 and Winchester Avenue. Pedestrian rail crossings are provided on both sides of OR 38. Marked crosswalks are provided on all crossings of the 5th Street and OR 38 intersection. Sidewalk facilities appear to be in good condition and range from 6 to 10 feet in width in the study area.

Winchester Avenue

Partial sidewalks are provided on Winchester from US 101 to the Kel-Cee Ace Hardware southern access and 12th Street to East Railroad Avenue. Sidewalks on both sides of Winchester Avenue are provided from E. Railroad Avenue to OR 38. There is currently no sidewalk from the Kel-Cee Ace Hardware southern access to 12th Street. The TSP has identified complete sidewalks on both sides of Winchester from US 101 to Schofield Drive. Pedestrian rail crossings are provided on the south side of Winchester Avenue. Marked crosswalks are provided on the west leg of N. 10th Street and Winchester Avenue intersection, the east leg of N. 5th Street and Winchester Avenue intersection, and the midblock crossing between 5th Street and 4th Street. Sidewalk facilities appear to be in good condition and vary from 5 to 7 feet in width along the study area.

Local Roads

West Railroad Avenue currently has no sidewalks north of OR 38 and partial sidewalks on the west side from Juniper Avenue to Winchester. 6th Street currently has sidewalks on both sides from OR 38 to Elm Avenue. E. Railroad Avenue and Elm Avenue currently have no sidewalks.

Intermodal Connections

There is currently no fixed route transit service provided in the City of Reedsport. CCAT provides intercity connections from Coos Bay to Florence with a stop in Reedsport. The northbound and southbound stops in Reedsport are located on the southside of the US 101/13th Street intersection. Sidewalks are provided to and from the stops along US 101.

Pedestrian Generators

Pedestrian accessibility to key destinations within the study area described below:

- Downtown Reedsport – The downtown area has the most complete sidewalk network and generally provides good pedestrian connectivity to destinations. The commercial core around OR 38 and Winchester Avenue has a complete sidewalk network, the Lower Umpqua Library has a complete sidewalk network surrounding it, and Florence City Hall (on US 101 between 1st Street and 2nd Street) has a complete sidewalk network except on 1st Street.

Bicycles

Within the City of Reedsport study area, existing bicycle facilities were inventoried and compared to the Reedsport TSP.

OR 38

Striped bike lanes are provided on OR 38 from US 101 to 3rd Street. The bicycle facilities appear to be in good condition and are 6 feet in width.

Winchester Avenue

There are currently no bicycle facilities on Winchester Avenue, which is a shared roadway. The roadway width is 13 feet from US 101 to OR 38.

Local Roads

There are currently no bicycle facilities on local roads within the study area. The local roads are shared roadway facilities.

Intermodal Connections

There is currently no fixed route transit service provided in the City of Reedsport. CCAT provides intercity connections from Coos Bay to Florence with a stop in Reedsport. The northbound and southbound stops in Reedsport are located on the southside of the US 101/13th Street intersection. Striped bicycle lanes are provided to and from the stops along US 101.

RAIL

Since resuming rail service in 2011, the Coos Bay Rail Line (CBRL) provides freight service to industrial customers in and around Coos Bay and Coquille via interchange connections with the Union Pacific Railroad, Portland and Western, and Central Oregon & Pacific in Eugene, approximately 120 railroad miles to the north and east.

Rail Owners and Operators

Coos Bay Rail Line (CBRL) is the owner and operator of the rail line.

Historic Rail Activity and Operations

Rail activity over the line has been consistent since 2011, when CBRL began operations. The Umpqua swing span is kept in the open position for river traffic, closing only for rail passages as required. The train speeds are restricted to 10 mph across the Umpqua River bridge, which is the maximum and average speed for trains passing through Reedsport.

Existing Operations

Based upon data obtained from the existing crossing inventories within Reedsport and input from Coos Bay Railroad staff, the current train service on the line through Reedsport consists of a maximum of two trains per day, a maximum operating length of about 1,500 feet, with a maximum train speed of 10 mph though town. The 10 mph speed restriction in place on the Umpqua swing span at the east side of town is the limiting feature along the rail line within Reedsport.

The frequency of operation of the swing span was not provided by the CBRL. However, it was described as infrequent, with vessel passages occurring weekly rather than daily, though it was noted to be seasonal, with passages in correlation with the fishing seasons along the Oregon Coast. The current operation of the swing span favors watercraft, with the bridge remaining open until train passage requires closure. CRBL staff reported that efforts are underway to petition the U.S. Coast Guard to allow the bridge to remain closed, with openings for watercraft on a scheduled or on-call basis. This would favor railroad operations, providing the CBRL with the ability to coordinate opening with rail traffic, thus lessening the potential delays incurred by train traffic waiting for bridge openings.

Rail Crossing Controls and Configurations

There are two at-grade rail CBRL crossings in the City within the study area.

Winchester Avenue

The CBRL rail line crosses Winchester Avenue at grade between River Bend Rd and Elm Avenue. Winchester Avenue is one lane in each direction. There are stop bars roughly 20 feet from the tracks in both travel lanes, and rail crossing warning striping within 220 feet of the rail in either direction. The crossing is controlled by a two quadrant active warning gate system to manage vehicle conflicts. The gates are accompanied by flashing lights and a cross buck "rail crossing" warning sign (Figure 9). The single pedestrian crossing is uncontrolled and on the east side of the street (Figure 10). Attachment E contains the crossing key data for Winchester Avenue.

Figure 9 Winchester Avenue at Grade Rail Crossing (Looking Eastbound)

Figure 10. Winchester Avenue At-Grade Pedestrian Crossing (Looking Eastbound)

OR 38

The rail line crosses OR 38 at grade between W. Railroad Avenue and E. Railroad Avenue, where there is a slight curve on the westbound approach (Figure 11). There are stop bars roughly 15 feet from the tracks in both travel lanes, and rail crossing warning striping within 220 feet of the rail in the westbound direction and 300 feet in the eastbound direction. The crossing is controlled by a two-quadrant active warning gate system to manage vehicle conflicts. The gates are accompanied by flashing lights and a cross buck “rail crossing” warning sign. There are uncontrolled pedestrian crossings in both directions. Attachment E contains the crossing key data for OR 38.

Figure 11. OR 38 At-Grade Rail Crossing

DRAINAGE SYSTEM

Floodplain

All study intersections are located within the Reedsport levee system, which protects the area from riverine flooding from the Umpqua River and Scholfield Creek. The potential for flooding is still present in the event of a levee failure or failure of the storm drainage system. The levee system has been provisionally accredited by the Federal Emergency Management Agency. The area is expected to be protected from flooding up to the 200-year event, with larger events potentially overtopping the levees. Floodwalls are provided along the study area as shown in Figure 12.

Figure 12. Floodwalls within Study Area

Drainage System

Storm drainage for the study intersections is provided by the City of Reedsport drainage system, with catch basins leading to the gravity storm sewer that provides a means for stormwater to drain from the roadway. Most of the system is gravity-driven with pump stations at the discharge points along the Umpqua River and Scholfield Creek that discharge flows when levels in these water bodies are high enough to prevent gravity flow. The existing conditions drainage system is shown in Figure 13.

- Study Intersection
- City Boundary
- Urban Growth Boundary
- National Forest or Park
- Railroad
- Reedsport Storm Lines
- Levee

FEMA Special Flood Hazard Area

- 1% annual chance flood hazard
- Floodway
- 0.2% annual chance flood hazard
- Area with reduced flood risk due to levee

0 1,000 Feet

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Figure 13

Drainage System
Reedsport, Oregon

EXISTING DEFICIENCIES AND NEEDS

This working memorandum identified existing deficiencies and needs. These include the following key findings:

- Capacity - Under existing conditions, the study intersections are currently meeting respective performance standards during the weekday PM peak hour.
- Queue storage - Train events at OR 38 and Winchester Avenue are likely to cause queuing exceeding the eastbound and westbound approach storage length both today and in the future.
- Safety - A crash analysis indicates the study intersections do not exceed the 90th percentile crash rates and critical crash rates. It also indicates that the long-term expected proportion of specific crash types will be greater than the long-term expected proportion of specific crash types in other intersections in the reference population.
- Title VI and environmental justice populations – The study area in Reedsport has a higher percentage of people living below the federal poverty level, older adults, people with disabilities, and zero-vehicle households than the rest of the State.
- Pedestrian connectivity – Sidewalks are provided in the study area on one or both sides, with the exception of the following:
  - Winchester Avenue – There is no sidewalk from the Kel-Cee Hardware southern access to 12th Street.
  - West Railroad Avenue – There is no sidewalk north of OR 38.
  - E. Railroad Avenue and Elm Avenue – No sidewalk is provided.
- Bicycle connectivity – Bicycle connectivity is provided in the study area through bike lanes on US 101, OR 38 from US 101 to 3rd Street, and shared roadways on Winchester Avenue and local streets.
- Rail system – There are currently at grade rail CBRL crossings at OR 38 and Winchester Avenue with a current 10 mph speed limit restriction in place on the Umpqua swing span at the east side of town.
- Stormwater infrastructure – The study area is located within the Reedsport levee system, which protects the area from riverine flooding up to the 200-year event. Potential flooding is likely in the event of a levee failure or a failure of the storm drainage system.

REFERENCES

1. City of Reedsport. City of Reedsport Transportation System Plan, 2006.

ATTACHMENTS

A. Existing Traffic Conditions Worksheets
B. Train Event Queueing Calculations
C. ODOT Crash Data
D. Crash Rate Analysis Worksheets
E. Crossing Key Data

Attachment A: Existing Traffic Conditions Worksheets

Intersection Level Of Service Report
Intersection 1: US 101 / OR 38

Control Type:	Signalized	Delay (sec / veh):	24.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.809

Intersection Setup

Name	US 101			US 101			Port Dock Rd			OR 38		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	1
Entry Pocket Length [ft]	150.00	100.00	100.00	225.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	320.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
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	49.21
Speed [mph]	30.00			30.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			No			Yes			No		
Crosswalk	Yes			Yes			Yes			No		

Volumes

Name	US 101			US 101			Port Dock Rd			OR 38		
Base Volume Input [veh/h]	17	237	210	41	271	14	13	8	27	234	5	46
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 [%]	18.00	9.00	5.00	2.00	6.00	0.00	0.00	50.00	11.00	9.00	20.00	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
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	17	237	210	41	271	14	13	8	27	234	5	46
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	64	57	11	74	4	4	2	7	64	1	13
Total Analysis Volume [veh/h]	18	258	228	45	295	15	14	9	29	254	5	50
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			1			0		
v_di, Inbound Pedestrian Volume crossing m	1			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			1			0		

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]	12.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	1	6	0	5	2	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lag	-	-	-	-	-	-	-	-
Minimum Green [s]	3	10	0	3	10	0	0	5	0	0	7	0
Maximum Green [s]	15	45	0	15	45	0	0	35	0	0	35	0
Amber [s]	3.5	3.8	0.0	3.5	3.8	0.0	0.0	3.5	0.0	0.0	3.8	0.0
All red [s]	1.8	1.0	0.0	1.8	1.5	0.0	0.0	1.8	0.0	0.0	2.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	2.5	4.5	0.0	2.5	4.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Walk [s]	0	0	0	0	7	0	0	7	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	19	0	0	20	0	0	0	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			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.3	2.8	0.0	3.3	3.3	0.0	0.0	3.3	0.0	0.0	3.8	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		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	C	R	L	C	C	C	C	R
C, Cycle Length [s]	66	66	66	66	66	66	66	66	66	66
L, Total Lost Time per Cycle [s]	5.05	4.80	4.80	4.80	5.30	5.30	5.30	5.30	5.80	5.80
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	2.00	0.00	0.00	2.00	2.00	0.00
l2, Clearance Lost Time [s]	0.00	2.80	2.80	2.80	0.00	3.30	3.30	0.00	3.80	3.80
g_i, Effective Green Time [s]	20	13	13	13	20	14	14	35	35	35
g / C, Green / Cycle	0.30	0.20	0.20	0.20	0.30	0.21	0.21	0.54	0.53	0.53
(v / s)_i Volume / Saturation Flow Rate	0.02	0.10	0.10	0.10	0.03	0.09	0.09	0.22	0.56	0.03
s, saturation flow rate [veh/h]	1187	1765	1616	1517	1292	1810	1775	231	466	1615
c, Capacity [veh/h]	318	352	322	303	335	377	369	91	355	856
d1, Uniform Delay [s]	21.92	23.36	23.44	23.45	23.23	22.60	22.62	13.16	16.43	7.51
k, delay calibration	0.19	0.19	0.19	0.19	0.19	0.08	0.19	0.08	0.45	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.13	1.77	2.04	2.30	0.31	0.54	1.29	4.11	11.34	0.02
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.06	0.48	0.50	0.51	0.13	0.41	0.42	0.57	0.73	0.06
d, Delay for Lane Group [s/veh]	22.05	25.13	25.47	25.75	23.54	23.14	23.91	17.27	27.78	7.53
Lane Group LOS	C	C	C	C	C	C	C	B	C	A
Critical Lane Group	No	No	No	Yes	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.19	2.40	2.28	2.23	0.49	2.04	2.09	0.42	4.64	0.31
50th-Percentile Queue Length [ft/ln]	4.79	59.90	57.09	55.64	12.15	50.91	52.35	10.57	116.07	7.81
95th-Percentile Queue Length [veh/ln]	0.34	4.31	4.11	4.01	0.88	3.67	3.77	0.76	8.18	0.56
95th-Percentile Queue Length [ft/ln]	8.62	107.8	102.7	100.1	21.88	91.64	94.23	19.03	204.41	14.06

Movement, Approach, & Intersection Results

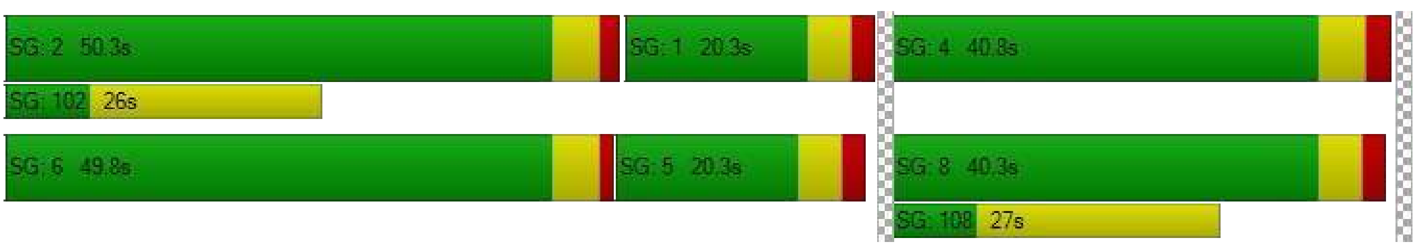
d_M, Delay for Movement [s/veh]	22.05	25.25	25.67	23.54	23.50	23.91	17.27	17.27	17.27	27.78	27.78	7.53
Movement LOS	C	C	C	C	C	C	B	B	B	C	C	A
d_A, Approach Delay [s/veh]	25.32			23.52			17.27			24.50		
Approach LOS	C			C			B			C		
d_I, Intersection Delay [s/veh]	24.25											
Intersection LOS	C											
Intersection V/C	0.809											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	-5.8	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	9708.42	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	22.91	39.04	22.91	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.973	2.507	1.757	0.000
Crosswalk LOS	C	B	A	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1364	1364	1061	1061
d_b, Bicycle Delay [s]	3.34	3.34	7.28	7.27
I_b,int, Bicycle LOS Score for Intersection	1.975	1.852	1.645	2.069
Bicycle LOS	A	A	A	B

Sequence

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



Intersection Level Of Service Report
Intersection 2: OR 38 / W Railroad Ave

Control Type:	Two-way stop	Delay (sec / veh):	13.9
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.010

Intersection Setup

Name	W Railroad Ave			W Railroad Ave			OR 38			OR 38		
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			25.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	W Railroad Ave			W Railroad Ave			OR 38			OR 38		
Base Volume Input [veh/h]	4	3	2	0	1	4	4	248	4	5	276	3
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	9.00	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]	4	3	2	0	1	4	4	248	4	5	276	3
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	1	0	0	1	1	67	1	1	75	1
Total Analysis Volume [veh/h]	4	3	2	0	1	4	4	270	4	5	300	3
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	13.85	13.77	9.82	13.75	13.67	9.89	7.84	0.00	0.00	7.78	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.06	0.06	0.06	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
95th-Percentile Queue Length [ft/ln]	1.49	1.49	1.49	0.59	0.59	0.59	0.24	0.24	0.24	0.29	0.29	0.29
d_A, Approach Delay [s/veh]	12.93			10.65			0.11			0.13		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	0.40											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 3: OR 38 / E Railroad Ave

Control Type:	Two-way stop	Delay (sec / veh):	14.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.005

Intersection Setup

Name	E Railroad Ave			E Railroad Ave			OR 38			OR 38		
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			25.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	E Railroad Ave			E Railroad Ave			OR 38			OR 38		
Base Volume Input [veh/h]	0	3	3	0	2	17	20	226	5	1	268	1
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00	8.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	3	3	0	2	17	20	226	5	1	268	1
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	1	1	0	1	5	6	63	1	0	74	0
Total Analysis Volume [veh/h]	0	3	3	0	2	19	22	251	6	1	298	1
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.00	0.00	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	14.27	13.87	9.63	14.07	13.99	9.99	7.88	0.00	0.00	7.73	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.03	0.03	0.03	0.09	0.09	0.09	0.05	0.05	0.05	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.84	0.84	0.84	2.35	2.35	2.35	1.32	1.32	1.32	0.06	0.06	0.06
d_A, Approach Delay [s/veh]	11.75			10.37			0.62			0.03		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	0.77											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 4: OR 38 / N 6th St

Control Type:	Two-way stop	Delay (sec / veh):	13.4
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.027

Intersection Setup

Name	S 6th St		OR 38		OR 38	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	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]	20.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	S 6th St		OR 38		OR 38	
Base Volume Input [veh/h]	11	8	287	13	9	269
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	8.00	38.00	0.00	7.00
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]	11	8	287	13	9	269
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	2	78	4	2	73
Total Analysis Volume [veh/h]	12	9	312	14	10	292
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.03	0.01	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	13.39	10.23	0.00	0.00	7.91	0.00
Movement LOS	B	B	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.12	0.12	0.00	0.00	0.02	0.02
95th-Percentile Queue Length [ft/ln]	3.07	3.07	0.00	0.00	0.61	0.61
d_A, Approach Delay [s/veh]	12.04		0.00		0.26	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.51					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 5: OR 38 / Riverfront Way / Winchester

Control Type:	Two-way stop	Delay (sec / veh):	15.7
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.092

Intersection Setup

Name	Winchester Ave			Riverfront Way			OR 38			OR 38		
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	1	0	0	0	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	50.00	100.00	100.00	100.00	100.00	100.00	450.00	250.00	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]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Winchester Ave			Riverfront Way			OR 38			OR 38		
Base Volume Input [veh/h]	28	6	1	3	2	15	5	214	5	25	208	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	20.00	4.00	12.00	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]	28	6	1	3	2	15	5	214	5	25	208	6
Peak Hour Factor	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900
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]	9	2	0	1	1	5	2	68	2	8	66	2
Total Analysis Volume [veh/h]	35	8	1	4	3	19	6	271	6	32	263	8
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	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.09	0.02	0.00	0.01	0.01	0.02	0.00	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	15.69	15.30	9.67	14.58	14.39	9.90	7.77	0.00	0.00	7.90	0.00	0.00
Movement LOS	C	C	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.38	0.38	0.00	0.13	0.13	0.13	0.01	0.01	0.00	0.08	0.00	0.00
95th-Percentile Queue Length [ft/ln]	9.43	9.43	0.10	3.32	3.32	3.32	0.35	0.35	0.00	1.93	0.00	0.00
d_A, Approach Delay [s/veh]	15.48			11.14			0.16			0.83		
Approach LOS	C			B			A			A		
d_I, Intersection Delay [s/veh]	1.94											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 6: US 101 / Winchester Ave

Control Type:	Signalized	Delay (sec / veh):	10.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.522

Intersection Setup

Name	US 101			US 101			Winchester Ave			Winchester 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	1	0	0	1	0	0	0	0	1	0	0	0
Entry Pocket Length [ft]	125.00	100.00	100.00	75.00	100.00	100.00	100.00	100.00	75.00	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			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 101			US 101			Winchester Ave			Winchester Ave		
Base Volume Input [veh/h]	47	489	80	13	545	23	24	5	56	78	16	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 [%]	2.00	6.00	2.00	8.00	7.00	4.00	8.00	0.00	2.00	1.00	0.00	13.00
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	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	47	489	80	13	545	23	24	5	56	78	16	15
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	131	22	3	147	6	6	1	15	21	4	4
Total Analysis Volume [veh/h]	51	526	86	14	586	25	26	5	60	84	17	16
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			1			0			1		
v_di, Inbound Pedestrian Volume crossing m	0			1			2			1		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			7			0			0		

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]	12.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	0	1	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	10	0	3	10	0	0	5	0	0	5	0
Maximum Green [s]	20	45	0	20	45	0	0	30	0	0	30	0
Amber [s]	3.5	3.8	0.0	3.5	3.8	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.6	1.3	0.0	1.6	1.6	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	0.0	2.5	4.5	0.0	0.0	2.5	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	15	0	0	16	0	0	18	0	0	19	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			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.1	3.1	0.0	3.1	3.4	0.0	0.0	3.5	0.0	0.0	3.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		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	C	L	C	C	C	R	C
C, Cycle Length [s]	33	33	33	33	33	33	33	33	33
L, Total Lost Time per Cycle [s]	5.10	5.10	5.10	5.40	5.40	5.40	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00
l2, Clearance Lost Time [s]	0.00	3.10	3.10	0.00	3.40	3.40	3.50	3.50	3.50
g_i, Effective Green Time [s]	18	12	12	17	10	10	5	5	5
g / C, Green / Cycle	0.53	0.37	0.37	0.52	0.31	0.31	0.15	0.15	0.15
(v / s)_i Volume / Saturation Flow Rate	0.03	0.17	0.17	0.01	0.17	0.17	0.02	0.04	0.14
s, saturation flow rate [veh/h]	1781	1810	1723	957	1795	1764	1772	1583	815
c, Capacity [veh/h]	1041	666	634	729	560	551	457	229	305
d1, Uniform Delay [s]	4.00	7.98	7.98	4.00	9.42	9.43	12.27	12.55	14.84
k, delay calibration	0.11	0.11	0.11	0.08	0.19	0.19	0.08	0.08	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.02	0.52	0.55	0.01	1.44	1.48	0.05	0.45	0.79
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.05	0.47	0.47	0.02	0.55	0.55	0.07	0.26	0.38
d, Delay for Lane Group [s/veh]	4.02	8.49	8.53	4.01	10.86	10.91	12.32	12.99	15.63
Lane Group LOS	A	A	A	A	B	B	B	B	B
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.08	1.20	1.16	0.02	1.50	1.49	0.17	0.35	0.80
50th-Percentile Queue Length [ft/ln]	1.99	30.11	28.95	0.57	37.48	37.17	4.21	8.76	19.94
95th-Percentile Queue Length [veh/ln]	0.14	2.17	2.08	0.04	2.70	2.68	0.30	0.63	1.44
95th-Percentile Queue Length [ft/ln]	3.58	54.20	52.12	1.02	67.47	66.90	7.58	15.76	35.90

Movement, Approach, & Intersection Results

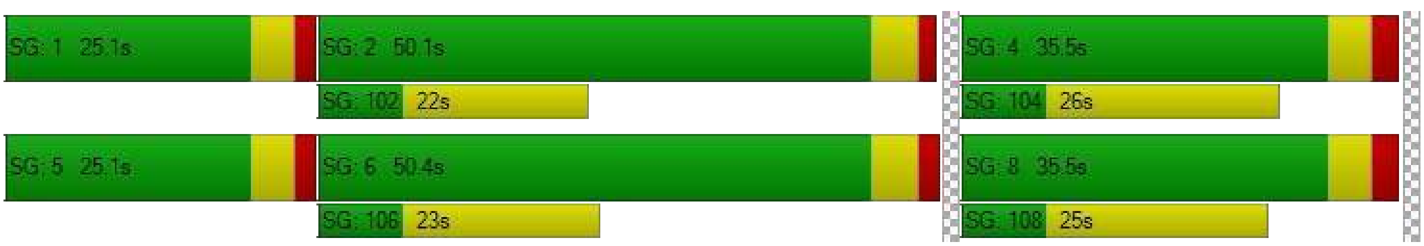
d_M, Delay for Movement [s/veh]	4.02	8.51	8.53	4.01	10.88	10.91	12.32	12.32	12.99	15.63	15.63	15.63
Movement LOS	A	A	A	A	B	B	B	B	B	B	B	B
d_A, Approach Delay [s/veh]	8.17			10.73			12.76			15.63		
Approach LOS	A			B			B			B		
d_I, Intersection Delay [s/veh]	10.10											
Intersection LOS	B											
Intersection V/C	0.522											

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]	7.34	7.34	7.34	7.34
I_p,int, Pedestrian LOS Score for Intersection	2.628	2.621	1.958	1.751
Crosswalk LOS	B	B	A	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2726	2726	1817	1817
d_b, Bicycle Delay [s]	2.18	2.18	0.14	0.14
I_b,int, Bicycle LOS Score for Intersection	2.107	2.075	1.710	1.753
Bicycle LOS	B	B	A	A

Sequence

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



Intersection Level Of Service Report
Intersection 7: Winchester Ave / W Railroad Ave

Control Type:	Two-way stop	Delay (sec / veh):	10.4
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.001

Intersection Setup

Name	River Bend Rd			W Railroad Ave			Winchester Ave			Winchester 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]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	River Bend Rd			W Railroad Ave			Winchester Ave			Winchester Ave		
Base Volume Input [veh/h]	12	0	4	2	1	4	1	92	21	3	83	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	12	0	4	2	1	4	1	92	21	3	83	0
Peak Hour Factor	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	0	1	1	0	1	0	26	6	1	24	0
Total Analysis Volume [veh/h]	14	0	5	2	1	5	1	106	24	3	95	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.05	10.42	8.95	9.97	10.42	8.76	7.38	0.00	0.00	7.46	0.00	0.00
Movement LOS	B	B	A	A	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.08	0.08	0.08	0.03	0.03	0.03	0.00	0.00	0.00	0.01	0.01	0.01
95th-Percentile Queue Length [ft/ln]	1.88	1.88	1.88	0.71	0.71	0.71	0.05	0.05	0.05	0.15	0.15	0.15
d_A, Approach Delay [s/veh]	9.76			9.27			0.06			0.23		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	1.13											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 8: Winchester Ave / Elm Ave

Control Type:	Two-way stop	Delay (sec / veh):	9.8
Analysis Method:	HCM 6th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.013

Intersection Setup

Name	Elm Ave		Winchester Ave		Winchester Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00
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]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Elm Ave		Winchester Ave		Winchester Ave	
Base Volume Input [veh/h]	9	4	99	5	2	101
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	3.00	0.00	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]	9	4	99	5	2	101
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	28	1	1	28
Total Analysis Volume [veh/h]	10	4	110	6	2	112
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	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.80	8.89	0.00	0.00	7.43	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.05	0.05	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.32	1.32	0.00	0.00	0.10	0.10
d_A, Approach Delay [s/veh]	9.54		0.00		0.13	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.61					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 9: Winchester Ave / E Railroad Ave

Control Type:	Two-way stop	Delay (sec / veh):	10.4
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.013

Intersection Setup

Name	Private Dwy			E Railroad Ave			Winchester Ave			Winchester Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	+			+			+			+		
Turning Movement	Left	Right	Right2	Left2	Left	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			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Private Dwy			E Railroad Ave			Winchester Ave			Winchester Ave		
Base Volume Input [veh/h]	8	3	0	1	1	22	14	86	5	2	79	2
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	2.00	0.00	0.00	0.00	7.00	0.00	0.00	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]	8	3	0	1	1	22	14	86	5	2	79	2
Peak Hour Factor	0.8800	0.8800	1.0000	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]	2	1	0	0	0	6	4	24	1	1	22	1
Total Analysis Volume [veh/h]	9	3	0	1	1	25	16	98	6	2	90	2
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.40	8.88	8.85	10.10	10.10	8.81	7.47	0.00	0.00	7.40	0.00	0.00
Movement LOS	B	A	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.05	0.05	0.05	0.09	0.09	0.09	0.03	0.03	0.03	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.25	1.25	1.25	2.20	2.20	2.20	0.82	0.82	0.82	0.10	0.10	0.10
d_A, Approach Delay [s/veh]	10.02			8.91			1.00			0.16		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	1.96											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 10: Winchester Ave / S 6th St

Control Type:	Two-way stop	Delay (sec / veh):	10.2
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.011

Intersection Setup

Name	S 6th St			S 6th St			Winchester Ave			Winchester 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]	20.00			25.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	S 6th St			S 6th St			Winchester Ave			Winchester Ave		
Base Volume Input [veh/h]	6	3	1	1	6	7	5	66	11	0	56	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 [%]	17.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	2.00	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]	6	3	1	1	6	7	5	66	11	0	56	0
Peak Hour Factor	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	1	0	0	2	2	2	21	4	0	18	0
Total Analysis Volume [veh/h]	8	4	1	1	8	9	6	85	14	0	72	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.02	10.10	8.80	9.70	10.15	8.71	7.35	0.00	0.00	7.39	0.00	0.00
Movement LOS	B	B	A	A	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.05	0.05	0.05	0.07	0.07	0.07	0.01	0.01	0.01	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.34	1.34	1.34	1.65	1.65	1.65	0.29	0.29	0.29	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.95			9.41			0.42			0.00		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	1.65											
Intersection LOS	B											

Attachment B: Train Event Queueing Calculations

Existing OR 38 Train Event

PM	EB		Existing
3	minutes/train		
250	vehicles/hour		
13	vehicles/train		
475	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.1%	0.2%
4		0.4%	0.5%
5		0.9%	1.5%
6		2.0%	3.5%
7		3.5%	7.0%
8		5.5%	12.5%
9		7.7%	20.1%
10		9.6%	29.7%
11		10.9%	40.6%
12		11.3%	51.9%
13		10.9%	62.8%
14		9.7%	72.5%
15		8.1%	80.6%
16		6.3%	86.9%
17		4.7%	91.6%
18		3.2%	94.8%
19		2.1%	96.9%
20		1.3%	98.3%
21		0.8%	99.1%
22		0.4%	99.5%
23		0.2%	99.8%
24		0.1%	99.9%
25		0.1%	99.9%
26		0.0%	100.0%
27		0.0%	100.0%
28		0.0%	100.0%
29		0.0%	100.0%
30		0.0%	100.0%
31		0.0%	100.0%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

PM	WB		Existing
3	minutes/train		
285	vehicles/hour		
14	vehicles/train		
525	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.1%	0.2%
5		0.3%	0.5%
6		0.8%	1.2%
7		1.5%	2.8%
8		2.7%	5.5%
9		4.3%	9.8%
10		6.2%	16.0%
11		8.0%	24.0%
12		9.5%	33.4%
13		10.4%	43.8%
14		10.6%	54.4%
15		10.0%	64.4%
16		8.9%	73.4%
17		7.5%	80.9%
18		5.9%	86.8%
19		4.5%	91.3%
20		3.2%	94.5%
21		2.2%	96.6%
22		1.4%	98.0%
23		0.9%	98.9%
24		0.5%	99.4%
25		0.3%	99.7%
26		0.2%	99.8%
27		0.1%	99.9%
28		0.0%	100.0%
29		0.0%	100.0%
30		0.0%	100.0%
31		0.0%	100.0%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

40	0.0%	100.0%	40	0.0%	100.0%
41	0.0%	100.0%	41	0.0%	100.0%
42	0.0%	100.0%	42	0.0%	100.0%
43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%
143	0.0%	100.0%	143	0.0%	100.0%
144	0.0%	100.0%	144	0.0%	100.0%
145	0.0%	100.0%	145	0.0%	100.0%
146	0.0%	100.0%	146	0.0%	100.0%
147	0.0%	100.0%	147	0.0%	100.0%
148	0.0%	100.0%	148	0.0%	100.0%
149	0.0%	100.0%	149	0.0%	100.0%
150	0.0%	100.0%	150	0.0%	100.0%

Existing Winchester Train Event

PM	EB		Existing
3	minutes/train		
98	vehicles/hour		
5	vehicles/train		
225	95% queue length		
k	P		Cumulative
0		0.7%	0.7%
1		3.6%	4.4%
2		8.9%	13.3%
3		14.6%	27.9%
4		17.9%	45.8%
5		17.5%	63.4%
6		14.3%	77.7%
7		10.0%	87.7%
8		6.1%	93.8%
9		3.3%	97.2%
10		1.6%	98.8%
11		0.7%	99.5%
12		0.3%	99.8%
13		0.1%	99.9%
14		0.0%	100.0%
15		0.0%	100.0%
16		0.0%	100.0%
17		0.0%	100.0%
18		0.0%	100.0%
19		0.0%	100.0%
20		0.0%	100.0%
21		0.0%	100.0%
22		0.0%	100.0%
23		0.0%	100.0%
24		0.0%	100.0%
25		0.0%	100.0%
26		0.0%	100.0%
27		0.0%	100.0%
28		0.0%	100.0%
29		0.0%	100.0%
30		0.0%	100.0%
31		0.0%	100.0%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

PM	WB		Existing
3	minutes/train		
110	vehicles/hour		
6	vehicles/train		
250	95% queue length		
k	P		Cumulative
0		0.4%	0.4%
1		2.2%	2.7%
2		6.2%	8.8%
3		11.3%	20.2%
4		15.6%	35.8%
5		17.1%	52.9%
6		15.7%	68.6%
7		12.3%	80.9%
8		8.5%	89.4%
9		5.2%	94.6%
10		2.9%	97.5%
11		1.4%	98.9%
12		0.7%	99.6%
13		0.3%	99.8%
14		0.1%	99.9%
15		0.0%	100.0%
16		0.0%	100.0%
17		0.0%	100.0%
18		0.0%	100.0%
19		0.0%	100.0%
20		0.0%	100.0%
21		0.0%	100.0%
22		0.0%	100.0%
23		0.0%	100.0%
24		0.0%	100.0%
25		0.0%	100.0%
26		0.0%	100.0%
27		0.0%	100.0%
28		0.0%	100.0%
29		0.0%	100.0%
30		0.0%	100.0%
31		0.0%	100.0%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

40	0.0%	100.0%
41	0.0%	100.0%
42	0.0%	100.0%
43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%
48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

40	0.0%	100.0%
41	0.0%	100.0%
42	0.0%	100.0%
43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%
48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
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Attachment C: ODOT Crash Data

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at OR-38, Umpqua Hwy (#045) & 2nd St / Riverfront Wy in Reedsport, OR.
January 1, 2015 through December 31, 2020

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2019														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2019 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CONTINUOUS SYSTEM CRASH LISTING

045 UMPQUA

Intersectional Crashes at OR-38, Umpqua Hwy (#045) & 2nd St / Riverfront Wy in Reedsport, OR.

January 1, 2015 through December 31, 2020

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          D
          R
      S   U
      P   G S W                                  RD#  FC    CONN #                           INT-TYP                             SPCL USE
SER#  E A / C O  DATE       COUNTY               CMPT/MLG  FIRST  STREET       RD CHAR   (MEDIAN) INT-REL  OFFRD WTHR  CRASH TYP   TRLR QTY  MOVE                     A  S
INVEST E L M H R DAY/TIME   CITY                 MILEPNT   SECOND STREET       DIRECT      LEGS   TRAF-    RNDBT SURF  COLL TYP    OWNER     FROM      PRTC INJ       G  E  LICNS  PED
UNLOC? D C J L K LAT/LONG   URBAN AREA           LRS       INTERSECTION SEQ#   LOCTN    (#LANES) CNTL     DRVWY LIGHT SVRTY  V# VEH TYPE   TO     P# TYPE SVRTY  E  X  RES    LOC ERROR       ACTN EVENT       CAUSE

00431  N N N   05/08/2019 DOUGLAS            1     02                          INTER      3-LEG  N            N CLR  ANGL-OTH  01 NONE    9  TURN-R                                                          02
CITY       N   Wed     1P REEDSPORT          MN     0    FIR AVE               CN                STOP SIGN    N DRY  TURN         N/A        SW E                                          015              00
                                               0.63    WINCHESTER AVE      04           0                 N DAY  PDO          PSNGR CAR      01 DRVR NONE   00 U  UNK       000         000              00
No     43 42   9.58 -124  5  36.92           004500100S00                1                                                                          UNK
                                                                                                                        02 NONE    9  STRGHT
                                                                                                                           N/A        W  E                                          000              00
                                                                                                                           PSNGR CAR      01 DRVR NONE   00 U  UNK       000         000              00
                                                                                                                                                               UNK
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TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at OR-38, Umpqua Hwy (#045) & E Railroad Ave in Reedsport, OR.
January 1, 2015 through December 31, 2020

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2016														
REAR-END	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2016 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

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045 UMPQUA

Intersectional Crashes at OR-38, Umpqua Hwy (#045) & E Railroad Ave in Reedsport, OR.
January 1, 2015 through December 31, 2020

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG/MJ	SCHL	WORK	DATE / DAY/TIME / *LAT/LONG*	COUNTY / CITY / URBAN AREA	RD# FC / CMPT/MLG / MILEPNT / LRS	CONN # / FIRST STREET / SECOND STREET / INTERSECTION SEQ#	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL / TRAF- CNTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / VEH TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS / RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00465	N	N	N			05/13/2016	DOUGLAS	1 02		INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 9	STRGHT											07,29
CITY			N			Fri 1P	REEDSPORT	MN 0	E RAILROAD AVE	NW		NONE	N	DRY	REAR		N/A	NW SE									000		00
								0.24	UMPQUA AVE	06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
No	*43*	*42*				*6.61 -124*	*6 4.03*	004500100S00	1															UNK					
																02	NONE 9	STOP											
																	N/A	NW SE									012		00
																	PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
																								UNK					

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at OR-38, Umpqua Hwy (#045) & W Railroad Ave in Reedsport, OR.
January 1, 2015 through December 31, 2020

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2016														
ANGLE	0	1	0	1	0	2	0	1	0	1	0	1	0	0
2016 TOTAL	0	1	0	1	0	2	0	1	0	1	0	1	0	0
FINAL TOTAL	0	1	0	1	0	2	0	1	0	1	0	1	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

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TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

045 UMPQUA

Intersectional Crashes at OR-38, Umpqua Hwy (#045) & W Railroad Ave in Reedsport, OR.
January 1, 2015 through December 31, 2020

SER# / INVEST / UNLOC?	SPEED (S P E D)	ALC (E A L C)	DRUG/MJ (D R U G / M J)	SCHL (S C H L)	WORK (W O R K)	DATE / DAY/TIME / *LAT/LONG*	COUNTY / CITY / URBAN AREA	RD# FC / CMPT/MLG / MILEPNT / LRS	CONN # / FIRST STREET / SECOND STREET / INTERSECTION SEQ#	RD CHAR / DIRECT / LOCTN	INT-TYP / (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CNTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / VEH TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS / RES	PED LOC	ERROR	ACTN EVENT	CAUSE
00832	N	N	N	N	N	06/03/2016	DOUGLAS	1 02		INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE	STRGHT										02
CITY			N			Fri 9A	REEDSPORT	MN 0	UMPQUA AVE	CN		STOP SIGN	N	DRY	ANGL		PRVTE	NE SW									015	00
								0.17	W RAILROAD AVE	03	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	75	M	OR-Y		028	000	02
No	*43*		*42*			*8.04 -124*	*6 8.36*	004500100S00	1															OR<25				
																02	NONE	STRGHT										
																	PRVTE	NW SE									000	00
																	PSNGR CAR		01	DRVR	INJC	65	F	OTH-Y		000	000	00
																								N-RES				
																			02	PSNG	INJC	66	M			000	000	00

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at US-101, Oregon Coast Hwy (#009) & Winchester Ave in Reedsport, OR.

January 1, 2015 through December 31, 2020

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2020														
TURNING MOVEMENTS	0	1	1	2	0	1	0	1	1	2	0	2	0	0
2020 TOTAL	0	1	1	2	0	1	0	1	1	2	0	2	0	0
YEAR: 2019														
ANGLE	0	1	1	2	0	2	0	2	0	1	1	2	0	0
2019 TOTAL	0	1	1	2	0	2	0	2	0	1	1	2	0	0
YEAR: 2018														
ANGLE	0	0	1	1	0	0	0	1	0	1	0	1	0	0
REAR-END	0	1	0	1	0	1	0	1	0	1	0	1	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2018 TOTAL	0	1	2	3	0	1	0	3	0	3	0	3	0	0
FINAL TOTAL	0	3	4	7	0	4	0	6	1	6	1	7	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

009 OREGON COAST

Intersectional Crashes at US-101, Oregon Coast Hwy (#009) & Winchester Ave in Reedsport, OR.
January 1, 2015 through December 31, 2020

SER# INVEST UNLOC?	SPED	A L C	DRUG / MJ	S C H L	W O R K	DATE DAY/TIME LAT/LONG	COUNTY CITY URBAN AREA	RD# FC CMPT/MLG MILEPNT LRS	CONN # FIRST STREET SECOND STREET INTERSECTION SEQ#	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00236	N	N	N			03/18/2018	DOUGLAS	1 02		INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE	STRGHT										013	32,07,29
NO RPT			N			Sun 11A	REEDSPORT	MN 0	OREGON COAST HY	NE		TRF SIGNAL	N	DRY	REAR		PRVTE	NE SW									000		00
								212.05	WINCHESTER AVE	06	0		Y	DAY	INJ		PSNGR CAR		01	DRVR	NONE	21	M	OR-Y		043,052	000		32,07,29
No						*43 41 54.77 -124 6 40.18*		000900100S00	1															OR>25					
																02	NONE	STOP											
																	PRVTE	NE SW									011	013	00
																	PSNGR CAR		01	DRVR	INJC	47	M	OR-Y		000	000		00
																								OR>25					
																03	NONE	STOP											
																	PRVTE	NE SW									011		00
																	PSNGR CAR		01	DRVR	NONE	60	M	OR-Y		000	000		00
																								OR<25					
00029	N	N	N			01/11/2019	DOUGLAS	1 02		INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 9	STRGHT											04
NO RPT			N			Fri 10A	REEDSPORT	MN 0	OREGON COAST HY	CN		TRF SIGNAL	N	DRY	ANGL		N/A	NE SW									000		00
								212.05	WINCHESTER AVE	01	0		Y	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
No						*43 41 54.76 -124 6 40.18*		000900100S00	1															UNK					
																02	NONE 9	STRGHT											
																	N/A	SE NW									019		00
																	PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
																								UNK					
01017	N	N	N			11/23/2020	DOUGLAS	1 02		INTER	3-LEG	N	N	CLD	O-1 L-TURN	01	NONE 9	STRGHT											02,08
NO RPT			N			Mon 12P	REEDSPORT	MN 0	OREGON COAST HY	CN		TRF SIGNAL	N	WET	TURN		N/A	SE NW									000		00
								212.05	WINCHESTER AVE	02	0		Y	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
No						*43 41 54.77 -124 6 40.18*		000900100S00	1															UNK					
																02	NONE 9	TURN-L											
																	N/A	NW NE									018		00
																	PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
																								UNK					
00151	N	N	N			02/23/2018	DOUGLAS	1 02		INTER	3-LEG	N	N	CLR	O-1 L-TURN	01	NONE 9	STRGHT											02,08
NO RPT			N			Fri 3P	REEDSPORT	MN 0	OREGON COAST HY	CN		TRF SIGNAL	N	DRY	TURN		N/A	NW SE									000		00
								212.05	WINCHESTER AVE	03	0		Y	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
No						*43 41 54.77 -124 6 40.18*		000900100S00	1															UNK					
																02	NONE 9	TURN-L											
																	N/A	SE SW									000		00
																	PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
																								UNK					

009 OREGON COAST

Intersectional Crashes at US-101, Oregon Coast Hwy (#009) & Winchester Ave in Reedsport, OR.
January 1, 2015 through December 31, 2020

SER# / INVEST / UNLOC?	SPEC / ELEC / D… (S P E D, E L C, D R U G / M J, G C H L, S O R K, W)	DATE / DAY/TIME / LAT/LONG	COUNTY / CITY / URBAN AREA	RD# FC / CMPT/MLG / MILEPNT / LRS	CONN # / FIRST STREET / SECOND STREET / INTERSECTION SEQ#	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL / TRAF- / CNTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / VEH TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS / RES	PED LOC	ERROR	ACTN EVENT	CAUSE
00575	N N N	07/24/2020	DOUGLAS	1 02		INTER	3-LEG	N	N	CLR	O-1 L-TURN	01	NONE	STRGHT										04
NO RPT	N	Fri 12P	REEDSPORT	MN 0	OREGON COAST HY	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	NW SE									000	00
				212.05	WINCHESTER AVE	03	0		Y	DAY	INJ		PSNGR CAR		01	DRVR	NONE	51	M	OR-Y		020	000	04
No		43 41 54.78 -124 6 40.14		000900100S00	1															OR>25				
												02	NONE	TURN-L										
													PRVTE	SE SW									000	00
													PSNGR CAR		01	DRVR	INJB	68	F	OR-Y		000	000	00
																				OR>25				
00113	N N N	02/09/2018	DOUGLAS	1 02		INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 9	STRGHT										04
NO RPT	N	Fri 3P	REEDSPORT	MN 0	OREGON COAST HY	CN		TRF SIGNAL	N	DRY	ANGL		N/A	NW SE									000	00
				212.05	WINCHESTER AVE	04	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000	00
No		43 41 54.76 -124 6 40.17		000900100S00	1															UNK				
												02	NONE 9	STRGHT										
													N/A	SW NE									000	00
													PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000	00
																				UNK				
00077	N N N N N	01/24/2019	DOUGLAS	1 02		INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE	STRGHT										04
CITY	N	Thu 7P	REEDSPORT	MN 0	OREGON COAST HY	CN		TRF SIGNAL	N	DRY	ANGL		PRVTE	SW NE									000	00
				212.05	WINCHESTER AVE	04	0		Y	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	89	M	OR-Y		020	000	04
No		43 41 54.76 -124 6 40.17		000900100S00	1															OR<25				
												02	NONE	STRGHT										
													PRVTE	NW SE									018	00
													PSNGR CAR		01	DRVR	INJC	62	F	OR-Y		000	000	00
																				OR<25				
															02	PSNG	INJC	33	F			000	000	00

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at Winchester Ave & 6th St in Reedsport, OR.

January 1, 2015 through December 31, 2020

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2018														
REAR-END	0	1	0	1	0	1	0	1	0	1	0	1	0	0
2018 TOTAL	0	1	0	1	0	1	0	1	0	1	0	1	0	0
FINAL TOTAL	0	1	0	1	0	1	0	1	0	1	0	1	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

URBAN NON-SYSTEM CRASH LISTING

CITY OF REEDSPORT, DOUGLAS COUNTY

Intersectional Crashes at Winchester Ave & 6th St in Reedsport, OR.

January 1, 2015 through December 31, 2020

SER# INVEST UNLOC?	SPED	EALC	DRUG/MJ	SCHL	WORK	DATE DAY/TIME LAT/LONG	FC DISTNC	CITY STREET FIRST STREET SECOND STREET INTERSECTION SEQ #	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CONTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00403	N	N	N			03/10/2018	09	WINCHESTER AVE	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE	STRGHT											07,29
NONE			N			Sat 10A	0	6TH ST	SE		STOP SIGN	N	DRY	REAR		PRVTE	SE NW									000		00
No	43	42	3.51			-124 5 57.89		1	06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	24	M	OR-Y OR>25		026	000		07,29
															02	NONE	STOP											
																PRVTE	SE NW									011		00
																PSNGR CAR		01	DRVR	INJC	65	F	OR-Y OR>25		000	000		00

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at Winchester Ave & W Railroad Ave / Riverbend Rd in Reedsport, OR.
January 1, 2015 through December 31, 2020

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2019														
ANGLE	0	1	0	1	0	2	0	0	1	1	0	1	0	1
2019 TOTAL	0	1	0	1	0	2	0	0	1	1	0	1	0	1
FINAL TOTAL	0	1	0	1	0	2	0	0	1	1	0	1	0	1

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

URBAN NON-SYSTEM CRASH LISTING

CITY OF REEDSPORT, DOUGLAS COUNTY

Intersectional Crashes at Winchester Ave & W Railroad Ave / Riverbend Rd in Reedsport, OR.

January 1, 2015 through December 31, 2020

SER# INVEST UNLOC?	SPEED ALC DRUG/MJ SCHL WORK	DATE DAY/TIME *LAT/LONG*	FC DISTNC	CITY STREET FIRST STREET SECOND STREET INTERSECTION SEQ #	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00299	N N N	03/27/2019	07	RIVERBEND RD	INTER	CROSS	N	Y	CLD	ANGL-OTH	01	NONE 0	STRGHT										129,084,040	03,02
CITY	N	Wed 2P	0	WINCHESTER AVE	CN		STOP SIGN	N	WET	ANGL		PRVTE	NW SE									000	129	00
No		*43 41 59.58 -124 6 13.22*		1	04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	36	M	OR-Y		021,028	000	084	03,02
																			OR<25					
											02	NONE 0	STRGHT											
												PRVTE	SW NE									000	040,079	00
												PSNGR CAR		01	DRVR	INJB	79	F	OR-Y		000	000		00
																			OR<25					

ACTION CODE TRANSLATION LIST

ACTION CODE	SHORT DESCRIPTION	LONG DESCRIPTION
000	NONE	NO ACTION OR NON-WARRANTED
001	SKIDDED	SKIDDED
002	ON/OFF V	GETTING ON OR OFF STOPPED OR PARKED VEHICLE
003	LOAD OVR	OVERHANGING LOAD STRUCK ANOTHER VEHICLE, ETC.
006	SLOW DN	SLOWED DOWN
007	AVOIDING	AVOIDING MANEUVER
008	PAR PARK	PARALLEL PARKING
009	ANG PARK	ANGLE PARKING
010	INTERFERE	PASSENGER INTERFERING WITH DRIVER
011	STOPPED	STOPPED IN TRAFFIC NOT WAITING TO MAKE A LEFT TURN
012	STP/L TRN	STOPPED BECAUSE OF LEFT TURN SIGNAL OR WAITING, ETC.
013	STP TURN	STOPPED WHILE EXECUTING A TURN
014	EMR V PKD	EMERGENCY VEHICLE LEGALLY PARKED IN THE ROADWAY
015	GO A/STOP	PROCEED AFTER STOPPING FOR A STOP SIGN/FLASHING RED.
016	TRN A/RED	TURNED ON RED AFTER STOPPING
017	LOSTCTRL	LOST CONTROL OF VEHICLE
018	EXIT DWY	ENTERING STREET OR HIGHWAY FROM ALLEY OR DRIVEWAY
019	ENTR DWY	ENTERING ALLEY OR DRIVEWAY FROM STREET OR HIGHWAY
020	STR ENTR	BEFORE ENTERING ROADWAY, STRUCK PEDESTRIAN, ETC. ON SIDEWALK OR SHOULDER
021	NO DRVR	CAR RAN AWAY - NO DRIVER
022	PREV COL	STRUCK, OR WAS STRUCK BY, VEHICLE OR PEDESTRIAN IN PRIOR COLLISION BEFORE ACC. STABILIZED
023	STALLED	VEHICLE STALLED OR DISABLED
024	DRVR DEAD	DEAD BY UNASSOCIATED CAUSE
025	FATIGUE	FATIGUED, SLEEPY, ASLEEP
026	SUN	DRIVER BLINDED BY SUN
027	HDLGHTS	DRIVER BLINDED BY HEADLIGHTS
028	ILLNESS	PHYSICALLY ILL
029	THRU MED	VEHICLE CROSSED, PLUNGED OVER, OR THROUGH MEDIAN BARRIER
030	PURSUIT	PURSUING OR ATTEMPTING TO STOP A VEHICLE
031	PASSING	PASSING SITUATION
032	PRKOFFRD	VEHICLE PARKED BEYOND CURB OR SHOULDER
033	CROS MED	VEHICLE CROSSED EARTH OR GRASS MEDIAN
034	X N/SGNL	CROSSING AT INTERSECTION - NO TRAFFIC SIGNAL PRESENT
035	X W/ SGNL	CROSSING AT INTERSECTION - TRAFFIC SIGNAL PRESENT
036	DIAGONAL	CROSSING AT INTERSECTION - DIAGONALLY
037	BTWN INT	CROSSING BETWEEN INTERSECTIONS
038	DISTRACT	DRIVER'S ATTENTION DISTRACTED
039	W/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC
040	A/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC
041	W/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC
042	A/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC
043	PLAYINRD	PLAYING IN STREET OR ROAD
044	PUSH MV	PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER
045	WORK ON	WORKING IN ROADWAY OR ALONG SHOULDER
046	W/ TRAFIC	NON-MOTORIST WALKING, RUNNING, RIDING, ETC. WITH TRAFFIC
047	A/ TRAFIC	NON-MOTORIST WALKING, RUNNING, RIDING, ETC. FACING TRAFFIC
050	LAY ON RD	STANDING OR LYING IN ROADWAY
051	ENT OFFRD	ENTERING / STARTING IN TRAFFIC LANE FROM OFF ROAD
052	MERGING	MERGING

ACTION CODE TRANSLATION LIST

ACTION CODE	SHORT DESCRIPTION	LONG DESCRIPTION
055	SPRAY	BLINDED BY WATER SPRAY
088	OTHER	OTHER ACTION
099	UNK	UNKNOWN ACTION

CAUSE CODE TRANSLATION LIST

CAUSE CODE	SHORT DESCRIPTION	LONG DESCRIPTION
00	NO CODE	NO CAUSE ASSOCIATED AT THIS LEVEL
01	TOO-FAST	TOO FAST FOR CONDITIONS (NOT EXCEED POSTED SPEED
02	NO-YIELD	DID NOT YIELD RIGHT-OF-WAY
03	PAS-STOP	PASSED STOP SIGN OR RED FLASHER
04	DIS SIG	DISREGARDED TRAFFIC SIGNAL
05	LEFT-CTR	DROVE LEFT OF CENTER ON TWO-WAY ROAD; STRADDLING
06	IMP-OVER	IMPROPER OVERTAKING
07	TOO-CLOS	FOLLOWED TOO CLOSELY
08	IMP-TURN	MADE IMPROPER TURN
09	DRINKING	ALCOHOL OR DRUG INVOLVED
10	OTHR-IMP	OTHER IMPROPER DRIVING
11	MECH-DEF	MECHANICAL DEFECT
12	OTHER	OTHER (NOT IMPROPER DRIVING)
13	IMP LN C	IMPROPER CHANGE OF TRAFFIC LANES
14	DIS TCD	DISREGARDED OTHER TRAFFIC CONTROL DEVICE
15	WRNG WAY	WRONG WAY ON ONE-WAY ROAD; WRONG SIDE DIVIDED RO
16	FATIGUE	DRIVER DROWSY/FATIGUED/SLEEPY
17	ILLNESS	PHYSICAL ILLNESS
18	IN RDWY	NON-MOTORIST ILLEGALLY IN ROADWAY
19	NT VISBL	NON-MOTORIST NOT VISIBLE; NON-REFLECTIVE CLOTHIN
20	IMP PKNG	VEHICLE IMPROPERLY PARKED
21	DEF STER	DEFECTIVE STEERING MECHANISM
22	DEF BRKE	INADEQUATE OR NO BRAKES
24	LOADSHFT	VEHICLE LOST LOAD OR LOAD SHIFTED
25	TIREFAIL	TIRE FAILURE
26	PHANTOM	PHANTOM / NON-CONTACT VEHICLE
27	INATTENT	INATTENTION
28	NM INATT	NON-MOTORIST INATTENTION
29	F AVOID	FAILED TO AVOID VEHICLE AHEAD
30	SPEED	DRIVING IN EXCESS OF POSTED SPEED
31	RACING	SPEED RACING (PER PAR)
32	CARELESS	CARELESS DRIVING (PER PAR)
33	RECKLESS	RECKLESS DRIVING (PER PAR)
34	AGGRESV	AGGRESSIVE DRIVING (PER PAR)
35	RD RAGE	ROAD RAGE (PER PAR)
40	VIEW OBS	VIEW OBSCURED
50	USED MDN	IMPROPER USE OF MEDIAN OR SHOULDER
51	FAIL LN	FAILED TO MAINTAIN LANE
52	OFF RD	RAN OFF ROAD

COLLISION TYPE CODE TRANSLATION LIST

COLL CODE	SHORT DESCRIPTION	LONG DESCRIPTION
&	OTH	MISCELLANEOUS
-	BACK	BACKING
0	PED	PEDESTRIAN
1	ANGL	ANGLE
2	HEAD	HEAD-ON
3	REAR	REAR-END
4	SS-M	SIDESWIPE - MEETING
5	SS-O	SIDESWIPE - OVERTAKING
6	TURN	TURNING MOVEMENT
7	PARK	PARKING MANEUVER
8	NCOL	NON-COLLISION
9	FIX	FIXED OBJECT OR OTHER OBJECT

CRASH TYPE CODE TRANSLATION LIST

CRASH TYPE	SHORT DESCRIPTION	LONG DESCRIPTION
&	OVERTURN	OVERTURNED
0	NON-COLL	OTHER NON-COLLISION
1	OTH RDWY	MOTOR VEHICLE ON OTHER ROADWAY
2	PRKD MV	PARKED MOTOR VEHICLE
3	PED	PEDESTRIAN
4	TRAIN	RAILWAY TRAIN
6	BIKE	PEDALCYCLIST
7	ANIMAL	ANIMAL
8	FIX OBJ	FIXED OBJECT
9	OTH OBJ	OTHER OBJECT
A	ANGL-STP	ENTERING AT ANGLE - ONE VEHICLE STOPPED
B	ANGL-OTH	ENTERING AT ANGLE - ALL OTHERS
C	S-STRGHT	FROM SAME DIRECTION - BOTH GOING STRAIGHT
D	S-1TURN	FROM SAME DIRECTION - ONE TURN, ONE STRAIGHT
E	S-1STOP	FROM SAME DIRECTION - ONE STOPPED
F	S-OTHER	FROM SAME DIRECTION-ALL OTHERS, INCLUDING PARKING
G	O-STRGHT	FROM OPPOSITE DIRECTION - BOTH GOING STRAIGHT
H	O-1 L-TURN	FROM OPPOSITE DIRECTION-ONE LEFT TURN,ONE STRAIGHT
I	O-1STOP	FROM OPPOSITE DIRECTION - ONE STOPPED
J	O-OTHER	FROM OPPOSITE DIRECTION-ALL OTHERS INCL. PARKING

DRIVER LICENSE CODE TRANSLATION LIST

LIC CODE	SHORT DESC	LONG DESCRIPTION
0	NONE	NOT LICENSED (HAD NEVER BEEN LICENSED)
1	OR-Y	VALID OREGON LICENSE
2	OTH-Y	VALID LICENSE, OTHER STATE OR COUNTRY
3	SUSP	SUSPENDED/REVOKED
4	EXP	EXPIRED
8	N-VAL	OTHER NON-VALID LICENSE
9	UNK	UNKNOWN IF DRIVER WAS LICENSED AT TIME OF CRASH

DRIVER RESIDENCE CODE TRANSLATION LIST

RES CODE	SHORT DESC	LONG DESCRIPTION
1	OR<25	OREGON RESIDENT WITHIN 25 MILE OF HOME
2	OR>25	OREGON RESIDENT 25 OR MORE MILES FROM HOME
3	OR-?	OREGON RESIDENT - UNKNOWN DISTANCE FROM HOME
4	N-RES	NON-RESIDENT
9	UNK	UNKNOWN IF OREGON RESIDENT

ERROR CODE TRANSLATION LIST

ERROR CODE	SHORT DESCRIPTION	FULL DESCRIPTION
000	NONE	NO ERROR
001	WIDE TRN	WIDE TURN
002	CUT CORN	CUT CORNER ON TURN
003	FAIL TRN	FAILED TO OBEY MANDATORY TRAFFIC TURN SIGNAL, SIGN OR LANE MARKINGS
004	L IN TRF	LEFT TURN IN FRONT OF ONCOMING TRAFFIC
005	L PROHIB	LEFT TURN WHERE PROHIBITED
006	FRM WRNG	TURNED FROM WRONG LANE
007	TO WRONG	TURNED INTO WRONG LANE
008	ILLEG U	U-TURNED ILLEGALLY
009	IMP STOP	IMPROPERLY STOPPED IN TRAFFIC LANE
010	IMP SIG	IMPROPER SIGNAL OR FAILURE TO SIGNAL
011	IMP BACK	BACKING IMPROPERLY (NOT PARKING)
012	IMP PARK	IMPROPERLY PARKED
013	UNPARK	IMPROPER START LEAVING PARKED POSITION
014	IMP STRT	IMPROPER START FROM STOPPED POSITION
015	IMP LGHT	IMPROPER OR NO LIGHTS (VEHICLE IN TRAFFIC)
016	INATTENT	INATTENTION (FAILURE TO DIM LIGHTS PRIOR TO 4/1/97)
017	UNSF VEH	DRIVING UNSAFE VEHICLE (NO OTHER ERROR APPARENT)
018	OTH PARK	ENTERING/EXITING PARKED POSITION W/ INSUFFICIENT CLEARANCE; OTHER IMPROPER PARKING MANEUVER
019	DIS DRIV	DISREGARDED OTHER DRIVER'S SIGNAL
020	DIS SGNL	DISREGARDED TRAFFIC SIGNAL
021	RAN STOP	DISREGARDED STOP SIGN OR FLASHING RED
022	DIS SIGN	DISREGARDED WARNING SIGN, FLARES OR FLASHING AMBER
023	DIS OFCR	DISREGARDED POLICE OFFICER OR FLAGMAN
024	DIS EMER	DISREGARDED SIREN OR WARNING OF EMERGENCY VEHICLE
025	DIS RR	DISREGARDED RR SIGNAL, RR SIGN, OR RR FLAGMAN
026	REAR-END	FAILED TO AVOID STOPPED OR PARKED VEHICLE AHEAD OTHER THAN SCHOOL BUS
027	BIKE ROW	DID NOT HAVE RIGHT-OF-WAY OVER PEDALCYCLIST
028	NO ROW	DID NOT HAVE RIGHT-OF-WAY
029	PED ROW	FAILED TO YIELD RIGHT-OF-WAY TO PEDESTRIAN
030	PAS CURV	PASSING ON A CURVE
031	PAS WRNG	PASSING ON THE WRONG SIDE
032	PAS TANG	PASSING ON STRAIGHT ROAD UNDER UNSAFE CONDITIONS
033	PAS X-WK	PASSED VEHICLE STOPPED AT CROSSWALK FOR PEDESTRIAN
034	PAS INTR	PASSING AT INTERSECTION
035	PAS HILL	PASSING ON CREST OF HILL
036	N/PAS ZN	PASSING IN "NO PASSING" ZONE
037	PAS TRAF	PASSING IN FRONT OF ONCOMING TRAFFIC
038	CUT-IN	CUTTING IN (TWO LANES - TWO WAY ONLY)
039	WRNGSIDE	DRIVING ON WRONG SIDE OF THE ROAD (2-WAY UNDIVIDED ROADWAYS)

ERROR CODE TRANSLATION LIST

ERROR CODE	SHORT DESCRIPTION	FULL DESCRIPTION
040	THRU MED	DRIVING THROUGH SAFETY ZONE OR OVER ISLAND
041	F/ST BUS	FAILED TO STOP FOR SCHOOL BUS
042	F/SLO MV	FAILED TO DECREASE SPEED FOR SLOWER MOVING VEHICLE
043	TOO CLOSE	FOLLOWING TOO CLOSELY (MUST BE ON OFFICER'S REPORT)
044	STRDL LN	STRADDLING OR DRIVING ON WRONG LANES
045	IMP CHG	IMPROPER CHANGE OF TRAFFIC LANES
046	WRNG WAY	WRONG WAY ON ONE-WAY ROADWAY; WRONG SIDE DIVIDED ROAD
047	BASCRULE	DRIVING TOO FAST FOR CONDITIONS (NOT EXCEEDING POSTED SPEED)
048	OPN DOOR	OPENED DOOR INTO ADJACENT TRAFFIC LANE
049	IMPEDING	IMPEDING TRAFFIC
050	SPEED	DRIVING IN EXCESS OF POSTED SPEED
051	RECKLESS	RECKLESS DRIVING (PER PAR)
052	CARELESS	CARELESS DRIVING (PER PAR)
053	RACING	SPEED RACING (PER PAR)
054	X N/SGNL	CROSSING AT INTERSECTION, NO TRAFFIC SIGNAL PRESENT
055	X W/SGNL	CROSSING AT INTERSECTION, TRAFFIC SIGNAL PRESENT
056	DIAGONAL	CROSSING AT INTERSECTION - DIAGONALLY
057	BTWN INT	CROSSING BETWEEN INTERSECTIONS
059	W/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC
060	A/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC
061	W/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC
062	A/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC
063	PLAYINRD	PLAYING IN STREET OR ROAD
064	PUSH MV	PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER
065	WORK IN RD	WORKING IN ROADWAY OR ALONG SHOULDER
070	LAY ON RD	STANDING OR LYING IN ROADWAY
071	NM IMP USE	IMPROPER USE OF TRAFFIC LANE BY NON-MOTORIST
073	ELUDING	ELUDING / ATTEMPT TO ELUDE
079	F NEG CURV	FAILED TO NEGOTIATE A CURVE
080	FAIL LN	FAILED TO MAINTAIN LANE
081	OFF RD	RAN OFF ROAD
082	NO CLEAR	DRIVER MISJUDGED CLEARANCE
083	OVRSTEER	OVER-CORRECTING
084	NOT USED	CODE NOT IN USE
085	OVRLOAD	OVERLOADING OR IMPROPER LOADING OF VEHICLE WITH CARGO OR PASSENGERS
097	UNA DIS TC	UNABLE TO DETERMINE WHICH DRIVER DISREGARDED TRAFFIC CONTROL DEVICE

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
001	FEL/JUMP	OCCUPANT FELL, JUMPED OR WAS EJECTED FROM MOVING VEHICLE
002	INTERFER	PASSENGER INTERFERED WITH DRIVER
003	BUG INTF	ANIMAL OR INSECT IN VEHICLE INTERFERED WITH DRIVER
004	INDRCT PED	PEDESTRIAN INDIRECTLY INVOLVED (NOT STRUCK)
005	SUB-PED	"SUB-PED": PEDESTRIAN INJURED SUBSEQUENT TO COLLISION, ETC.
006	INDRCT BIK	PEDALCYCLIST INDIRECTLY INVOLVED (NOT STRUCK)
007	HITCHIKR	HITCHHIKER (SOLICITING A RIDE)
008	PSNGR TOW	PASSENGER OR NON-MOTORIST BEING TOWED OR PUSHED ON CONVEYANCE
009	ON/OFF V	GETTING ON/OFF STOPPED/PARKED VEHICLE (OCCUPANTS ONLY; MUST HAVE PHYSICAL CONTACT W/ VEHI(
010	SUB OTRN	OVERTURNED AFTER FIRST HARMFUL EVENT
011	MV PUSHD	VEHICLE BEING PUSHED
012	MV TOWED	VEHICLE TOWED OR HAD BEEN TOWING ANOTHER VEHICLE
013	FORCED	VEHICLE FORCED BY IMPACT INTO ANOTHER VEHICLE, PEDALCYCLIST OR PEDESTRIAN
014	SET MOTN	VEHICLE SET IN MOTION BY NON-DRIVER (CHILD RELEASED BRAKES, ETC.)
015	RR ROW	AT OR ON RAILROAD RIGHT-OF-WAY (NOT LIGHT RAIL)
016	LT RL ROW	AT OR ON LIGHT-RAIL RIGHT-OF-WAY
017	RR HIT V	TRAIN STRUCK VEHICLE
018	V HIT RR	VEHICLE STRUCK TRAIN
019	HIT RR CAR	VEHICLE STRUCK RAILROAD CAR ON ROADWAY
020	JACKNIFE	JACKKNIFE; TRAILER OR TOWED VEHICLE STRUCK TOWING VEHICLE
021	TRL OTRN	TRAILER OR TOWED VEHICLE OVERTURNED
022	CN BROKE	TRAILER CONNECTION BROKE
023	DETACH TRL	DETACHED TRAILING OBJECT STRUCK OTHER VEHICLE, NON-MOTORIST, OR OBJECT
024	V DOOR OPN	VEHICLE DOOR OPENED INTO ADJACENT TRAFFIC LANE
025	WHEELOFF	WHEEL CAME OFF
026	HOOD UP	HOOD FLEW UP
028	LOAD SHIFT	LOST LOAD, LOAD MOVED OR SHIFTED
029	TIREFAIL	TIRE FAILURE
030	PET	PET: CAT, DOG AND SIMILAR
031	LVSTOCK	STOCK: COW, CALF, BULL, STEER, SHEEP, ETC.
032	HORSE	HORSE, MULE, OR DONKEY
033	HRSE&RID	HORSE AND RIDER
034	GAME	WILD ANIMAL, GAME (INCLUDES BIRDS; NOT DEER OR ELK)
035	DEER ELK	DEER OR ELK, WAPITI
036	ANML VEH	ANIMAL-DRAWN VEHICLE
037	CULVERT	CULVERT, OPEN LOW OR HIGH MANHOLE
038	ATENUATN	IMPACT ATTENUATOR
039	PK METER	PARKING METER
040	CURB	CURB (ALSO NARROW SIDEWALKS ON BRIDGES)
041	JIGGLE	JIGGLE BAR OR TRAFFIC SNAKE FOR CHANNELIZATION
042	GDRL END	LEADING EDGE OF GUARDRAIL
043	GARDRAIL	GUARD RAIL (NOT METAL MEDIAN BARRIER)
044	BARRIER	MEDIAN BARRIER (RAISED OR METAL)
045	WALL	RETAINING WALL OR TUNNEL WALL
046	BR RAIL	BRIDGE RAILING OR PARAPET (ON BRIDGE OR APPROACH)
047	BR ABUTMNT	BRIDGE ABUTMENT (INCLUDED "APPROACH END" THRU 2013)
048	BR COLMN	BRIDGE PILLAR OR COLUMN
049	BR GIRDR	BRIDGE GIRDER (HORIZONTAL BRIDGE STRUCTURE OVERHEAD)
050	ISLAND	TRAFFIC RAISED ISLAND
051	GORE	GORE
052	POLE UNK	POLE - TYPE UNKNOWN
053	POLE UTL	POLE - POWER OR TELEPHONE
054	ST LIGHT	POLE - STREET LIGHT ONLY
055	TRF SGNL	POLE - TRAFFIC SIGNAL AND PED SIGNAL ONLY
056	SGN BRDG	POLE - SIGN BRIDGE
057	STOPSIGN	STOP OR YIELD SIGN

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
058	OTH SIGN	OTHER SIGN, INCLUDING STREET SIGNS
059	HYDRANT	HYDRANT
060	MARKER	DELINEATOR OR MARKER (REFLECTOR POSTS)
061	MAILBOX	MAILBOX
062	TREE	TREE, STUMP OR SHRUBS
063	VEG OHED	TREE BRANCH OR OTHER VEGETATION OVERHEAD, ETC.
064	WIRE/CBL	WIRE OR CABLE ACROSS OR OVER THE ROAD
065	TEMP SGN	TEMPORARY SIGN OR BARRICADE IN ROAD, ETC.
066	PERM SGN	PERMANENT SIGN OR BARRICADE IN/OFF ROAD
067	SLIDE	SLIDES, FALLEN OR FALLING ROCKS
068	FRGN OBJ	FOREIGN OBSTRUCTION/DEBRIS IN ROAD (NOT GRAVEL)
069	EQP WORK	EQUIPMENT WORKING IN/OFF ROAD
070	OTH EQP	OTHER EQUIPMENT IN OR OFF ROAD (INCLUDES PARKED TRAILER, BOAT)
071	MAIN EQP	WRECKER, STREET SWEEPER, SNOW PLOW OR SANDING EQUIPMENT
072	OTHER WALL	ROCK, BRICK OR OTHER SOLID WALL
073	IRRGL PVMT	OTHER BUMP (NOT SPEED BUMP), POTHOLE OR PAVEMENT IRREGULARITY (PER PAR)
074	OVERHD OBJ	OTHER OVERHEAD OBJECT (HIGHWAY SIGN, SIGNAL HEAD, ETC.); NOT BRIDGE
075	CAVE IN	BRIDGE OR ROAD CAVE IN
076	HI WATER	HIGH WATER
077	SNO BANK	SNOW BANK
078	LO-HI EDGE	LOW OR HIGH SHOULDER AT PAVEMENT EDGE
079	DITCH	CUT SLOPE OR DITCH EMBANKMENT
080	OBJ FRM MV	STRUCK BY ROCK OR OTHER OBJECT SET IN MOTION BY OTHER VEHICLE (INCL. LOST LOADS)
081	FLY-OBJ	STRUCK BY ROCK OR OTHER MOVING OR FLYING OBJECT (NOT SET IN MOTION BY VEHICLE)
082	VEH HID	VEHICLE OBSCURED VIEW
083	VEG HID	VEGETATION OBSCURED VIEW
084	BLDG HID	VIEW OBSCURED BY FENCE, SIGN, PHONE BOOTH, ETC.
085	WIND GUST	WIND GUST
086	IMMERSED	VEHICLE IMMERSED IN BODY OF WATER
087	FIRE/EXP	FIRE OR EXPLOSION
088	FENC/BLD	FENCE OR BUILDING, ETC.
089	OTHR CRASH	CRASH RELATED TO ANOTHER SEPARATE CRASH
090	TO 1 SIDE	TWO-WAY TRAFFIC ON DIVIDED ROADWAY ALL ROUTED TO ONE SIDE
091	BUILDING	BUILDING OR OTHER STRUCTURE
092	PHANTOM	OTHER (PHANTOM) NON-CONTACT VEHICLE
093	CELL PHONE	CELL PHONE (ON PAR OR DRIVER IN USE)
094	VIOL GDL	TEENAGE DRIVER IN VIOLATION OF GRADUATED LICENSE PGM
095	GUY WIRE	GUY WIRE
096	BERM	BERM (EARTHEN OR GRAVEL MOUND)
097	GRAVEL	GRAVEL IN ROADWAY
098	ABR EDGE	ABRUPT EDGE
099	CELL WTNSD	CELL PHONE USE WITNESSED BY OTHER PARTICIPANT
100	UNK FIXD	FIXED OBJECT, UNKNOWN TYPE.
101	OTHER OBJ	NON-FIXED OBJECT, OTHER OR UNKNOWN TYPE
102	TEXTING	TEXTING
103	WZ WORKER	WORK ZONE WORKER
104	ON VEHICLE	PASSENGER RIDING ON VEHICLE EXTERIOR
105	PEDAL PSGR	PASSENGER RIDING ON PEDALCYCLE
106	MAN WHLCHR	PEDESTRIAN IN NON-MOTORIZED WHEELCHAIR
107	MTR WHLCHR	PEDESTRIAN IN MOTORIZED WHEELCHAIR
108	OFFICER	LAW ENFORCEMENT / POLICE OFFICER
109	SUB-BIKE	"SUB-BIKE": PEDALCYCLIST INJURED SUBSEQUENT TO COLLISION, ETC.
110	N-MTR	NON-MOTORIST STRUCK VEHICLE
111	S CAR VS V	STREET CAR/TROLLEY (ON RAILS OR OVERHEAD WIRE SYSTEM) STRUCK VEHICLE
112	V VS S CAR	VEHICLE STRUCK STREET CAR/TROLLEY (ON RAILS OR OVERHEAD WIRE SYSTEM)
113	S CAR ROW	AT OR ON STREET CAR OR TROLLEY RIGHT-OF-WAY

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
114	RR EQUIP	VEHICLE STRUCK RAILROAD EQUIPMENT (NOT TRAIN) ON TRACKS
115	DSTRCT GPS	DISTRACTED BY NAVIGATION SYSTEM OR GPS DEVICE
116	DSTRCT OTH	DISTRACTED BY OTHER ELECTRONIC DEVICE
117	RR GATE	RAIL CROSSING DROP-ARM GATE
118	EXPNSN JNT	EXPANSION JOINT
119	JERSEY BAR	JERSEY BARRIER
120	WIRE BAR	WIRE OR CABLE MEDIAN BARRIER
121	FENCE	FENCE
123	OBJ IN VEH	LOOSE OBJECT IN VEHICLE STRUCK OCCUPANT
124	SLIPPERY	SLIDING OR SWERVING DUE TO WET, ICY, SLIPPERY OR LOOSE SURFACE (NOT GRAVEL)
125	SHLDR	SHOULDER GAVE WAY
126	BOULDER	ROCK(S), BOULDER (NOT GRAVEL; NOT ROCK SLIDE)
127	LAND SLIDE	ROCK SLIDE OR LAND SLIDE
128	CURVE INV	CURVE PRESENT AT CRASH LOCATION
129	HILL INV	VERTICAL GRADE / HILL PRESENT AT CRASH LOCATION
130	CURVE HID	VIEW OBSCURED BY CURVE
131	HILL HID	VIEW OBSCURED BY VERTICAL GRADE / HILL
132	WINDOW HID	VIEW OBSCURED BY VEHICLE WINDOW CONDITIONS
133	SPRAY HID	VIEW OBSCURED BY WATER SPRAY
134	TORRENTIAL	TORRENTIAL RAIN (EXCEPTIONALLY HEAVY RAIN)
135	RAIL OCC	INJURED OCCUPANT OF RAILWAY TRAIN, LIGHT RAIL, STREET CAR OR CABLE CAR

FUNCTIONAL CLASSIFICATION TRANSLATION LIST

FUNC CLASS	DESCRIPTION
01	RURAL PRINCIPAL ARTERIAL - INTERSTATE
02	RURAL PRINCIPAL ARTERIAL - OTHER
06	RURAL MINOR ARTERIAL
07	RURAL MAJOR COLLECTOR
08	RURAL MINOR COLLECTOR
09	RURAL LOCAL
11	URBAN PRINCIPAL ARTERIAL - INTERSTATE
12	URBAN PRINCIPAL ARTERIAL - OTHER FREEWAYS AND EXP
14	URBAN PRINCIPAL ARTERIAL - OTHER
16	URBAN MINOR ARTERIAL
17	URBAN MAJOR COLLECTOR
18	URBAN MINOR COLLECTOR
19	URBAN LOCAL
78	UNKNOWN RURAL SYSTEM
79	UNKNOWN RURAL NON-SYSTEM
98	UNKNOWN URBAN SYSTEM
99	UNKNOWN URBAN NON-SYSTEM

HIGHWAY COMPONENT TRANSLATION LIST

CODE	DESCRIPTION
0	MAINLINE STATE HIGHWAY
1	COUPLET
3	FRONTAGE ROAD
6	CONNECTION
8	HIGHWAY - OTHER

INJURY SEVERITY CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
1	KILL	FATAL INJURY (K)
2	INJA	SUSPECTED SERIOUS INJURY (A)
3	INJB	SUSPECTED MINOR INJURY (B)
4	INJC	POSSIBLE INJURY (C)
5	PRI	DIED PRIOR TO CRASH
7	NO<5	NO INJURY - 0 TO 4 YEARS OF AGE
9	NONE	NO APPARENT INJURY (O)

LIGHT CONDITION CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	DAY	DAYLIGHT
2	DLIT	DARKNESS - WITH STREET LIGHTS
3	DARK	DARKNESS - NO STREET LIGHTS
4	DAWN	DAWN (TWILIGHT)
5	DUSK	DUSK (TWILIGHT)

MEDIAN TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	NONE	NO MEDIAN
1	RSDMD	SOLID MEDIAN BARRIER
2	DIVMD	EARTH, GRASS OR PAVED MEDIAN

MILEAGE TYPE CODE TRANSLATION LIST

CODE	LONG DESCRIPTION
0	REGULAR MILEAGE
T	TEMPORARY
Y	SPUR
Z	OVERLAPPING

MOVEMENT TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	STRGHT	STRAIGHT AHEAD
2	TURN-R	TURNING RIGHT
3	TURN-L	TURNING LEFT
4	U-TURN	MAKING A U-TURN
5	BACK	BACKING
6	STOP	STOPPED IN TRAFFIC
7	PRKD-P	PARKED - PROPERLY
8	PRKD-I	PARKED - IMPROPERLY
9	PARKNG	PARKING MANEUVER

NON-MOTORIST LOCATION CODE TRANSLATION LIST

CODE	LONG DESCRIPTION
00	AT INTERSECTION - NOT IN ROADWAY
01	AT INTERSECTION - INSIDE CROSSWALK
02	AT INTERSECTION - IN ROADWAY, OUTSIDE CROSSWALK
03	AT INTERSECTION - IN ROADWAY, XWALK AVAIL UNKNWN
04	NOT AT INTERSECTION - IN ROADWAY
05	NOT AT INTERSECTION - ON SHOULDER
06	NOT AT INTERSECTION - ON MEDIAN
07	NOT AT INTERSECTION - WITHIN TRAFFIC RIGHT-OF-WAY
08	NOT AT INTERSECTION - IN BIKE PATH OR PARKING LANE
09	NOT-AT INTERSECTION - ON SIDEWALK
10	OUTSIDE TRAFFICWAY BOUNDARIES
13	AT INTERSECTION - IN BIKE LANE
14	NOT AT INTERSECTION - IN BIKE LANE
15	NOT AT INTERSECTION - INSIDE MID-BLOCK CROSSWALK
16	NOT AT INTERSECTION - IN PARKING LANE
18	OTHER, NOT IN ROADWAY
99	UNKNOWN LOCATION

ROAD CHARACTER CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	INTER	INTERSECTION
2	ALLEY	DRIVEWAY OR ALLEY
3	STRGHT	STRAIGHT ROADWAY
4	TRANS	TRANSITION
5	CURVE	CURVE (HORIZONTAL CURVE)
6	OPENAC	OPEN ACCESS OR TURNOUT
7	GRADE	GRADE (VERTICAL CURVE)
8	BRIDGE	BRIDGE STRUCTURE
9	TUNNEL	TUNNEL

PARTICIPANT TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	OCC	UNKNOWN OCCUPANT TYPE
1	DRVR	DRIVER
2	PSNG	PASSENGER
3	PED	PEDESTRIAN
4	CONV	PEDESTRIAN USING A PEDESTRIAN CONVEYA
5	PTOW	PEDESTRIAN TOWING OR TRAILERING AN OB
6	BIKE	PEDALCYCLIST
7	BTOW	PEDALCYCLIST TOWING OR TRAILERING AN
8	PRKD	OCCUPANT OF A PARKED MOTOR VEHICLE
9	OTHR	OTHER TYPE OF NON-MOTORIST

TRAFFIC CONTROL DEVICE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
000	NONE	NO CONTROL
001	TRF SIGNAL	TRAFFIC SIGNALS
002	FLASHBCN-R	FLASHING BEACON - RED (STOP)
003	FLASHBCN-A	FLASHING BEACON - AMBER (SLOW)
004	STOP SIGN	STOP SIGN
005	SLOW SIGN	SLOW SIGN
006	REG-SIGN	REGULATORY SIGN
007	YIELD	YIELD SIGN
008	WARNING	WARNING SIGN
009	CURVE	CURVE SIGN
010	SCHL X-ING	SCHOOL CROSSING SIGN OR SPECIAL SIGNAL
011	OFCR/FLAG	POLICE OFFICER, FLAGMAN - SCHOOL PATROL
012	BRDG-GATE	BRIDGE GATE - BARRIER
013	TEMP-BARR	TEMPORARY BARRIER
014	NO-PASS-ZN	NO PASSING ZONE
015	ONE-WAY	ONE-WAY STREET
016	CHANNEL	CHANNELIZATION
017	MEDIAN BAR	MEDIAN BARRIER
018	PILOT CAR	PILOT CAR
019	SP PED SIG	SPECIAL PEDESTRIAN SIGNAL
020	X-BUCK	CROSSBUCK
021	THR-GN-SIG	THROUGH GREEN ARROW OR SIGNAL
022	L-GRN-SIG	LEFT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL
023	R-GRN-SIG	RIGHT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL
024	WIGWAG	WIGWAG OR FLASHING LIGHTS W/O DROP-ARM GATE
025	X-BUCK WRN	CROSSBUCK AND ADVANCE WARNING
026	WW W/ GATE	FLASHING LIGHTS WITH DROP-ARM GATES
027	OVRHD SGNL	SUPPLEMENTAL OVERHEAD SIGNAL (RR XING ONLY)
028	SP RR STOP	SPECIAL RR STOP SIGN
029	ILUM GRD X	ILLUMINATED GRADE CROSSING
037	RAMP METER	METERED RAMPS
038	RUMBLE STR	RUMBLE STRIP
040	AUTO. FLAG	AUTOMATED FLAGGER ASSISTANCE DEVICE
090	L-TURN REF	LEFT TURN REFUGE (WHEN REFUGE IS INVOLVED)
091	R-TURN ALL	RIGHT TURN AT ALL TIMES SIGN, ETC.
092	EMR SGN/FL	EMERGENCY SIGNS OR FLARES
093	ACCEL LANE	ACCELERATION OR DECELERATION LANES
094	R-TURN PRO	RIGHT TURN PROHIBITED ON RED AFTER STOPPING
095	BUS STPSGN	BUS STOP SIGN AND RED LIGHTS

099	UNKNOWN	UNKNOWN OR NOT DEFINITE

VEHICLE TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
00	PDO	NOT COLLECTED FOR PDO CRASHES
01	PSNGR CAR	PASSENGER CAR, PICKUP, LIGHT DELIVERY, ETC.
02	BOBTAIL	TRUCK TRACTOR WITH NO TRAILERS (BOBTAIL)
03	FARM TRCTR	FARM TRACTOR OR SELF-PROPELLED FARM EQUIPMENT
04	SEMI TOW	TRUCK TRACTOR WITH TRAILER/MOBILE HOME IN TOW
05	TRUCK	TRUCK WITH NON-DETACHABLE BED, PANEL, ETC.
06	MOPED	MOPED, MINIBIKE, SEATED MOTOR SCOOTER, MOTOR BIKE
07	SCHL BUS	SCHOOL BUS (INCLUDES VAN)
08	OTH BUS	OTHER BUS
09	MTRCYCLE	MOTORCYCLE, DIRT BIKE
10	OTHER	OTHER: FORKLIFT, BACKHOE, ETC.
11	MOTRHOME	MOTORHOME
12	TROLLEY	MOTORIZED STREET CAR/TROLLEY (NO RAILS/WIRES)
13	ATV	ATV
14	MTRSCTR	MOTORIZED SCOOTER (STANDING)
15	SNOWMOBILE	SNOWMOBILE
99	UNKNOWN	UNKNOWN VEHICLE TYPE

WEATHER CONDITION CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	CLR	CLEAR
2	CLD	CLOUDY
3	RAIN	RAIN
4	SLT	SLEET
5	FOG	FOG
6	SNOW	SNOW
7	DUST	DUST
8	SMOK	SMOKE
9	ASH	ASH

Attachment D: Crash Rate Analysis Worksheets

Crash Rate Analysis

#	Location	Collision Type: Angle	Head-on	Turn	Rear-End	Sideswipes/ Overtaking	Others?	Severity: PDO[1]	Injury	Fatal	Total Crashes	Observed Crash Rate	Critical Crash Rate by Intersection Type	Observed Crash Rate > Critical Crash Rate by Intersection	Critical Crash Rate by Volume	Observed Crash Rate > Critical Crash Rate by Volume	90th Percentile Rate by Intersection Type	Observed Crash Rate > 90th Percentile Rate
1	US 101 / OR 38 (No Crashes)				3			2	1		3	0.15	0.56	No	0.46	No	0.86	No
2	W Railroad Avenue/ OR 38	1							1		1	0.10	0.82	No	0.62	No	0.41	No
3	E Railroad Avenue/ OR 38				1			1			1	0.10	0.83	No	0.62	No	0.41	No
4	N 6th Street/ Fir / OR 38 (No Crashes)										0	0.00	0.46	No	0.60	No	0.29	No
5	OR 38/Riverfront Way/2nd/Winchester Avenue			1				1			1	0.11	0.84	No	0.63	No	0.41	No
6	US 101/Winchester Avenue	3		3	1			4	3		7	0.28	0.53	No	0.44	No	0.86	No
7	W Railroad Avenue/ Winchester Avenue	1							1		1	0.25	1.09	No	0.85	No	0.41	No
8	Elm Avenue/Winchester Avenue (intersection combined with #9 in ODOT database) - No Crahses										0	0.00	0.68	No	0.85	No	0.29	No
9	E Railroad Avenue/Winchester Avenue - No Crashes										0	0.00	0.68	No	0.85	No	0.29	No
10	South 6th Street/Winchester Avenue				1				1		1	0.34	1.23	No	0.97	No	0.41	No
11											0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.51	#DIV/0!
12											0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.86	#DIV/0!
13											0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.86	#DIV/0!
14											0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.51	#DIV/0!

#	Peak hour volumes: AM Peak	PM Peak	EST AADT	EST 5Y TEV	Crash Rate	Intersection Type (Drop-down menu)	Intersection Class	Ra	K	M	Rc	AADT Class	Ra	K	M	Rc
1		1123	11,230	20,494,750	0.15	Rural	4 SG	0.324	1.645	20	0.56	7,500<x<15,000	0.25	1.645	20	0.46
2		554	5,540	10,110,500	0.10		4 ST	0.434	1.645	10	0.82	x<7,500	0.29	1.645	10	0.62
3		546	5,460	9,964,500	0.10		4 ST	0.434	1.645	10	0.83	x<7,500	0.29	1.645	10	0.62
4		597	5,970	10,895,250	0.00		3 ST	0.196	1.645	11	0.46	x<7,500	0.29	1.645	11	0.60
5		518	5,180	9,453,500	0.11		4 ST	0.434	1.645	9	0.84	x<7,500	0.29	1.645	9	0.63
6		1391	13,910	25,385,750	0.28		4 SG	0.324	1.645	25	0.53	7,500<x<15,000	0.25	1.645	25	0.44
7		223	2,230	4,069,750	0.25		4 ST	0.434	1.645	4	1.09	x<7,500	0.29	1.645	4	0.85
8		220	2,200	4,015,000	0.00		3 ST	0.196	1.645	4	0.68	x<7,500	0.29	1.645	4	0.85
9		223	2,230	4,069,750	0.00		3 ST	0.196	1.645	4	0.68	x<7,500	0.29	1.645	4	0.85
10		162	1,620	2,956,500	0.34		4 ST	0.434	1.645	3	1.23	x<7,500	0.29	1.645	3	0.97
11			-	-	#DIV/0!		3 SG	0.226	1.645	0	#DIV/0!	x<7,500	0.29	1.645	0	#DIV/0!
12			-	-	#DIV/0!		4 SG	0.324	1.645	0	#DIV/0!	x<7,500	0.29	1.645	0	#DIV/0!
13			-	-	#DIV/0!		4 SG	0.324	1.645	0	#DIV/0!	x<7,500	0.29	1.645	0	#DIV/0!
14			-	-	#DIV/0!		3 SG	0.226	1.645	0	#DIV/0!	x<7,500	0.29	1.645	0	#DIV/0!

Critical Crash Rate Analysis

General & Site Information	
Analyst:	MAR
Agency/Company:	KAI
Date:	2/16/2023
Project Name:	Reedsport Study

Intersection Crash Data

Intersection	Intersection Type	Year 2016	2017	2018	2019	2020	Total
US 101 / OR 38 (No Crashes)	Rural 4SG	1	1			1	3
W Railroad Avenue/ OR 38	Rural 4ST	1					1
E Railroad Avenue/ OR 38	Rural 4ST	1					1
N 6th Street/ Fir / OR 38 (No Crashes)	Rural 3ST						0
OR 38/Riverfront Way/2nd/Winchester Avenue	Rural 4ST				1		1
US 101/Winchester Avenue	Rural 4SG			3	2	2	7
W Railroad Avenue/ Winchester Avenue	Rural 3ST				1		1
Elm Avenue/Winchester Avenue (intersection combined with #9 in ODOT database) - No Crashes	Rural 3ST						0
E Railroad Avenue/Winchester Avenue - No Crashes	Rural 3ST						0
South 6th Street/Winchester Avenue	Rural 4ST			1			1
	Total	3	1	4	4	3	15

Intersection Population Type Crash Rate

Average Crash Rate per intersection type

Intersection Pop. Type	Sum of Crashes	Sum of 5-year MEV	Avg Crash Rate for Ref Pop.	INT in Pop
Rural 3SG	0	0		
Rural 3ST	1	23	0.0434	4
Rural 4SG	10	46	0.2180	2
Rural 4ST	4	32	0.1231	4
Urban 3ST	0	0		
Urban 3SG	0	0		
Urban 4ST	0	0		
Urban 4SG	0	0		

Critical Rate Calculation

Intersection	AADT Entering Intersection	5-year MEV	Crash Total	Intersection Population Type	Intersection Crash Rate	Reference Population Crash Rate	Critical Rate	Over Critical
US 101 / OR 38 (No Crashes)	11,230	20.5	3	Rural 4SG	0.15	APM Exhibit 4-1		
W Railroad Avenue/ OR 38	5,540	10.1	1	Rural 4ST	0.10	APM Exhibit 4-1		
E Railroad Avenue/ OR 38	5,460	10.0	1	Rural 4ST	0.10	APM Exhibit 4-1		
N 6th Street/ Fir / OR 38 (No Crashes)	5,970	10.9	0	Rural 3ST	0.00	APM Exhibit 4-1		
OR 38/Riverfront Way/2nd/Winchester Avenue	5,180	9.5	1	Rural 4ST	0.11	APM Exhibit 4-1		
US 101/Winchester Avenue	13,910	25.4	7	Rural 4SG	0.28	APM Exhibit 4-1		
W Railroad Avenue/ Winchester Avenue	2,230	4.1	1	Rural 3ST	0.25	APM Exhibit 4-1		
Elm Avenue/Winchester Avenue (intersection combined with #9 in ODOT database) - No Crashes	2,200	4.0	0	Rural 3ST	0.00	APM Exhibit 4-1		
E Railroad Avenue/Winchester Avenue - No Crashes	2,230	4.1	0	Rural 3ST	0.00	APM Exhibit 4-1		
South 6th Street/Winchester Avenue	1,620	3.0	1	Rural 4ST	0.34	APM Exhibit 4-1		

Excess Proportions

General & Site Information	
Analyst:	MAR
Agency/Company:	KAI
Date:	3/23/23
Project Name:	Reedsport Rail Crossing
Highway Number and Name:	US 101 OR OR 38
Mile Points:	
Crash Years Pulled:	2016-2020

Intersection Population Type Crash Rate

Total Crash Types

Reference Population	Angle	Back	Bike	Fix	Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear	Total
3ST	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3SG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4ST	2	0	0	0	0	0	0	0	0	0	0	1	2	5
4SG	3	0	0	0	0	0	0	0	0	0	0	3	4	10
Threshold Proportions														
3ST	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
3SG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
4ST	0.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.400	
4SG	0.300	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.300	0.400	
Sample Variance														
3ST	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
3SG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
4ST	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
4SG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

	Angle	Back	Bike	Fix
3ST	N/A	N/A	N/A	N/A
3SG	N/A	N/A	N/A	N/A
4ST	N/A	N/A	N/A	N/A
4SG	N/A	N/A	N/A	N/A

	Angle	Back	Bike	Fix
3ST	N/A	N/A	N/A	N/A
3SG	N/A	N/A	N/A	N/A
4ST	N/A	N/A	N/A	N/A
4SG	N/A	N/A	N/A	N/A

	Angle	Back	Bike	Fix
3ST	N/A	N/A	N/A	N/A
3SG	N/A	N/A	N/A	N/A
4ST	N/A	N/A	N/A	N/A
4SG	N/A	N/A	N/A	N/A

Observed Proportions

					Type of Crash													30.85714286
Hwy	MP	Reference Pop	Street 1	Street 2	Angle	Back	Bike	Fix	Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear	
1	0.00	4SG	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
2	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0.00	3ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0.00	4SG	1	2	0.43	0	0	0	0	0	0	0	0	0	0	0.43	0	0.857142857
7	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0.00	3ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0.00	3ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																		0
																		0

Intersection Crash Data

					Type of Crash													15
Hwy	MP	Reference Pop	Street 1	Street 2	Angle	Back	Bike	Fix	Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear	Total
1	0.00	4SG	1	2													3	3
2	0.00	4ST	1	2	1													1
3	0.00	4ST	1	2													1	1
4	0.00	3ST	1	2														0
5	0.00	4ST	1	2												1		1
6	0.00	4SG	1	2	3											3	1	7
7	0.00	4ST	1	2	1													1
8	0.00	3ST	1	2														0
9	0.00	3ST	1	2														0
10	0.00	4ST	1	2													1	1
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Sample Alpha								
Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sample Beta								
Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

$p^*_{¿}$ (bar)								
Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

General & Site Information	
Analyst:	MAR
Agency/Company:	KAI
Date:	3/23/23
Project Name:	Reedsport Rail Crossing
Highway Number and Name:	US 101 OR OR 38
Mile Points:	
Crash Years Pulled:	2016-2020

Intersection Population Type Crash Rate

Sample Alpha	Angle	Back	Bike	Fix	Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear
3ST	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3SG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4ST	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4SG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sample Beta													
3ST	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3SG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4ST	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4SG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Threshold Proportions													
3ST	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3SG	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4ST	0.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.400
4SG	0.300	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.300	0.400

Excess Proportion with a probability of greater than 0.9

					Type of Crash													123.4285714
Hwy	MP	Reference Pop	Street 1	Street 2	Angle	Back	Bike	Fix	Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear	
1	0.00	4SG	1	2														
2	0.00	4ST	1	2														
3	0.00	4ST	1	2														0
4	0.00	3ST	1	2														0
5	0.00	4ST	1	2														0
6	0.00	4SG	1	2														0
7	0.00	4ST	1	2														0
8	0.00	3ST	1	2														0
9	0.00	3ST	1	2														0
10	0.00	4ST	1	2														0

Probability

					Type of Crash													61.71428571
Hwy	MP	Reference Pop	Street 1	Street 2	Angle	Back	Bike	Fix	Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear	
1	0.00	4SG	1	2														
2	0.00	4ST	1	2														
3	0.00	4ST	1	2														0
4	0.00	3ST	1	2														0
5	0.00	4ST	1	2														0
6	0.00	4SG	1	2														0
7	0.00	4ST	1	2														0
8	0.00	3ST	1	2														0
9	0.00	3ST	1	2														0
10	0.00	4ST	1	2														0

Observed Proportions

					Type of Crash													30.85714286
Hwy	MP	Reference Pop	Street 1	Street 2	Angle	Back	Bike	Fix	Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear	
1	0.00	4SG	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1.00	
2	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0.00	3ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0.00	4SG	1	2	0.43	0	0	0	0	0	0	0	0	0	0	0.43	0	0.857142857
7	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0.00	3ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0.00	3ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0.00	4ST	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																		0
																		0

Intersection Crash Data

					Type of Crash													15
Hwy	MP	Reference Pop	Street 1	Street 2	Angle	Back	Bike	Fix	Head	NonCol	OTH	Park	Ped	SS-M	SS-O	Turn	Rear	Total
1	0.00	4SG	1	2													3	3
2	0.00	4ST	1	2	1													1
3	0.00	4ST	1	2													1	1
4	0.00	3ST	1	2														0
5	0.00	4ST	1	2												1		1
6	0.00	4SG	1	2	3											3	1	7
7	0.00	4ST	1	2	1													1
8	0.00	3ST	1	2														0
9	0.00	3ST	1	2														0
10	0.00	4ST	1	2													1	1
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Attachment E: Crossing Key Data

Crossing Key Data

Street Name	Winchester Ave
County	Polk
Crossing ID	CO-740.50
Active	☐
Latitude	43.70003
Longitude	-124.103
USDOT NO	756507K
Line No	CO
Milepost	740.5
Milepost Text	740.5
ROW Owner	Oregon International Port of Coos Bay
Track Owner	Oregon International Port of Coos Bay
Operator	Coos Bay Rail Line
Segment Name	Mainline

qryCrossingDevices2 subform

DEVICE_ID	DEVICE_NM	QUAD_NM
1	Advance Warning Pavement Markings	LR
1	Advance Warning Pavement Markings	RR
2	Stop Clearance Line/Crosswalk Marking	LR
2	Stop Clearance Line/Crosswalk Marking	RR
3	Advance Warning Sign	LR
3	Advance Warning Sign	RR
4	Standard Curb	RR
13	Flashing-Light Signal	LR
13	Flashing-Light Signal	RR
15	Automatic Gate <= 26 Ft In Length	LR
15	Automatic Gate <= 26 Ft In Length	RR
29	Railroad STOP sign	RL
29	Railroad STOP sign	RR

Crossing Key Data

Street Name	Umpqua Ave (Hwy 38)
County	Douglas
Crossing ID	CO-740.30
Active	☐
Latitude	43.702
Longitude	-124.1018
USDOT NO	756506D
Line No	CO
Milepost	740.3
ROW Owner	Oregon International Port of Coos Bay
Track Owner	Oregon International Port of Coos Bay
Operator	Coos Bay Rail Line
Segment Name	Mainline

DEVICE_ID	DEVICE_NM	QUAD_NM
1	Advance Warning Pavement Markings	LR
1	Advance Warning Pavement Markings	RR
2	Stop Clearance Line/Crosswalk Marking	LR
2	Stop Clearance Line/Crosswalk Marking	RR
3	Advance Warning Sign	LR
3	Advance Warning Sign	RR
4	Standard Curb	LR
4	Standard Curb	RR
6	Number of Tracks Sign	LR
6	Number of Tracks Sign	RR
13	Flashing-Light Signal	LR
13	Flashing-Light Signal	RR
15	Automatic Gate <= 26 Ft In Length	LR
15	Automatic Gate <= 26 Ft In Length	RR
19	Guardrail	LR
29	Railroad STOP sign	LL
29	Railroad STOP sign	LR

TECHNICAL MEMORANDUM #5

Future Land Use and Transportation Conditions

KITTELSON & ASSOCIATES
851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

Technical Memorandum

June 6, 2023 Project# 27003.011

To:	Thomas Guevara, Oregon Department of Transportation Deanna Schafer and Kim Clardy, City of Reedsport
From:	Michael Ruiz-Leon, Allison Woodsworth, Matt Bell, and Marc Butorac, PE, PTOE (Kittelson); Chat Hewitt (HDR)
Project:	City of Reedsport Rail Crossing Study and Refinement Plan
Subject:	Tech Memo #5: Future Land Use and Transportation Conditions

TABLE OF CONTENTS

INTRODUCTION

This memorandum summarizes future (no-build) transportation system conditions within the study area for the Reedsport Rail Crossing Study and Refinement Plan, including future gaps, deficiencies, and needs to accommodate future growth. The information provided in this memorandum reflects planned improvements identified in State and local planning documents as well as forecast traffic volumes developed for the study area. The future gaps, deficiencies, and needs identified in this memorandum will serve as the basis for developing transportation system alternatives and improvement projects for the Reedsport Rail Crossing Study and Refinement Plan.

PLANNED IMPROVEMENTS

This section summarizes planned improvements identified in the Oregon Department of Transportation (ODOT) Statewide Transportation Improvement Program (STIP) and City of Reedsport (City) Capital Improvement Program (CIP). One expected outcome of the Reedsport Rail Crossing Study and Refinement Plan is the identification of projects for inclusion in updated versions of the ODOT STIP and City CIP.

Statewide Transportation Improvement Program

The Statewide Transportation Improvement Program (STIP) is the ODOT's 4-year capital improvement program for State and federally funded projects. The Oregon Transportation Commission (OTC) and ODOT develop the STIP in coordination with a wide range of stakeholders, including local jurisdictions and the public. The OTC allocates funding among the following categories:

- **Fix-it** programs fund projects that fix or preserve the state's transportation system, including bridges, pavement, culverts, traffic signals, and others.
- **Enhance-it** programs fund projects that enhance or expand the transportation system. These are typically high-priority projects from State and local transportation plans, such as the Reedsport TSP.
- **Safety** programs reduce fatalities and injuries on Oregon roads. This includes the All Roads Transportation Safety (ARTS) program, which includes projects on State highways and local roads.
- **Non-highway** programs fund bicycle and pedestrian projects and public transportation.
- **Local government** programs direct funding to local governments so they can fund projects.

The current STIP (2021–2024) includes two projects in the Reedsport area and the draft STIP (2024–2027) includes one project. Table 1 summarizes projects from the current and draft STIP.

Table 1. ODOT 2021-2024 and Draft 2024-2027 STIP Projects for Reedsport

Key	Project Name	Projects	Work Type	Status	Project Total
Current STIP (2021–2024)					
20153	US 101/OR 38: Variable Message Signs	Replace existing hazard warning system with LID-based variable message (VMS) system to increase visibility to the traveling public	OP-ITS	Construction contract complete	$2,022,870.51
22387	US 101/OR 38 Curb Ramps	Construct curb ramps to meet compliance with American with Disabilities Act (ADA) standards	ADAP	Project under construction	$6,192,472.36
Draft STIP (2024–2027)					
22977	US 101: Washington State Line to California State Line	Install National Electric Vehicle Infrastructure (NEVI) fast-charging stations at 50-mile internals along US 101	Electric	Project scheduled for construction	$6,281,000

The project(s) shown in Table 1 will be considered in the future (no-build) traffic conditions analysis; however, they are not expected to directly impact study intersection operations.

Reedsport Capital Improvement Plan

The City CIP is a short-range plan for capital improvement projects and funding sources in the City. Table 2 lists relevant project from the 2023-2027 CIP in the study area.

Table 2. City of Reedsport 2023–2027 Capital Improvement Projects

Fiscal Year	Fund	Projects	Estimated Cost	Funding Source
2023	150	Greenwood & East Railroad Realignment	$65,000	None listed
2023–2027	002	Americans with Disabilities Act Upgrades	$50,000	None listed

2026	002	Winchester Ave. 2nd Phase Paving	$150,000	Pending SCA Grant
2024	005/150	Levee Repairs and Upgrades	$5,600,000	Pending grant

The project(s) shown in Table 2 were considered in the future (no-build) traffic conditions analysis summarized below and will be further evaluated in the alternatives analysis.

FUTURE TRAFFIC VOLUMES

Forecast traffic volumes were developed for the study intersections based on the existing traffic counts and an assessment of data from the Statewide Integrated Model (SWIM), ODOT's Future Volume Tables, and Automatic Traffic Recorders (ATRs) located along US 101 and OR 38 as indicated below.

- The SWIM provides base and forecast year traffic volume projections for the study area that reflect anticipated land use changes and planned transportation improvements. The model is up-to-date and readily available with base year 2019 and future year 2045 traffic volume projections. Based on the data, traffic volumes along US 101 and OR 38 are expected to grow by approximately 1.0% per year through the planning horizon.
- ODOT's Future Volume Tables also provide base and forecast year traffic volume projections for the study area. The model provides base year 2021 and future year 2041 traffic volume projections. Based on the data, traffic volumes are expected to grow by approximately 0.05% per year along US 101 and 0.10% per year along OR 38 through the planning horizon.
- ATRs are located in select locations throughout the State highway system and collect traffic data 24-hours a day, 365 days a year. Data from two ATRs located near the study area were analyzed to determine potential growth rates for the study area. The Scottsburg ATR (#10-003) located on OR 38 approximately 7.08 miles east of Scottsburg West Roads shows traffic volume growth of approximately 1.02% per year over the last 10 years, excluding year 2020 volumes. The Lakeside ATR (#06-001) located on US 101 approximately 1.09 miles south of the Douglas and Coos County line shows traffic volume growth of approximately 0.50% per year over the last 10 years, excluding year 2020 volumes.

Based on an assessment of the growth rates described above, the growth rates from the SWIM were applied to existing traffic volumes along US 101 and OR 38 to estimate growth in regional traffic volumes. The SWIM annual growth rate was also applied to the local side street movements in the study area to yield a more conservative future traffic analysis.

MOTOR VEHICLE TRANSPORTATION ANALYSIS

Intersection Operations Analysis

The intersection operations analysis was conducted using PTV Vistro 2022, which is a software tool designed to assist with operations analyses in accordance with Highway Capacity Manual (HCM) methodologies. The analysis results include level-of-service (LOS), delay (del), and volume-to-capacity (v/c) ratios at all intersections, regardless of jurisdiction. The LOS, del, and v/c ratios are reported for the overall intersection at signalized intersections and the critical movement at unsignalized intersections in accordance with the methodologies outlined in ODOT's Analysis Procedures Manual (APM).p

Table 3 and Figure 1 summarize the results of the intersection operations analysis and compares the results to the applicable mobility standards and targets, which were presented in *Technical Memorandum #3: Analysis Methodology and Assumptions*. Values shown in **bold** exceed their applicable mobility standard/ target. Attachment A to this memorandum contains the year 2045 traffic conditions worksheets.

Table 3. Year 2045 Intersection Operations, Weekday PM Peak Hour

Map ID	Intersection	Control Type	Mobility Standard/Target¹	Intersection Operations			
				CM	LOS²	Del³	v/c⁴
1	US 101/OR 38[1]	Signal	v/c = 0.85	WB/L	C	31.8	**1.0**
2	W. Railroad Avenue/OR 38	TWSC	v/c = 0.85 / 0.95	NB/L	C	16.1	0.02
3	E. Railroad Avenue/OR 38	TWSC	v/c = 0.85 / 0.95	NB/T	C	15.8	0.01
4	N. 6th Street/OR 38	TWSC	v/c = 0.85 / 0.95	NB/L	C	15.4	0.04
5	OR 38/Riverfront Way-Winchester Avenue	TWSC	V/C = 0.85 / 0.95	NB/L	C	19.5	0.14
6	US 101/Winchester Avenue	Signal	v/c = 0.85	WB/L	B	11.0	0.55
7	W. Railroad Avenue/Winchester Avenue	TWSC	LOS D	NB/L	B	10.5	0.03
8	Elm Avenue/Winchester Avenue	TWSC	LOS D	NB/L	B	10.2	0.02
9	E. Railroad Avenue/Winchester Avenue	TWSC	LOS D	NB/L	B	11.0	0.02
10	South 6th Street/Winchester Avenue	TWSC	LOS D	SB/T	B	10.5	0.01

¹ State highway v/c ratio/side-street v/c ratio.
² LOS = Intersection LOS (signal); CM LOS (TWSC).
³ Delay = Intersection average vehicle delay (signal); CM vehicle delay (TWSC).
⁴ v/c = Intersection v/c (signal); CM v/c (TWSC).

CM = critical movement; Del = delay; L = left; T = through; LOS = level of service; NB = northbound; TWSC = two-way stop-control; SB = southbound; WB = westbound; v/c = volume-to-capacity.

As shown in Table 3 and Figure 1, all study intersections are forecast to meet their applicable mobility standards and targets except the US 101/OR 38 intersection, which is forecast to operate at an intersection v/c of 1.0 in the year 2045. The westbound left-through movement is expected to be the critical movement and is forecast to operate at a v/c of 0.95.

The Reedsport Transportation System Plan (TSP) projects the US 101/OR 38 intersection to meet mobility targets in the planning horizon year of 2025. The Reedsport Waterfront and Downtown Plan forecasted the US 101/OR 38 intersection to meet mobility targets and operate at a v/c of 0.84 in 2033. The additional 12 years of growth at the intersections to 2045 is forecasted to bring the intersection to capacity at a v/c of 1.0.

Queueing Analysis

A queuing analysis during non-train events was conducted at the signalized study intersections using PTV Vistro 2022. Table 4 summarizes the year 2045 95th percentile queues during the weekday PM peak hour and indicates if existing storage can accommodate the queues. The vehicle queues and storage lengths were rounded up to the nearest 25 feet. The storage lengths reflect the striped storage for each movement at the intersections or the distance to the upstream intersection. Values shown in **bold** exceed their available storage. Unsignalized intersection queues were also analyzed and were found to be less than one vehicle length during the peak hour. Attachment A contains the queuing analysis worksheets.

[1] The intersection was projected to meet mobility standards during the Reedsport TSP horizon year (2025). The intersection was analyzed using HCM 2000 methodologies. The future conditions analysis utilizes HCM 6th edition.

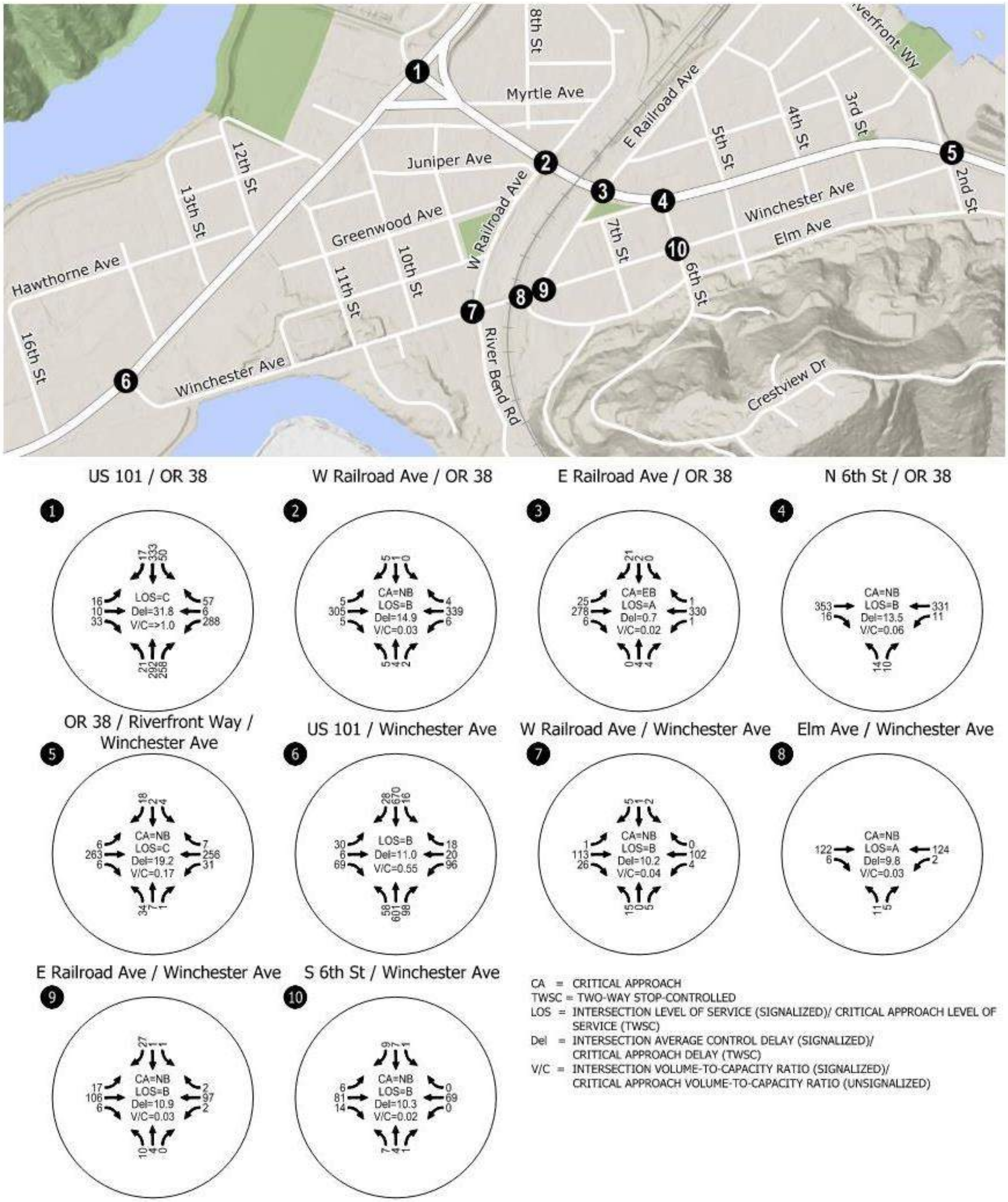
Table 4. Queueing Summary, Year 2045 Weekday PM Peak Hour

Map ID	Intersection	Movement	Storage Length (feet)	95th Percentile Queue (feet)	Adequate?
1	US 101/ OR 38	EBTL	200	50	Yes
		WBTL	250	350	**No**
		NBL	150	<25	Yes
		SBL	225	25	Yes
6	US 101/ Winchester Ave.	EBTL	70	<25	Yes
		WBTLR	175	50	Yes
		NBL	115	<25	Yes
		SBL	80	<25	Yes

EB = eastbound; L = left; NB = northbound; SB = southbound; R = right; T = through; WB = westbound.

As shown in Table 4., the striped storage lengths at the signalized study intersections are currently adequate to accommodate the 95th percentile queues, except the westbound through-left movement, which is forecast to have a queue extend south of Myrtle Avenue during the weekday PM peak hour.

Figure 1. Year 2045 Traffic Conditions, Weekday PM Peak Hour



RAIL

The CBRL provides freight service to industrial customers in and around Coos Bay and Coquille via interchange connections with the Union Pacific Railroad in Eugene, approximately 120 railroad miles to the north and east.

Future Operations

Future operations on the CBRL would increase rail traffic through Reedsport by way of containerized rail traffic moving to/from an international container port being planned within Coos Bay. The proposed container facility will be designed to accommodate 1.2 million Twenty-foot Equivalent Unit (TEU) containers per year, which equates to approximately 600,000 containers per year. Depending upon the operational length of trains on the CBRL, as well as several other factors documented in *Tech Memo #3: Analysis Methodology and Assumptions,* the number of trains could vary from 10 to 12 intermodal trains per day (4,000 to 5,000 feet per train, respectively). The operational length of the trains will be limited largely by the grades and curvature along the rail line after improvements, all of which have yet to be finalized.

Based on CBRL train characteristics and potential operational speed restrictions within Reedsport, the following train analysis assumptions were used for analysis and are summarized in Table 5.

Table 5. Train Characteristics Assumptions

Train	Length (ft)	Speed (mph)	Crossing Time (min)
Intermodal	4,000	25	3
Intermodal (current speed restrictions)	4,000	10	5
Mixed Freight Traffic	1,500	25	2

The goal for operational speeds for the improved rail line was stated by CBRL as 40 mph; however, it is possible that the swing span bridge across the Umpqua River could still present an operational speed restriction within Reedsport even after capital improvements. Based upon this, the crossings were analyzed under an operational speed of 25 mph within Reedsport and existing 10 mph speed restrictions for a conservative approach with respect to grade crossing blockages by passing trains.

Rail Crossing Controls and Configurations

Future rail crossing controls and configurations have not been identified. The two at-grade rail crossings in the City of Reedsport on OR 38 and Winchester Avenue are anticipated to remain under this no-build analysis documented herein.

Train Event Considerations

Impacts of train events at the railroad crossings on OR 38 and Winchester Avenue were evaluated for the future operations on the Coos Bay Rail Line (CBRL) conditions. Projected queueing outcomes during intermodal and mixed freight train events were used to estimate queueing. Queues were calculated using the crossing volumes and heavy vehicle percentages, including the total eastbound and total westbound approaches. For the analysis it was assumed a heavy vehicle is 75 feet and a passenger car is 25 feet. Train event assumptions are detailed above and in *Technical Memorandum #3: Analysis Methodology and Assumptions*.

The 95th percentile queue lengths shown quantify those lengths that have a 5 percent probability of being exceeded during a train crossing. These were calculated by applying a Poisson distribution to the expected number of vehicle arrivals during each train crossing time and summing the associated probability for each number of arrivals, starting at zero vehicles, until a total probability of 95% was attained. The 95th percentile queue lengths are shown in Table 6 and Figure 2. Values shown in **bold** exceed their available storage.

Table 6. Train Event Year 2045 95th Percentile Queueing

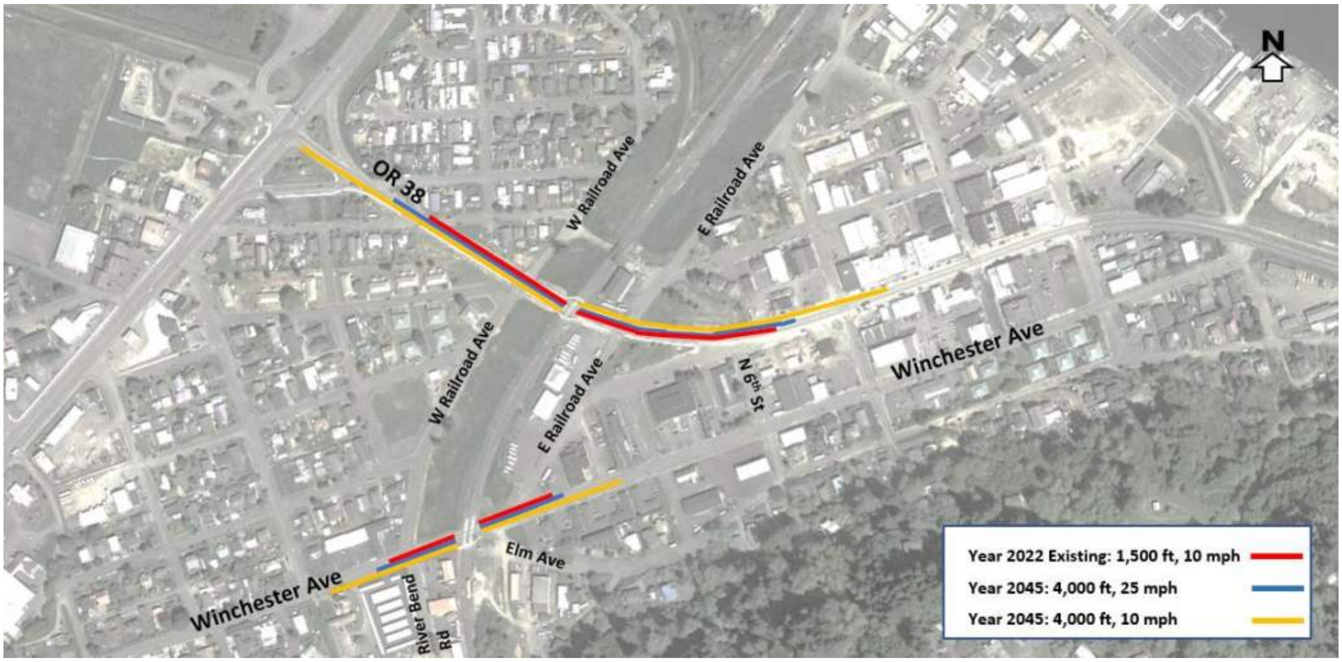
Crossing	Approach	Storage Length (feet)	95th Percentile Queues (feet)		
			Existing	Intermodal at 25 mph / Intermodal at 10 mph / Mixed Freight at 25 mph	Exceeds Storage?
OR 38	Eastbound	140[1]	525	625/975/450	**Yes**
	Westbound	150[2]	600	700/1100/500	**Yes**
Winchester Avenue	Eastbound	130[1]	225	275/425/200	**Yes**
	Westbound	100[2]	250	300/450/200	**Yes**

[1] Distance to W. Railroad Avenue.
[2] Distance to E. Railroad Avenue.

The 95th percentile queue lengths are anticipated to still exceed storage for eastbound and westbound movements on OR 38 and Winchester Avenue. During a future train event, OR 38 eastbound traffic is expected to queue west of Laurel Avenue, and westbound traffic is expected to queue east of N. 6th Street during an intermodal train event. On Winchester Avenue, the eastbound traffic is expected to queue west of W. Railroad Avenue, and westbound traffic is expected to queue east of E. Railroad Avenue during an intermodal train event. During a future mixed freight train event, queues are expected to be less than the existing train event as future trains are anticipated to operate at 25 mph, 15 mph more than existing conditions.

During a future intermodal train event with existing speed restrictions in place, OR 38 eastbound traffic is expected to queue west of Myrtle Avenue, and westbound traffic is expected to queue east of N. 5th Street. On Winchester Avenue, the eastbound traffic is expected to queue west of W. Railroad Avenue, and westbound traffic is expected to queue east of E. Railroad Avenue during an intermodal train event with existing speed restrictions in place. ***In an event with a train length exceeding 4,100 feet at 10 mph, the OR 38 eastbound traffic is expected to queue to US 101.*** Attachment B contains the train event queuing calculations.

Figure 2. Train Event Queue Lengths



FUTURE DEFICIENCIES AND NEEDS

This memorandum identified the following future deficiencies and needs:

- Capacity - Under future year 2045 conditions, the US 101/OR 38 intersection is expected to exceed mobility targets and operate at capacity (v/c = 1.0) in the weekday PM peak hour.
- Queue storage – Under future year 2045 conditions, westbound through-left queueing at the US 101/OR 38 intersection is expected to exceed striped storage in the weekday PM peak hour.
- Train event queue storage – Train events are likely to cause queues on OR 38 and Winchester Avenue that exceed the eastbound and westbound approach storage length today and in the future. During a 4,100-foot or greater train event at 10 mph with current Umpqua swing span speed restrictions, eastbound OR 38 queues would be expected to extend to US 101.

ATTACHMENTS

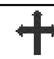
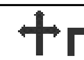
A. Future Traffic Conditions Worksheets
B. Future Train Event Queueing Calculations

Attachment A: Future Traffic Conditions Worksheets

Intersection Level Of Service Report
Intersection 1: US 101 / OR 38

Control Type:	Signalized	Delay (sec / veh):	31.8
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.004

Intersection Setup

Name	US 101			US 101			Port Dock Rd			OR 38		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	1
Entry Pocket Length [ft]	150.00	100.00	100.00	225.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	320.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
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	49.21
Speed [mph]	30.00			30.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			No			Yes			No		
Crosswalk	Yes			Yes			Yes			No		

Volumes

Name	US 101			US 101			Port Dock Rd			OR 38		
Base Volume Input [veh/h]	21	292	258	50	333	17	16	10	33	288	6	57
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 [%]	18.00	9.00	5.00	2.00	6.00	0.00	0.00	50.00	11.00	9.00	20.00	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
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	21	292	258	50	333	17	16	10	33	288	6	57
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	79	70	14	90	5	4	3	9	78	2	15
Total Analysis Volume [veh/h]	23	317	280	54	362	18	17	11	36	313	7	62
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing		0			0			1			0	
v_di, Inbound Pedestrian Volume crossing m		1			0			0			0	
v_co, Outbound Pedestrian Volume crossing		0			0			0			0	
v_ci, Inbound Pedestrian Volume crossing mi		0			0			0			0	
v_ab, Corner Pedestrian Volume [ped/h]		0			0			0			0	
Bicycle Volume [bicycles/h]		1			1			1			0	

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]	12.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	1	6	0	5	2	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lag	-	-	-	-	-	-	-	-
Minimum Green [s]	3	10	0	3	10	0	0	5	0	0	7	0
Maximum Green [s]	15	45	0	15	45	0	0	35	0	0	35	0
Amber [s]	3.5	3.8	0.0	3.5	3.8	0.0	0.0	3.5	0.0	0.0	3.8	0.0
All red [s]	1.8	1.0	0.0	1.8	1.5	0.0	0.0	1.8	0.0	0.0	2.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	2.5	4.5	0.0	2.5	4.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Walk [s]	0	0	0	0	7	0	0	7	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	19	0	0	20	0	0	0	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			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.3	2.8	0.0	3.3	3.3	0.0	0.0	3.3	0.0	0.0	3.8	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		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	C	R	L	C	C	C	C	R
C, Cycle Length [s]	69	69	69	69	69	69	69	69	69	69
L, Total Lost Time per Cycle [s]	5.05	4.80	4.80	4.80	5.30	5.30	5.30	5.30	5.80	5.80
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	2.00	0.00	0.00	2.00	2.00	0.00
l2, Clearance Lost Time [s]	0.00	2.80	2.80	2.80	0.00	3.30	3.30	0.00	3.80	3.80
g_i, Effective Green Time [s]	23	16	16	16	23	17	17	35	35	35
g / C, Green / Cycle	0.33	0.23	0.23	0.23	0.33	0.24	0.24	0.51	0.51	0.51
(v / s)_i Volume / Saturation Flow Rate	0.02	0.12	0.12	0.12	0.04	0.11	0.11	0.27	0.70	0.04
s, saturation flow rate [veh/h]	1120	1765	1614	1518	1209	1810	1776	233	456	1615
c, Capacity [veh/h]	325	402	368	346	344	438	430	87	333	816
d1, Uniform Delay [s]	22.17	23.44	23.50	23.50	23.93	22.24	22.26	14.22	21.98	8.81
k, delay calibration	0.19	0.19	0.19	0.19	0.19	0.08	0.19	0.08	0.50	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.16	1.81	2.07	2.30	0.36	0.51	1.21	8.62	40.07	0.03
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.07	0.52	0.54	0.55	0.16	0.44	0.44	0.74	0.96	0.08
d, Delay for Lane Group [s/veh]	22.33	25.25	25.57	25.80	24.29	22.75	23.47	22.84	62.05	8.83
Lane Group LOS	C	C	C	C	C	C	C	C	E	A
Critical Lane Group	No	No	No	Yes	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	0.25	3.07	2.90	2.80	0.59	2.56	2.62	0.67	9.02	0.45
50th-Percentile Queue Length [ft/ln]	6.14	76.87	72.55	70.09	14.68	64.01	65.41	16.69	225.52	11.24
95th-Percentile Queue Length [veh/ln]	0.44	5.53	5.22	5.05	1.06	4.61	4.71	1.20	13.95	0.81
95th-Percentile Queue Length [ft/ln]	11.06	138.3	130.5	126.1	26.42	115.21	117.74	30.03	348.67	20.23

Movement, Approach, & Intersection Results

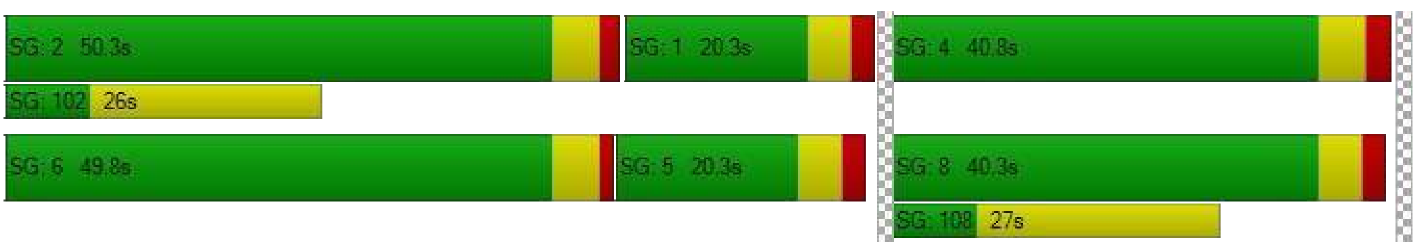
d_M, Delay for Movement [s/veh]	22.33	25.36	25.73	24.29	23.09	23.47	22.84	22.84	22.84	62.05	62.05	8.83
Movement LOS	C	C	C	C	C	C	C	C	C	E	E	A
d_A, Approach Delay [s/veh]	25.41			23.25			22.84			53.42		
Approach LOS	C			C			C			D		
d_I, Intersection Delay [s/veh]	31.81											
Intersection LOS	C											
Intersection V/C	1.004											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	-5.8	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	7991.55	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	24.52	40.69	24.52	0.00
I_p,int, Pedestrian LOS Score for Intersection	3.100	2.555	1.775	0.000
Crosswalk LOS	C	B	A	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1299	1299	1010	1010
d_b, Bicycle Delay [s]	4.26	4.26	8.49	8.49
I_b,int, Bicycle LOS Score for Intersection	2.071	1.918	1.665	2.190
Bicycle LOS	B	A	A	B

Sequence

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



Intersection Level Of Service Report
Intersection 2: OR 38 / W Railroad Ave

Control Type:	Two-way stop	Delay (sec / veh):	16.1
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.015

Intersection Setup

Name	W Railroad Ave			W Railroad Ave			OR 38			OR 38		
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			25.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	W Railroad Ave			W Railroad Ave			OR 38			OR 38		
Base Volume Input [veh/h]	5	4	2	0	1	5	5	305	5	6	339	4
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	9.00	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]	5	4	2	0	1	5	5	305	5	6	339	4
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	1	1	0	0	1	1	83	1	2	92	1
Total Analysis Volume [veh/h]	5	4	2	0	1	5	5	332	5	7	368	4
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	16.09	15.66	10.35	15.89	15.44	10.36	8.02	0.00	0.00	7.94	0.00	0.00
Movement LOS	C	C	B	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.09	0.09	0.09	0.03	0.03	0.03	0.01	0.01	0.01	0.02	0.02	0.02
95th-Percentile Queue Length [ft/ln]	2.26	2.26	2.26	0.78	0.78	0.78	0.31	0.31	0.31	0.43	0.43	0.43
d_A, Approach Delay [s/veh]	14.89			11.20			0.12			0.15		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	0.44											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 3: OR 38 / E Railroad Ave

Control Type:	Two-way stop	Delay (sec / veh):	15.9
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.006

Intersection Setup

Name	E Railroad Ave			E Railroad Ave			OR 38			OR 38		
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			25.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	E Railroad Ave			E Railroad Ave			OR 38			OR 38		
Base Volume Input [veh/h]	0	4	4	0	2	21	25	278	6	1	330	1
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00	8.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	4	4	0	2	21	25	278	6	1	330	1
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	1	1	0	1	6	7	77	2	0	92	0
Total Analysis Volume [veh/h]	0	4	4	0	2	23	28	309	7	1	367	1
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.01	0.01	0.00	0.01	0.03	0.02	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	16.74	15.80	10.05	16.42	15.94	10.51	8.07	0.00	0.00	7.87	0.00	0.00
Movement LOS	C	C	B	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.05	0.05	0.05	0.12	0.12	0.12	0.07	0.07	0.07	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.32	1.32	1.32	3.09	3.09	3.09	1.79	1.79	1.79	0.06	0.06	0.06
d_A, Approach Delay [s/veh]	12.93			10.95			0.66			0.02		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	0.82											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 4: OR 38 / N 6th St

Control Type:	Two-way stop	Delay (sec / veh):	15.4
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.041

Intersection Setup

Name	S 6th St		OR 38		OR 38	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	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]	20.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	S 6th St		OR 38		OR 38	
Base Volume Input [veh/h]	14	10	353	16	11	331
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	8.00	38.00	0.00	7.00
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	10	353	16	11	331
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	3	96	4	3	90
Total Analysis Volume [veh/h]	15	11	384	17	12	360
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.02	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	15.39	10.94	0.00	0.00	8.11	0.00
Movement LOS	C	B	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.18	0.18	0.00	0.00	0.03	0.03
95th-Percentile Queue Length [ft/ln]	4.59	4.59	0.00	0.00	0.78	0.78
d_A, Approach Delay [s/veh]	13.51		0.00		0.26	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	0.56					
Intersection LOS	C					

Intersection Level Of Service Report

Intersection 5: OR 38 / Riverfront Way / Winchester

Control Type:	Two-way stop	Delay (sec / veh):	19.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.144

Intersection Setup

Name	Winchester Ave			Riverfront Way			OR 38			OR 38		
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	1	0	0	0	0	0	1	1	0	0
Entry Pocket Length [ft]	100.00	100.00	50.00	100.00	100.00	100.00	100.00	100.00	450.00	250.00	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]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Winchester Ave			Riverfront Way			OR 38			OR 38		
Base Volume Input [veh/h]	34	7	1	4	2	18	6	263	6	31	256	7
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	20.00	4.00	12.00	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]	34	7	1	4	2	18	6	263	6	31	256	7
Peak Hour Factor	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900	0.7900
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]	11	2	0	1	1	6	2	83	2	10	81	2
Total Analysis Volume [veh/h]	43	9	1	5	3	23	8	333	8	39	324	9
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	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.14	0.03	0.00	0.02	0.01	0.03	0.01	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	19.49	18.54	10.05	17.18	16.56	10.43	7.93	0.00	0.00	8.08	0.00	0.00
Movement LOS	C	C	B	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.61	0.61	0.00	0.18	0.18	0.18	0.02	0.02	0.00	0.10	0.00	0.00
95th-Percentile Queue Length [ft/ln]	15.24	15.24	0.11	4.58	4.58	4.58	0.49	0.49	0.00	2.50	0.00	0.00
d_A, Approach Delay [s/veh]	19.15			12.11			0.18			0.85		
Approach LOS	C			B			A			A		
d_I, Intersection Delay [s/veh]	2.20											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 6: US 101 / Winchester Ave

Control Type:	Signalized	Delay (sec / veh):	11.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.546

Intersection Setup

Name	US 101			US 101			Winchester Ave			Winchester 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	1	0	0	1	0	0	0	0	1	0	0	0
Entry Pocket Length [ft]	125.00	100.00	100.00	75.00	100.00	100.00	100.00	100.00	75.00	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			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			Yes			Yes			Yes		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 101			US 101			Winchester Ave			Winchester Ave		
Base Volume Input [veh/h]	58	601	98	16	670	28	30	6	69	96	20	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 [%]	2.00	6.00	2.00	8.00	7.00	4.00	8.00	0.00	2.00	1.00	0.00	13.00
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	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	58	601	98	16	670	28	30	6	69	96	20	18
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	162	26	4	180	8	8	2	19	26	5	5
Total Analysis Volume [veh/h]	62	646	105	17	720	30	32	6	74	103	22	19
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	2			1			0			1		
v_di, Inbound Pedestrian Volume crossing m	0			1			2			1		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			7			0			0		

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]	12.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	5	2	0	1	6	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lead	-	-	Lead	-	-	-	-	-	-	-	-
Minimum Green [s]	5	10	0	3	10	0	0	5	0	0	5	0
Maximum Green [s]	20	45	0	20	45	0	0	30	0	0	30	0
Amber [s]	3.5	3.8	0.0	3.5	3.8	0.0	0.0	3.5	0.0	0.0	3.5	0.0
All red [s]	1.6	1.3	0.0	1.6	1.6	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	0.0	2.5	4.5	0.0	0.0	2.5	0.0	0.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	15	0	0	16	0	0	18	0	0	19	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			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.1	3.1	0.0	3.1	3.4	0.0	0.0	3.5	0.0	0.0	3.5	0.0
Minimum Recall	No	No		No	No			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		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	C	L	C	C	C	R	C
C, Cycle Length [s]	38	38	38	38	38	38	38	38	38
L, Total Lost Time per Cycle [s]	5.10	5.10	5.10	5.40	5.40	5.40	5.50	5.50	5.50
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00
l2, Clearance Lost Time [s]	0.00	3.10	3.10	0.00	3.40	3.40	3.50	3.50	3.50
g_i, Effective Green Time [s]	21	15	15	21	13	13	7	7	7
g / C, Green / Cycle	0.55	0.40	0.40	0.54	0.35	0.35	0.17	0.17	0.17
(v / s)_i Volume / Saturation Flow Rate	0.03	0.21	0.21	0.02	0.21	0.21	0.02	0.05	0.14
s, saturation flow rate [veh/h]	1781	1810	1723	854	1795	1765	1613	1584	996
c, Capacity [veh/h]	975	736	700	642	624	614	445	267	329
d1, Uniform Delay [s]	4.50	8.53	8.54	4.41	10.28	10.29	13.48	13.84	16.14
k, delay calibration	0.11	0.11	0.11	0.08	0.19	0.19	0.08	0.08	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.03	0.58	0.61	0.01	1.62	1.66	0.06	0.42	0.91
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.06	0.52	0.52	0.03	0.60	0.61	0.09	0.28	0.44
d, Delay for Lane Group [s/veh]	4.53	9.11	9.14	4.42	11.90	11.95	13.54	14.26	17.05
Lane Group LOS	A	A	A	A	B	B	B	B	B
Critical Lane Group	Yes	No	No	No	No	Yes	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.13	1.79	1.71	0.04	2.22	2.19	0.25	0.51	1.15
50th-Percentile Queue Length [ft/ln]	3.19	44.79	42.85	0.89	55.40	54.85	6.14	12.67	28.83
95th-Percentile Queue Length [veh/ln]	0.23	3.23	3.09	0.06	3.99	3.95	0.44	0.91	2.08
95th-Percentile Queue Length [ft/ln]	5.73	80.63	77.14	1.61	99.72	98.73	11.05	22.81	51.89

Movement, Approach, & Intersection Results

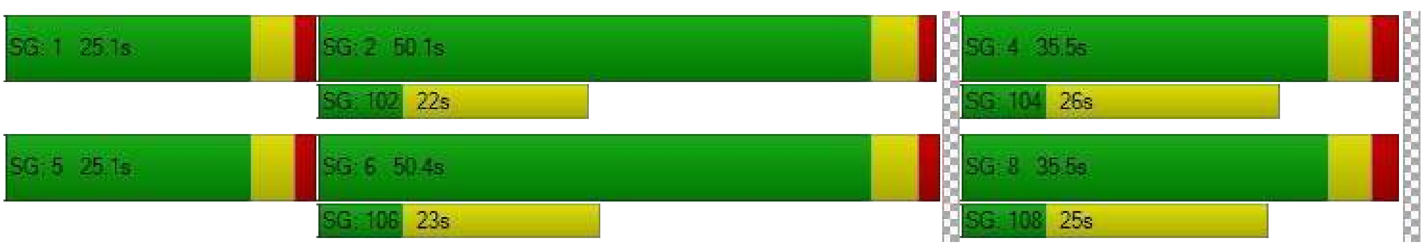
d_M, Delay for Movement [s/veh]	4.53	9.12	9.14	4.42	11.92	11.95	13.54	13.54	14.26	17.05	17.05	17.05
Movement LOS	A	A	A	A	B	B	B	B	B	B	B	B
d_A, Approach Delay [s/veh]	8.78			11.76			14.01			17.05		
Approach LOS	A			B			B			B		
d_I, Intersection Delay [s/veh]	10.99											
Intersection LOS	B											
Intersection V/C	0.546											

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]	9.67	9.67	9.67	9.67
I_p,int, Pedestrian LOS Score for Intersection	2.728	2.685	1.990	1.785
Crosswalk LOS	B	B	A	A
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2358	2358	1572	1572
d_b, Bicycle Delay [s]	0.61	0.61	0.87	0.87
I_b,int, Bicycle LOS Score for Intersection	2.230	2.192	1.744	1.797
Bicycle LOS	B	B	A	A

Sequence

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



Intersection Level Of Service Report
Intersection 7: Winchester Ave / W Railroad Ave

Control Type:	Two-way stop	Delay (sec / veh):	10.8
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.002

Intersection Setup

Name	River Bend Rd			W Railroad Ave			Winchester Ave			Winchester 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]	25.00			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	River Bend Rd			W Railroad Ave			Winchester Ave			Winchester Ave		
Base Volume Input [veh/h]	15	0	5	2	1	5	1	113	26	4	102	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	15	0	5	2	1	5	1	113	26	4	102	0
Peak Hour Factor	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700	0.8700
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	1	1	0	1	0	32	7	1	29	0
Total Analysis Volume [veh/h]	17	0	6	2	1	6	1	130	30	5	117	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.03	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.53	10.85	9.13	10.40	10.84	8.88	7.43	0.00	0.00	7.52	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.10	0.10	0.10	0.03	0.03	0.03	0.00	0.00	0.00	0.01	0.01	0.01
95th-Percentile Queue Length [ft/ln]	2.47	2.47	2.47	0.83	0.83	0.83	0.05	0.05	0.05	0.26	0.26	0.26
d_A, Approach Delay [s/veh]	10.16			9.43			0.05			0.31		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	1.15											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 8: Winchester Ave / Elm Ave

Control Type:	Two-way stop	Delay (sec / veh):	10.2
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.017

Intersection Setup

Name	Elm Ave		Winchester Ave		Winchester Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	11.00	11.00	11.00	11.00	11.00	11.00
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]	25.00		25.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Elm Ave		Winchester Ave		Winchester Ave	
Base Volume Input [veh/h]	11	5	122	6	2	124
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	3.00	0.00	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]	11	5	122	6	2	124
Peak Hour Factor	0.9000	0.9000	0.9000	0.9000	0.9000	0.9000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	34	2	1	34
Total Analysis Volume [veh/h]	12	6	136	7	2	138
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.01	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.17	9.05	0.00	0.00	7.48	0.00
Movement LOS	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.07	0.07	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.80	1.80	0.00	0.00	0.10	0.10
d_A, Approach Delay [s/veh]	9.80		0.00		0.11	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.64					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 9: Winchester Ave / E Railroad Ave

Control Type:	Two-way stop	Delay (sec / veh):	10.9
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.018

Intersection Setup

Name	Private Dwy			E Railroad Ave			Winchester Ave			Winchester Ave		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Right	Right2	Left2	Left	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			25.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	Private Dwy			E Railroad Ave			Winchester Ave			Winchester Ave		
Base Volume Input [veh/h]	10	4	0	1	1	27	17	106	6	2	97	2
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	2.00	0.00	0.00	0.00	7.00	0.00	0.00	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]	10	4	0	1	1	27	17	106	6	2	97	2
Peak Hour Factor	0.8800	0.8800	1.0000	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]	3	1	0	0	0	8	5	30	2	1	28	1
Total Analysis Volume [veh/h]	11	5	0	1	1	31	19	120	7	2	110	2
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.01	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.95	9.04	9.01	10.53	10.52	8.94	7.52	0.00	0.00	7.45	0.00	0.00
Movement LOS	B	A	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.07	0.07	0.07	0.11	0.11	0.11	0.04	0.04	0.04	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.78	1.78	1.78	2.77	2.77	2.77	1.00	1.00	1.00	0.10	0.10	0.10
d_A, Approach Delay [s/veh]	10.35			9.04			0.98			0.13		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	2.01											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 10: Winchester Ave / S 6th St

Control Type:	Two-way stop	Delay (sec / veh):	10.5
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.013

Intersection Setup

Name	S 6th St			S 6th St			Winchester Ave			Winchester 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]	20.00			25.00			25.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	S 6th St			S 6th St			Winchester Ave			Winchester Ave		
Base Volume Input [veh/h]	7	4	1	1	7	9	6	81	14	0	69	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 [%]	17.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	2.00	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]	7	4	1	1	7	9	6	81	14	0	69	0
Peak Hour Factor	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800	0.7800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	1	0	0	2	3	2	26	4	0	22	0
Total Analysis Volume [veh/h]	9	5	1	1	9	12	8	104	18	0	88	0
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

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

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.42	10.40	8.92	10.04	10.47	8.81	7.38	0.00	0.00	7.44	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.07	0.07	0.07	0.08	0.08	0.08	0.02	0.02	0.02	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.66	1.66	1.66	2.08	2.08	2.08	0.40	0.40	0.40	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	10.32			9.55			0.45			0.00		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	1.66											
Intersection LOS	B											

Attachment B: Future Train Event Queueing Calculations

2045 Winchester - Mixed Freight

PM	EB		Existing
2	minutes/train		
127	vehicles/hour		
4	vehicles/train		
200	95% queue length		
k	P		Cumulative
0		1.5%	1.5%
1		6.1%	7.6%
2		13.0%	20.6%
3		18.3%	38.9%
4		19.4%	58.3%
5		16.4%	74.8%
6		11.6%	86.4%
7		7.0%	93.4%
8		3.7%	97.1%
9		1.7%	98.8%
10		0.7%	99.6%
11		0.3%	99.9%
12		0.1%	100.0%
13		0.0%	100.0%
14		0.0%	100.0%
15		0.0%	100.0%
16		0.0%	100.0%
17		0.0%	100.0%
18		0.0%	100.0%
19		0.0%	100.0%
20		0.0%	100.0%
21		0.0%	100.0%
22		0.0%	100.0%
23		0.0%	100.0%
24		0.0%	100.0%
25		0.0%	100.0%
26		0.0%	100.0%
27		0.0%	100.0%
28		0.0%	100.0%
29		0.0%	100.0%
30		0.0%	100.0%
31		0.0%	100.0%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

PM	WB		Existing
2	minutes/train		
134	vehicles/hour		
4	vehicles/train		
200	95% queue length		
k	P		Cumulative
0		1.1%	1.1%
1		5.1%	6.3%
2		11.5%	17.7%
3		17.1%	34.8%
4		19.0%	53.8%
5		17.0%	70.9%
6		12.7%	83.5%
7		8.1%	91.6%
8		4.5%	96.1%
9		2.2%	98.4%
10		1.0%	99.4%
11		0.4%	99.8%
12		0.2%	99.9%
13		0.1%	100.0%
14		0.0%	100.0%
15		0.0%	100.0%
16		0.0%	100.0%
17		0.0%	100.0%
18		0.0%	100.0%
19		0.0%	100.0%
20		0.0%	100.0%
21		0.0%	100.0%
22		0.0%	100.0%
23		0.0%	100.0%
24		0.0%	100.0%
25		0.0%	100.0%
26		0.0%	100.0%
27		0.0%	100.0%
28		0.0%	100.0%
29		0.0%	100.0%
30		0.0%	100.0%
31		0.0%	100.0%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

40	0.0%	100.0%	40	0.0%	100.0%
41	0.0%	100.0%	41	0.0%	100.0%
42	0.0%	100.0%	42	0.0%	100.0%
43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
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149	0.0%	100.0%
150	0.0%	100.0%

2045 Winchester - Non- Mixed Freight

PM	EB	Existing
3	minutes/train	
127	vehicles/hour	
6	vehicles/train	
275	95% queue length	
k	P	Cumulative
0	0.2%	0.2%
1	1.1%	1.3%
2	3.5%	4.8%
3	7.5%	12.3%
4	11.8%	24.1%
5	15.0%	39.1%
6	15.9%	55.0%
7	14.4%	69.5%
8	11.5%	80.9%
9	8.1%	89.0%
10	5.1%	94.1%
11	3.0%	97.1%
12	1.6%	98.6%
13	0.8%	99.4%
14	0.3%	99.8%
15	0.1%	99.9%
16	0.1%	100.0%
17	0.0%	100.0%
18	0.0%	100.0%
19	0.0%	100.0%
20	0.0%	100.0%
21	0.0%	100.0%
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31	0.0%	100.0%
32	0.0%	100.0%
33	0.0%	100.0%
34	0.0%	100.0%
35	0.0%	100.0%
36	0.0%	100.0%
37	0.0%	100.0%
38	0.0%	100.0%
39	0.0%	100.0%

PM	WB	Existing
3	minutes/train	
134	vehicles/hour	
7	vehicles/train	
275	95% queue length	
k	P	Cumulative
0	0.1%	0.1%
1	0.8%	0.9%
2	2.8%	3.7%
3	6.2%	9.9%
4	10.3%	20.2%
5	13.8%	34.1%
6	15.5%	49.5%
7	14.8%	64.3%
8	12.4%	76.7%
9	9.2%	86.0%
10	6.2%	92.1%
11	3.8%	95.9%
12	2.1%	98.0%
13	1.1%	99.1%
14	0.5%	99.6%
15	0.2%	99.8%
16	0.1%	99.9%
17	0.0%	100.0%
18	0.0%	100.0%
19	0.0%	100.0%
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146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

2045 Winchester - Non- Mixed Freight @ 10 mph

PM	EB		2045 @ 10 mph
5	minutes/train		
127	vehicles/hour		
11	vehicles/train		
400	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.1%	0.2%
3		0.5%	0.7%
4		1.3%	2.0%
5		2.8%	4.8%
6		4.9%	9.7%
7		7.5%	17.2%
8		9.9%	27.1%
9		11.6%	38.7%
10		12.3%	51.0%
11		11.8%	62.9%
12		10.4%	73.3%
13		8.5%	81.8%
14		6.4%	88.3%
15		4.5%	92.8%
16		3.0%	95.8%
17		1.9%	97.7%
18		1.1%	98.8%
19		0.6%	99.4%
20		0.3%	99.7%
21		0.2%	99.9%
22		0.1%	99.9%
23		0.0%	100.0%
24		0.0%	100.0%
25		0.0%	100.0%
26		0.0%	100.0%

PM	WB		2045 @ 10 mph
5	minutes/train		
134	vehicles/hour		
11	vehicles/train		
425	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.1%	0.1%
3		0.3%	0.4%
4		0.9%	1.3%
5		2.0%	3.4%
6		3.8%	7.2%
7		6.1%	13.3%
8		8.5%	21.8%
9		10.5%	32.3%
10		11.7%	44.0%
11		11.9%	55.9%
12		11.1%	67.0%
13		9.5%	76.6%
14		7.6%	84.2%
15		5.7%	89.8%
16		3.9%	93.8%
17		2.6%	96.4%
18		1.6%	98.0%
19		0.9%	98.9%
20		0.5%	99.5%
21		0.3%	99.7%
22		0.1%	99.9%
23		0.1%	99.9%
24		0.0%	100.0%
25		0.0%	100.0%
26		0.0%	100.0%

27	0.0%	100.0%
28	0.0%	100.0%
29	0.0%	100.0%
30	0.0%	100.0%
31	0.0%	100.0%
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69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
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147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

2045 OR38 - Non- Mixed Freight

PM	EB		Existing
3	minutes/train		
307	vehicles/hour		
15	vehicles/train		
550	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.1%
5		0.2%	0.2%
6		0.4%	0.6%
7		0.9%	1.5%
8		1.6%	3.1%
9		2.8%	5.9%
10		4.3%	10.2%
11		6.0%	16.3%
12		7.7%	24.0%
13		9.1%	33.1%
14		10.0%	43.0%
15		10.2%	53.2%
16		9.8%	63.0%
17		8.8%	71.9%
18		7.5%	79.4%
19		6.1%	85.5%
20		4.7%	90.2%
21		3.4%	93.6%
22		2.4%	96.0%
23		1.6%	97.5%
24		1.0%	98.6%
25		0.6%	99.2%
26		0.4%	99.6%
27		0.2%	99.8%
28		0.1%	99.9%
29		0.1%	99.9%
30		0.0%	100.0%
31		0.0%	100.0%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

PM	WB		Existing
3	minutes/train		
351	vehicles/hour		
18	vehicles/train		
625	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.1%	0.1%
7		0.2%	0.4%
8		0.5%	0.9%
9		1.0%	2.0%
10		1.8%	3.8%
11		2.9%	6.7%
12		4.3%	11.0%
13		5.7%	16.7%
14		7.2%	23.9%
15		8.4%	32.3%
16		9.2%	41.6%
17		9.5%	51.1%
18		9.3%	60.4%
19		8.6%	69.0%
20		7.5%	76.6%
21		6.3%	82.9%
22		5.0%	87.9%
23		3.8%	91.7%
24		2.8%	94.5%
25		2.0%	96.5%
26		1.3%	97.8%
27		0.9%	98.7%
28		0.5%	99.2%
29		0.3%	99.6%
30		0.2%	99.8%
31		0.1%	99.9%
32		0.1%	99.9%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

40	0.0%	100.0%
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145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

2045 OR38 - Mixed Freight

PM	EB		Existing
2	minutes/train		
307	vehicles/hour		
10	vehicles/train		
400	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.2%	0.2%
3		0.6%	0.9%
4		1.6%	2.5%
5		3.4%	5.9%
6		5.7%	11.6%
7		8.4%	20.0%
8		10.7%	30.7%
9		12.2%	42.9%
10		12.5%	55.4%
11		11.6%	67.0%
12		9.9%	76.9%
13		7.8%	84.7%
14		5.7%	90.4%
15		3.9%	94.3%
16		2.5%	96.8%
17		1.5%	98.2%
18		0.9%	99.1%
19		0.5%	99.6%
20		0.2%	99.8%
21		0.1%	99.9%
22		0.1%	100.0%
23		0.0%	100.0%
24		0.0%	100.0%
25		0.0%	100.0%
26		0.0%	100.0%
27		0.0%	100.0%
28		0.0%	100.0%
29		0.0%	100.0%
30		0.0%	100.0%
31		0.0%	100.0%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

PM	WB		Existing
2	minutes/train		
351	vehicles/hour		
12	vehicles/train		
450	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.1%	0.1%
3		0.2%	0.3%
4		0.6%	0.9%
5		1.5%	2.5%
6		3.0%	5.4%
7		4.9%	10.3%
8		7.2%	17.6%
9		9.4%	27.0%
10		11.0%	37.9%
11		11.7%	49.6%
12		11.4%	61.0%
13		10.3%	71.3%
14		8.6%	79.8%
15		6.7%	86.5%
16		4.9%	91.4%
17		3.4%	94.8%
18		2.2%	97.0%
19		1.3%	98.3%
20		0.8%	99.1%
21		0.4%	99.5%
22		0.2%	99.8%
23		0.1%	99.9%
24		0.1%	100.0%
25		0.0%	100.0%
26		0.0%	100.0%
27		0.0%	100.0%
28		0.0%	100.0%
29		0.0%	100.0%
30		0.0%	100.0%
31		0.0%	100.0%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%

40	0.0%	100.0%
41	0.0%	100.0%
42	0.0%	100.0%
43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%
48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
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58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
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67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

40	0.0%	100.0%
41	0.0%	100.0%
42	0.0%	100.0%
43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%
48	0.0%	100.0%
49	0.0%	100.0%
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51	0.0%	100.0%
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67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

2045 OR38 - Non- Mixed Freight @ 10 mph

PM	EB		2045 @ 10 mph
5	minutes/train		
307	vehicles/hour		
26	vehicles/train		
850	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.1%	0.1%
12		0.1%	0.2%
13		0.3%	0.5%
14		0.5%	0.9%
15		0.8%	1.7%
16		1.2%	3.0%
17		1.9%	4.8%
18		2.7%	7.5%
19		3.6%	11.1%
20		4.6%	15.7%
21		5.6%	21.3%
22		6.5%	27.8%
23		7.2%	35.0%
24		7.7%	42.8%
25		7.9%	50.7%
26		7.8%	58.4%

PM	WB		2045 @ 10 mph
5	minutes/train		
351	vehicles/hour		
29	vehicles/train		
950	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.0%	0.0%
12		0.0%	0.0%
13		0.0%	0.1%
14		0.1%	0.1%
15		0.1%	0.3%
16		0.3%	0.6%
17		0.5%	1.0%
18		0.8%	1.8%
19		1.2%	3.0%
20		1.7%	4.7%
21		2.4%	7.1%
22		3.2%	10.2%
23		4.0%	14.3%
24		4.9%	19.2%
25		5.7%	24.9%
26		6.5%	31.4%

27	7.4%	65.8%	27	7.0%	38.4%
28	6.7%	72.5%	28	7.3%	45.7%
29	5.9%	78.5%	29	7.4%	53.1%
30	5.1%	83.5%	30	7.2%	60.3%
31	4.2%	87.7%	31	6.8%	67.1%
32	3.3%	91.0%	32	6.2%	73.3%
33	2.6%	93.6%	33	5.5%	78.8%
34	1.9%	95.6%	34	4.7%	83.5%
35	1.4%	97.0%	35	4.0%	87.4%
36	1.0%	98.0%	36	3.2%	90.7%
37	0.7%	98.7%	37	2.5%	93.2%
38	0.5%	99.2%	38	2.0%	95.2%
39	0.3%	99.5%	39	1.5%	96.6%
40	0.2%	99.7%	40	1.1%	97.7%
41	0.1%	99.8%	41	0.8%	98.5%
42	0.1%	99.9%	42	0.5%	99.0%
43	0.0%	99.9%	43	0.4%	99.4%
44	0.0%	100.0%	44	0.2%	99.6%
45	0.0%	100.0%	45	0.2%	99.7%
46	0.0%	100.0%	46	0.1%	99.8%
47	0.0%	100.0%	47	0.1%	99.9%
48	0.0%	100.0%	48	0.0%	99.9%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%

61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%
93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%

95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%

95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%

129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

2045 OR38 - Non- Mixed Freight @ 10 mph
with a 4300 ft train length

PM	EB		2045 @ 10 mph
5.72	minutes/train		
307	vehicles/hour		
29	vehicles/train		
950	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.0%	0.0%
12		0.0%	0.0%
13		0.0%	0.1%
14		0.1%	0.1%
15		0.1%	0.3%
16		0.3%	0.6%
17		0.5%	1.0%
18		0.8%	1.8%
19		1.2%	2.9%
20		1.7%	4.6%
21		2.4%	7.0%
22		3.2%	10.2%
23		4.0%	14.2%
24		4.9%	19.1%
25		5.7%	24.8%
26		6.5%	31.3%

PM	WB		2045 @ 10 mph
5.72	minutes/train		
351	vehicles/hour		
33	vehicles/train		
1075	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.0%	0.0%
12		0.0%	0.0%
13		0.0%	0.0%
14		0.0%	0.0%
15		0.0%	0.0%
16		0.0%	0.1%
17		0.1%	0.1%
18		0.1%	0.3%
19		0.2%	0.5%
20		0.4%	0.9%
21		0.6%	1.5%
22		0.9%	2.4%
23		1.3%	3.7%
24		1.8%	5.5%
25		2.5%	8.0%
26		3.2%	11.1%

27	7.0%	38.3%	27	3.9%	15.1%
28	7.3%	45.6%	28	4.7%	19.8%
29	7.4%	53.0%	29	5.4%	25.2%
30	7.2%	60.2%	30	6.0%	31.2%
31	6.8%	66.9%	31	6.5%	37.7%
32	6.2%	73.2%	32	6.8%	44.5%
33	5.5%	78.7%	33	6.9%	51.4%
34	4.7%	83.4%	34	6.8%	58.2%
35	4.0%	87.4%	35	6.5%	64.7%
36	3.2%	90.6%	36	6.0%	70.8%
37	2.6%	93.2%	37	5.5%	76.2%
38	2.0%	95.1%	38	4.8%	81.0%
39	1.5%	96.6%	39	4.1%	85.2%
40	1.1%	97.7%	40	3.5%	88.6%
41	0.8%	98.4%	41	2.8%	91.4%
42	0.5%	99.0%	42	2.2%	93.7%
43	0.4%	99.3%	43	1.7%	95.4%
44	0.2%	99.6%	44	1.3%	96.7%
45	0.2%	99.7%	45	1.0%	97.7%
46	0.1%	99.8%	46	0.7%	98.4%
47	0.1%	99.9%	47	0.5%	99.0%
48	0.0%	99.9%	48	0.4%	99.3%
49	0.0%	100.0%	49	0.2%	99.6%
50	0.0%	100.0%	50	0.2%	99.7%
51	0.0%	100.0%	51	0.1%	99.8%
52	0.0%	100.0%	52	0.1%	99.9%
53	0.0%	100.0%	53	0.0%	99.9%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%

61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
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TECHNICAL MEMORANDUM #6

Alternatives Analysis

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Technical Memorandum

August 21, 2023 Project# 27003.011

To: Deanna Schafer and Kim Clardy, *City of Reedsport*
Thomas Guevara, *Oregon Department of Transportation*

From: Michael Ruiz-Leon, Allison Woodworth, Matt Bell, Jon Gerlach, PE, and Marc Butorac, PE, PTOE

Project: City of Reedsport Rail Crossing Study and Refinement Plan

RE: Final Tech Memorandum #6: Alternatives Analysis

TABLE OF CONTENTS

INTRODUCTION

This memorandum provides a summary of the transportation needs (Needs Statement) introduced to the Reedsport transportation system with the development of the Port of Coos Bay Pacific Coast Intermodal Port and associated increased train activity through the community. To address these needs, a set of potential alternative solutions are identified and initially evaluated to address transportation system deficiencies and mitigation impacts associated with the anticipated increased rail activity. From this evaluation, the top two most promising alternatives have been identified for further consideration and refinement.

NEEDS STATEMENT

Based on the existing and future conditions analysis and feedback from the Project Advisory Committee (PAC), Project Management Team (PMT), community member interviews, and Online Open House #1, the following deficiencies have been identified to date based on the projected increase in traffic demand and train activity associated with the Port of Coos Bay Pacific Coast Intermodal Port:

1) **Rail crossing delays and access/circulation barriers** – A 4,100-foot train traveling at 10 mph through downtown Reedsport during 30th highest hour traffic conditions will create the following operational and/or safety related deficiencies:
    a. Eastbound vehicular queues on OR 38 will spill back into the US 101/OR 38 intersection.

   b. Multiple cycles will be required at the US 101/OR 38 intersection to recover from the train event.
   c. Simultaneous delays of 5 ½ minutes or greater will occur at the OR 38 and Winchester Avenue rail crossings – the delays will increase response times for emergency service vehicles (fire, ambulance, and police).
   d. Local circulation and access delays exceeding 60 seconds (level-of-service F) will occur at cross streets to OR 38 (i.e., Myrtle Avenue, Laurel Avenue, W Railroad Avenue, E Railroad Avenue, Fir Avenue, North 6th Street, and North 5th Street) and Winchester Avenue (i.e., North 10th Street, W Railroad Avenue-River Bend Road, Elm Avenue, E Railroad Avenue, and North 7th Street).
   e. Traffic volumes will increase on the vertically and horizontal restricted Port Dock Road rail undercrossing, as well as E Railroad Avenue, W Railroad Avenue, and Riverfront Way.
2) **Increased train activity** – The forecasted increase from 2 to 14 trains per day is anticipated to create the following potential issues:
   a. Increased probability of delays to emergency service provider (fire, ambulance, and police) response time to areas east and west of the rail line as the police station and Fire Station 1 are located east of the rail line on 4th Avenue. The hospital and Fire Station 2 are located west of the rail line on Ranch Road and Frontage Road.
   b. Increased train horn use during school or nighttime hours leading to quality-of-life concerns from nearby residents and businesses.
   c. Increased pedestrian-train conflicts due to the lack of sidewalk gates on OR 38 and lack of sidewalks on Winchester Avenue.
   d. Peak hour queues on OR 38 and Winchester Avenue that create local circulation and access delays at cross streets, including W Railroad Avenue, River Bend Road, Elm Avenue, and E Railroad Avenue.
   e. Increased use of Port Dock Road undercrossing and related increases in cut-through traffic on local streets will create issues at the undercrossing as well as the OR 38/Riverfront Way-2nd Street and US 101/OR 38 intersections.

3) **US 101/OR 38 operations** – The signalized intersection is forecasted to operate at capacity (a volume-to-capacity [v/c] ratio of 1.0) in Year 2045 and exceed the Oregon Highway Plan mobility standard of 0.85. These operations will result in decreased mobility for motorists and freight and long delays during conditions exceeding the 30th highest peak hour.

Given the published high-level program associated with the proposed Port of Coos Bay container facility project and the inability to establish defined train schedules due to Port operations and rail operations throughout the western United States, the project team has focused on identifying the point at which the transportation system does not function effectively (a 4,100-foot train at 10 mph) nor meet the goals of the City of Reedsport's comprehensive plan and necessitate mitigation. However, the specific timing of the identified mitigation measures will be primarily driven by the availability of funding and the ramp up of rail operations at the proposed Port facility driven by market demands. In addition, the following factors have been identified that may further degrade or minimize the issues identified above:

Degradation factors:

- Longer trains – Exceeding 4,100 feet at 10 mph
- Slower trains – Traveling at speeds less than 10 mph
- Increased number of trains – Greater than 14 trains per day
- Traffic conditions exceeding the 30th highest peak hour demand on OR 38 – Higher peak hour volumes and proportion of trucks and recreation vehicles

Minimization factors:

- Shorter trains – Less than 4,100 feet at 10 mph
- Faster trains – Traveling in excess of 10 mph
- Reduced number of trains – Less than 14 trains per day

Other Considerations and Study Assumptions:

Train length – Ports and railroads are generally incentivized to operate fewer and longer trains to transport containers. There are operational and physical limitations to the maximum train length permitted along any railroad line. Operational limitations include the grade and horizontal curvature of the railroad alignment, which is directly related to the number and position of the locomotives required to move the train over the line segment. These limitations can be challenging to overcome, and some are impractical to change. Additional limitations to train length are typically physical constraints such as port/dock rail capacity, upstream/downstream switching yard capacity, and rail siding lengths. Based on the available program information for the proposed Port facility and a cursory review of the Coos Bay Rail Line infrastructure between Coos Bay and Eugene, ***trains are anticipated to be between 4,000 and 5,000 feet in length and potentially longer***. Future studies by the Port will better characterize the constraints to potential train length.

A 5,000-foot (or longer) train traveling at 10 mph through downtown Reedsport will further increase motor vehicle queues, crossing delays, emergency vehicle response times, access delays, and traffic volumes on the local street system. Table 1 shows how train length impacts motor vehicle queues and delays on OR 38 and Winchester Avenue. Attachment "A" contains the queuing analysis worksheets.

Table 1. Train Length versus Motor Vehicle Queues and Delays

Train Length (ft)	OR 38 Queue (ft)		OR 38 Delay (sec)	Winchester Avenue Queue (ft)		Winchester Avenue Delay (sec)
	Eastbound	Westbound		Eastbound	Westbound	
6,000	1,425	1,600	459.1	575	625	459.1
5,000	1,225	1,375	390.9	500	550	390.9
4,100	1,050	1,200	329.5	450	475	329.5
4,000	975	1,100	322.7	425	475	322.7
3,000	825	950	254.4	350	375	254.4
2,000	650	725	186.4	275	300	186.4
1,500	525	600	152.3	225	250	152.3

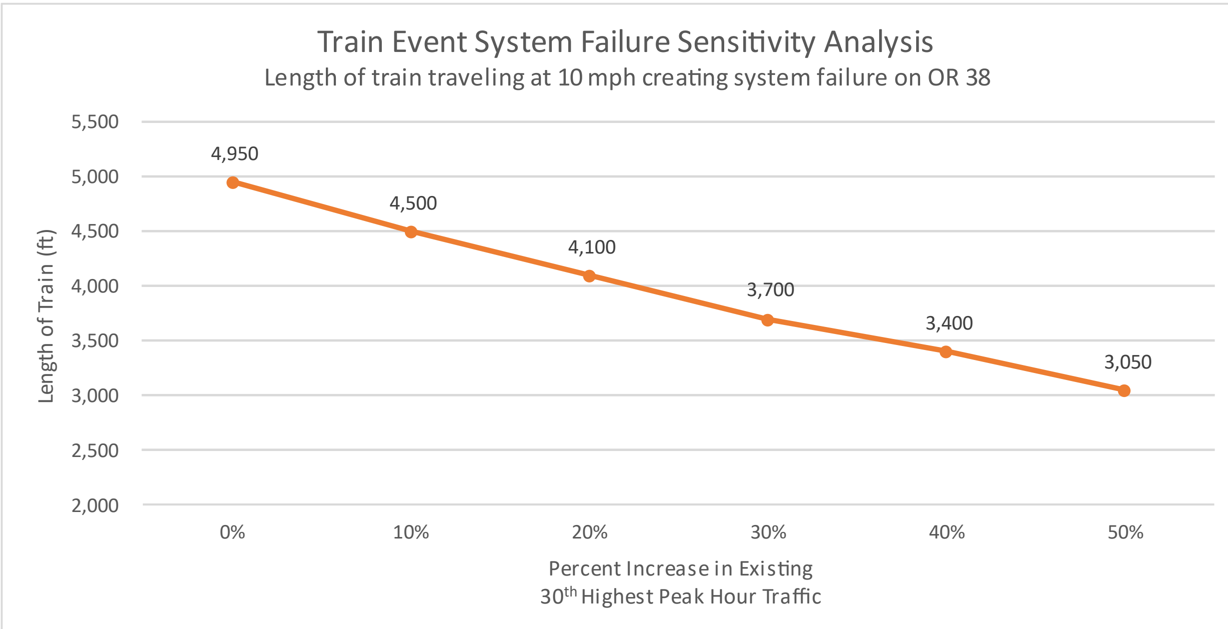
Potential for moving containers by truck vs. train – Port facilities are generally set up to transport containers by train, truck, or a mix of modes depending on their location and proximity to population centers, and availability of trucks to support the required transit. The Port of Coos Bay's remote nature (i.e., 185 miles south of Portland) and relatively limited access to the interstate freeway system will make it similar in nature to Port of Prince Rupert in British Columbia, Canada, which is primarily serviced by trains. Given the location, likely destination of containerized goods, and existing highway infrastructure capacity, nearly all containers will be transported by rail. Thus, ***significantly increased truck traffic through Reedsport via OR 38 and US 101 is <u>not anticipated</u> based on the project team's understanding of the proposed Port of Coos Bay container facility***.

Train speed – Due to the existing conditions of the Umpqua Bridge, horizontal curvature in the rail line both upstream and downstream of Reedsport, and magnitude of funding likely needed to improve existing rail tunnels and bridges, ***trains speeds through Reedsport are anticipated to remain in the 10 to 25 mph range***. Future studies by the Port will better characterize the constraints to potential train speeds within Reedsport.

OR 38 forecasted traffic growth and peak season conditions – The traffic forecasts used in the existing and future conditions analysis represent the 30th highest peak hour conditions that typically occur on an average weekday in August. The future forecasted 2045 traffic volumes are based on a 1 percent growth rate (23 percent total growth in traffic). While the vehicular queues and blockage delays at the OR 38 and

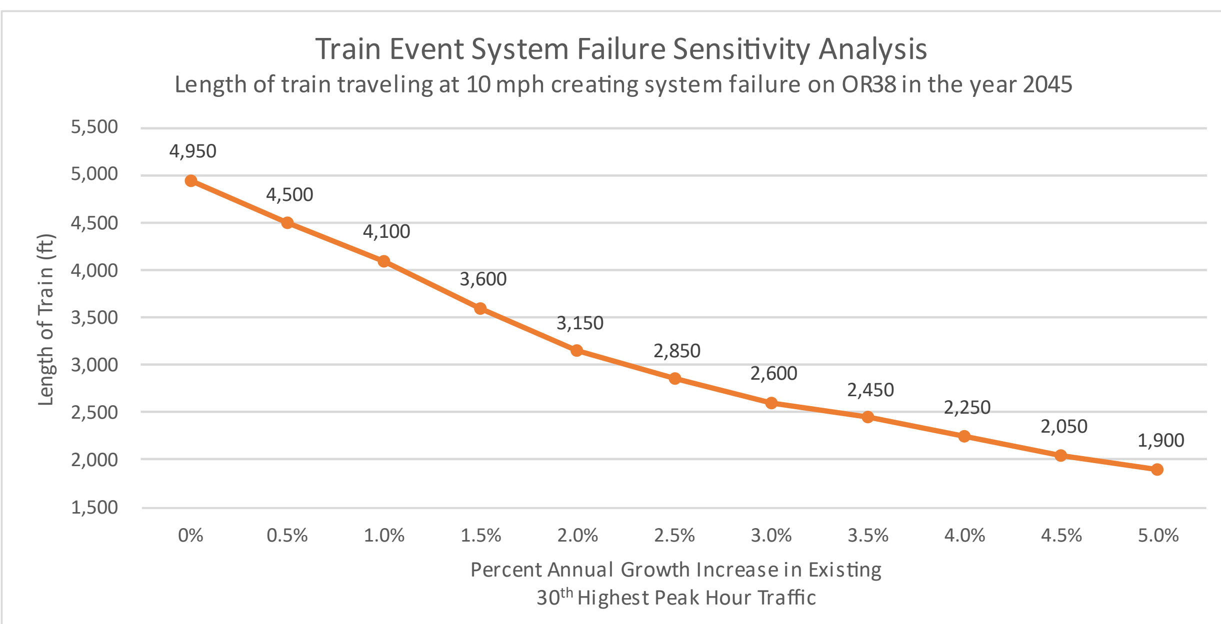
Winchester Avenue rail crossings are primarily driven by train length and speed, traffic volumes and vehicle types play a lesser role in the overall associated delay and queuing-related impacts to the community. To further understand the role that vehicular traffic plays, the following two exhibits provide a near- and long-term sensitivity analysis as to when the transportation system breaks down (i.e., eastbound vehicles on OR 38 spilling back into US 101).

Exhibit A. Percent Increase in Traffic Over Existing 30th Highest Peak Hour Conditions



As shown in Exhibit A, a 50 percent increase in traffic (over existing volumes) on OR 38 during the peak hour would lead to an approximately 3,050-foot train at 10 mph, extending queues into the US 101 intersection.

Exhibit B. Percent Annual Growth Rate in Over Forecasted Year 2045 30th Highest Peak Hour Conditions



As shown in Exhibit B, a theoretical annualized growth rate of 5 percent per year on OR 38 during the peak hour would lead to an approximately 1,900-foot train at 10 mph extending queues into the US 101 intersection in Year 2045. **However, it should be noted that traffic volumes between Years 2004 and 2022 have grown by approximately 1 percent per year, consistent with the study assumptions identified above.** Attachment "A" contains the queuing analysis worksheets.

ALTERNATIVES DEVELOPMENT

The following alternatives were developed to address these transportation needs. The alternatives were developed by the project team with input from the PMT and PAC and documented in the *Alternative Design Methodology & Assumptions and List of Initial Alternatives* memorandum (see Attachment "B").

No-Build Alternative

This alternative includes no improvements at the rail crossings, nor any improvements along OR 38 or Winchester Avenue. As indicated previously, the proposed Port facility is expected to increase train activity through downtown Reedsport, which will increase crossing delays, create access/circulation barriers, and impact traffic operations and safety on OR 38, Winchester Avenue, and other streets and intersections within the area. The level of impact varies based on the length and speed of the trains, as well as the frequency of train events; however, as indicated in previous memorandums and in the needs statement above, the impact is expected to be significant. This alternative establishes the baseline for evaluating and understanding the impacts of the increase in train activity of the goals and objectives of the City's Transportation System Plan (TSP) and the goals and objectives of this study.

No-Build Alternative Evaluation

The no-build alternative was evaluated based on the project evaluation criteria. Table 2 summarizes the average rating for each criterion and overall average rating for the alternative. Attachment "C" provides the full detailed rating for the alternative.

Table 2. No-Build Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
No-Build	-1.2	-0.8	-1.0	-1.3	-1.0	-1.0	-0.7	-1.0

At-Grade Rail Crossing Alternatives

There are well-established criteria for the protection of at-grade crossings, largely based upon established Manual of Uniform Traffic Control Device (MUTCD) standards.

The existing at-grade crossings on OR 38 and Winchester Avenue currently feature modern and appropriate crossing protection, with active warning features that include gate arms, warning bell, and flashers. Both crossings have been improved with new active warning hardware and crossing surfaces within the last decade as shown in the images below.

OR 38 Rail Crossing (Facing East)

Winchester Avenue Rail Crossing (Facing East)

Improvements can be made to the existing at-grade crossing(s) to further enhance their safety while also providing for the implementation of a quite-zone within Reedsport, which would limit the prescribed and regular use of train horns when trains approach and occupy the crossing(s).

The methodologies required for the application of a quiet zone generally provide for additional means of keeping vehicles and pedestrians away from the tracks as a train approaches. The two most common crossing enhancements are the installation of a centerline median or barrier that limits the ability of vehicles to circumvent the typical dual quadrant gate arms that are in place, or the installation of four quadrant gate arms that provide protection of all travel lanes in both directions and limit the access of vehicles into the crossing as a train approaches. Either approach could further enhance safety at the existing at-grade crossings while reducing train horn use by complying with quiet zone requirements.

A third less common but effective means of reducing train horn use is the installation of fixed wayside horn devices that are mounted at the crossing and focus their horn sounds upon the traffic lanes (as opposed to trains using their horns). Since the sound from the wayside horns are focused upon the roadway, the horn volume required is much less than that from the horn mounted upon the train, which generally radiates sound at not only a greater volume, but also within a widely radiating pattern around the tracks, often at considerable distance from the grade crossing in order to be effectively heard at the crossing.

In addition to the protections for vehicular traffic, gates and flashers across the pedestrian and/or combined-use crossings could be installed. These dedicated warning devices provide positive protection of the crossing similar to roadway gates and can be augmented with additional fixed fencing or elements that further limit the ability of pedestrian of bicycle traffic to circumvent the closed gate arms.

1A – Four-Quadrant Gated Rail Crossing on OR 38

This alternative would provide a four-quadrant gated rail crossing on OR 38 to improve the safety of the existing at-grade rail crossing as well as support implementation of a quiet zone through downtown Reedsport. The crossing would include two gate arms and flashers on both sides of the rail line and in both directions. The crossing would also include gate arms and flashers across the pedestrian facilities. This type of crossing prevents motorists from driving around the lowered gates. With this type of crossing, the entry gates close before the exit gates to allow motorists to clear the rail line. The gates also lower long before the train arrives. Exhibit 1A illustrates a four-quadrant gated rail crossing on OR 38.

Exhibit 1A. Four-Quadrant Gated Rail Crossing on OR 38

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the four-quadrant gated rail crossing on OR 38 based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $360,000.

1B – Median Barrier on OR 38

This alternative would provide a median barrier on OR 38 to improve the safety of the existing at-grade rail crossing as well as support implementation of a quiet zone through downtown Reedsport. The median barrier would be provided at each approach to the rail crossing to prevent motorists from driving around the lowered gates. Exhibit 1B illustrates a median barrier on OR 38.

Exhibit 1B. Median Barrier on OR 38

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the median barrier on OR 38 based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $550,000.

1C – Four-Quadrant Gated Rail Crossing on Winchester Avenue

This alternative would provide a four-quadrant gated rail crossing on Winchester Avenue to improve the safety of the existing at-grade rail crossing as well as support implementation of a quiet zone through downtown Reedsport. The crossing would include two gate arms and flashers on both sides of the rail line and in both directions. The crossing would also include gate arms and flashers across the pedestrian facilities. This type of crossing prevents motorists from driving around the lowered gates. With this type of crossing, the entry gates close before the exit gates to allow motorists to clear the rail line. The gates also lower long before the train arrives. Exhibit 1C illustrates a four-quadrant gated rail crossing on Winchester Avenue.

Exhibit 1C. Four-Quadrant Gated Rail Crossing on Winchester Avenue

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the four-quadrant gated rail crossing on Winchester Avenue based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $285,000.

1D – Median Barrier on Winchester Avenue

This alternative would provide a median barrier on Winchester Avenue to improve the safety of the existing at-grade rail crossing as well as support implementation of a quiet zone through downtown Reedsport. The median barrier would be provided at each approach to the rail crossing to prevent motorists from driving around the lowered gates. Exhibit 1D illustrates a median barrier on Winchester Avenue.

Exhibit 1D. Median Barrier on Winchester Avenue

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the median barrier on OR 38 based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $400,000.

At-Grade Rail Crossing Evaluation

The at-grade rail crossing alternatives were evaluated based on the project evaluation criteria. Table 3 summarizes the average rating for each criterion and overall average rating for the alternatives. Attachment "C" provides the full detailed rating for the alternatives.

Table 3. At-Grade Rail Crossing Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
1A. Four-Quadrant Gated Rail Crossing on OR 38	-0.4	-0.8	0.0	-0.7	1.0	-0.7	0.7	-0.2
1B. Median Barrier on OR 38	-0.4	-0.8	-0.3	-1.0	0.0	-0.7	0.7	-0.4
1C. Four-Quadrant Gated Rail Crossing on Winchester Avenue	-0.4	-0.8	0.0	-0.7	1.0	-0.7	0.7	-0.2
1D. Median Barrier on Winchester Avenue	-0.4	-0.8	-0.3	-1.0	0.0	-0.7	0.7	-0.4

While all the at-grade crossing alternatives can reduce train-related horn noise, none of the alternatives by themselves address the identified rail crossing delays and access/circulation barriers introduced by the proposed Port project. As such, an at-grade alternative at one rail crossing would likely need to be paired with a potential grade-separated rail crossing alternative at the other rail crossing.

Grade-Separated Rail Crossing Alternatives

Several alternatives were developed to provide a grade-separated rail crossing in downtown Reedsport. The alternatives consist of overcrossings and undercrossings with and without retaining walls (embankment only support). The alternatives vary by location and by type and their anticipated impacts on local street connectivity, traffic operations, and safety, as well as adjacent land uses. The following provides a brief description of the alternatives, their anticipated impacts, and how well they meet the goals and objectives of the study.

OR 38 Rail Overcrossing

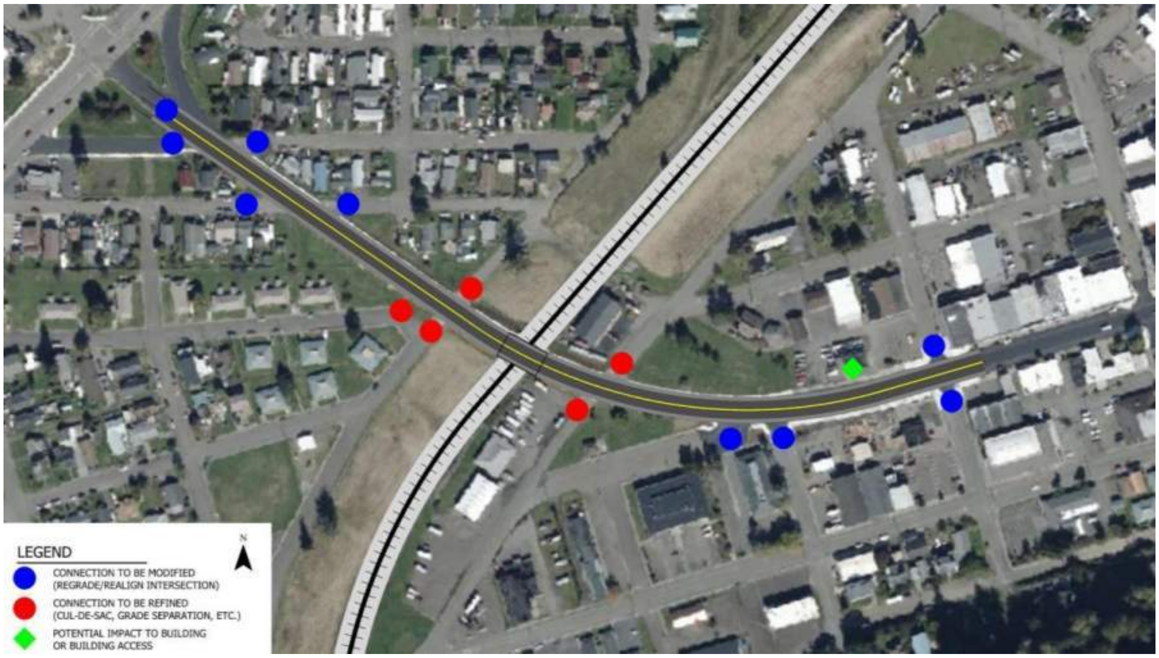
This alternative would provide a grade-separated rail crossing (overcrossing) on OR 38. Based on the preferred approach grade and minimum vertical clearance requirements, the overcrossing would require approaches of approximately 600 feet on both sides. Therefore, the overcrossing would extend from approximately Laurel Street to N 5th Street and all street connections and driveways would need to be reconfigured or closed; the Laurel Street intersection could be reconfigured to maintain its connection to OR 38 while the W Railroad Avenue, E Railroad Avenue, Fir Avenue, and N 6th Street intersections would potentially need to be closed. Box culvert-type structures or simple bridges could be provided to allow W Railroad Avenue and/or E Railroad Avenue to maintain connectivity and additional street connections could be explored to increase connectivity.

2A1 – With Retaining Walls

The design of the OR 38 rail overcrossing may incorporate retaining walls and other bridge design elements to minimize the impact of the abutment side slopes on adjacent properties and transportation facilities. Exhibit 2A1-1 and 2A1-2 illustrate the OR 38 rail overcrossing with retaining walls throughout the length of the overpass. As shown, several existing street connections would need to be modified or refined and one building or building access could be impacted.

Exhibit 2A1-1. OR 38 Rail Overcrossing with Retaining Walls – Aerial Perspective

Exhibit 2A1-2. OR 38 Rail Overcrossing with Retaining Walls



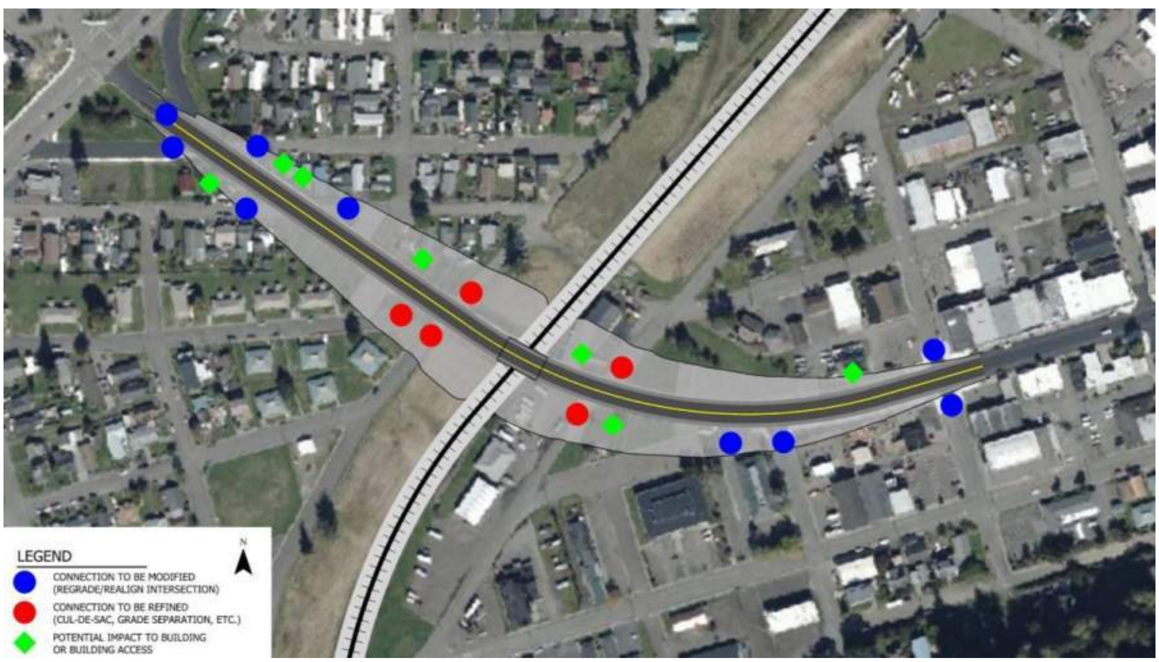
Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the OR 38 rail overcrossing with retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $12.0M.

2A2 – Without Retaining Walls (Embankment Support)

The design of the OR 38 rail overcrossing may exclude retaining walls in certain areas and instead incorporate abutment side slopes, or embankment support. This alternative would have a greater impact on adjacent properties and transportation facilities. Exhibit 2A2-1 and Exhibit 2A2-2 illustrate the OR 38 rail overcrossing without retaining walls (embankment support) throughout the length of the overpass. As shown, a few existing structures (commercial and residential) would potentially need to be removed to accommodate the side slopes.

Exhibit 2A2-1. OR 38 Rail Overcrossing without Retaining Walls – Aerial Perspective

Exhibit 2A2-2. OR 38 Rail Overcrossing without Retaining Walls – Aerial



Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the OR 38 rail overcrossing without retaining walls based on unit costs from similar projects in the northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $15.0M.

Winchester Avenue Rail Overcrossing

This alternative would provide a grade-separated rail crossing (overcrossing) on Winchester Avenue. Based on the desired maximum approach grade and minimum vertical clearance requirements, the overcrossing would require approaches of approximately 500 feet on both sides. Therefore, the overcrossing would extend from N 11th Street to N 6th Street and all street connections, and driveways would need to be reconfigured or closed; the N 10th street, W Railroad Avenue-Riverbend Road, Elm Avenue, E Railroad Avenue, and N 7th Street intersections would need to be potentially closed. Box culverts or simple bridge structures could be potentially provided to allow W Railroad Avenue-Riverbend Road, Elm Avenue, and E Railroad Avenue to maintain connectivity to the area south of Winchester Avenue. Additional street connections could be explored to increase connectivity, such as an extension of Scholefield Drive to River Bend Road.

2B1 – With Retaining Walls

The design of the Winchester Avenue overcrossing may incorporate retaining walls and other bridge design elements to minimize the impact of the abutment side slopes on adjacent properties and transportation facilities. Exhibit 2B1-1 and Exhibit 2B1-2 illustrate the Winchester Avenue rail overcrossing with retaining walls throughout the length of the overpass. As shown, a few existing street connections would need to be modified or refined and several buildings or building accesses could be impacted.

Exhibit 2B1-1. Winchester Avenue Rail Overcrossing with Retaining Walls – Aerial Perspective

Exhibit 2B1-2. Winchester Avenue Rail Overcrossing with Retaining Walls

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the Winchester Avenue rail overcrossing with retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $12.5M.

2B2 – Without Retaining Walls (Embankment Support)

The design of the Winchester Avenue rail overcrossing may exclude retaining walls and instead incorporate abutment side slopes, or embankment support. This alternative would have greater impact on adjacent properties and transportation facilities. Exhibit 2B2-1 and Exhibit 2B2-2 illustrate the Winchester Avenue rail overcrossing without retaining walls (embankment support) throughout the length of the overpass. As shown, several existing structures would need to be removed to accommodate the side slopes.

Exhibit 2B2-1. Winchester Avenue Rail Overcrossing without Retaining Walls – Aerial Perspective

Exhibit 2B2-2. Winchester Avenue Rail Overcrossing without Retaining Walls

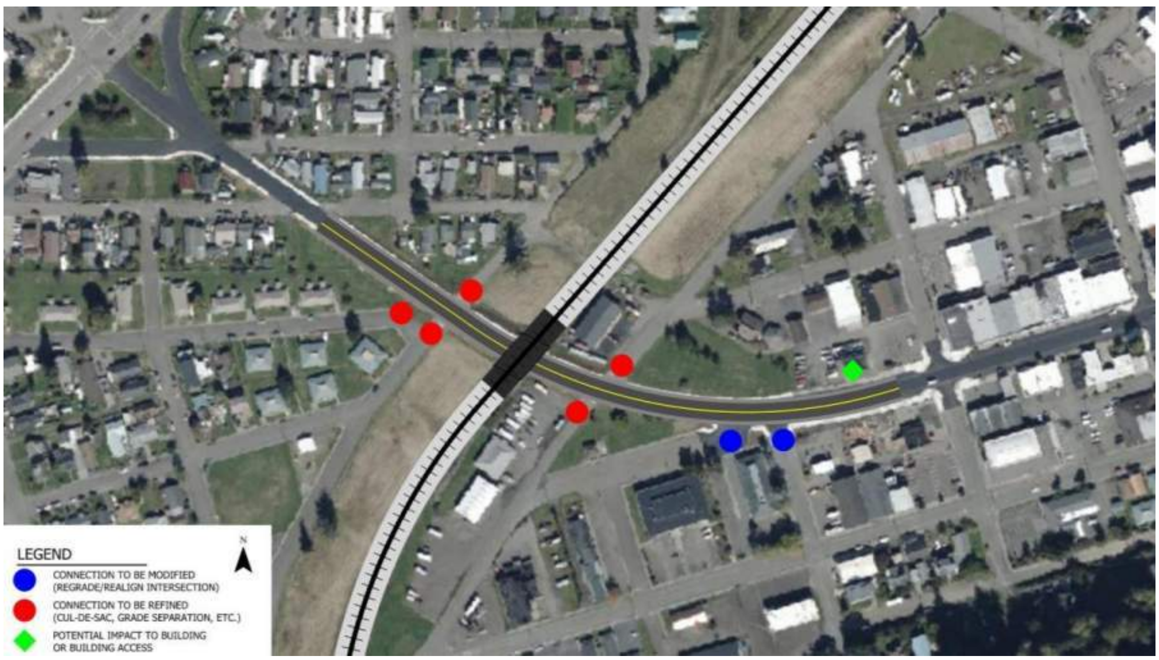
Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the Winchester Avenue rail overcrossing without retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $15.0M.

Other considerations: Implementation of an overcrossing on Winchester Avenue may require additional roadway upgrades to create a suitable alternate freight access route due to potential truck diversions identified in the traffic study. Further evaluation is required to determine the impact of the upgrades on adjacent properties and transportation facilities.

2C – OR 38 Rail Undercrossing with Retaining Walls

This alternative would provide a grade-separated rail crossing (undercrossing) on OR 38. Based on the preferred approach grade and minimum vertical clearance requirements, the undercrossing would require approaches of approximately 450 feet on both sides. Therefore, the undercrossing would extend from Laurel Street to N 5th Street and all street connections, and driveways would need to be reconfigured or closed; the N 6th Street intersection could be reconfigured to maintain its connection to OR 38 while the W Railroad Avenue and E Railroad Avenue intersections would be closed. Additional street connections could be explored to increase connectivity. A new rail bridge would be needed to span the undercrossing. Exhibit 2C illustrates the OR 38 rail undercrossing with retaining walls.

Exhibit 2C. OR 38 Rail Undercrossing with Retaining Walls



Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the OR 38 rail undercrossing with retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $13.0M.

Other considerations: Implementation of an undercrossing on OR 38 would also require additional study to mitigate potential flooding risks due to the creation of a new low point. Based on preliminary feedback from the city, this alternative is likely not feasible. The construction of a new rail bridge would require additional coordination and specialized construction methods to maintain normal rail operations.

2D – Winchester Avenue Rail Undercrossing with Retaining Walls

This alternative would provide a grade-separated rail crossing (undercrossing) on Winchester Avenue. Based on the desired maximum approach grade and minimum vertical clearance requirements, the undercrossing would require approaches of approximately 350 feet on both sides, depending on the thickness of the structure needed to support the existing railroad. Therefore, the undercrossing would extend from N 10th Street to N 7th Street, and all street connections and driveways would need to be reconfigured or closed, including the W Railroad Avenue-Riverbend Road, Elm Avenue, and E Railroad Avenue intersections. Additional street connections would be required to provide connectivity to areas south of Winchester Avenue. Exhibit 2D illustrates the Winchester Ave rail undercrossing with retaining walls.

Exhibit 2D. Winchester Avenue Rail Undercrossing with Retaining Walls

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the Winchester Avenue rail undercrossing with retaining walls based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $10.5M.

Other considerations: Implementation of an undercrossing on Winchester Avenue would also require additional study to mitigate potential flooding risks and install an adequate drainage and pumping systems, as well as the challenge of maintaining continuous rail access during construction.

Other Crossing Locations

Adjustments to the street alignments and network could potentially be made to upgrade the existing grade-separated rail crossings north of OR 38 or along Port Dock Road. The potential locations would seek to minimize the overall impacts of grade-separation and consider improvements to overall circulation.

2E1 – Port Dock Road Undercrossing Upgrade

The existing Port Dock Road undercrossing is located below the west end of the Umpqua River Bridge. The existing undercrossing includes a narrow (one-lane) roadway with a 13-foot vertical clearance. Access from the south is provided by Riverfront Way that connects to OR 38 across from Winchester Avenue, while access from the north is provided by Port Dock Road that connects to US 101 across from OR 38. The existing undercrossing would need to be upgraded to provide one lane in each direction. The existing roadway would be lowered by approximately 5 feet to provide adequate vertical clearance, and a new structure would be constructed to replace the existing bridge, as well as construction of a new bulkhead due to the proximity of the river to the undercrossing. The alignment of Riverfront Way and Port Dock Road would also need to be upgraded to provide a more direct connection from OR 38 to US 101. Exhibit 2E1 illustrates the Port Dock Road undercrossing and Riverfront Way realignment.

Exhibit 2E1. Port Dock Road Undercrossing Upgrade

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the Port Dock Road undercrossing upgrade based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $7.5M.

Other considerations: upgrading the Port Dock Road undercrossing would also require additional study to review the water tables, consider the need for stormwater facilities, mitigate potential flooding risks, and install an adequate drainage and pumping systems.

2E2 – Northerly OR 38 Undercrossing Upgrade

The northerly OR 38 undercrossing is located approximately 230 feet north of OR 38. The undercrossing includes a narrow (one-lane) roadway with a 13-foot vertical clearance. Access from the south is provided by E Railroad Avenue and Greenwood Avenue, while access from the north is provided by W Railroad Avenue and Laurel Avenue. The existing undercrossing would need to be upgraded to provide one lane in each direction, and the roadways would need to be upgraded to meet maximum approach grade and minimum vertical clearance requirements. The existing roadway would be lowered by approximately 6 feet to provide adequate vertical clearance, and a new structure would be constructed to replace the existing bridge. The alignment of several roadways surrounding the crossing would also need to be upgraded to provide a more direct connection to the undercrossing. Exhibit 2E2 illustrates the northerly OR 38 undercrossing upgrade and roadway realignment.

Exhibit 2E2. Northerly OR 38 Undercrossing Upgrade

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the northerly OR 38 undercrossing upgrades based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $7.0M.

Grade-Separated Rail Crossing Evaluation

The grade-separated rail crossing alternatives were rated based on the project evaluation criteria. Table 4 summarizes the ratings for each criterion and overall average ratings for each alternative. As shown, the OR 38 overcrossing with retailing walls has the highest overall average rating among the at-grade rail crossing alternatives. Attachment "C" provides the full detailed rating for the alternatives.

Table 4. Grade-Separated Rail Crossing Evaluation Summary

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
2A1. OR 38 Rail Overcrossing with Retaining Wall	2.0	-0.1	1.7	1.0	1.0	1.7	1.0	1.2
2A2. OR 38 Rail Overcrossing without Retaining Wall	1.2	-0.5	1.3	0.8	0.5	0.7	1.0	0.7
2B1. Winchester Avenue Rail Overcrossing with Retaining Walls	1.1	-0.3	1.7	1.0	1.0	1.7	0.7	0.9
2B2. Winchester Avenue Rail Overcrossing without Retaining Walls	0.4	-0.5	1.3	0.8	0.5	0.7	0.7	0.5
2C. OR 38 Rail Undercrossing with Retaining Walls	0.2	-0.5	1.3	0.8	0.5	0.7	0.7	0.5

2D. Winchester Avenue Rail Undercrossing with Retaining Walls	-0.2	-0.5	1.3	0.8	0.5	0.7	0.7	0.4
2E1. Port Dock Road Rail Undercrossing Upgrade	0.1	0.5	1.0	0.3	0.0	0.7	0.5	0.4
2E2. Northerly OR 38 Rail Undercrossing Upgrade	0.1	0.5	1.0	0.3	0.0	0.7	0.5	0.4

Rail Line Upgrade Alternatives

Current rail traffic operates at a reduced speed along the majority of the Coos Bay Rail Line. Given the level of service and tonnage, this slower operation is an economic trade-off against the physical plant improvements required along the line. It is expected that in parallel with the development of the container terminal, considerable improvements will be made to the railroad track, bridges, and geometry along the majority of the line. These investments will improve the rails, ties, and ballast along the line to allow a dramatic increase in aggregate tonnage from the container traffic. An expected benefit of the track improvements is the ability of the railroad line to support increased speeds.

3A1 – Increase Rail Speeds through Reedsport to 40 MPH

Within the immediate area of Reedsport, the existing railroad has favorable horizontal curvature and gradient due to the water level route through the area. The horizontal curvature at the south end of town would be considered the most restrictive at 4 degrees and 46 minutes, however. This existing curvature can readily support speeds of up to 40 mph with an increase in superelevation through the curve, without any horizontal modifications to the rail alignment. For a design speed of approximately 40 mph, superelevation of 2.5 inches (with an unbalance of 3 inches) would be required through the existing curve, which is within industry norms and would likely be provided as part of the basic track structure improvements along the railroad.

Planning level cost opinion: The significant nature and scope of the rail enhancements to achieve 40 mph rail speeds through the City of Reedsport is beyond the scope of this study as it requires investigating many facets of the rail line north and south of Reedsport, including bridges (e.g., Umpqua River Bridge) and tunnels. However, for the purposes of this study, the magnitude of these investments would be several times that of any of the other alternatives discussed, including Alternative 3A2 – Increase Rail Speeds through Reedsport to 25 MPH.

3A2 – Increase Rail Speeds through Reedsport to 25 MPH

The other significant consideration for train speeds is the existing Umpqua River swing span, which currently has speed restrictions due to the age of the structure. As noted previously, for the rail line to provide for the increased tonnage of traffic brought by the container terminal, this bridge will require considerable investment in the structural capacity, which will in turn allow for increased speeds across the structure. The achievement of lower speeds could likely be done at lower cost, with 25 mph likely achieved with no additional costs beyond the improvements required to handle the increased gross tonnage of the additional traffic (e.g., no new or significantly reconstructed structures).

Planning level cost opinion: The significant nature and scope of the rail enhancements to achieve 25 mph rail speeds through the City of Reedsport is beyond the scope of this study as it requires investigating many facets of the rail line north and south of Reedsport, including bridges (e.g., Umpqua River Bridge) and tunnels. However, for the purposes of this study, the magnitude of these investments would be several times that of any of the other alternatives discussed herein and lower in magnitude compared to Alternative 3A1 – Increase Rail Speeds through Reedsport to 40 MPH.

Rail Line Upgrade Evaluation

The rail line upgrade alternatives were rated based on the project evaluation criteria. Table 5 summarizes the average rating for each criterion and overall average rating for the alternatives. Attachment "C" provides the full detailed rating for the alternatives.

Table 5. Elevated Rail Line Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
3A1. Increase Rail Speeds through Reedsport to 40 MPH	0.8	0.1	0.5	0.8	0.5	0.3	0.7	0.5
3A2. Increase Rail Speeds through Reedsport to 25 MPH	0.8	0.1	0.5	0.8	0.5	0.3	0.7	0.5

Elevated Rail Line Alternative

Another option to consider to grade-separate the rail and highway traffic would be to elevate the rail line grade through the extent of both at-grade crossings. Considering the Umpqua River bridge to be a fixed limitation in elevating the line, with OR 38 at approximately 1,600 linear feet away from the bridge and a moderate railway grade of 1.41 percent over that distance, an increase in rail elevation of approximately 22 feet, 6 inches could be achieved. This elevation would be sufficient to provide for normal vertical roadway clearances of 16 feet, 6 inches below the railroad undercrossing structure that would require approximately 6 feet of structure depth.

With nearly 2,700 linear feet of track to the south before crossing the next railroad bridge structure, a favorable railroad gradient of just 0.84 percent would be required to achieve vertical clearance upon the undercrossing.

4A – Elevated Rail Line

Construction associated with the elevated rail line would require significant effort and costs. Phasing of the construction for the embankment required to elevate the tracks would be difficult while maintaining railroad operations along the same right-of-way. The use of retaining walls would limit the base width of the embankment, however, would add to the cost. Depending upon the final elevation of the railroad track, the use of retaining walls may be required to keep the embankment within the existing railroad right-of-way. For the planning level cost opinion provided, we have assumed retaining walls are required for the majority of the alignment.

Regardless of the construction method, the embankment created for the railroad would practically and visually bisect downtown Reedsport, and may detract from community livability. Exhibits 4A-1 and 4A-2 illustrate the elevated rail line alternative.

Exhibit 4A-1. Elevated Rail Line Alternative

Exhibit 4A-2. Elevated Rail Line Alternative – Aerial Perspective

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the elevated rail line alternative based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors, but additional costs may be incurred due to railroad access requirements during construction. Potential right-of-way and property costs are not included at this time. The cost opinion is $24.5M.

Elevated Rail Line Evaluation

The elevated rail line alternative was rated based on the project evaluation criteria. Table 6 summarizes the average rating for each criterion and overall average rating for the alternatives. Attachment "C" provides the full detailed rating for the alternative.

Table 6. Elevated Rail Line Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
4A. Elevated Rail Line	1.6	0.6	1.3	1.0	0.5	1.3	0.7	1.1

OR 38/US 101 Intersection Operation Alternative

To address the forecasted future mobility issues at the OR 38/US 101 signalized intersection, alternative signal phasing and timing were explored at the intersection.

5A – OR 38/US 101 East-West Split Phasing

Due to the substantial difference in westbound and eastbound volumes, modifying the approaches from permissive (left-turning vehicles yield to oncoming traffic) to split phasing (left, thru, and right-turning vehicles travel through the intersection one approach at a time) was found to reduce the Year 2045 v/c ratio from 1.0 to 0.52. *Attachment "D" contains the year 2045 traffic operations analysis worksheets with east-west split phasing.*

Planning level cost opinion: An order-of-magnitude planning level cost opinion was prepared for the OR 38/US 101 intersection East-West Split Phasing Alternative based on unit costs from similar projects in the Pacific Northwest. The cost opinion accounts for design and construction along with several other factors. Potential right-of-way and property costs are not included at this time. The cost opinion is $40,000.

OR 38/US 101 Intersection Operation Evaluation

The east-west split phasing alternative was rated based on the project evaluation criteria. Table 7 summarizes the average rating for each criterion and overall average rating for the alternatives. Attachment "C" provides the full detailed rating for the alternative.

Table 7. OR 38/US 101 Intersection Operation Evaluation

Alternative	Livability	Connectivity	Safety	Efficiency	Accessibility	Freight	Funding	Average
5A. OR 38/US 101 East-West Split Phasing	0.6	0.3	0.3	0.8	0.5	0.3	1.0	0.5

EVALUATION RESULTS

The alternatives presented and described in the previous section were evaluated against the project goals and objectives described in *Memorandum #2: Purpose and Need* and the evaluation. Table 8 below provides an initial high-level comparison and ranking of the alternatives.

Table 8. Summary Comparison of Rail Alternatives

Alternative	Average Evaluation Score	Order-of-Magnitude Cost	Preliminary Rank
No-Build	-1.0	$0.00	17
1A. Four-Quadrant Gated Rail Crossing on OR 38	-0.2	$360,000	13
1B. Median Barrier on OR 38	-0.4	$550,000	15
1C. Four-Quadrant Gated Rail Crossing on Winchester Avenue	-0.2	$285,000	13
1D. Median Barrier on Winchester Avenue	-0.4	$400,000	15
2A1. OR 38 Rail Overcrossing with Retaining Walls	1.2	$12,000,000	**1**
2A2. OR 38 Rail Overcrossing without Retaining Walls	0.7	$15,000,000	4
2B1. Winchester Avenue Rail Overcrossing with Retailing Walls	0.9	$12,500,000	**3**
2B2. Winchester Avenue Rail Overcrossing without Retailing Walls	0.5	$15,000,000	8
2C. OR 38 Rail Undercrossing with Retaining Walls	0.5	$13,000,000	9
2D. Winchester Avenue Rail Undercrossing with Retaining Walls	0.4	$10,500,000	12
2E1. Port Dock Road Undercrossing Upgrade	0.4	$7,500,000	10
2E2. Northerly OR 38 Rail Undercrossing Upgrade	0.4	$7,000,000	10
3A1. Increase Rail Speeds through Reedsport to 40 MPH	0.5	NA	5
3A2. Increase Rail Speeds through Reedsport to 25 MPH	0.5	NA	5
4A. Elevated Rail Line	1.1	$24,500,000	**2**
5A – OR 38/US 101 East-West Split Phasing	0.5	$40,000	5

Alternatives Considered but Dismissed

The following alternatives were found to score lower against the evaluation criteria; only partially address the identified needs; and have potentially substantial environmental and/or right-of-way impacts, constructability issues, and/or high costs.

Alternative	Consideration
1A. Four-Quadrant Gated Rail Crossing on OR 38	– Does not address the identified Rail Crossing Delays and Access/Circulation Barriers issues

1B. Median Barrier on OR 38	– Does not address the identified Rail Crossing Delays and Access/Circulation Barriers issues
1D. Median Barrier on Winchester Avenue	– Due the close proximity of the E Railroad Avenue-Elm Avenue intersection, a median cannot be effectively placed to ensure vehicles do not attempt to avoid the westbound rail crossing gate
2A2 – OR 38 Rail Overcrossing without Retaining Walls	– Impacts up to 7 properties (6 residential and 1 commercial)
2B1 - Winchester Avenue Rail Overcrossing with Retaining Walls	– Does not address queuing related impacts to upstream and downstream cross streets on OR 38 – Impacts access up to 11 properties
2B2 - Winchester Avenue Rail Overcrossing without Retaining Walls	– Does not address queuing related impacts to upstream and downstream cross streets on OR 38 – Impacts up to 15 properties (1 residential and 14 commercial)
2C - OR 38 Rail Undercrossing with Retaining Walls	– Introduces potential roadway flooding and pumping concerns – Significantly impacts circulation by eliminating the W Railroad Avenue and E Railroad Avenue north-south connectivity – Impacts access up to 1 property
2D - Winchester Avenue Rail Undercrossing with Retaining Walls	– Does not address queuing related impacts to upstream and downstream cross streets on OR 38 – Introduces potential roadway flooding and pumping concerns. – Significantly impacts circulation by eliminating access to W Railroad Avenue and E Railroad Avenue and precluding access to properties served by River Bend Road – Impacts access up to 11 properties
2E1 – Port Dock Road Undercrossing Upgrade	– Does not address queuing related impacts to upstream and downstream cross streets on OR 38 – Introduces significant out of direction travel on Port Dock Road, W Railroad Avenue, E Railroad Avenue, and Riverfront Way – Requires significant underpass improvements and exposes lower roadway to increased Umpqua River flooding
2E2 – Northerly OR 38 Undercrossing Upgrade	– Introduces significant out of direction travel on W Railroad Avenue, E Railroad Avenue, Laurel Avenue, and Greenwood Avenue – Requires significant underpass improvements and exposes lower roadway to flooding – Creates queuing and road spacing issues due to the out of direction travel to/from OR 38
3A1 and 3A2 - Rail Line Upgrade Alternatives (Increase Rail Speeds)	– Retrofit improvement to or replacement of the Umpqua River swing bridge as well as track enhancements north and south of Reedsport to accommodate higher speeds present significant constructability issues; rail downtime; and feasibility analysis, engineering, and construction costs at a scale of magnitude significantly higher than other higher performing alternatives – Does not fully address the related impacts to upstream and downstream cross streets on OR 38 and Winchester Avenue or increased train activity issues

Alternatives Still Under Consideration

The following alternatives were found to score higher against the evaluation criteria; partially or fully address the identified needs; and have manageable potential environmental and/or right-of-way impacts, constructability issues, and/or construction costs.

Alternative	Consideration
1C - Four-Quadrant Gated Railing Crossing on Winchester Avenue 	– Addresses noise related Issues with train activity at Winchester Avenue – Feasible to construct with minimal to potential no right-of-way nor environmental impacts – Economically feasible at a magnitude cost of $285,000 – Requires grade separated improvements on OR 38 to meet all identified needs – Can work in tandem with ***Alternative 2A1 - OR 38 Rail Overcrossing with Retaining Walls***
2A1 - OR 38 Rail Overcrossing with Retaining Walls 	– Addresses the identified Rail Crossing Delays and Access/Circulation Barriers issues – Addresses the increase train activity issues – Addresses queuing related impacts to upstream and downstream cross streets on OR 38 – Partially addresses queuing related impacts to upstream and downstream cross streets on Winchester Avenue – Addresses noise related issues with increased train activity at OR 38 – Further refinements needed to minimize potential right-of-way and/or environmental impacts and assess construction costs – Can work in tandem with ***Alternative 1C - Four-Quadrant Gate on Winchester Avenue***
4A – Elevated Rail Line 	– Addresses queuing related impacts to upstream and downstream cross streets on OR 38 and Winchester Avenue – Addresses Noise Related Issues with Train Activity at OR 38 and Winchester Avenue – Further refinements needed to understand potential constructability and visual barrier issues and assess construction costs
5A - OR 38/US 101 East-West Split Phasing 	– Addresses the Year 2045 mobility issues at the OR 38/US 101 signalized intersection – ***Needed under all alternatives to address future OR 38/US 101 mobility issues***

TOP TWO MOST PROMISING ALTERNATIVES

Based on the evaluation contained herein, the project team preliminary recommends the following top two most promising alternative improvement packages to address the identified transportation needs associated with increase rail activity from the proposed Port of Coos Bay container facility:

Most Promising Improvement Package I

- Alternative 1C - Four-Quadrant Gated Rail Crossing on Winchester Avenue
- Alternative 2A1 - OR 38 Rail Overcrossing with Retaining Walls
- Alternative 5A – OR 38/US 101 East-West Split Phasing

Most Promising Improvement Package II

- Alternative 4A - Elevated Rail Line
- Alternative 5A – OR 38/US 101 East-West Split Phasing

Exhibits C and D Illustrate the two most promising improvement packages.

Exhibit C. Most Promising Improvement Package I

Exhibit D. Most Promising Improvement Package II

These two most promising alternative improvement packages provide the ability to maintain and/or enhance the community's transportation system while promoting healthy lifestyles; reducing barriers to access; improving vehicular, freight, pedestrian, bicycle, transit, and traffic mobility and safety; and minimizing environmental impacts. These two alternative improvement packages will be further refined following feedback from the PMT, PAC, City Planning Commission, and City Council. Specific areas of focus in the refinement process will include but are not limited to:

- Understanding the visual impacts associated with the vertical elements of the overpass structures and considering a viaduct type design with columns versus retaining walls to provide the ability to see through the structure.
- Understanding and identifying local roadway and driveway tie-ins to modified roadways,
- Identifying necessary localized pedestrian, bicycle, and transit enhancements throughout the study area to support the improvements (e.g., local roadway connections, pedestrian bicycle connections to the city's trail system, potential pedestrian/bicycle enhancements at Port Dock Road and the northerly OR 38 undercrossing, etc.)
- Addressing stormwater impacts
- Evaluating potential Title VI impacts
- Evaluating potential National Environmental Protection Act 4F (park and recreational lands, wildlife and waterfowl refuges, and historic sites) and 6F (park land) impacts
- Considering westbound dual-left turn lanes at the OR 38/US101 intersection
- Developing refined cost estimates including potential right-of-way and property impacts and verifying structure cost needs based on additional geotechnical information.

NEXT STEPS

The information and preliminary recommendations for the most promising two alternative improvement packages will be presented to the PMT, PAC, City Planning Commission, and City Council for review and feedback. Based on this feedback, additional analysis and refinement will be conducted to select a preferred alternative improvement package to address the identified transportation needs. This subsequent work will be documented in future *Technical Memorandum #7 – Preferred Alternative*.

REFERENCES

1. Oregon Department of Transportation. *Analysis Procedures Manual*, 2018.
2. Transportation Research Board. *NCHRP Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design*, 2014.
3. Oregon Department of Transportation. *Oregon Highway Plan*, 2015.
4. Oregon Department of Transportation. *Highway Design Manual*, 2023.
5. Transportation Research Board. *Highway Capacity Manual, 7th Edition*, 2022.

ATTACHMENTS

A. Queuing Analysis Worksheets
B. Alternative Design Methodology and Assumptions and List of Initial Alternatives Memorandum
C. Evaluation Matrix
D. Year 2045 Traffic Operations Analysis Worksheets

Attachment A: Queuing Analysis Worksheets

PM	EB	2045 @ 10 mph	
2.5	minutes/train	1500 ft train	
357	vehicles/hour		
15	vehicles/train		
525	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.1%		0.1%
5	0.2%		0.3%
6	0.5%		0.8%
7	1.1%		1.9%
8	2.1%		4.0%
9	3.4%		7.4%
10	5.1%		12.5%
11	6.9%		19.3%
12	8.5%		27.8%
13	9.7%		37.5%
14	10.3%		47.9%
15	10.2%		58.1%
16	9.5%		67.6%
17	8.3%		75.9%
18	6.9%		82.8%
19	5.4%		88.2%
20	4.0%		92.2%
21	2.8%		95.1%
22	1.9%		97.0%
23	1.2%		98.2%
24	0.8%		99.0%
25	0.5%		99.4%
26	0.3%		99.7%
27	0.1%		99.8%
28	0.1%		99.9%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%
43	0.0%		100.0%
44	0.0%		100.0%
45	0.0%		100.0%
46	0.0%		100.0%
47	0.0%		100.0%

PM	WB		2045 @ 10 mph
2.5	minutes/train		1500 ft train
407	vehicles/hour		
17	vehicles/train		
600	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.1%	0.1%
6		0.1%	0.2%
7		0.3%	0.6%
8		0.7%	1.3%
9		1.4%	2.7%
10		2.3%	5.0%
11		3.6%	8.6%
12		5.1%	13.7%
13		6.6%	20.4%
14		8.1%	28.4%
15		9.1%	37.5%
16		9.7%	47.2%
17		9.6%	56.8%
18		9.1%	65.9%
19		8.1%	74.0%
20		6.9%	80.8%
21		5.5%	86.4%
22		4.3%	90.7%
23		3.2%	93.8%
24		2.2%	96.0%
25		1.5%	97.5%
26		1.0%	98.5%
27		0.6%	99.1%
28		0.4%	99.5%
29		0.2%	99.7%
30		0.1%	99.9%
31		0.1%	99.9%
32		0.0%	100.0%
33		0.0%	100.0%
34		0.0%	100.0%
35		0.0%	100.0%
36		0.0%	100.0%
37		0.0%	100.0%
38		0.0%	100.0%
39		0.0%	100.0%
40		0.0%	100.0%
41		0.0%	100.0%
42		0.0%	100.0%
43		0.0%	100.0%
44		0.0%	100.0%
45		0.0%	100.0%
46		0.0%	100.0%
47		0.0%	100.0%

48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%
93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%

103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%
143	0.0%	100.0%	143	0.0%	100.0%
144	0.0%	100.0%	144	0.0%	100.0%
145	0.0%	100.0%	145	0.0%	100.0%
146	0.0%	100.0%	146	0.0%	100.0%
147	0.0%	100.0%	147	0.0%	100.0%
148	0.0%	100.0%	148	0.0%	100.0%
149	0.0%	100.0%	149	0.0%	100.0%
150	0.0%	100.0%	150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
3.1	minutes/train	2000 ft train	
357	vehicles/hour		
18	vehicles/train		
650	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.1%		0.1%
7	0.1%		0.2%
8	0.3%		0.5%
9	0.7%		1.2%
10	1.2%		2.4%
11	2.1%		4.5%
12	3.2%		7.6%
13	4.5%		12.1%
14	5.9%		18.0%
15	7.3%		25.3%
16	8.4%		33.7%
17	9.1%		42.8%
18	9.3%		52.1%
19	9.0%		61.1%
20	8.3%		69.4%
21	7.3%		76.8%
22	6.1%		82.9%
23	4.9%		87.8%
24	3.8%		91.6%
25	2.8%		94.4%
26	2.0%		96.4%
27	1.4%		97.7%
28	0.9%		98.6%
29	0.6%		99.2%
30	0.3%		99.5%
31	0.2%		99.7%
32	0.1%		99.9%
33	0.1%		99.9%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%
43	0.0%		100.0%
44	0.0%		100.0%
45	0.0%		100.0%
46	0.0%		100.0%
47	0.0%		100.0%

PM	WB	2045 @ 10 mph
3.1	minutes/train	2000 ft train
407	vehicles/hour	
21	vehicles/train	
725	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.1%	0.1%
9	0.2%	0.3%
10	0.3%	0.6%
11	0.7%	1.3%
12	1.2%	2.4%
13	1.9%	4.3%
14	2.8%	7.1%
15	3.9%	11.0%
16	5.1%	16.1%
17	6.4%	22.5%
18	7.4%	30.0%
19	8.2%	38.2%
20	8.7%	46.9%
21	8.7%	55.5%
22	8.3%	63.8%
23	7.6%	71.4%
24	6.6%	78.0%
25	5.6%	83.6%
26	4.5%	88.1%
27	3.5%	91.6%
28	2.6%	94.3%
29	1.9%	96.2%
30	1.3%	97.5%
31	0.9%	98.5%
32	0.6%	99.1%
33	0.4%	99.4%
34	0.2%	99.7%
35	0.1%	99.8%
36	0.1%	99.9%
37	0.0%	99.9%
38	0.0%	100.0%
39	0.0%	100.0%
40	0.0%	100.0%
41	0.0%	100.0%
42	0.0%	100.0%
43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%

48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%
93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%

103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%
143	0.0%	100.0%	143	0.0%	100.0%
144	0.0%	100.0%	144	0.0%	100.0%
145	0.0%	100.0%	145	0.0%	100.0%
146	0.0%	100.0%	146	0.0%	100.0%
147	0.0%	100.0%	147	0.0%	100.0%
148	0.0%	100.0%	148	0.0%	100.0%
149	0.0%	100.0%	149	0.0%	100.0%
150	0.0%	100.0%	150	0.0%	100.0%

PM	EB	2045 @ 10 mph
4.2	minutes/train	3000 ft train
357	vehicles/hour	
25	vehicles/train	
825	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.1%
11	0.1%	0.1%
12	0.2%	0.3%
13	0.3%	0.7%
14	0.6%	1.2%
15	1.0%	2.2%
16	1.6%	3.8%
17	2.3%	6.1%
18	3.2%	9.2%
19	4.2%	13.4%
20	5.2%	18.6%
21	6.2%	24.8%
22	7.0%	31.8%
23	7.6%	39.5%
24	8.0%	47.4%
25	8.0%	55.4%
26	7.6%	63.0%
27	7.1%	70.1%
28	6.3%	76.4%
29	5.4%	81.8%
30	4.5%	86.4%
31	3.7%	90.0%
32	2.9%	92.9%
33	2.2%	95.0%
34	1.6%	96.6%
35	1.1%	97.8%
36	0.8%	98.6%
37	0.5%	99.1%
38	0.3%	99.4%
39	0.2%	99.7%
40	0.1%	99.8%
41	0.1%	99.9%
42	0.1%	99.9%
43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%

PM	WB	2045 @ 10 mph
4.2	minutes/train	3000 ft train
407	vehicles/hour	
28	vehicles/train	
950	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.1%	0.1%
14	0.1%	0.2%
15	0.2%	0.4%
16	0.4%	0.8%
17	0.6%	1.4%
18	1.0%	2.5%
19	1.5%	4.0%
20	2.2%	6.1%
21	2.9%	9.1%
22	3.8%	12.9%
23	4.7%	17.6%
24	5.6%	23.1%
25	6.4%	29.5%
26	7.0%	36.5%
27	7.4%	43.8%
28	7.5%	51.3%
29	7.4%	58.7%
30	7.0%	65.7%
31	6.4%	72.1%
32	5.7%	77.8%
33	4.9%	82.7%
34	4.1%	86.9%
35	3.4%	90.2%
36	2.7%	92.9%
37	2.1%	94.9%
38	1.5%	96.5%
39	1.1%	97.6%
40	0.8%	98.4%
41	0.6%	99.0%
42	0.4%	99.3%
43	0.2%	99.6%
44	0.2%	99.7%
45	0.1%	99.8%
46	0.1%	99.9%
47	0.0%	99.9%

48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
5	minutes/train	4000 ft train	
357	vehicles/hour		
30	vehicles/train		
975	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.1%		0.1%
15	0.1%		0.2%
16	0.2%		0.4%
17	0.4%		0.8%
18	0.6%		1.4%
19	1.0%		2.4%
20	1.5%		3.9%
21	2.1%		5.9%
22	2.8%		8.7%
23	3.6%		12.3%
24	4.5%		16.8%
25	5.3%		22.1%
26	6.1%		28.2%
27	6.7%		34.9%
28	7.1%		42.1%
29	7.3%		49.4%
30	7.3%		56.7%
31	7.0%		63.6%
32	6.5%		70.1%
33	5.8%		75.9%
34	5.1%		81.0%
35	4.3%		85.4%
36	3.6%		89.0%
37	2.9%		91.8%
38	2.3%		94.1%
39	1.7%		95.8%
40	1.3%		97.1%
41	0.9%		98.0%
42	0.7%		98.7%
43	0.5%		99.1%
44	0.3%		99.5%
45	0.2%		99.7%
46	0.1%		99.8%
47	0.1%		99.9%

PM	WB		2045 @ 10 mph
5	minutes/train		4000 ft train
407	vehicles/hour		
34	vehicles/train		
1100	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.0%	0.0%
12		0.0%	0.0%
13		0.0%	0.0%
14		0.0%	0.0%
15		0.0%	0.0%
16		0.0%	0.0%
17		0.1%	0.1%
18		0.1%	0.2%
19		0.2%	0.4%
20		0.3%	0.7%
21		0.5%	1.2%
22		0.8%	2.0%
23		1.1%	3.1%
24		1.6%	4.7%
25		2.2%	6.9%
26		2.9%	9.8%
27		3.6%	13.4%
28		4.3%	17.7%
29		5.1%	22.8%
30		5.7%	28.5%
31		6.3%	34.8%
32		6.7%	41.4%
33		6.8%	48.3%
34		6.8%	55.1%
35		6.6%	61.7%
36		6.2%	68.0%
37		5.7%	73.7%
38		5.1%	78.8%
39		4.4%	83.2%
40		3.8%	87.0%
41		3.1%	90.1%
42		2.5%	92.6%
43		2.0%	94.6%
44		1.5%	96.1%
45		1.2%	97.2%
46		0.8%	98.1%
47		0.6%	98.7%

48	0.1%	99.9%	48	0.4%	99.1%
49	0.0%	100.0%	49	0.3%	99.4%
50	0.0%	100.0%	50	0.2%	99.6%
51	0.0%	100.0%	51	0.1%	99.8%
52	0.0%	100.0%	52	0.1%	99.9%
53	0.0%	100.0%	53	0.1%	99.9%
54	0.0%	100.0%	54	0.0%	99.9%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%
93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph
5.5	minutes/train	4100 ft train
357	vehicles/hour	
33	vehicles/train	
1050	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.0%	0.0%
16	0.1%	0.1%
17	0.1%	0.2%
18	0.2%	0.4%
19	0.3%	0.7%
20	0.5%	1.2%
21	0.8%	2.0%
22	1.2%	3.1%
23	1.6%	4.8%
24	2.2%	7.0%
25	2.9%	10.0%
26	3.7%	13.7%
27	4.5%	18.2%
28	5.3%	23.4%
29	5.9%	29.3%
30	6.5%	35.8%
31	6.8%	42.6%
32	7.0%	49.6%
33	6.9%	56.5%
34	6.7%	63.2%
35	6.2%	69.4%
36	5.7%	75.1%
37	5.0%	80.1%
38	4.3%	84.4%
39	3.6%	88.0%
40	3.0%	91.0%
41	2.4%	93.3%
42	1.8%	95.2%
43	1.4%	96.6%
44	1.0%	97.6%
45	0.8%	98.4%
46	0.5%	98.9%
47	0.4%	99.3%

PM	WB	2045 @ 10 mph
5.5	minutes/train	4100 ft train
407	vehicles/hour	
37	vehicles/train	
1200	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.0%	0.0%
16	0.0%	0.0%
17	0.0%	0.0%
18	0.0%	0.0%
19	0.0%	0.1%
20	0.1%	0.1%
21	0.1%	0.3%
22	0.2%	0.5%
23	0.3%	0.8%
24	0.5%	1.4%
25	0.8%	2.2%
26	1.1%	3.3%
27	1.6%	4.9%
28	2.1%	7.0%
29	2.7%	9.7%
30	3.4%	13.1%
31	4.1%	17.1%
32	4.7%	21.9%
33	5.3%	27.2%
34	5.9%	33.1%
35	6.3%	39.3%
36	6.5%	45.8%
37	6.5%	52.3%
38	6.4%	58.8%
39	6.1%	64.9%
40	5.7%	70.6%
41	5.2%	75.8%
42	4.6%	80.5%
43	4.0%	84.5%
44	3.4%	87.9%
45	2.8%	90.7%
46	2.3%	93.0%
47	1.8%	94.8%

48	0.3%	99.5%
49	0.2%	99.7%
50	0.1%	99.8%
51	0.1%	99.9%
52	0.0%	99.9%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

48	1.4%	96.2%
49	1.1%	97.3%
50	0.8%	98.1%
51	0.6%	98.7%
52	0.4%	99.1%
53	0.3%	99.4%
54	0.2%	99.6%
55	0.1%	99.7%
56	0.1%	99.8%
57	0.1%	99.9%
58	0.0%	99.9%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph
6.5	minutes/train	5000 ft train
357	vehicles/hour	
39	vehicles/train	
1225	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.0%	0.0%
16	0.0%	0.0%
17	0.0%	0.0%
18	0.0%	0.0%
19	0.0%	0.0%
20	0.0%	0.1%
21	0.1%	0.1%
22	0.1%	0.3%
23	0.2%	0.5%
24	0.3%	0.8%
25	0.5%	1.3%
26	0.7%	2.0%
27	1.1%	3.1%
28	1.5%	4.6%
29	2.0%	6.5%
30	2.5%	9.1%
31	3.2%	12.2%
32	3.8%	16.0%
33	4.5%	20.5%
34	5.1%	25.6%
35	5.6%	31.2%
36	6.0%	37.2%
37	6.3%	43.5%
38	6.4%	49.9%
39	6.4%	56.3%
40	6.2%	62.5%
41	5.8%	68.3%
42	5.3%	73.6%
43	4.8%	78.4%
44	4.2%	82.7%
45	3.6%	86.3%
46	3.1%	89.3%
47	2.5%	91.9%

PM	WB	2045 @ 10 mph
6.5	minutes/train	5000 ft train
407	vehicles/hour	
44	vehicles/train	
1375	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.0%	0.0%
16	0.0%	0.0%
17	0.0%	0.0%
18	0.0%	0.0%
19	0.0%	0.0%
20	0.0%	0.0%
21	0.0%	0.0%
22	0.0%	0.0%
23	0.0%	0.0%
24	0.0%	0.1%
25	0.1%	0.1%
26	0.1%	0.2%
27	0.2%	0.4%
28	0.3%	0.6%
29	0.4%	1.0%
30	0.6%	1.6%
31	0.8%	2.4%
32	1.1%	3.5%
33	1.5%	5.0%
34	1.9%	7.0%
35	2.5%	9.4%
36	3.0%	12.5%
37	3.6%	16.0%
38	4.2%	20.2%
39	4.7%	24.9%
40	5.2%	30.0%
41	5.6%	35.6%
42	5.8%	41.5%
43	6.0%	47.4%
44	6.0%	53.4%
45	5.9%	59.3%
46	5.6%	65.0%
47	5.3%	70.3%

48	2.0%	93.9%	48	4.9%	75.1%
49	1.6%	95.5%	49	4.4%	79.5%
50	1.2%	96.7%	50	3.9%	83.3%
51	0.9%	97.7%	51	3.3%	86.7%
52	0.7%	98.4%	52	2.8%	89.5%
53	0.5%	98.9%	53	2.4%	91.8%
54	0.4%	99.2%	54	1.9%	93.8%
55	0.3%	99.5%	55	1.5%	95.3%
56	0.2%	99.7%	56	1.2%	96.5%
57	0.1%	99.8%	57	0.9%	97.5%
58	0.1%	99.9%	58	0.7%	98.2%
59	0.1%	99.9%	59	0.5%	98.7%
60	0.0%	99.9%	60	0.4%	99.1%
61	0.0%	100.0%	61	0.3%	99.4%
62	0.0%	100.0%	62	0.2%	99.6%
63	0.0%	100.0%	63	0.1%	99.7%
64	0.0%	100.0%	64	0.1%	99.8%
65	0.0%	100.0%	65	0.1%	99.9%
66	0.0%	100.0%	66	0.0%	99.9%
67	0.0%	100.0%	67	0.0%	99.9%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%
93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%

103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%
143	0.0%	100.0%	143	0.0%	100.0%
144	0.0%	100.0%	144	0.0%	100.0%
145	0.0%	100.0%	145	0.0%	100.0%
146	0.0%	100.0%	146	0.0%	100.0%
147	0.0%	100.0%	147	0.0%	100.0%
148	0.0%	100.0%	148	0.0%	100.0%
149	0.0%	100.0%	149	0.0%	100.0%
150	0.0%	100.0%	150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
7.7	minutes/train	6000 ft train	
357	vehicles/hour		
46	vehicles/train		
1425	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.0%
16	0.0%		0.0%
17	0.0%		0.0%
18	0.0%		0.0%
19	0.0%		0.0%
20	0.0%		0.0%
21	0.0%		0.0%
22	0.0%		0.0%
23	0.0%		0.0%
24	0.0%		0.0%
25	0.0%		0.1%
26	0.0%		0.1%
27	0.1%		0.2%
28	0.1%		0.3%
29	0.2%		0.5%
30	0.3%		0.9%
31	0.5%		1.3%
32	0.7%		2.0%
33	0.9%		3.0%
34	1.3%		4.2%
35	1.7%		5.9%
36	2.1%		8.1%
37	2.6%		10.7%
38	3.2%		13.9%
39	3.7%		17.6%
40	4.3%		21.9%
41	4.8%		26.7%
42	5.2%		31.9%
43	5.6%		37.4%
44	5.8%		43.2%
45	5.9%		49.1%
46	5.9%		55.0%
47	5.7%		60.7%

PM	WB	2045 @ 10 mph	
7.7	minutes/train	6000 ft train	
407	vehicles/hour		
52	vehicles/train		
1600	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.0%
16	0.0%		0.0%
17	0.0%		0.0%
18	0.0%		0.0%
19	0.0%		0.0%
20	0.0%		0.0%
21	0.0%		0.0%
22	0.0%		0.0%
23	0.0%		0.0%
24	0.0%		0.0%
25	0.0%		0.0%
26	0.0%		0.0%
27	0.0%		0.0%
28	0.0%		0.0%
29	0.0%		0.0%
30	0.0%		0.1%
31	0.0%		0.1%
32	0.1%		0.2%
33	0.1%		0.3%
34	0.2%		0.5%
35	0.3%		0.7%
36	0.4%		1.1%
37	0.6%		1.7%
38	0.8%		2.4%
39	1.0%		3.5%
40	1.3%		4.8%
41	1.7%		6.5%
42	2.1%		8.6%
43	2.5%		11.1%
44	3.0%		14.1%
45	3.5%		17.6%
46	4.0%		21.6%
47	4.4%		26.1%

48	5.5%	66.2%
49	5.1%	71.3%
50	4.7%	76.0%
51	4.2%	80.2%
52	3.7%	83.9%
53	3.2%	87.1%
54	2.7%	89.8%
55	2.3%	92.0%
56	1.9%	93.9%
57	1.5%	95.4%
58	1.2%	96.6%
59	0.9%	97.5%
60	0.7%	98.2%
61	0.5%	98.7%
62	0.4%	99.1%
63	0.3%	99.4%
64	0.2%	99.6%
65	0.1%	99.7%
66	0.1%	99.8%
67	0.1%	99.9%
68	0.0%	99.9%
69	0.0%	99.9%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

48	4.8%	30.9%
49	5.1%	36.0%
50	5.4%	41.4%
51	5.5%	46.9%
52	5.5%	52.4%
53	5.4%	57.8%
54	5.3%	63.1%
55	5.0%	68.1%
56	4.7%	72.8%
57	4.3%	77.0%
58	3.8%	80.9%
59	3.4%	84.3%
60	3.0%	87.2%
61	2.5%	89.8%
62	2.1%	91.9%
63	1.8%	93.7%
64	1.4%	95.1%
65	1.2%	96.3%
66	0.9%	97.2%
67	0.7%	97.9%
68	0.6%	98.5%
69	0.4%	98.9%
70	0.3%	99.2%
71	0.2%	99.5%
72	0.2%	99.6%
73	0.1%	99.7%
74	0.1%	99.8%
75	0.1%	99.9%
76	0.0%	99.9%
77	0.0%	99.9%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
2.5	minutes/train	1500 ft Train length	
128	vehicles/hour		
5	vehicles/train		
225	95% queue length		
k	P	Cumulative	
0	0.5%		0.5%
1	2.6%		3.1%
2	6.9%		9.9%
3	12.2%		22.1%
4	16.3%		38.4%
5	17.4%		55.8%
6	15.4%		71.2%
7	11.8%		83.0%
8	7.8%		90.8%
9	4.6%		95.4%
10	2.5%		97.9%
11	1.2%		99.1%
12	0.5%		99.7%
13	0.2%		99.9%
14	0.1%		100.0%
15	0.0%		100.0%
16	0.0%		100.0%
17	0.0%		100.0%
18	0.0%		100.0%
19	0.0%		100.0%
20	0.0%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
2.5	minutes/train	1500 ft Train length	
141	vehicles/hour		
6	vehicles/train		
250	95% queue length		
k	P	Cumulative	
0	0.3%		0.3%
1	1.7%		1.9%
2	4.8%		6.8%
3	9.5%		16.3%
4	13.9%		30.2%
5	16.4%		46.6%
6	16.0%		62.6%
7	13.5%		76.1%
8	9.9%		86.0%
9	6.5%		92.4%
10	3.8%		96.2%
11	2.0%		98.3%
12	1.0%		99.2%
13	0.4%		99.7%
14	0.2%		99.9%
15	0.1%		100.0%
16	0.0%		100.0%
17	0.0%		100.0%
18	0.0%		100.0%
19	0.0%		100.0%
20	0.0%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%
103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
3.1	minutes/train	2000 ft Train length	
128	vehicles/hour		
7	vehicles/train		
275	95% queue length		
k	P	Cumulative	
0	0.1%		0.1%
1	0.9%		1.0%
2	2.9%		4.0%
3	6.5%		10.4%
4	10.7%		21.1%
5	14.2%		35.3%
6	15.6%		50.9%
7	14.7%		65.6%
8	12.2%		77.8%
9	9.0%		86.7%
10	5.9%		92.7%
11	3.6%		96.2%
12	2.0%		98.2%
13	1.0%		99.2%
14	0.5%		99.7%
15	0.2%		99.9%
16	0.1%		99.9%
17	0.0%		100.0%
18	0.0%		100.0%
19	0.0%		100.0%
20	0.0%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
3.1	minutes/train	2000 ft Train length	
141	vehicles/hour		
7	vehicles/train		
300	95% queue length		
k	P	Cumulative	
0	0.1%		0.1%
1	0.5%		0.6%
2	1.8%		2.4%
3	4.4%		6.8%
4	8.0%		14.9%
5	11.7%		26.6%
6	14.2%		40.8%
7	14.8%		55.6%
8	13.5%		69.1%
9	10.9%		80.0%
10	8.0%		88.0%
11	5.3%		93.3%
12	3.2%		96.5%
13	1.8%		98.3%
14	0.9%		99.2%
15	0.5%		99.6%
16	0.2%		99.9%
17	0.1%		99.9%
18	0.0%		100.0%
19	0.0%		100.0%
20	0.0%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
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143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
4.2	minutes/train	3000 ft Train length	
128	vehicles/hour		
9	vehicles/train		
350	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.1%		0.1%
2	0.5%		0.6%
3	1.5%		2.2%
4	3.4%		5.6%
5	6.2%		11.8%
6	9.2%		21.0%
7	11.8%		32.9%
8	13.2%		46.1%
9	13.2%		59.3%
10	11.8%		71.1%
11	9.6%		80.7%
12	7.2%		87.9%
13	4.9%		92.8%
14	3.2%		96.0%
15	1.9%		97.9%
16	1.1%		98.9%
17	0.6%		99.5%
18	0.3%		99.8%
19	0.1%		99.9%
20	0.1%		100.0%
21	0.0%		100.0%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
4.2	minutes/train	3000 ft Train length	
141	vehicles/hour		
10	vehicles/train		
375	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.1%		0.1%
2	0.3%		0.3%
3	0.8%		1.1%
4	2.0%		3.2%
5	4.0%		7.2%
6	6.6%		13.9%
7	9.4%		23.2%
8	11.5%		34.8%
9	12.7%		47.4%
10	12.5%		59.9%
11	11.2%		71.1%
12	9.2%		80.4%
13	7.0%		87.4%
14	4.9%		92.3%
15	3.2%		95.6%
16	2.0%		97.6%
17	1.2%		98.7%
18	0.6%		99.4%
19	0.3%		99.7%
20	0.2%		99.9%
21	0.1%		99.9%
22	0.0%		100.0%
23	0.0%		100.0%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

93	0.0%	100.0%
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139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%

93	0.0%	100.0%
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102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
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122	0.0%	100.0%
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125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
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137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%

143	0.0%	100.0%
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145	0.0%	100.0%
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147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
5.4	minutes/train	4000 ft Train length	
128	vehicles/hour		
12	vehicles/train		
425	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.1%		0.1%
3	0.3%		0.3%
4	0.7%		1.1%
5	1.7%		2.7%
6	3.2%		6.0%
7	5.3%		11.3%
8	7.6%		18.9%
9	9.8%		28.7%
10	11.3%		39.9%
11	11.8%		51.7%
12	11.3%		63.1%
13	10.0%		73.1%
14	8.3%		81.4%
15	6.3%		87.7%
16	4.6%		92.3%
17	3.1%		95.4%
18	2.0%		97.3%
19	1.2%		98.5%
20	0.7%		99.2%
21	0.4%		99.6%
22	0.2%		99.8%
23	0.1%		99.9%
24	0.0%		100.0%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
5.4	minutes/train	4000 ft Train length	
141	vehicles/hour		
13	vehicles/train		
475	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.1%		0.1%
4	0.3%		0.5%
5	0.8%		1.3%
6	1.8%		3.1%
7	3.2%		6.3%
8	5.1%		11.5%
9	7.2%		18.7%
10	9.2%		27.9%
11	10.6%		38.5%
12	11.2%		49.8%
13	11.0%		60.7%
14	9.9%		70.6%
15	8.4%		79.0%
16	6.7%		85.7%
17	5.0%		90.7%
18	3.5%		94.2%
19	2.3%		96.5%
20	1.5%		98.0%
21	0.9%		98.9%
22	0.5%		99.4%
23	0.3%		99.7%
24	0.2%		99.9%
25	0.1%		99.9%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%
103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
5.5	minutes/train	4100 ft Train length	
128	vehicles/hour		
12	vehicles/train		
450	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.1%		0.1%
3	0.2%		0.3%
4	0.6%		0.9%
5	1.5%		2.4%
6	2.9%		5.3%
7	4.9%		10.2%
8	7.1%		17.3%
9	9.3%		26.6%
10	10.9%		37.6%
11	11.7%		49.2%
12	11.4%		60.6%
13	10.3%		70.9%
14	8.6%		79.6%
15	6.7%		86.3%
16	4.9%		91.3%
17	3.4%		94.7%
18	2.2%		96.9%
19	1.4%		98.3%
20	0.8%		99.1%
21	0.5%		99.5%
22	0.2%		99.8%
23	0.1%		99.9%
24	0.1%		99.9%
25	0.0%		100.0%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
5.5	minutes/train	4100 ft Train length	
141	vehicles/hour		
13	vehicles/train		
475	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.1%		0.1%
4	0.3%		0.4%
5	0.7%		1.1%
6	1.6%		2.7%
7	2.9%		5.6%
8	4.7%		10.3%
9	6.8%		17.1%
10	8.7%		25.8%
11	10.3%		36.1%
12	11.1%		47.1%
13	11.0%		58.1%
14	10.1%		68.3%
15	8.7%		77.0%
16	7.1%		84.1%
17	5.4%		89.5%
18	3.9%		93.3%
19	2.6%		95.9%
20	1.7%		97.6%
21	1.0%		98.7%
22	0.6%		99.3%
23	0.3%		99.6%
24	0.2%		99.8%
25	0.1%		99.9%
26	0.0%		100.0%
27	0.0%		100.0%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%
103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH	
6.5	minutes/train	5000 ft Train length	
128	vehicles/hour		
14	vehicles/train		
500	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.1%
4	0.1%		0.2%
5	0.4%		0.6%
6	0.9%		1.5%
7	1.9%		3.4%
8	3.2%		6.6%
9	5.0%		11.6%
10	6.9%		18.5%
11	8.7%		27.1%
12	10.0%		37.2%
13	10.7%		47.9%
14	10.6%		58.5%
15	9.8%		68.2%
16	8.5%		76.7%
17	6.9%		83.7%
18	5.3%		89.0%
19	3.9%		92.9%
20	2.7%		95.6%
21	1.8%		97.4%
22	1.1%		98.5%
23	0.7%		99.2%
24	0.4%		99.6%
25	0.2%		99.8%
26	0.1%		99.9%
27	0.1%		99.9%
28	0.0%		100.0%
29	0.0%		100.0%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
35	0.0%		100.0%
36	0.0%		100.0%
37	0.0%		100.0%
38	0.0%		100.0%
39	0.0%		100.0%
40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

PM	WB	2045 @ 10 MPH	
6.5	minutes/train	5000 ft Train length	
141	vehicles/hour		
15	vehicles/train		
550	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.1%		0.1%
5	0.2%		0.2%
6	0.4%		0.6%
7	0.9%		1.5%
8	1.7%		3.2%
9	2.9%		6.1%
10	4.4%		10.6%
11	6.1%		16.7%
12	7.8%		24.5%
13	9.2%		33.7%
14	10.0%		43.8%
15	10.2%		54.0%
16	9.8%		63.7%
17	8.8%		72.5%
18	7.4%		80.0%
19	6.0%		85.9%
20	4.6%		90.5%
21	3.3%		93.8%
22	2.3%		96.1%
23	1.5%		97.7%
24	1.0%		98.6%
25	0.6%		99.2%
26	0.3%		99.6%
27	0.2%		99.8%
28	0.1%		99.9%
29	0.1%		99.9%
30	0.0%		100.0%
31	0.0%		100.0%
32	0.0%		100.0%
33	0.0%		100.0%
34	0.0%		100.0%
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40	0.0%		100.0%
41	0.0%		100.0%
42	0.0%		100.0%

43	0.0%	100.0%	43	0.0%	100.0%
44	0.0%	100.0%	44	0.0%	100.0%
45	0.0%	100.0%	45	0.0%	100.0%
46	0.0%	100.0%	46	0.0%	100.0%
47	0.0%	100.0%	47	0.0%	100.0%
48	0.0%	100.0%	48	0.0%	100.0%
49	0.0%	100.0%	49	0.0%	100.0%
50	0.0%	100.0%	50	0.0%	100.0%
51	0.0%	100.0%	51	0.0%	100.0%
52	0.0%	100.0%	52	0.0%	100.0%
53	0.0%	100.0%	53	0.0%	100.0%
54	0.0%	100.0%	54	0.0%	100.0%
55	0.0%	100.0%	55	0.0%	100.0%
56	0.0%	100.0%	56	0.0%	100.0%
57	0.0%	100.0%	57	0.0%	100.0%
58	0.0%	100.0%	58	0.0%	100.0%
59	0.0%	100.0%	59	0.0%	100.0%
60	0.0%	100.0%	60	0.0%	100.0%
61	0.0%	100.0%	61	0.0%	100.0%
62	0.0%	100.0%	62	0.0%	100.0%
63	0.0%	100.0%	63	0.0%	100.0%
64	0.0%	100.0%	64	0.0%	100.0%
65	0.0%	100.0%	65	0.0%	100.0%
66	0.0%	100.0%	66	0.0%	100.0%
67	0.0%	100.0%	67	0.0%	100.0%
68	0.0%	100.0%	68	0.0%	100.0%
69	0.0%	100.0%	69	0.0%	100.0%
70	0.0%	100.0%	70	0.0%	100.0%
71	0.0%	100.0%	71	0.0%	100.0%
72	0.0%	100.0%	72	0.0%	100.0%
73	0.0%	100.0%	73	0.0%	100.0%
74	0.0%	100.0%	74	0.0%	100.0%
75	0.0%	100.0%	75	0.0%	100.0%
76	0.0%	100.0%	76	0.0%	100.0%
77	0.0%	100.0%	77	0.0%	100.0%
78	0.0%	100.0%	78	0.0%	100.0%
79	0.0%	100.0%	79	0.0%	100.0%
80	0.0%	100.0%	80	0.0%	100.0%
81	0.0%	100.0%	81	0.0%	100.0%
82	0.0%	100.0%	82	0.0%	100.0%
83	0.0%	100.0%	83	0.0%	100.0%
84	0.0%	100.0%	84	0.0%	100.0%
85	0.0%	100.0%	85	0.0%	100.0%
86	0.0%	100.0%	86	0.0%	100.0%
87	0.0%	100.0%	87	0.0%	100.0%
88	0.0%	100.0%	88	0.0%	100.0%
89	0.0%	100.0%	89	0.0%	100.0%
90	0.0%	100.0%	90	0.0%	100.0%
91	0.0%	100.0%	91	0.0%	100.0%
92	0.0%	100.0%	92	0.0%	100.0%

93	0.0%	100.0%	93	0.0%	100.0%
94	0.0%	100.0%	94	0.0%	100.0%
95	0.0%	100.0%	95	0.0%	100.0%
96	0.0%	100.0%	96	0.0%	100.0%
97	0.0%	100.0%	97	0.0%	100.0%
98	0.0%	100.0%	98	0.0%	100.0%
99	0.0%	100.0%	99	0.0%	100.0%
100	0.0%	100.0%	100	0.0%	100.0%
101	0.0%	100.0%	101	0.0%	100.0%
102	0.0%	100.0%	102	0.0%	100.0%
103	0.0%	100.0%	103	0.0%	100.0%
104	0.0%	100.0%	104	0.0%	100.0%
105	0.0%	100.0%	105	0.0%	100.0%
106	0.0%	100.0%	106	0.0%	100.0%
107	0.0%	100.0%	107	0.0%	100.0%
108	0.0%	100.0%	108	0.0%	100.0%
109	0.0%	100.0%	109	0.0%	100.0%
110	0.0%	100.0%	110	0.0%	100.0%
111	0.0%	100.0%	111	0.0%	100.0%
112	0.0%	100.0%	112	0.0%	100.0%
113	0.0%	100.0%	113	0.0%	100.0%
114	0.0%	100.0%	114	0.0%	100.0%
115	0.0%	100.0%	115	0.0%	100.0%
116	0.0%	100.0%	116	0.0%	100.0%
117	0.0%	100.0%	117	0.0%	100.0%
118	0.0%	100.0%	118	0.0%	100.0%
119	0.0%	100.0%	119	0.0%	100.0%
120	0.0%	100.0%	120	0.0%	100.0%
121	0.0%	100.0%	121	0.0%	100.0%
122	0.0%	100.0%	122	0.0%	100.0%
123	0.0%	100.0%	123	0.0%	100.0%
124	0.0%	100.0%	124	0.0%	100.0%
125	0.0%	100.0%	125	0.0%	100.0%
126	0.0%	100.0%	126	0.0%	100.0%
127	0.0%	100.0%	127	0.0%	100.0%
128	0.0%	100.0%	128	0.0%	100.0%
129	0.0%	100.0%	129	0.0%	100.0%
130	0.0%	100.0%	130	0.0%	100.0%
131	0.0%	100.0%	131	0.0%	100.0%
132	0.0%	100.0%	132	0.0%	100.0%
133	0.0%	100.0%	133	0.0%	100.0%
134	0.0%	100.0%	134	0.0%	100.0%
135	0.0%	100.0%	135	0.0%	100.0%
136	0.0%	100.0%	136	0.0%	100.0%
137	0.0%	100.0%	137	0.0%	100.0%
138	0.0%	100.0%	138	0.0%	100.0%
139	0.0%	100.0%	139	0.0%	100.0%
140	0.0%	100.0%	140	0.0%	100.0%
141	0.0%	100.0%	141	0.0%	100.0%
142	0.0%	100.0%	142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 MPH
7.7	minutes/train	6000 ft Train length
128	vehicles/hour	
16	vehicles/train	
575	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.1%	0.1%
6	0.2%	0.3%
7	0.5%	0.8%
8	1.0%	1.7%
9	1.8%	3.5%
10	2.9%	6.4%
11	4.3%	10.7%
12	5.9%	16.6%
13	7.5%	24.1%
14	8.8%	32.9%
15	9.6%	42.5%
16	9.9%	52.4%
17	9.5%	61.9%
18	8.7%	70.6%
19	7.5%	78.1%
20	6.2%	84.3%
21	4.8%	89.1%
22	3.6%	92.7%
23	2.6%	95.3%
24	1.8%	97.1%
25	1.2%	98.2%
26	0.7%	99.0%
27	0.4%	99.4%
28	0.3%	99.7%
29	0.1%	99.8%
30	0.1%	99.9%
31	0.0%	100.0%
32	0.0%	100.0%
33	0.0%	100.0%
34	0.0%	100.0%
35	0.0%	100.0%
36	0.0%	100.0%
37	0.0%	100.0%
38	0.0%	100.0%
39	0.0%	100.0%
40	0.0%	100.0%
41	0.0%	100.0%
42	0.0%	100.0%

PM	WB	2045 @ 10 MPH
7.7	minutes/train	6000 ft Train length
141	vehicles/hour	
18	vehicles/train	
625	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.1%	0.1%
7	0.2%	0.3%
8	0.4%	0.7%
9	0.8%	1.5%
10	1.4%	2.9%
11	2.4%	5.3%
12	3.6%	8.8%
13	5.0%	13.8%
14	6.4%	20.2%
15	7.7%	27.9%
16	8.7%	36.7%
17	9.3%	46.0%
18	9.4%	55.3%
19	8.9%	64.2%
20	8.1%	72.3%
21	6.9%	79.3%
22	5.7%	85.0%
23	4.5%	89.5%
24	3.4%	92.9%
25	2.5%	95.3%
26	1.7%	97.0%
27	1.1%	98.2%
28	0.7%	98.9%
29	0.5%	99.4%
30	0.3%	99.6%
31	0.2%	99.8%
32	0.1%	99.9%
33	0.1%	99.9%
34	0.0%	100.0%
35	0.0%	100.0%
36	0.0%	100.0%
37	0.0%	100.0%
38	0.0%	100.0%
39	0.0%	100.0%
40	0.0%	100.0%
41	0.0%	100.0%
42	0.0%	100.0%

43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%
48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
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66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%

43	0.0%	100.0%
44	0.0%	100.0%
45	0.0%	100.0%
46	0.0%	100.0%
47	0.0%	100.0%
48	0.0%	100.0%
49	0.0%	100.0%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
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70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%
87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%

93	0.0%	100.0%
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96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
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117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%

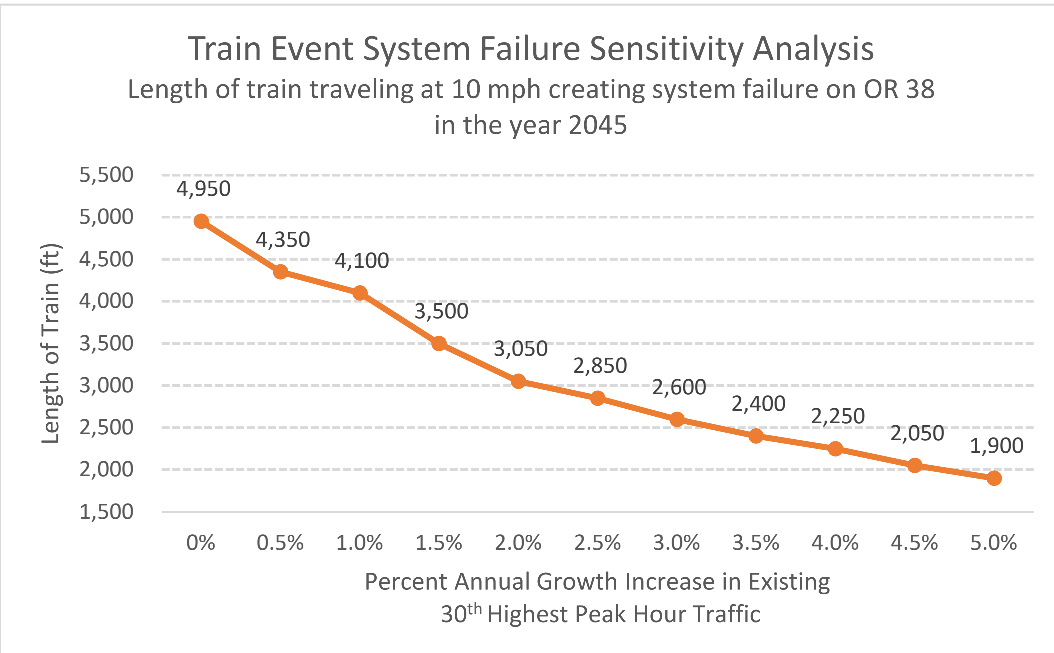
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%
134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

Sensitivity Analysis - Annual Increase in Existing 30th Highest Peak Hour Traffic into Year 2045

Percent Increase %	Traffic	Length of Train @ 10 MPH creating system failure
0%	291	4,950
0.5%	324	4,350
1.0%	358	4,100
1.5%	391	3,500
2.0%	425	3,050
2.5%	458	2,850
3.0%	492	2,600
3.5%	525	2,400
4.0%	559	2,250
4.5%	592	2,050
5.0%	626	1,900



PM	EB	2045 @ 10 mph	
6.5	minutes/train	0% Increase Existing	
291	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.2%
20	0.8%		1.9%
21	1.2%		3.1%
22	1.7%		4.8%
23	2.3%		7.1%
24	3.0%		10.2%
25	3.8%		14.0%
26	4.7%		18.7%
27	5.4%		24.1%
28	6.1%		30.2%
29	6.7%		36.9%
30	7.0%		43.9%
31	7.1%		51.0%
32	7.0%		58.0%
33	6.7%		64.7%
34	6.2%		70.9%
35	5.6%		76.5%
36	4.9%		81.4%
37	4.2%		85.6%
38	3.5%		89.0%
39	2.8%		91.8%

40	2.2%	94.0%
41	1.7%	95.7%
42	1.3%	97.0%
43	0.9%	98.0%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph
5.8	minutes/train	0.5% Annual Increase Existing
324	vehicles/hour	
31	vehicles/train	
1025	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.1%	0.1%
16	0.1%	0.2%
17	0.2%	0.4%
18	0.3%	0.7%
19	0.5%	1.3%
20	0.8%	2.1%
21	1.3%	3.4%
22	1.8%	5.2%
23	2.5%	7.6%
24	3.2%	10.8%
25	4.0%	14.8%
26	4.8%	19.7%
27	5.6%	25.2%
28	6.3%	31.5%
29	6.8%	38.3%
30	7.1%	45.3%
31	7.1%	52.5%
32	7.0%	59.5%
33	6.6%	66.1%
34	6.1%	72.2%
35	5.5%	77.6%
36	4.8%	82.4%
37	4.0%	86.4%
38	3.3%	89.7%
39	2.7%	92.4%

40	2.1%	94.5%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.1%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
5.5	minutes/train	1.0% Annual Increase Existing	
358	vehicles/hour		
33	vehicles/train		
1075	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.0%
16	0.0%		0.1%
17	0.1%		0.2%
18	0.2%		0.4%
19	0.3%		0.6%
20	0.5%		1.1%
21	0.8%		1.9%
22	1.1%		3.0%
23	1.6%		4.6%
24	2.2%		6.8%
25	2.9%		9.7%
26	3.6%		13.3%
27	4.4%		17.7%
28	5.2%		22.9%
29	5.9%		28.8%
30	6.4%		35.2%
31	6.8%		42.0%
32	7.0%		49.0%
33	6.9%		55.9%
34	6.7%		62.6%
35	6.3%		68.8%
36	5.7%		74.5%
37	5.1%		79.6%
38	4.4%		84.0%
39	3.7%		87.7%

40	3.0%	90.7%
41	2.4%	93.1%
42	1.9%	95.0%
43	1.4%	96.4%
44	1.1%	97.5%
45	0.8%	98.3%
46	0.6%	98.9%
47	0.4%	99.2%
48	0.3%	99.5%
49	0.2%	99.7%
50	0.1%	99.8%
51	0.1%	99.9%
52	0.0%	99.9%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.8	minutes/train	1.5% Annual Increase Existing	
391	vehicles/hour		
31	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.1%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.3%
20	0.9%		2.1%
21	1.3%		3.4%
22	1.8%		5.2%
23	2.5%		7.7%
24	3.2%		10.9%
25	4.0%		15.0%
26	4.9%		19.8%
27	5.6%		25.5%
28	6.3%		31.8%
29	6.8%		38.5%
30	7.1%		45.6%
31	7.1%		52.8%
32	7.0%		59.7%
33	6.6%		66.3%
34	6.1%		72.4%
35	5.4%		77.9%
36	4.7%		82.6%
37	4.0%		86.6%
38	3.3%		89.9%
39	2.6%		92.5%

40	2.1%	94.6%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.2%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.0%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.3	minutes/train	2.0% Annual Increase Existing	
425	vehicles/hour		
30	vehicles/train		
1000	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.1%
15	0.1%		0.2%
16	0.2%		0.3%
17	0.3%		0.6%
18	0.5%		1.1%
19	0.8%		1.8%
20	1.1%		3.0%
21	1.7%		4.6%
22	2.3%		6.9%
23	3.1%		10.0%
24	3.9%		13.9%
25	4.7%		18.6%
26	5.5%		24.1%
27	6.2%		30.4%
28	6.8%		37.1%
29	7.1%		44.3%
30	7.2%		51.5%
31	7.1%		58.6%
32	6.8%		65.4%
33	6.2%		71.6%
34	5.6%		77.2%
35	4.9%		82.1%
36	4.1%		86.2%
37	3.4%		89.6%
38	2.7%		92.3%
39	2.1%		94.5%

40	1.6%	96.1%
41	1.2%	97.3%
42	0.9%	98.2%
43	0.6%	98.8%
44	0.4%	99.2%
45	0.3%	99.5%
46	0.2%	99.7%
47	0.1%	99.8%
48	0.1%	99.9%
49	0.0%	99.9%
50	0.0%	100.0%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph
4.1	minutes/train	2.5% Annual Increase Existing
458	vehicles/hour	
31	vehicles/train	
1025	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.1%	0.1%
16	0.1%	0.2%
17	0.2%	0.4%
18	0.3%	0.7%
19	0.5%	1.3%
20	0.9%	2.1%
21	1.3%	3.4%
22	1.8%	5.2%
23	2.5%	7.7%
24	3.2%	10.9%
25	4.0%	14.9%
26	4.8%	19.8%
27	5.6%	25.4%
28	6.3%	31.7%
29	6.8%	38.4%
30	7.1%	45.5%
31	7.1%	52.6%
32	7.0%	59.6%
33	6.6%	66.2%
34	6.1%	72.3%
35	5.4%	77.8%
36	4.7%	82.5%
37	4.0%	86.5%
38	3.3%	89.8%
39	2.6%	92.5%

40	2.1%	94.5%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.2%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph
3.8	minutes/train	3.0% Annual Increase Existing
492	vehicles/hour	
31	vehicles/train	
1025	95% queue length	
k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.1%	0.1%
16	0.1%	0.2%
17	0.2%	0.4%
18	0.4%	0.8%
19	0.6%	1.3%
20	0.9%	2.2%
21	1.3%	3.6%
22	1.9%	5.5%
23	2.6%	8.0%
24	3.3%	11.3%
25	4.1%	15.5%
26	5.0%	20.4%
27	5.7%	26.2%
28	6.4%	32.5%
29	6.8%	39.4%
30	7.1%	46.5%
31	7.1%	53.6%
32	7.0%	60.6%
33	6.6%	67.1%
34	6.0%	73.2%
35	5.4%	78.5%
36	4.6%	83.2%
37	3.9%	87.1%
38	3.2%	90.3%
39	2.6%	92.8%

40	2.0%	94.8%
41	1.5%	96.3%
42	1.1%	97.5%
43	0.8%	98.3%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.0%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
3.6	minutes/train	3.5% Annual Increase Existing	
525	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.2%
20	0.8%		2.0%
21	1.2%		3.1%
22	1.7%		4.9%
23	2.3%		7.2%
24	3.1%		10.3%
25	3.9%		14.1%
26	4.7%		18.8%
27	5.5%		24.3%
28	6.1%		30.4%
29	6.7%		37.1%
30	7.0%		44.1%
31	7.1%		51.2%
32	7.0%		58.2%
33	6.7%		64.9%
34	6.2%		71.1%
35	5.6%		76.7%
36	4.9%		81.5%
37	4.2%		85.7%
38	3.4%		89.1%
39	2.8%		91.9%

40	2.2%	94.1%
41	1.7%	95.8%
42	1.3%	97.0%
43	0.9%	98.0%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
3.6	minutes/train	4.0% Annual Increase Existing	
559	vehicles/hour		
34	vehicles/train		
1075	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.0%
16	0.0%		0.1%
17	0.1%		0.1%
18	0.1%		0.2%
19	0.2%		0.5%
20	0.4%		0.8%
21	0.6%		1.4%
22	0.9%		2.3%
23	1.3%		3.6%
24	1.8%		5.4%
25	2.4%		7.8%
26	3.1%		10.9%
27	3.9%		14.8%
28	4.6%		19.4%
29	5.4%		24.7%
30	6.0%		30.7%
31	6.5%		37.2%
32	6.8%		44.0%
33	6.9%		50.9%
34	6.8%		57.7%
35	6.5%		64.2%
36	6.1%		70.3%
37	5.5%		75.8%
38	4.9%		80.6%
39	4.2%		84.8%

40	3.5%	88.3%
41	2.9%	91.2%
42	2.3%	93.5%
43	1.8%	95.3%
44	1.4%	96.6%
45	1.0%	97.6%
46	0.7%	98.4%
47	0.5%	98.9%
48	0.4%	99.3%
49	0.3%	99.5%
50	0.2%	99.7%
51	0.1%	99.8%
52	0.1%	99.9%
53	0.0%	99.9%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
3.2	minutes/train	4.5% Annual Increase Existing	
592	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.2%
17	0.2%		0.3%
18	0.3%		0.6%
19	0.5%		1.1%
20	0.8%		1.9%
21	1.2%		3.1%
22	1.7%		4.7%
23	2.3%		7.0%
24	3.0%		10.0%
25	3.8%		13.8%
26	4.6%		18.5%
27	5.4%		23.9%
28	6.1%		29.9%
29	6.6%		36.6%
30	7.0%		43.6%
31	7.1%		50.7%
32	7.0%		57.7%
33	6.7%		64.4%
34	6.2%		70.6%
35	5.6%		76.2%
36	4.9%		81.2%
37	4.2%		85.4%
38	3.5%		88.9%
39	2.8%		91.7%

40	2.2%	93.9%
41	1.7%	95.7%
42	1.3%	97.0%
43	0.9%	97.9%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB		2045 @ 10 mph	
3	minutes/train		5.0% Annual Increase Existing	
626	vehicles/hour			
31	vehicles/train			
1025	95% queue length			
k	P		Cumulative	
0		0.0%		0.0%
1		0.0%		0.0%
2		0.0%		0.0%
3		0.0%		0.0%
4		0.0%		0.0%
5		0.0%		0.0%
6		0.0%		0.0%
7		0.0%		0.0%
8		0.0%		0.0%
9		0.0%		0.0%
10		0.0%		0.0%
11		0.0%		0.0%
12		0.0%		0.0%
13		0.0%		0.0%
14		0.0%		0.0%
15		0.1%		0.1%
16		0.1%		0.2%
17		0.2%		0.4%
18		0.3%		0.7%
19		0.5%		1.3%
20		0.9%		2.1%
21		1.3%		3.4%
22		1.8%		5.2%
23		2.5%		7.7%
24		3.2%		10.9%
25		4.0%		14.9%
26		4.8%		19.7%
27		5.6%		25.4%
28		6.3%		31.6%
29		6.8%		38.4%
30		7.1%		45.5%
31		7.1%		52.6%
32		7.0%		59.6%
33		6.6%		66.2%
34		6.1%		72.3%
35		5.5%		77.8%
36		4.7%		82.5%
37		4.0%		86.5%
38		3.3%		89.8%
39		2.6%		92.5%

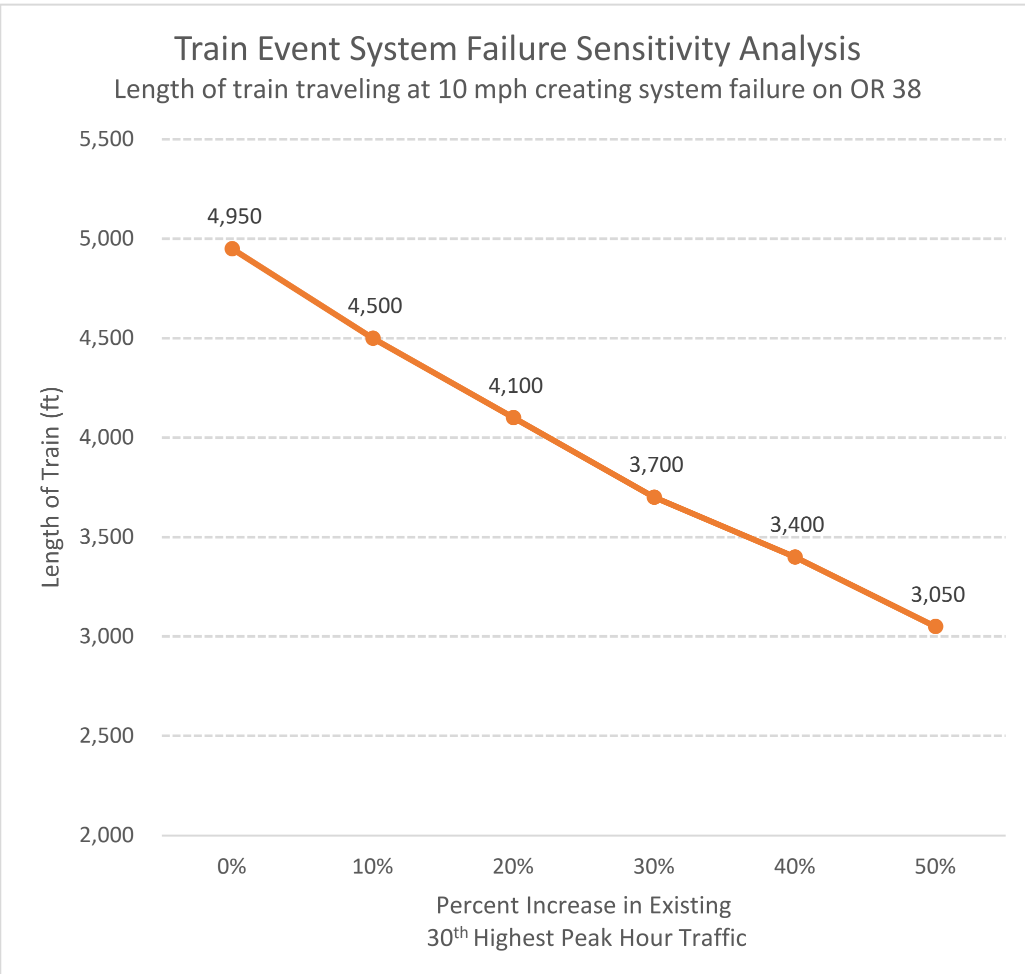
40	2.1%	94.5%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.2%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

Sensitivity Analysis - Percent Incrase in Existing 30th Highest Peak Hour Traffic

Percent Increase %	Traffic	Length of Train @ 10 MPH creating system failure
0%	291	4,950
10%	320	4,500
20%	349	4,100
30%	378	3,700
40%	407	3,400
50%	437	3,050



PM	EB		2045 @ 10 mp
6.5	minutes/train		
291	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P		Cumulative
0		0.0%	0.0%
1		0.0%	0.0%
2		0.0%	0.0%
3		0.0%	0.0%
4		0.0%	0.0%
5		0.0%	0.0%
6		0.0%	0.0%
7		0.0%	0.0%
8		0.0%	0.0%
9		0.0%	0.0%
10		0.0%	0.0%
11		0.0%	0.0%
12		0.0%	0.0%
13		0.0%	0.0%
14		0.0%	0.0%
15		0.0%	0.1%
16		0.1%	0.2%
17		0.2%	0.4%
18		0.3%	0.7%
19		0.5%	1.2%
20		0.8%	1.9%
21		1.2%	3.1%
22		1.7%	4.8%
23		2.3%	7.1%
24		3.0%	10.2%
25		3.8%	14.0%
26		4.7%	18.7%
27		5.4%	24.1%
28		6.1%	30.2%
29		6.7%	36.9%
30		7.0%	43.9%
31		7.1%	51.0%
32		7.0%	58.0%
33		6.7%	64.7%
34		6.2%	70.9%
35		5.6%	76.5%
36		4.9%	81.4%
37		4.2%	85.6%
38		3.5%	89.0%
39		2.8%	91.8%

40	2.2%	94.0%
41	1.7%	95.7%
42	1.3%	97.0%
43	0.9%	98.0%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph
5.9	minutes/train	10% Increase Existing
320	vehicles/hour	
31	vehicles/train	
1025	95% queue length	

k	P	Cumulative
0	0.0%	0.0%
1	0.0%	0.0%
2	0.0%	0.0%
3	0.0%	0.0%
4	0.0%	0.0%
5	0.0%	0.0%
6	0.0%	0.0%
7	0.0%	0.0%
8	0.0%	0.0%
9	0.0%	0.0%
10	0.0%	0.0%
11	0.0%	0.0%
12	0.0%	0.0%
13	0.0%	0.0%
14	0.0%	0.0%
15	0.0%	0.1%
16	0.1%	0.2%
17	0.2%	0.4%
18	0.3%	0.7%
19	0.5%	1.2%
20	0.8%	2.0%
21	1.2%	3.2%
22	1.7%	4.9%
23	2.4%	7.3%
24	3.1%	10.4%
25	3.9%	14.2%
26	4.7%	19.0%
27	5.5%	24.4%
28	6.2%	30.6%
29	6.7%	37.3%
30	7.0%	44.3%
31	7.1%	51.4%
32	7.0%	58.4%
33	6.7%	65.1%
34	6.2%	71.3%
35	5.6%	76.8%
36	4.9%	81.7%
37	4.1%	85.8%
38	3.4%	89.2%
39	2.8%	92.0%

40	2.2%	94.2%
41	1.7%	95.8%
42	1.2%	97.1%
43	0.9%	98.0%
44	0.7%	98.7%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
5.5	minutes/train	20% Increase Existing	
349	vehicles/hour		
32	vehicles/train		
1050	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.1%
17	0.1%		0.3%
18	0.2%		0.5%
19	0.4%		0.9%
20	0.7%		1.6%
21	1.0%		2.6%
22	1.5%		4.1%
23	2.0%		6.1%
24	2.7%		8.8%
25	3.5%		12.3%
26	4.3%		16.6%
27	5.1%		21.7%
28	5.8%		27.5%
29	6.4%		33.9%
30	6.8%		40.7%
31	7.0%		47.7%
32	7.0%		54.7%
33	6.8%		61.6%
34	6.4%		68.0%
35	5.9%		73.8%
36	5.2%		79.1%
37	4.5%		83.6%
38	3.8%		87.4%
39	3.1%		90.5%

40	2.5%	93.0%
41	1.9%	94.9%
42	1.5%	96.4%
43	1.1%	97.5%
44	0.8%	98.3%
45	0.6%	98.8%
46	0.4%	99.2%
47	0.3%	99.5%
48	0.2%	99.7%
49	0.1%	99.8%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
5	minutes/train	30% Increase Existing	
378	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.2%
20	0.8%		2.0%
21	1.2%		3.1%
22	1.7%		4.9%
23	2.3%		7.2%
24	3.1%		10.3%
25	3.9%		14.1%
26	4.7%		18.8%
27	5.5%		24.3%
28	6.1%		30.4%
29	6.7%		37.1%
30	7.0%		44.1%
31	7.1%		51.2%
32	7.0%		58.2%
33	6.7%		64.9%
34	6.2%		71.1%
35	5.6%		76.7%
36	4.9%		81.5%
37	4.2%		85.7%
38	3.4%		89.1%
39	2.8%		91.9%

40	2.2%	94.1%
41	1.7%	95.8%
42	1.3%	97.0%
43	0.9%	98.0%
44	0.7%	98.6%
45	0.5%	99.1%
46	0.3%	99.4%
47	0.2%	99.6%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.7	minutes/train	40% Increase Existing	
407	vehicles/hour		
32	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.0%		0.1%
16	0.1%		0.1%
17	0.1%		0.3%
18	0.3%		0.6%
19	0.4%		1.0%
20	0.7%		1.7%
21	1.0%		2.7%
22	1.5%		4.2%
23	2.1%		6.3%
24	2.8%		9.1%
25	3.6%		12.7%
26	4.4%		17.1%
27	5.2%		22.2%
28	5.9%		28.1%
29	6.5%		34.6%
30	6.9%		41.4%
31	7.1%		48.5%
32	7.0%		55.5%
33	6.8%		62.3%
34	6.4%		68.7%
35	5.8%		74.5%
36	5.1%		79.6%
37	4.4%		84.1%
38	3.7%		87.8%
39	3.0%		90.8%

40	2.4%	93.2%
41	1.9%	95.1%
42	1.4%	96.5%
43	1.1%	97.6%
44	0.8%	98.4%
45	0.5%	98.9%
46	0.4%	99.3%
47	0.3%	99.5%
48	0.2%	99.7%
49	0.1%	99.8%
50	0.1%	99.9%
51	0.0%	99.9%
52	0.0%	100.0%
53	0.0%	100.0%
54	0.0%	100.0%
55	0.0%	100.0%
56	0.0%	100.0%
57	0.0%	100.0%
58	0.0%	100.0%
59	0.0%	100.0%
60	0.0%	100.0%
61	0.0%	100.0%
62	0.0%	100.0%
63	0.0%	100.0%
64	0.0%	100.0%
65	0.0%	100.0%
66	0.0%	100.0%
67	0.0%	100.0%
68	0.0%	100.0%
69	0.0%	100.0%
70	0.0%	100.0%
71	0.0%	100.0%
72	0.0%	100.0%
73	0.0%	100.0%
74	0.0%	100.0%
75	0.0%	100.0%
76	0.0%	100.0%
77	0.0%	100.0%
78	0.0%	100.0%
79	0.0%	100.0%
80	0.0%	100.0%
81	0.0%	100.0%
82	0.0%	100.0%
83	0.0%	100.0%
84	0.0%	100.0%
85	0.0%	100.0%
86	0.0%	100.0%

87	0.0%	100.0%
88	0.0%	100.0%
89	0.0%	100.0%
90	0.0%	100.0%
91	0.0%	100.0%
92	0.0%	100.0%
93	0.0%	100.0%
94	0.0%	100.0%
95	0.0%	100.0%
96	0.0%	100.0%
97	0.0%	100.0%
98	0.0%	100.0%
99	0.0%	100.0%
100	0.0%	100.0%
101	0.0%	100.0%
102	0.0%	100.0%
103	0.0%	100.0%
104	0.0%	100.0%
105	0.0%	100.0%
106	0.0%	100.0%
107	0.0%	100.0%
108	0.0%	100.0%
109	0.0%	100.0%
110	0.0%	100.0%
111	0.0%	100.0%
112	0.0%	100.0%
113	0.0%	100.0%
114	0.0%	100.0%
115	0.0%	100.0%
116	0.0%	100.0%
117	0.0%	100.0%
118	0.0%	100.0%
119	0.0%	100.0%
120	0.0%	100.0%
121	0.0%	100.0%
122	0.0%	100.0%
123	0.0%	100.0%
124	0.0%	100.0%
125	0.0%	100.0%
126	0.0%	100.0%
127	0.0%	100.0%
128	0.0%	100.0%
129	0.0%	100.0%
130	0.0%	100.0%
131	0.0%	100.0%
132	0.0%	100.0%
133	0.0%	100.0%

134	0.0%	100.0%
135	0.0%	100.0%
136	0.0%	100.0%
137	0.0%	100.0%
138	0.0%	100.0%
139	0.0%	100.0%
140	0.0%	100.0%
141	0.0%	100.0%
142	0.0%	100.0%
143	0.0%	100.0%
144	0.0%	100.0%
145	0.0%	100.0%
146	0.0%	100.0%
147	0.0%	100.0%
148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

PM	EB	2045 @ 10 mph	
4.3	minutes/train	50% Increase Existing	
437	vehicles/hour		
31	vehicles/train		
1025	95% queue length		
k	P	Cumulative	
0	0.0%		0.0%
1	0.0%		0.0%
2	0.0%		0.0%
3	0.0%		0.0%
4	0.0%		0.0%
5	0.0%		0.0%
6	0.0%		0.0%
7	0.0%		0.0%
8	0.0%		0.0%
9	0.0%		0.0%
10	0.0%		0.0%
11	0.0%		0.0%
12	0.0%		0.0%
13	0.0%		0.0%
14	0.0%		0.0%
15	0.1%		0.1%
16	0.1%		0.2%
17	0.2%		0.4%
18	0.3%		0.7%
19	0.5%		1.3%
20	0.8%		2.1%
21	1.3%		3.4%
22	1.8%		5.2%
23	2.5%		7.6%
24	3.2%		10.8%
25	4.0%		14.8%
26	4.8%		19.7%
27	5.6%		25.3%
28	6.3%		31.5%
29	6.8%		38.3%
30	7.1%		45.3%
31	7.1%		52.5%
32	7.0%		59.5%
33	6.6%		66.1%
34	6.1%		72.2%
35	5.5%		77.7%
36	4.8%		82.4%
37	4.0%		86.4%
38	3.3%		89.7%
39	2.7%		92.4%

40	2.1%	94.5%
41	1.6%	96.1%
42	1.2%	97.3%
43	0.9%	98.1%
44	0.6%	98.8%
45	0.4%	99.2%
46	0.3%	99.5%
47	0.2%	99.7%
48	0.1%	99.8%
49	0.1%	99.9%
50	0.1%	99.9%
51	0.0%	100.0%
52	0.0%	100.0%
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148	0.0%	100.0%
149	0.0%	100.0%
150	0.0%	100.0%

Attachment B: Alternative Design Methodology and Assumptions and List of Initial Alternatives Memorandum

KITTELSON & ASSOCIATES
851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

Technical Memorandum

June 23, 2023 Project# 27003.011

To: Project Management Team

From: Jon Gerlach, PE, Nicholas Polenske, PE, and Marc Butorac, PE, PTOE, PMP

Project: City of Reedsport Rail Crossing Study and Refinement Plan

RE: Alternative Design Methodology & Assumptions and List of Initial Alternatives

INTRODUCTION

The Oregon International Port of Coos Bay is proposing to construct a new multi-modal container facility, which is anticipated to create an increase in rail activity at the existing OR 38 (Umpqua Highway No. 45) and Winchester Avenue at-grade railroad crossings in Reedsport. Several alternatives are being considered to provide safe access and reduce vehicle queueing at the crossing locations with three general approaches: improvements to the existing at-grade crossings, constructing a new grade-separated crossing, and/or adjusting rail operations/vertical alignment. This memorandum summarizes the proposed methodology and assumptions for the conceptual design elements to make improvements at existing crossing locations, and provides an overview of the initially identified alternatives which the project team plans to consider in *Technical Memorandum #6 – Transportation System Improvement Alternative Analysis.*

Methodology & Assumptions

- Apply design standards from AASHTO: A Policy of Geometric Design of Highways and Streets 2018, Douglas County Roadway Standards, Reedsport Transportation System Plan (TSP), Oregon Department of Transportation Highway Design Manual (ODOT HDM), and Union Pacific Railroad – BNSF Railway Guidelines for Railroad Grade Separation Projects.
- Assume a roadway design speed of 30 mph on OR 38 and Winchester Avenue.
- Assume 4% maximum roadway grade on OR 38 to accommodate truck usage, consider up to 7% maximum roadway grade on Winchester Avenue.
- Assume existing roadway cross sections to be upgraded to comply with the Reedsport TSP and ODOT HDM if necessary.
- Assume a minimum 23.5' of clearance from the railroad tracks to bottom of bridge is required for railroad overcrossings, and a minimum 17.5'of clearance from the roadway surface to bottom of bridge is required for railroad undercrossings.
- Assume any grade separation to span the entire 50' wide railroad right-of-way (e.g., an overcrossing would need a bridge a minimum of 50 feet long to span the rail right-of-way).

Existing Conditions

OR 38 is a statewide highway and a designated ORS 366.215 Freight Route running east-west and terminating at US 101 in Reedsport. Currently the crossing at OR 38 is for a single track, but additional parallel tracks may be built in the future (e.g., to lengthen the existing track siding to the south). The existing typical cross-section along the OR 38 near the railroad crossing is 48' wide: one 12' wide vehicle travel lane in each direction, one 6' wide shoulder/bike lane in each direction, and a 6' wide sidewalk on each side of the road, which meets the standards in the Reedsport TSP and ODOT HDM. The traffic control treatments at the existing crossing are crossbuck signs (MUTCD R15-1), automatic vehicular gates, flashing-light signals, and detectable warning units on the sidewalk. Both the eastbound and westbound approaches have advance warning pavement marking symbols and signage (MUTCD W10-1).

Winchester Avenue is classified as a Major Collector running northeast-southwest and connects from OR 38 east of the railroad crossing to US 101 south of the signalized OR 38 intersection. The current crossing at Winchester Avenue is for two tracks and is not expected to increase or decrease in the future. The existing typical cross-section along Winchester Avenue near the railroad crossing is 46' wide: one 12' wide vehicle travel lane in each direction, one 8' wide shoulder/bike lane in each direction, and a 6' wide sidewalk on the south side of the road. An additional sidewalk on the north side of the road was identified as part of the Reedsport TSP. The treatments at the existing crossing are crossbuck signs (MUTCD R15-1), automatic vehicular gates, flashing-light signals, and detectable warning units on the sidewalk. Both the eastbound and westbound approaches have advance warning pavement marking symbols and signage (MUTCD W10-1).

Initial Alternatives to Consider

Based on the findings in Technical Memorandums #4 and #5 and feedback from the Project Management Team, Project Advisory Committee, and the community through the online open house and interviews, the following initial alternatives have been identified for evaluation:

1) **At-Grade Rail Crossing Alternatives**
    a. Four-Quadrant Quiet Zone Gate at OR 38
    b. Four-Quadrant Quiet Zone Gate at Winchester Avenue

2) **Grade Separated Rail Crossing Alternatives**

    a. <u>OR 38 Rail Overcrossing</u>
        i. With Retaining Walls
        ii. Without Retaining Walls (Embankment Support)

    Since OR 38 is classified as an Oregon Highway Plan (OHP) Freight Route, it is strongly preferred to limit the ramp gradient to 4% or less. To provide the minimum 23.5' vertical clearance below the overcrossing to the railroad tracks at a 4% grade would require approaches of at least 600' in both directions. The design of the overcrossing may incorporate retaining walls and other bridge design elements to minimize the impact of the abutment side slopes.

    b. <u>Winchester Avenue Rail Overcrossing</u>
        i. With Retaining Walls
        ii. Without Retaining Walls (Embankment Support)

    Since Winchester Avenue is not currently a designated truck route, the approach grades may be increased to a desired maximum of 5%, or an absolute maximum of 7%. To achieve the minimum 23.5' vertical clearance below the overcrossing would require approaches of at least 500' to achieve the desired maximum grade of 5% but could be reduced to approximately 350' with a maximum grade of 7%. The design of the overcrossing may incorporate retaining walls and other bridge design elements to minimize the impact of the abutment side slopes. Implementation of an overcrossing on

Winchester Avenue may require additional roadway upgrades to create a suitable alternate freight access route due to potential truck diversions identified in the traffic study.

c. OR 38 Rail Undercrossing with Retaining Wall

To provide the minimum 17.5' vertical clearance below the railroad tracks at a 4% grade would require approaches at least 450' long, depending on the thickness of the structure which would be needed to support the existing railroad. The undercrossing would also require additional study to mitigate potential flooding risks and install an adequate drainage system, as well as the challenge of maintaining continuous rail access during construction.

d. Winchester Avenue Rail Undercrossing with Retaining Wall

Creation of a railroad undercrossing on Winchester Ave would require approaches of at least 350' at a 5% grade or 250' at a 7% grade, depending on the thickness of the structure needed to support the existing railroad. The undercrossing would also require additional study to mitigate potential flooding risks and install an adequate drainage system, as well as the challenges of maintaining continuous rail access during construction.

e. Other Crossing Locations (e.g., OR38 realignment)
   i. Port Dock Road Undercrossing Upgrades and Riverfront Way Intersection Realignment
   ii. Northerly OR38 Undercrossing Upgrade

Adjustments to the street alignments and network could be made to upgrade an existing grade-separated crossing at a new location north of OR 38 or near Port Dock Road. The potential route would seek to minimize the overall impacts of grade-separation and consider improvements to the overall circulation.

3) Rail Line Upgrade Alternatives

a. Increase Rail Speeds through Reedsport to 25 MPH
b. Increase Rail Speeds through Reedsport to 40 MPH

Increased rail speeds could shorten the duration of rail crossings and thereby reduce the queue lengths of at-grade crossings. The current maximum train speed in Reedsport is limited to 10 mph due to the existing Umpqua River Bridge, but it is under consideration to raise the speed limit to 25 mph or 40 mph, depending on additional safety improvements, bridge upgrades, and other geometric constraints associated with the existing horizontal track curvature. ***While this alternative evaluation is not directly scoped in the study and will be evaluated by the railroad and Port of Coos Bay under a future evaluation for feasibility and suitability, the benefits (i.e., reduced delays and queuing) will be documented qualitatively.***

4) Elevated Rail Line Alternative

As an alternate approach to roadway undercrossings or overcrossings, the entire rail line could theoretically be raised with a series of rail bridge replacements and earthwork to pass above the existing roads at the crossing locations. The finished track profile is limited to a maximum grade of 1.5%, which would require additional investigation into the extents of the track replacement north of the Umpqua River, including the bridge, and south of the southerly water crossing. ***While this alternative is likely unfeasible from a cost and environmental perspective compared to other alternatives, it will be documented qualitatively.***

Next Steps

The Project Management Team and Project Advisory Committee will review and confirm the methodology and assumptions and initial alternatives presented herein. Once confirmed, the project team will move forward in preparing *Technical Memorandum #6 – Transportation System Improvement Alternative Analysis.*

Attachment C: Evaluation Matrix

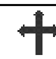
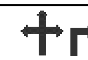
Objective	Evaluation Criteria	Evaluation Score	Criteria are applied relative to the no-build and with consideration to future conditions with increased rail activity	No-Build	2A1. OR 38 Rail Overcrossing with Retaining Wall	2A2. OR 38 Rail Overcrossing without Retaining Wall	2B1. Winchester Avenue Rail Overcrossing with Retailing Walls	2B2. Winchester Avenue Rail Overcrossing without Retailing Walls	2C. OR 38 Rail Undercrossing with Retaining Walls	2D. Winchester Avenue Rail Undercrossing with Retaining Walls	2E1. Port Dock Road Rail Undercrossing Upgrade	2E2. Northerly OR 38 Rail Undercrossing Upgrade	3A1. Increase Rail Speeds through Reedsport to 40 MPH	3A2. Increase Rail Speeds through Reedsport to 25 MPH	4A. Elevated Rail Line	5A – OR 38/US 101 East-West Split Phasing
Goal #1: Develop a transportation system to enhance Reedsport's livability and meet federal, state, and local requirements.																
Objective 1.a	Concept maintains the livability of Reedsport through proper location and design of transportation facilities.	(-2 to +2)	(+2) Concept improves transportation facilities (0) Concept maintains existing transportation facilities (-2) Concept degrades existing transportation facilities	-2	2	-1	0.5	-2	-2	-2	0.5	0.5	1	1	1	1
Objective 1.b	Concept consider noise impacts in the design, redesign, and reconstruction of arterial streets immediately adjacent to residential neighborhoods.	(-2 to +2)	(+2) Concept reduces noise impacts of arterial streets (0) Concept maintains existing noise impacts (-2) Concept increases noise impacts of arterial streets	-2	2	2	2	2	2	2	1	1	1	1	2	0
Objective 1.c	Concept protects neighborhoods from excessive through traffic and travel speeds while providing reasonable access to and from residential areas.	(-2 to +2)	(+2) Concept minimizes cut-through traffic (0) Concept maintains existing cut-through traffic (-2) Concepts increases cut-through traffic	-1	2	1	1	0.5	1	0.5	-0.5	-0.5	0.5	0.5	1	1
Objective 1.e	Concept cooperates with ODOT to maintain and improve US 101 and OR 38 consistent with the Oregon Highway Plan (OHP).	(-2 to +2)	(+2) Concept improves state facilities per the OHP (0) Concept maintains state facilities (-2) Concept degrades state facilities	-1	2	2	1	0.5	2	0.5	0.5	0.5	0.5	0.5	2	1
Objective 1.f	Concept ensures that transportation improvements minimize impacts to storm drainage, particularly in the City's downtown.	(-2 to +2)	(+2) Concept improves storm drainage (0) Concept maintains existing storm drainage (-2) Concept degrades storm drainage	0	2	2	1	1	-2	-2	-1	-1	1	1	2	0
Goal #2: Create a balanced transportation system																
Objective 2.b	Concept provides connectivity to each area of Reedsport to ensure pedestrian, bicycle, and vehicle access to schools, parks, employment, and recreational areas.	(-2 to +2)	(+2) Concept improves connectivity (0) Concept maintaines existing connectivity (-2) Concept degrades connectivity	-1	1	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1
Objective 2.c	Concept develops neighborhood and local connections to provide adequate circulation into and out of neighborhoods.	(-2 to +2)	(+2) Concept develops neighborhood and local connections (0) Concept maintains existing neighborhood and local connections (-2) Concept degrades existing neighborhood and local connections	-1	-0.5	-1	-0.5	-1	-1	-1	0.5	0.5	0	0	0.5	0
Objective 2.f	Concept ensures that local connections are maintained or enhanced to minimize reliance on major street connections	(-2 to +2)	(+2) Concept reduces reliance on major street connections (0) Concept maintains reliance on major street connectinons (-2) Concept increases reliance on major street connections	0	-0.5	-0.5	-1	-0.5	-0.5	-0.5	0.5	0.5	0	0	1	0
Objective 2.g	Concept improves roadway connectivity and/or parallel routes on the location transportation network.	(-2 to +2)	(+2) Concept improves connectivity through parallel routes (0) Concept maintaines existing connectivity (-2) Concept degrades connectivity	-1	-0.5	-1	-0.5	-1	-1	-1	0.5	0.5	0	0	0.5	0
Goal #3: Improve the safety of the transportation system																
Objective 3.e	Concept maintains access management standards for streets to reduce conflicts between vehicles and trucks, and between vehicles and bicycles and pedestrians.	(-2 to +2)	(+2) Concept increases access spacing (0) Concept maintains existing access spacing (-2) Concept decreases access spacing	0	1	1	1	1	1	1	0	0	0	0	0	0
Objective 3.f	Concept ensures that adequate access for emergency services vehicles is provided throughout the city.	(-2 to +2)	(+2) Concept improves emergency access (0) Concept maintains existing emergency access (-2) Concept degrades emergency access	-2	2	1	2	1	1	1	1	1	1	1	2	1
Objective 3.g	Concept meets federal and state safety standards for rail crossings.	(-2 to +2)	(+2) Concept meets safety standards for rail crossings (0) Concept does not impact a rail crossing (0) Concept does not meet safety standards for rail crossings	-1	2	2	2	2	2	2	2	2	0.5	0.5	2	0
Goal #4: Develop an efficient transportation system that will handle future traffic growth																
Objective 4.d	Concept implements the bicycle, pedestrian, and vehicle improvements to create a multi-modal transportation system.	(-2 to +2)	(+2) Concept improves multimodal transportation system (0) Concept maintains the existing multimodal transportation system (-2) Concept degrades the existing multimodal transportation system	-1	1	0.5	1	0.5	0.5	0.5	0	0	0.5	0.5	1	0.5
Objective 4.e	Concept maintains levels of service consistent with the Oregon Transportation Plan.	(-2 to +2)	(+2) Concept improves levels of service per the OTP (0) Concept maintains levels of service (-2) Concept degrades levels of service	-1	1	1	1	1	1	1	0.5	0.5	1	1	1	1
Objective 4.g	Concept considers fluctuations in traffic volumes on weekends, holidays, and during the summer season when developing transportation improvements.	(-2 to +2)	(+2) Concept improves conditions during peak season events (0) Concept maintains existing conditions during peak season events (-2) Concept degrades conditions during peak season events	-2	1	1	1	1	1	1	0.5	0.5	1	1	1	1
Goal #5: Provide a transportation system that is accessible to all members of the community.																
Objective 5.a	Concept constructs transportation facilities to meet the requirements of the Americans with Disabilities Act.	(-2 to +2)	(+2) Concept improves accessibility for people with disabilities (0) Concept maintains maintains existing levels of accessibility (-2) Concept degrades existing levels of accessibility	-1	1	0.5	1	0.5	0.5	0.5	0	0	0.5	0.5	0.5	0.5
Objective 5.b	Concept supports service to respond to the transportation needs of disadvantaged individuals.	(-2 to +2)	(+2) Concept improves access for transportation disadvantaged (0) Concept maintains existing levels of access (-2) Concept degrades existing levels of access	-1	1	0.5	1	0.5	0.5	0.5	0	0	0.5	0.5	0.5	0.5
Goal #6: Develop a transportation system to provide for efficient freight movement.																
Objective 6.a	Truck routes and highway access are essential for efficient movement of goods. Concept designs these facilities and adjacent land uses to reflect the needs of freight movement.	(-2 to +2)	(+2) Concept improves access for freight trucks (0) Concept maintains existing levels of access for freight trucks (-2) Concept degrades access for freight trucks	-1	2	1	2	1	1	1	0.5	0.5	0	0	1	1
Objective 6.b	Concept considers the impact on railroad facilities in land use decisions.	(-2 to +2)	(+2) Concept reduces impact of rail facilities on adjacent land uses (0) Concept has no impact on adjacent land uses (-2) Concept increases impact of rail facilities on adjacent land uses	-1	1	-1	1	-1	-1	-1	0.5	0.5	0	0	1	0
Objective 6.c	Concept protects the function of rail facilities and develop and implement strategies that minimize conflicts with other travel modes and adjacent land uses, including strategies that support a "No Horn Ordinance."	(-2 to +2)	(+2) Concept imrpoves the function of rail facilities (0) Concept does not impact the function of rail facilities (-2) Concept degrades the function of rail facilties	-1	2	2	2	2	2	2	1	1	1	1	2	0
Goal #7: Create a funding system to implement the recommended transportation system improvement projects.																
Objective 7.a	Concept partners with ODOT and other jurisdictions to develop a long-range financial strategy to make needed improvements to the transportation system and support operational and maintenance requirements.	(-2 to +2)	(+2) Concept has a long-range financial strategy (0) Concept's financial strategy is uncertain (-2) Concept does not have a long-range financial strategy	0	1	1	1	1	1	1	0.5	0.5	1	1	1	1
Objective 7.b	Concept is coordinated with transportation projects, policy issues, and development actions with all affected governmental units in the area. Key agencies for coordination include Douglas County and ODOT.	(-2 to +2)	(+2) Concept was developed in coordination with other agencies (0) Concept does not require coordination with other agencies (-2) Concept is not supported by other agencies	-2	2	2	1	1	1	1	1	1	1	1	1	2
Objective 7.h	Concept ensures that the Transportation System Plan is consistent with other state and local plans and that it reflects the City's overall development plan.	(-2 to +2)	(+2) Concept is consistent with existing plans (0) Concept is not included in any existing plans (-2) Concept is inconsistent with existing plans	0	0	0	0	0	0	0	0	0	0	0	0	0
			Livability	-1.2	2.0	1.2	1.1	0.4	0.2	-0.2	0.1	0.1	0.8	0.8	1.6	0.6
			Connectivity	-0.8	-0.1	-0.5	-0.3	-0.5	-0.5	-0.5	0.5	0.5	0.1	0.1	0.6	0.3
			Safety	-1.0	1.7	1.3	1.7	1.3	1.3	1.3	1.0	1.0	0.5	0.5	1.3	0.3
			Efficiency	-1.3	1.0	0.8	1.0	0.8	0.8	0.8	0.3	0.3	0.8	0.8	1.0	0.8
			Accessibility	-1.0	1.0	0.5	1.0	0.5	0.5	0.5	0.0	0.0	0.5	0.5	0.5	0.5
			Freight	-1.0	1.7	0.7	1.7	0.7	0.7	0.7	0.7	0.7	0.3	0.3	1.3	0.3
			Funding	-0.7	1.0	1.0	0.7	0.7	0.7	0.7	0.5	0.5	0.7	0.7	0.7	1.0
			Average	-1.0	1.2	0.7	0.9	0.5	0.5	0.4	0.4	0.4	0.5	0.5	1.1	0.5

Attachment D: Year 2045 Traffic Operations Analysis Worksheets

Intersection Level Of Service Report
Intersection 1: US 101 / OR 38

Control Type:	Signalized	Delay (sec / veh):	20.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.517

Intersection Setup

Name	US 101			US 101			Port Dock Rd			OR 38		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	0	0	0	0	0	1
Entry Pocket Length [ft]	150.00	100.00	100.00	225.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	320.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	1
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	49.21
Speed [mph]	30.00			30.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	Yes			No			Yes			No		
Crosswalk	Yes			Yes			Yes			No		

Volumes

Name	US 101			US 101			Port Dock Rd			OR 38		
Base Volume Input [veh/h]	21	292	258	50	333	17	16	10	33	288	6	57
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 [%]	18.00	9.00	5.00	2.00	6.00	0.00	0.00	50.00	11.00	9.00	20.00	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
Right Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	21	292	258	50	333	17	16	10	33	288	6	57
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	79	70	14	90	5	4	3	9	78	2	15
Total Analysis Volume [veh/h]	23	317	280	54	362	18	17	11	36	313	7	62
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			1			0		
v_di, Inbound Pedestrian Volume crossing m	1			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	1			1			1			0		

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]	12.00

Phasing & Timing

Control Type	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	1	6	0	5	2	0	0	8	0	0	4	0
Auxiliary Signal Groups												
Lead / Lag	Lag	-	-	Lag	-	-	-	-	-	-	-	-
Minimum Green [s]	3	10	0	3	10	0	0	5	0	0	7	0
Maximum Green [s]	15	45	0	15	45	0	0	35	0	0	35	0
Amber [s]	3.5	3.8	0.0	3.5	3.8	0.0	0.0	3.5	0.0	0.0	3.8	0.0
All red [s]	1.8	1.0	0.0	1.8	1.5	0.0	0.0	1.8	0.0	0.0	2.0	0.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	2.5	4.5	0.0	2.5	4.5	0.0	0.0	2.5	0.0	0.0	2.5	0.0
Walk [s]	0	0	0	0	7	0	0	7	0	0	0	0
Pedestrian Clearance [s]	0	0	0	0	19	0	0	20	0	0	0	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			No	
I1, Start-Up Lost Time [s]	2.0	2.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	3.3	2.8	0.0	3.3	3.3	0.0	0.0	3.3	0.0	0.0	3.8	0.0
Minimum Recall	No	Yes		No	Yes			No			No	
Maximum Recall	No	No		No	No			No			No	
Pedestrian Recall	No	No		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	C	R	L	C	C	C	C	R
C, Cycle Length [s]	54	54	54	54	54	54	54	54	54	54
L, Total Lost Time per Cycle [s]	5.05	4.80	4.80	4.80	5.30	5.30	5.30	5.30	5.80	5.80
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	0.00	2.80	2.80	2.80	0.00	3.30	3.30	3.30	3.80	3.80
g_i, Effective Green Time [s]	20	13	13	13	20	14	14	4	13	13
g / C, Green / Cycle	0.38	0.25	0.25	0.25	0.38	0.26	0.26	0.07	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.02	0.12	0.12	0.12	0.04	0.11	0.11	0.06	0.21	0.04
s, saturation flow rate [veh/h]	1147	1765	1614	1518	1240	1810	1776	1033	1525	1615
c, Capacity [veh/h]	402	442	404	380	420	476	467	69	381	404
d1, Uniform Delay [s]	15.33	17.14	17.19	17.19	16.80	16.30	16.32	24.95	19.11	15.71
k, delay calibration	0.19	0.19	0.19	0.19	0.19	0.08	0.19	0.08	0.08	0.08
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.10	1.37	1.56	1.73	0.23	0.41	0.97	29.59	3.75	0.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.06	0.48	0.49	0.50	0.13	0.40	0.40	0.93	0.84	0.15
d, Delay for Lane Group [s/veh]	15.43	18.51	18.75	18.92	17.03	16.71	17.28	54.54	22.86	15.84
Lane Group LOS	B	B	B	B	B	B	B	D	C	B
Critical Lane Group	No	No	No	Yes	Yes	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	0.16	2.15	2.03	1.96	0.38	1.78	1.83	1.33	3.84	0.56
50th-Percentile Queue Length [ft/ln]	4.00	53.65	50.69	49.01	9.55	44.52	45.86	33.24	95.96	14.06
95th-Percentile Queue Length [veh/ln]	0.29	3.86	3.65	3.53	0.69	3.21	3.30	2.39	6.91	1.01
95th-Percentile Queue Length [ft/ln]	7.20	96.57	91.24	88.22	17.19	80.14	82.54	59.84	172.72	25.31

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	15.43	18.59	18.87	17.03	16.98	17.28	54.54	54.54	54.54	22.86	22.86	15.84
Movement LOS	B	B	B	B	B	B	D	D	D	C	C	B
d_A, Approach Delay [s/veh]	18.60			17.00			54.54			21.72		
Approach LOS	B			B			D			C		
d_I, Intersection Delay [s/veh]	20.46											
Intersection LOS	C											
Intersection V/C	0.517											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	-5.8	11.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	16886.05	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	16.90	32.88	16.90	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.640	2.459	1.759	0.000
Crosswalk LOS	B	B	A	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	1681	1681	1308	1308
d_b, Bicycle Delay [s]	0.68	0.68	3.21	3.21
I_b,int, Bicycle LOS Score for Intersection	2.071	1.918	1.665	2.190
Bicycle LOS	B	A	A	B

Sequence

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

TECHNICAL MEMORANDUM #7

Preferred Improvements

KITTELSON & ASSOCIATES
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Technical Memorandum

February 9, 2024 Project# 27003.011

To: Deanna Schafer and Kim Clardy, *City of Reedsport*
Thomas Guevara, *Oregon Department of Transportation*

From: Matt Bell, Jon Gerlach, PE, and Marc Butorac, PE, PTOE, Brian Bauman (HDR) and Mikal Mitchell, PE (HDR)

Project: City of Reedsport Rail Crossing Study and Refinement Plan

RE: Tech Memorandum #7: Preferred Improvements

TABLE OF CONTENTS

INTRODUCTION

This memorandum addresses outstanding questions and summarizes the feedback received on the two most promising improvement packages identified in Technical Memorandum #6, provides a high-level environmental review of the packages (see Table 1), and refines and recommends a preferred set of projects. These projects will address the needs identified with the development of the Port of Coos Bay Pacific Coast Intermodal Port and associated increase in train activity through the community of Reedsport. The memorandum includes draft project sheets for the refined and preferred alternative improvement package, the project team's opinion regarding the anticipated National Environmental Policy Act (NEPA) classification, and a draft environmental prospectus for the preferred improvement package.

OUTSTANDING ISSUES AND FEEDBACK ON THE MOST PROMISING IMPROVEMENT PACKAGES

Based on the Project Management Team (PMT), Project Advisory Committee (PAC), City of Reedsport Planning Commission and City Council, and community review of Technical Memorandum #6, the following outstanding issues were identified. Each identified issue, shown in *italics,* has a response in standard text.

- ***Issue**: Visual impacts associated with the vertical elements of the overpass structures and considering a viaduct-type design with columns versus retaining walls to provide the ability to see through the structure.*

  Response: The project team reviewed similar viaduct-type designs in Oregon and prepared initial cost opinions for the two most promising improvement packages. Exhibit 1 below shows a potential similar rail viaduct structure for Alternative 4A in Oregon City, Oregon.

Exhibit 1. 14th Street Rail Crossing, Oregon City, Oregon (Photo via Google Earth)

The project team estimated that converting Alternative 4A (Elevated Rail Line) to a viaduct would increase the construction cost from $27M to over $60M. Alternative 2A1 (OR 38 Rail Overcrossing with Retaining Walls) includes three bridge crossings between West and East Railroad Avenues that could potentially be converted to a viaduct, which would increase the cost opinion from approximately $18.1M to $22.2M.

- ***Issue**: Identifying needed local roadway and driveway tie-ins to modified roadways.*

  Response: The Preferred Alternative Package section in this memorandum addresses the local tie-ins to the modified roadways.

- ***Issue**: Necessary localized pedestrian, bicycle, and transit enhancements throughout the study area to support the improvements (e.g., local roadway connections, pedestrian bicycle connections to the City's trail system, potential pedestrian/bicycle enhancements at Port Dock Road and the northerly OR 38 undercrossing, etc.)*

  Response: The Preferred Alternative Package section in this memorandum addresses the pedestrian, bicycle, and transit enhancements to support the preferred improvement package roadways.

- ***Issue**: Addressing stormwater impacts.*

  Response: The Preferred Alternative Package section in this memorandum addresses the potential storm impacts associated with the preferred improvement package.

- ***Issue**: Evaluating potential Title VI impacts.*

  Response: The Environmental Review section in this memorandum addresses the potential Title VI impacts associated with the most promising improvement packages.

- ***Issue**: Potential NEPA 4F (park and recreational lands, wildlife and waterfowl refuges, and historic sites) and 6F (park land) impacts.*

Response: The Environmental Review of the Most Promising Improvement Packages section in this memorandum addresses the potential NEPA 4F (park and recreational lands, wildlife and waterfowl refuges, and historic sites) and 6F (recreational land) impacts associated with the most promising improvement packages.

- ***Issue**: Considering westbound dual left-turn lanes at the US 101/OR 38-Port Dock Road intersection.*

  Response: After further review and discussions with ODOT and City staff, it was recommended that the US 101/OR 38-Port Dock Road intersection continue to be monitored and a project (Alternative 5B) be added to the Transportation System Plan (TSP) to conduct a refinement plan for US 101 from the Umpqua River to Scholfield Creek and along OR 38 from Laurel Avenue to US 101. The study should include, at a minimum, an evaluation of potential modifications to the US 101/OR 38-Port Dock Road intersection, including additional eastbound and westbound left-turn lanes at the intersection to provide additional capacity and future signal timing and phasing flexibility (e.g., protect-left-turn phasing, split phase).

- ***Issue**: Developing refined cost estimates, including potential right-of-way and property impacts and verifying structure cost needs based on additional geotechnical information.*

  Response: The cost opinions provided below in Table 1 incorporate the additional geotechnical information. The comparative cost opinions for the preferred Refined Investment Package in the Preferred Alternative Package section of this memorandum includes potential right-of-way and property impacts and verifies the structure costs based on the additional geotechnical information.

- ***Issue**: Operational and safety impacts that would occur at the US 101/OR 38-Port Dock Road intersection with trains greater than 4,100 feet at 10 mph under a no-build condition.*

  Response: Trains greater than 4,100 feet at 10 mph during the 30th Highest Hour will lead to vehicular spillbacks into the southbound left-turn and northbound right-turn lanes along US 101. These spillbacks eventually would lead to vehicles blocking the inside southbound and outside northbound through lanes, creating the potential for rear-end related conflicts.

- ***Issue**: Understanding whether a mural budget could be added for the retaining walls proposed under the improvement packages.*

  Response: Depending on the specific grant funding and negotiations between the Port of Coos Bay, ODOT, and the City of Reedsport, mural budgets could be potentially allocated as part of the future construction budget or through an independent secondary project.

- ***Issue**: Alternatives non-split phase left-turn phasing at the US 101/OR 38-Port Dock Road intersection.*

  Response: To provide long-term mobility flexibility and extend the three-lane cross-section on OR 38 developed for the westbound left-turn lane at Laurel Avenue, the eastbound and westbound approaches to the US 101/OR 38-Port Dock Road intersection should ultimately be widened to include left-turn lanes.

Based on feedback from the PMT, PAC, City of Reedsport Planning Commission and City Council, and community to date, Improvement Package I was generally supported over Improvement Package II based on the key differences shown in Table 1. *Attachment A provides the cost opinion worksheets for each package.*

Table 1. Key Performance Differentiators between the Top Two Most Promising Improvement Packages

Key Differentiators	Improvement Package I	Improvement Package II
	Project Elements: – Alternative 1C – Four-Quadrant Gated Rail Crossing on Winchester Avenue – Alternative 2A1 – OR 38 Rail Overcrossing with Retaining Walls	Project Elements: – Alternative 4A - Elevated Rail Line
OR 38 Vertical Clearance	No vertical constraints.	Introduces the only vertical constraint between I-5 and US 101 (via OR 38 and OR 138)
Community Barrier Effect	The elevated OR 38 overpass creates an approximately 800-foot partial north-south visual barrier for homes along OR 38 to the west of the rail line.	The elevated rail line introduces an east-west visual barrier throughout the entire community, extending from the Scholfield Creek to Umpqua River.
Winchester Rail Crossing Queuing and Potential Cut-Through Traffic	The upgraded at-grade crossing would still create vehicular queues and potentially cut through traffic during train events.	The grade-separated rail overcrossing would eliminate vehicular queues and potentially cut through traffic.
Design and Construction Cost Opinions[1]	$18.1M (Assumes retaining walls, embankment support, and bridges) $22.2M (Assumes viaduct between east and west Railroad Avenue)	$27M (Assumes retaining walls, embankment support, and bridges $61M (Assumes viaduct between Winchester and OR 38)

1. The design and construction cost opinions will be refined with escalators and contingencies as part of the final plan.
2. Alternative 5A – OR 38/US 101 East-West Split Phasing was removed from the improvement packages in lieu of a future US 101 refinement plan.

To further address the remaining concerns associated with Improvement Package I, the following new project elements were added to further refine the package:

- **Alternative 1C1** – US 101 NB Dynamic Train Activity Warning Sign for Train Crossings at Winchester Avenue. To address the queuing and potential cut-through traffic at the upgraded at-grade Winchester Avenue rail crossing, a dynamic warning sign is proposed to be installed south of the Winchester Avenue/US 101 intersection to warn northbound travelers of train-related gate crossing closures and to utilize OR 38 as an alternative route while trains are approaching and traveling through the community.

In addition, to address the long-term operational needs, access, and safety, the City and ODOT should consider preparing a US 101 refinement plan between the Umpqua River and Scholfield Creek. The refinement plan should consider reconfiguration of the US 101/OR 38-Port Dock Road intersection and/or modification of the traffic control to address long-term operational needs.

- **Alternative 5B** – US 101 Refinement Plan. The City and ODOT should conduct a refinement plan for US 101 from the Umpqua River to Scholfield Creek and along OR 38 from Laurel Avenue to US 101. The study should include, at a minimum, an evaluation of potential modifications to the US 101/OR 38-Port Dock Road intersection, including additional eastbound and westbound left-turn lanes at the intersection to provide additional capacity and future signal timing and phasing flexibility (e.g., protect-left-turn phasing, split phase).

ENVIRONMENTAL REVIEW OF THE MOST PROMISING IMPROVEMENT PACKAGES

A desktop review of existing environmental resources was completed for the study areas of Improvement Package I and Improvement Package II. Existing resources within both study areas include Hahn Park, a Section 4(f) resource, Triangle/Roy Henderson Park, a Section 4(f) resource and a Section 6(f) resource, and several buildings previously evaluated for eligibility for the National Register of Historic Places (e.g., "historic resources"). The historic resources that are listed in the Oregon State Historic Preservation Office (SHPO) database are located on both sides of OR 38 east of E Railroad Avenue. Any building more than 45 years in age would need to be evaluated for National Register of Historic Places eligibility, as would the railroad.

The study areas consist of one census block group (#41090100002). According to census data from the U.S. Environmental Protection Agency, there are no environmental justice populations (e.g., minority, low income, elderly populations) in the study areas (i.e., population values exceeding 150% of Douglas County population values). However, census data does indicate there is a service gap in transportation access (same for Douglas County).

It is assumed that either improvement package could avoid impacts to Triangle/Roy Henderson Park. Hahn Park would likely be impacted by Alternative 2A1 in Improvement Package I due to construction access, staging, or right-of-way impacts. It is also assumed that minor amounts of right-of-way would be required from properties along OR 38/Fir Avenue to facilitate the construction of improvements in either package, which could affect historic resources.

Table 2. Potential Impacts for Each Alternative

Improvement Package	Alternative	Section 4(f)	Section 6(f)	Historic Resources	Title VI
I	1C	None	None	Likely	Likely none
	1C1	None	None	None	Likely none
	2A1	Hahn Park	None	Likely	Likely none
II	4A	None	None	Likely	Likely none

1. Alternative 5A – OR 38/US 101 East-West Split Phasing was removed from the improvement packages in lieu of a future US 101 refinement plan.

Areas to Explore Further during the NEPA Phase

Additional environmental resources need to be evaluated in the study area, including the following:

- Wetlands and waterbodies
  Threatened and endangered species and critical habitat listed under the Endangered Species Act
- Noise impacts
- Air quality impacts
- Archaeological resources
- Construction staging
- Hazardous materials

Field studies and additional reporting would be required for most, if not all, of these resources.

Anticipated NEPA Classification

Both Improvement Packages would likely be classified as a Documented Categorical Exclusion under CFR771.117(c)(28), which includes construction of grade separation to replace existing at-grade railroad crossings if the project: 1) does not result in more than a minor amount of right-of-way or does not result in any residential or non-residential displacements; 2) does not need a U.S. Coast Guard bridge permit; 3) does not result in finding of adverse effect to historic properties, does not result in Section 4(f) impacts (except *de minimis*), does not result in "may affect, likely to adversely affect" threatened and endangered species or critical habitat under the Endangered Species Act; 4) does not require construction of temporary access or the closure of existing road, bridge, or ramps that would result in major traffic disruptions; 5) does not result in access control changes; 6) does not result in floodplain encroachment. While the construction of the Preferred Improvement Package would require detour routes, those routes are expected to result in minor out of direction travel and access to properties would be maintained during construction.

PREFERRED ALTERNATIVE RECOMMENDATION

Based on the evaluation conducted in Technical Memorandum #6, feedback from the PMT, PAC, City of Reedsport Planning Commission and City Council, and community to date, and the further assessment and refinements and environmental review documented herein, the project team recommends Refined Improvement Package I as the preferred alternative. This alternative may be carried forward for adoption by the City of Reedsport into the TSP. The Refined Improvement Package I includes:

- Alternative 1C – Four-Quadrant Gated Rail Crossing on Winchester Avenue
- Alternative 1C1 – US 101 NB Train Activity Warning for Train Crossings at Winchester Avenue
- Alternative 2A1 – OR 38 Rail Overcrossing with Retaining Walls

Figure 1 provides a 3D perspective overview of the preferred improvement package. Figure 2 provides a plan view of the OR 38 related improvements, including the near-term Project 2A1.

Figure 1. Preferred Improvement Package Overview

Figure 2. OR 38 Related Improvements and Proposed Roadway, Bicycle, and Pedestrian Tie-ins

The project sheets for each element of the Railroad Crossing Study (RRCS) are provided in Attachment B.

The project team recommends that ODOT and the Federal Highway Administration consider a Documented Categorical Exclusion NEPA Classification when the project proceeds to environmental review/permitting and design. A preliminary environmental prospectus form is provided in Attachment C.

Based on the evaluation and conceptual development work prepared to date as part of the Facility Plan, the project team suggests that the following items be examined and addressed during the future Environmental review and Plans, Specification, and Estimate preparation stage of Improvement Package I:

1) Consider purchasing access control and/or consolidating private access approaches between East Railroad Avenue and North 5th Street.
2) Consider purchasing access control and/or consolidating public access approaches between West Railroad Avenue and US 101.

PEDESTRIAN AND BICYCLE REFINEMENTS TO SUPPORT IMPROVEMENT PACKAGE I

In developing the refined concept plans shown in Figure 2, the project team provided connections to the existing and/or planned pedestrian and bicycle network as outlined in Table 3.

Table 3. Pedestrian and Bicycle Refinements

Roadway	Description	Part of Package I	Addition to TSP
Myrtle Avenue	– Construct northerly sidewalk to fill existing gap east of OR 38. – Construct southerly sidewalk from OR 38 to N 8th Street.	Yes	Yes
Laurel Avenue (south)	– Reconstruct northerly and southerly sidewalks from 9th Street to OR 38.	Yes	Yes
Laurel Avenue (north)	– Construct northerly and southerly sidewalks from OR 38 to N 8th Street.	Yes	Yes
Juniper Avenue	– Construct northerly sidewalks to connect existing sidewalk to W Railroad Avenue.	Yes	Yes
W Railroad Avenue	– Construct westerly and easterly sidewalks between Juniper Avenue and Laurel Avenue.	Yes	Yes
East Railroad Avenue	– Construct westerly multi-use path and easterly sidewalk between Fir Avenue and Greenwood Avenue.	Yes	Yes
East Railroad Avenue	– Add multi-use path along west side of roadway between Winchester Avenue and Riverfront Way.	No	Yes
Fir Avenue	– Reconstruct sidewalk only connections to OR 38 from existing sidewalk.	Yes	NA
North 6th Street	– Construct and extend westerly and easterly sidewalks to new OR 38 intersection.	Yes	NA
OR 38 (5th to Myrtle)	– Construct northerly and southerly sidewalks and bike lanes.	Yes	NA
OR 38 (Myrtle to US101)	– Maintain sidewalk and bike lanes per the TSP.	Yes	No
Winchester Avenue	– Construct northerly sidewalks between West Railroad Avenue and East Railroad Avenue.	Yes	Yes

Parallel Northerly OR 38 Multi-use Path	– Add multi-use path between East and West Railroad Avenue utilizing the undercrossing on the north side of OR 38.	No	Yes

Attachment D provides mark-ups to the existing TSP pedestrian and bicycle master plans.

TRANSIT ENHANCEMENTS TO SUPPORT IMPROVEMENT PACKAGE I

Local transit service is provided in the area by Coos County Area Transit (CCAT). CCAT's Florence Express provides intercity service between Coos Bay and Florence Monday through Saturday with one morning and one evening trip. The closest stops are located at the US 101/13th Street intersection and will not be impacted by preferred Improvement Package I.

POTENTIAL STORMWATER IMPACTS OF REFINED IMPROVEMENT PACKAGE I

The refined improvements package must comply with stormwater treatment regulations set by ODOT and local/governmental agencies. Refined Improvement Package I necessitates water quality treatment due to significant changes, including increased impervious areas, conveyance system alterations, and pavement replacement. This ensures stormwater runoff from the Contributing Impervious Area (CIA) is treated before entering the stormwater system. Evaluating the existing conveyance system's capacity and its ability to accommodate increased runoff is key given the flood-prone nature of the community. If the existing system is found not to be adequate in the design phase, detention facilities will need to be added. Additionally, low impact development (LID) practices will be explored to minimize hydrologic impacts.

As for flood control, the project's location behind a dike, with no adverse effects to the Umpqua River floodplain, means flow control measures or Federal Emergency Management Agency permitting should not be required.

The envisioned grade-separated rail crossing with retaining walls will affect existing stormwater infrastructure, leading to increased impervious surfaces. Thus, water quality treatment, capacity of the existing system, and additional need for detention facilities will be evaluated during the design phase.

Based on a review of the refined improvement package, the project team does not foresee any fatal flaws with the design from a stormwater perspective and each identied item above can be effectively mitigated through the design phase of the project.

COST OPINION FOR REFINED IMPROVEMENT PACKAGE I

The project team developed refined cost opinions for each project within the package, including potential right-of-way needs and a 40 percent contingency. Based on these estimates and the potential to accommodate different bridge, retaining wall, and/or viaduct solutions between West Railroad Avenue and East Railroad Avenue, the conceptual cost opinion is $18.1M to $22.2M.

See Attachment A for detailed cost opinion worksheets.

NEXT STEPS

The information and preferred Refined Improvement Package I will be presented to the PMT, PAC, City Planning Commission, and City Council for review and feedback. Based on this feedback, the project team will prepare the draft Reedsport Rail Crossing Study and Refinement Plan to be presented to the public at an open house. An adoption hearing by the City of Reedsport Planning Commission and City Council will follow.

ATTACHMENTS

A. Cost Opinion Worksheets
B. Project Sheets
C. Draft Environmental Prospectus Sheet
D. TSP Pedestrian and Bicycle Master Plan Mark-ups

Attachment A: Cost Opinions

Improvement Package I – Bridge Option 1 (Triple Span)

Alternative 2A: OR 38 Rail Overcrossing with Retaining Walls

Item Category	Quantity	Unit	Unit Cost	Subtotal
Bridge Deck (Triple Span)	9,350	SF	$530 /SF	$4,955,500
Retaining Wall	40,000	SF	$100 /SF	$4,000,000
Structural Backfill	41,000	CY	$65/CY	$2,665,000
Asphalt Roadway	24,000	SF	$15/SF	$360,000
Curb and 6-Foot Sidewalk	2,500	LF	$100/LF	$250,000
Mobilization and Staging	1	LS	$400,000/EA	$400,000
Storm Improvements	1	LS	$200,000/EA	$200,000
Right-of-Way Impacts	1	LS	$100,000/EA	$100,000
			Subtotal:	$12,930,500
			Total (with 40% contingency*):	**$18,100,000**

Cost Opinions will be updated to incorporate additional improvements, right-of-way needs, environmental mitigation, and construction staging as part of the draft refinement plan.

Improvement Package I – Bridge Option 2 (Single Span)

Alternative 2A: OR 38 Rail Overcrossing with Retaining Walls

Item Category	Quantity	Unit	Unit Cost	Subtotal
Bridge Deck (Single Span)	20,900	SF	$470 /SF	$9,823,000
Retaining Wall	28,000	SF	$100 /SF	$2,800,000
Structural Backfill	29,000	CY	$65/CY	$1,885,000
Asphalt Roadway	24,000	SF	$15/SF	$360,000
Curb and 6-Foot Sidewalk	2,500	LF	$100/LF	$250,000
Mobilization and Staging	1	LS	$500,000/EA	$500,000
Storm Improvements	1	LS	$200,000/EA	$200,000
Right-of-Way Impacts	1	LS	$100,000/EA	$100,000
			Subtotal:	$15,818,000
			Total (with 40% contingency*):	**$22,200,000**

*Contingency accounts for additional costs for design and construction engineering, additional permitting, unit cost escalation, and potential impacts yet to be identified.

Cost Opinions will be updated to incorporate additional improvements, right-of-way needs, environmental mitigation, and construction staging as part of the draft refinement plan.

Improvement Package II

Alternative 4A – Option 1: Elevated Railroad on Fill

Item Category	Quantity	Unit	Unit Cost	Subtotal
Structural Fill	64,000	CY	$65 /CY	$4,160,000
Retaining Wall	115,000	SF	$50 /SF	$5,750,000
Undercrossing Structure	5,200	SF	$1,200 /SF	$6,240,000
Temporary Railroad Crossings	2	EA	$350,000 /EA	$700,000
Railroad Signaling	1	LS	$250,000 /EA	$250,000
Railroad Track Construction	8,600	TF	$250 /TF	$2,150,000
			Subtotal:	$19,250,000
			Total (with 40% contingency*):	$27,000,000

Alternative 4A – Option 2: Elevated Railroad on Viaduct

Item Category	Quantity	Unit	Unit Cost	Subtotal
Structural Fill	8,628	CY	$65 /CY	$565,500
Retaining Wall	15,530	SF	$50 /SF	$775,000
Viaduct Structure	2,747	LF	$12,000 /LF	$33,600,000
Undercrossing Structure	5,200	SF	$1,200 /SF	$6,240,000
Temporary Railroad Crossings	2	EA	$350,000 /EA	$700,000
Railroad Signaling	1	LS	$250,000 /EA	$250,000
Railroad Track Construction	8,600	TF	$250 /TF	$2,150,000
			Subtotal:	$43,715,000
			Total (with 40% contingency*):	$61,000,000

*Contingency accounts for additional costs for design and construction engineering, additional permitting, unit cost escalation, and potential impacts yet to be identified.

Attachment B: Project Sheets

See Reedsport Rail Crossing Study Attachment A for final project sheets

Purpose	This project is intended to address the transportation-related impacts associated with the Port of Coos Bay's Pacific Coast Intermodal Port project and the anticipated increases in rail activity along the Coos Bay Rail Line and in downtown Reedsport.	
Description	This project will involve installation of a grade-separated rail crossing (overcrossing) with retaining walls on OR 38, reconfiguration of the US 101/OR 38 intersection, as well as other intersections on OR 38 from US 101 to N 6th Street, and installation of pedestrian and bicycle facilities on OR 38 and the surrounding local street network as necessary to maintain connectivity for people walking and biking.	
Location	OR 38 from north of Laurel Street to east of N 6th Street.	
Roadway Characteristics	– **Jurisdiction:** ODOT – **Functional Classification:** Other Principal Arterial (Federal), Statewide Highway (State), Arterial (City) – **Freight Route Designation:** OHP Freight Route; Reduction Review Route – **Existing AADT:** 4,886 (Source: ODOT) – **Forecast AADT:** 5,600 (Source: ODOT)	– **Posted Speed:** 25 mph – **Pavement Width:** 34' – **Travel Lanes:** 2 (12' each way) – **Pedestrian Facilities:** Sidewalks (6' both sides) – **Bike Facilities:** Bike lanes (5' both sides) – **Transit Facilities:** None – **On-Street Parking:** None
How Improvement Addresses Deficiencies	**Existing/Future Need**: – The existing at-grade rail crossing on OR 38 is controlled by a two-quadrant gate system with flashing lights and cross buck "rail crossing" warning signs. – The Port project is expected to increase rail activity along the CBRL, including the frequency, length, and speed of trains. – The increase in rail activity will increase delays at the at-grade crossing as well as motor vehicle queues on OR 38 that block side streets and create access/ circulation issues in downtown Reedsport.	**With Improvement:** – Addresses delays and access/circulation issues. – Addresses increased train activity issues. – Addresses queuing-related impacts to upstream and downstream cross-streets on OR 38. – Partially addresses queuing-related impacts to upstream and downstream cross-streets on Winchester Avenue. – Addresses noise-related issues with increased train activity at OR 38 by eliminating the need for train horn warnings at the crossing.
Additional Considerations	Further refinements are needed to minimize potential right-of-way and/or environmental impacts, address visual impacts associated with the vertical elements of the overcrossing structures, and identify local roadway and driveway tie-ins to the modified roadway. ODOT should also consider installing a multi-use path on the south side of OR 38 from Laurel Avenue to Juniper Avenue.	
Cost Opinions	$34,215,000 (assumes retaining walls, embankment support, and bridges; 39,415,000 (assumes viaduct between east and west Railroad Avenue)	
Implementation	Implementation of this project will require closing OR 38 and re-routing traffic along Winchester Avenue during construction. Winchester Avenue will likely need to be upgraded before construction to accommodate the increase in traffic, including heavy vehicles.	

AADT = annual average daily traffic; CBRL = Coos Bay Rail Line; ODOT = Oregon Department of Transportation.

See Reedsport Rail Crossing Study Attachment A for final project sheets

Reedsport Railroad Crossing Study (RRCS-1)
Four-Quadrant Gated Rail Crossing on Winchester Avenue

City of Reedsport
Transportation System Plan

Purpose	This project will improve the safety of the existing at-grade rail crossing on Winchester Avenue as well as support implementation of a quiet zone through downtown Reedsport.	
Description	This project will provide a four-quadrant gated rail crossing on Winchester Avenue. The crossing would include two gate arms and flashers on both sides of the rail line and in both directions. The crossing would also include gate arms and flashers across the pedestrian facilities (sidewalks). This type of crossing prevents motorists from driving around the lowered gates. With this type of crossing, the entry gates will close before the exit gates to allow motorists to clear the rail line. The gates also lower long before the train arrives.	
Location	Winchester Avenue at-grade rail crossing.	
Roadway Characteristics	– **Jurisdiction:** City of Reedsport – **Functional Classification:** Rural Major Collector (Federal), Arterial (City) – **Freight Route Designation:** None – **Existing AADT:** 2,111 (Source: ODOT) – **Forecast AADT:** NA	– **Posted Speed:** 25 mph – **Pavement Width:** 40' – **Travel Lanes:** 2 (12' each way) – **Pedestrian Facilities:** Sidewalks (5' both sides) – **Bike Facilities:** None – **Transit Facilities:** None – **On-Street Parking:** (8' both sides)
How Improvement Addresses Deficiencies	**Existing/Future Need**: – The existing at-grade rail crossing on Winchester Avenue is controlled by a two-quadrant gate system with flashing lights and cross buck "rail crossing" warning signs. – The Port project is expected to increase rail activity along the CBRL, including the frequency, length, and speed of trains. – The increase in rail activity will increase delays at the at-grade crossing (OR 38 and Winchester Avenue).	**With Improvement:** – Addresses noise-related Issues with train activity at Winchester Avenue by eliminating the need for train horn warnings at the crossing. – Feasible to construct with minimal to potential zero right-of-way or environmental impacts. – Economically feasible at a magnitude cost of $285,000. – Requires grade-separated improvements on OR 38 to meet all identified needs.
Additional Considerations	The City should work with ODOT to install a dynamic train activity warning sign on US 101, south of Winchester Avenue, to alert northbound motorists that a train is approaching or present at the at-grade rail crossing on Winchester Avenue allowing them to re-route to OR 38.	
Cost Opinions	$335,000	
Implementation	This project may be implemented in tandem with Railroad Crossing Study-1: OR 38 Overcrossing with Retaining Walls.	

AADT = annual average daily traffic; CBRL = Coos Bay Rail Line; ODOT = Oregon Department of Transportation.

See Reedsport Rail Crossing Study Attachment A for final project sheets

Purpose	This project will provide further evaluation of intersection improvements along US 101 from the Umpqua River to Scholfield Creek and access management improvements along OR 38 from Laurel Avenue to US 101.	
Description	The project will involve a refinement plan for US 101 from the Umpqua River to Scholfield Creek. The study should include, at a minimum, an evaluation of potential modifications to the US 101/OR 38-Port Dock Road intersection, including additional lanes at the intersection to provide additional capacity and future signal timing and phasing flexibility.	
Location	US 101 from Umpqua River to Scholfield Creek and OR 38 from Laurel Avenue to US 101	
Roadway Characteristics	– **Jurisdiction:** ODOT – **Functional Classification:** Other Principal Arterial (Federal), Statewide Highway (State), Arterial (City) – **Freight Route Designation:** OHP Freight Route; Reduction Review Route – **Existing AADT:** 13,926 (Source: ODOT) – **Forecast AADT:** 13,000 (Source: ODOT)	– **Posted Speed:** 25 mph – **Pavement Width:** 71' – **Travel Lanes:** 5 (12' travel lane, 12'median) – **Ped Facilities:** Sidewalks (5' east side, 6' west) – **Bike Facilities:** Bike lanes (5' east side, 6' west) – **Transit Facilities:** Yes – **On-Street Parking:** None
How Improvement Addresses Deficiencies	**Existing/Future Need:** – The US 101/OR 38-Port Dock Road intersection currently experiences congestion during the summer peak weekend and is anticipated to worsen over time. – The westbound left/through queue on OR 38 is also projected to extend past the right-turn slip lane at the west approach. – There are multiple access points along OR 38 from Laurel Avenue to US 101	**With Project:** – Further evaluation of intersection operations and safety at the US 101/OR 38-Port Dock Road intersection and identification of preferred improvements for implementation. – Further evaluation of access management opportunities along OR 38 and identification oof a preferred strategy for implementation.
Additional Considerations	None	
Cost Opinions	$150,000	
Implementation	This project may be implemented at any time.	

AADT = annual average daily traffic; ODOT = Oregon Department of Transportation.

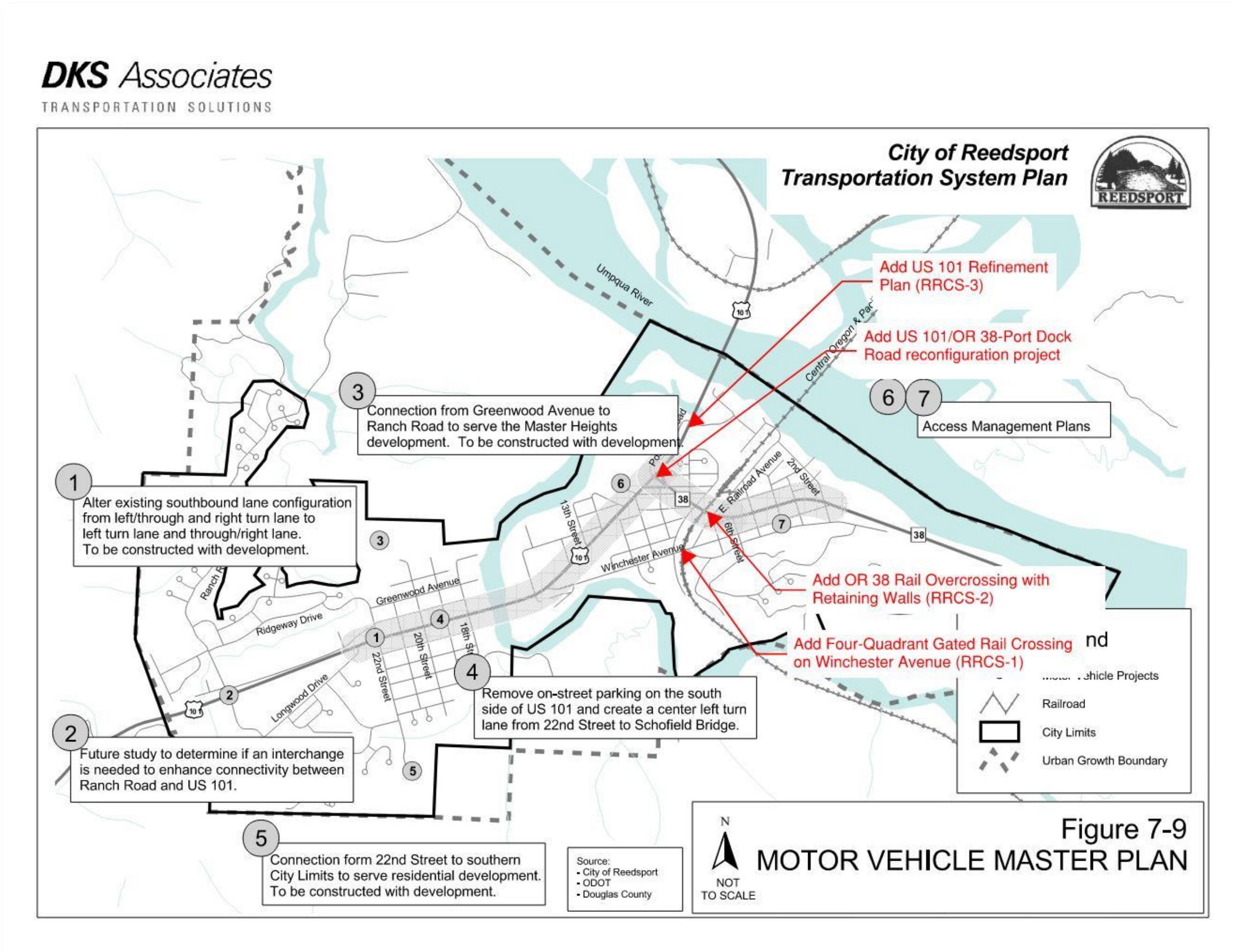
See Reedsport Rail Crossing Study Attachment A for final project sheets

Reedsport Railroad Crossing Study (RRCS-4) Greenwood Avenue Multi-use Path		City of Reedsport Transportation System Plan

Purpose	This project is needed to maintain pedestrian and bicycle connectivity between areas north and south of the Coos Bay Rail Line with implementation of the OR 38 rail overcrossing.	
Description	This project will involve installation of a multi-use path north of OR 38 and between E and W Railroad Avenues. The multi-use path will follow the former Greenwood Avenue right-of-way and utilize the existing northerly OR 38 rail undercrossing.	
Location	The multi-use path will be located north of OR 38 and between E and W Railroad Avenues.	
Roadway Characteristics	– **Jurisdiction:** N/A – **Functional Classification:** N/A – **Freight Route Designation:** N/A – **Existing AADT:** 0 – **Forecast AADT:** 0	– **Posted Speed:** N/A – **Pavement Width:** 0' – **Travel Lanes:** 0 – **Ped Facilities:** None – **Bike Facilities:** None – **Transit Facilities:** None – **On-Street Parking:** None
How Improvement Addresses Deficiencies	**Existing/Future Need:** – Currently, pedestrians and bicyclists may use OR 38 to travel between E and W Railroad Avenues and between areas north and south of the Coos Bay Rail Line – Implementation of the OR 38 rail overcrossing will grade-separate OR 38 and require pedestrians and bicyclists traveling between areas north and south to travel up and over the overcrossing.	**With Project:** – The Multi-use path will maintain pedestrian and bicycle connectivity between E and W Railroad Avenue and between areas north and south of the Coos Bay Rail Line.
Additional Considerations	The former Greenwood Avenue right-of way was abandoned by the City and the rail crossing was closed. Implementation of the project would require acquiring the right-of-way and gaining approval from the rail line to install the crossing.	
Cost Opinions	$85,000	
Implementation	This project may be implemented at any time.	

AADT = annual average daily traffic; ODOT = Oregon Department of Transportation.

See Reedsport Rail Crossing Study Attachment A for final project sheets



The motor vehicle projects shown in Figure 7-9 (above) should be adopted along with the rail crossing refinement plan and incorporated into the next TSP update. In addition, cost estimates for all motor vehicle projects should be developed along with the future TSP update.

Attachment C: Draft Environmental Prospectus Sheets

SHOW SUMMARY

PRELIM. NEPA CLASS
CE

Oregon Department of Transportation

ODOT ENVIRONMENTAL PROSPECTUS

PROJECT NAME	REGION	KEY NUMBER	FEDERAL AID NUMBER
Reedsport Rail Crossing Study and Refinement Plan	3		

CITY	COUNTY	FHWA NEXUS	PROJECT SPONSOR
Reedsport	Douglas		ODOT

HIGHWAY NAME	BEGIN MP	END MP
OR38	0.21	0.21

LATITUDE	LONGITUDE	TOWNSHIP	RANGE	SECTION
43.701811	-124.101076	21S	12W	34, 35

PROJECT DESCRIPTION (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The development of the Port of Coos Bay Pacific Coast Intermodal Port has led to increased train activity through the City of Reedsport. To address the City's transportation system needs, several alternatives have been identified to mitigate impacts associated with increased rail activity. This Environmental Prospectus addresses the "Refined Improvement Package I," which consists of four elements: Alternative 1C (four-quadrant gated rail crossing on Winchester Avenue), Alternative 1C1 (US101 northbound variable message sign [VMS] for train crossings at Winchester Avenue), Alternative 2A1 (OR38 rail overcrossing with retaining walls), and Alternative 5B (OR38/US101 east-west left turn lanes).

Checklist questions marked with an asterisk (*) indicate that the question is related to the qualifying thresholds ("kickouts") identified in the 2015 PCE Agreement.

Estimated Right of Way Impacts

Right of Way

1.	* Will the project involve temporary or permanent acquisition of right-of-way?	(●) Yes ( ) No ( ) Unknown
2.	* Will the project result in the temporary or permanent displacement of persons or businesses?	( ) Yes ( ) No (●) Unknown

Railroads

3.	Will the project involve work on or adjacent to railroad-owned property?	(●) Yes ( ) No ( ) Unknown

Utilities

4.	Will the project involve substantial impact to or relocation of existing reimbursable utilities that could create a disruption to service or additional environmental impacts??	( ) Yes ( ) No (●) Unknown

RIGHT OF WAY IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The Project is on and immediately adjacent to the Coos Bay Rail Line. Temporary construction easements and permanent acquisition of right-of-way is anticipated.

Estimated Traffic/Transportation Impacts

		CURRENT ADT	FUTURE ADT	
5.	What are the current and future ADT volumes for the project?	see below	see below	( ) Unknown ( ) N/A

TRAFFIC/TRANSPORTATION COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

OR38 - current: 4,973; future: 5,600
Winchester Ave - current: 2,231; future: unknown

Estimated Land Use Impacts

6.	Is the project outside of an Urban Growth Boundary?	( ) Yes (●) No ( ) Partially
7.	If the project is outside the UGB, is it expected to require new right-of-way?	( ) Yes ( ) No (●) N/A
8.	If the project is outside the UGB, is the project allowed, or conditionally allowed, by the rules forTransportation Planning on Rural Lands (OAR 660-012-0065)?	( ) Yes ( ) No (●) N/A
9.	Region Planner's opinion that the project conforms with:	
a.	Transportation Planning Rule	(●) Yes ( ) No
b.	* Statewide Planning Goals	(●) Yes ( ) No
c.	Comprehensive Plan and/or Transportation System Improvement Plan (city, county or both)	(●) Yes ( ) No
10.	Is the project located within the Oregon Coastal Zone?	(●) Yes ( ) No
11.	Will areas of Forest or Exclusive Farm Use (EFU), or Open Space Reserve zoning be impacted by the project?	( ) Yes (●) No

12. Will the project result in the conversion of prime farmland, unique farmland, or land of statewide or local importance by the Farmland Protection Policy Act?	○ Yes ◉ No	
13. What are the general uses of land adjacent to the project area?	☑ Residential ☑ Commercial ☐ Farm/Forest ☑ Public ☑ Other (explain below)	

LAND USE IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)
Land uses adjacent to the project area include commercial, residential, public, and industrial uses. No EFU or Open Space Reserve zoning would be impacted. The project is within the UGB of Reedsport and is within the Oregon Coastal Zone.

Estimated Socioeconomic Impacts

14. * Will the project involve displacements of key businesses, business districts, commercial/industrial areas, or public facilities?	○ Yes ◉ No ○ Unknown
15. * Will the project involve temporary or permanent changes to travel patterns, access to goods/services, or parking that appear important to business, business districts, commercial/industrial areas, community events, or neighborhoods? (Explain below)	○ Yes ◉ No ○ Unknown
16. Will the project divide or disrupt an established community, or affect neighborhood character or stability?	○ Yes ◉ No ○ Unknown
17. Will the project temporarily or permanently affect emergency and/or public services?	○ Yes ○ No ◉ Unknown
18. Does visual inspection and/or information sources such as census data indicate thepresence of low-income or minority populations within or near the project area?	○ Yes ◉ No
19. Does visual inspection and/or other information sources indicate the presence of elderly, handicapped, or transit-dependent populations?	○ Yes ◉ No

SOCIOECONOMIC IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)
The study areas consist of one census blockgroup. According to census data from the EPA, there are no environmental justice populations (e.g., minority, low income, elderly populations) in the study area (i.e., population values exceeding 150% of Douglas County population values). However, census data does indicate there is a service gap in transportation access for the blockgroup and in Douglas County.

Blockgroup 410190100002	Douglas County
People of color: 15%	14%
Low income: 51%	35%
Over age 64: 35%	25%
Persons with disabilities: 19.2%	20.6%
Transportation access service gap: Yes	Yes

It is unknown at this time how construction would occur; therefore impacts to travel patterns, access to goods/services, emergency and public services are unknown. The project will likely not have any disproportionate adverse effects on minority populations.

Estimated Water Resources and Wetlands Impacts

Stormwater

20. Will the project trigger the need for stormwater treatment?	◉ Yes ○ No ○ Unknown

Waters of the U.S./State

21. Are there waters of the U.S. or State within the project area? (If no, skip to Question 30)	◉ Yes ○ No
22. * Is the project within a FEMA 100-year flood plain?	◉ Yes ○ No
23. * Is the project within a FEMA regulated floodway?	○ Yes ◉ No
24. Will the project occur in or over publically owned submerged or submersible lands?	○ Yes ◉ No ○ Unknown
25. * Will the project require a new USCG Bridge Permit?	○ Yes ◉ No ○ Unknown
26. Will the project require modification to an existing USCG Bridge Permit or Temporary Rule Change?	○ Yes ◉ No ○ Unknown
27. Will there be any fill or removal from waters of the U.S. or state?	○ Yes ○ No ◉ Unknown
28. Will fill or removal take place in waters of the State listed by DSL as Essential Salmonid Habitat?	○ Yes ◉ No ○ N/A

29. Will fill or removal take place in waters of the State that are Aquatic Resources of SpecialConcern?	◯ Yes ◉ No ◯ N/A

Water Supply Wells

30. Will any active wells be impacted by the project?	◯ Yes ◯ No ◉ Unknown

Wetlands

31. Are wetlands potentially present in the project area?	◉ Yes ◯ No
32. Do soil surveys indicate hydric soils in the project area?	◉ Yes ◯ No
33. Is wetland vegetation evident from visual inspection?	◉ Yes ◯ No
34. Will the project fill or remove material from wetlands?	◯ Yes ◯ No ◉ Unknown
35. * Will the project require an Individual Permit, Nationwide Permit, General Authorization orGeneral Permit?	◉ Yes ◯ No ◯ Unknown

WATER RESOURCES AND WETLANDS IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

Several wetlands are mapped parallel to the railroad near Winchester Avenue and OR38. A wetlands and waters delineation would be required to verify the presence of wetlands and delineate the boundaries. It is likely that wetlands would be impacted with the construction of Improvements Package I, which would require permits from USACE and/or DSL. No streams or other water bodies appear to be present in the project area. The project area is within a FEMA Flood Hazard Zone of Area with Reduced Flood Risk due to Levee.

Estimated Biological Resources Impacts

Threatened, Endangered and/or Sensitive Species

36. Does the project have the potential to affect migratory birds and/or bats?	◉ Yes ◯ No
37. Are there USFWS T&E species, Proposed species, or critical habitat in the project's area ofpotential impact?	◯ Yes ◉ No
38. Are there NMFS T&E species, Proposed species, or critical habitat in the project's area ofpotential impact?	◯ Yes ◉ No
39. Are there State T&E or Proposed species present that are not federally listed?	◯ Yes ◉ No
40. Is the project located on or adjacent to BLM or USFS land?	◯ Yes ◉ No
41. * Will the project require an individual project-level formal consultation under Section 7 of theEndangered Species Act?	◯ Yes ◉ No ◯ Unknown

In-Water Work

42. Are any streams or water bodies potentially impacted by the project?	◯ Yes ◉ No
43. Will the project require in-water work?	◯ Yes ◉ No ◯ Unknown

Fish Passage

44. Will the project trigger the Oregon State Fish Passage Statute (ORS 509.585)?	◯ Yes ◉ No ◯ Unknown
45. Are there any culverts within the project limits that are on the ODFW priority list for replacement/retrofit?	◯ Yes ◉ No

Wildlife Passage

46. Is the project within a wildlife collision hot spot, priority wildlife linkage area, or an area otherwise known to be a barrier to wildlife passage?	◉ Yes ◯ No

Noxious Weeds

47. Are there known noxious weed populations in the project area?	◯ Yes ◉ No

BIOLOGICAL RESOURCES IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

A review of the Information for Planning and Consultation resulted in the following listed species with the potential to occur in Douglas County: pacific marten (*Martes caurina*; threatened), marbled murrelet (*Brachyramphus marmoratus*; threatened), northern spotted owl (*Strix occidentalis caurina*; threatened), western snowy plover (*Charadrius nivosus nivosus*; threatened), monarch butterfly (*Danaus plexippus*; candidate). A field survey would be required to determine presence/absence of listed species or their suitable habitat. There is no critical habitat within the project area, but there is critical habitat for marbled murrelet and northern spotted owl approximately 4 miles east of the project area. It is likely that the project would result in no effect to terrestrial ESA-listed species. Downstream stormwater impacts may affect threatened and endangered fish species protected under the National Marine Fisheries Service. Impacts to aquatic ESA-listed species would likely be addressed with the Federal Aid Highway Program (FAHP) Programmatic.

The project area is within an area with an average of 2-4 wildlife collisions per mile per year; however, the project would not

Estimated Cultural Resources Impacts

Archaeological Resources

48. Are there known archaeological sites in the project area?	◯ Yes ◯ No ⦿ Unknown
49. Will the project entail disturbance of previously undisturbed ground?	◯ Yes ◯ No ⦿ Unknown
50. Will archaeologically sensitive areas (confluence of rivers, headlands, coves, overlooks, etc.) be affected?	⦿ Yes ◯ No
51. If the project is on or adjacent to BLM or USFS land, does contact with BLM or USFS archaeologist indicate any issues?	◯ Yes ◯ No ⦿ N/A

Historic resources (Built)

52. Does the SHPO historic database list any resources in the project area?	⦿ Yes ◯ No ◯ Unknown
53. Will there be any impacts to known historic resources (either listed or determined eligible for listing in the National Register of Historic Places)?	◯ Yes ◯ No ⦿ Unknown
54. Does any city/county comprehensive plan list any buildings/items in the project area as Goal 5 resources?	◯ Yes ⦿ No ◯ Unknown
55. Are any buildings in the project area thought to be 50 years old or older?	⦿ Yes ◯ No
56. Are there any apparent/unique structures of potential historical interest?	⦿ Yes ◯ No

Section 4(f)

57. * Could the project impact any archaeological or historic resources eligible for protection under Section 4(f) of the Department of Transportation Act?	◯ Yes ◯ No ⦿ Unknown

CULTURAL RESOURCES IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

It is unknown if archaeological sites are within the project area. An archaeological survey and baseline report would be required for compliance with Section 106. The SHPO historic database shows several potential historic resources east of the railroad along Fir Avenue. Any structure over 45 years in age (including the railroad itself) would need to be evaluated for eligibility for listing in the National Register of Historic Places. A historic survey and baseline report would be required for Section 106 compliance.

Estimated Parks / Recreation and Visual Impacts

Parks/Recreation Areas

58. * Could the project impact any parks, recreation areas, or wildlife/waterfowl refuges eligible for protection under Section 4(f) of the Department of Transportation Act?	⦿ Yes ◯ No ◯ Unknown
59. Could the project cause a Section 6(f) conversion or temporary occupancy of park or recreation area property encumbered by Land and Water Conservation funds?	◯ Yes ◯ No ⦿ Unknown

Wild and Scenic Rivers

60. Is the project area within ¼ mile of the bank of an Oregon Scenic Waterway?	◯ Yes ⦿ No
61. * Will the project affect waterways designated as National Wild and Scenic Rivers?	◯ Yes ⦿ No

Visual

62. Will the project involve any potential triggers for visual impact analysis?	◯ Yes ◯ No ⦿ Unknown

PARKS / RECREATION AND VISUAL IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

There are two Section 4(f) resources near the project area: Hahn Park and Triangle Park (also known as Roy Henderson Park). Triangle/Roy Henderson Park is also a Section 6(f) resource. If impacts to either park cannot be avoided, Section 4(f)/Section 6(f) documentation and coordination would be required.

Estimated Air Quality and Noise Impacts

Air Quality

63. Is the project in an air quality nonattainment or maintenance area?	◯ Yes ⦿ No
64. Is the project type exempt from conformity or Mobile Source Air Toxic analysis (MSAT)? (If yes, skip to Question 69)	⦿ Yes ◯ No

Noise

70. Are noise-sensitive land-uses present within 500 feet of the project roadway?	⦿ Yes ◯ No
71. Does the project require a noise analysis?	⦿ Yes ◯ No ◯ Unknown

72. Does the project qualify for a screening analysis?	○ Yes ○ No ◉ Unknown ○ N/A

AIR QUALITY AND NOISE IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

The project area is not within an air quality maintenance or nonattainment area. The project type is exempt from conformity/MSAT analysis (railroad/highway crossing). Noise-sensitive land uses are within 500 feet of the project roadway, and the project would require a noise analysis as a railroad overcrossing would result in substantial vertical alteration (and is therefore a Type I project).

Estimated Hazardous Materials / Waste Impacts

73. Does the project involve right-of-way acquisition or subsurface disturbance (e.g., excavation or drilling)? (If no, skip to Question 76)	◉ Yes ○ No
74. Does a search of DEQ databases (LUST, UST or ECSI) indicate the presence of any potentially contaminated sites within or adjacent to the project area?	◉ Yes ○ No
75. Does a search of the Oregon Fire Marshal's Hazardous Materials Incident database indicate any hazardous materials releases within the project area?	◉ Yes ○ No
76. Are there known current or historical land uses within or adjacent to the project area that could possibly have involved the use or storage of hazardous materials?	◉ Yes ○ No
77. Will the project include any structure (including buildings or bridges) demolition, repair, or removal of potentially hazardous materials (e.g., lighting or electrical equipment, hydraulic equipment, bridge mechanics, striping paint, bridge/barrier paint, treated timbers, etc.)?	◉ Yes ○ No

HAZARDOUS MATERIALS / WASTE IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

There are LUSTs on both sides of Fir Avenue. There is also a LUST and an UST near Laurel Avenue, west of US101. The fire marshal database indicates one spill of propane in October of 1996 at the intersection of US101 and OR38. The railroad itself may have transported hazardous materials. A hazardous materials corridor study would be required.

Estimated Geological / Geotechnical Impacts

Geological Resources/Geotechnical

78. Will an ODOT owned/permitted material source be offered for this project?	○ Yes ○ No ◉ Unknown
79. Will ODOT owned/permitted disposal sites be offered for this project?	○ Yes ○ No ◉ Unknown
80. If an ODOT owned/permitted disposal or material source site is being offered, has it been previously cleared to federal environmental standards?	○ Yes ○ No ◉ N/A
81. Is drilling/subsurface exploration anticipated?	◉ Yes ○ No

GEOLOGICAL / GEOTECHNICAL IMPACTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

Drilling would likely occur to inform the design of the retaining walls for the overcrossing.

Stakeholder Concerns / Public Involvement

STAKEHOLDER CONCERNS / PUBLIC INVOLVEMENT COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

Key Environmental Issues and Requirements

KEY ENVIRONMENTAL ISSUES AND REQUIREMENTS COMMENTS (FIELD WILL EXPAND AS YOU TYPE. CLICK TAB TO SEE TEXT IN EXPANDED FIELD.)

Potential impacts to cultural resources, parks, and wetlands.

Potentially Required Permits / Approvals / Clearances

82. Local Land Use	◉ Yes ○ No ○ Unknown
83. Local Agency Floodplain Permit	◉ Yes ○ No ○ Unknown
84. U.S. Corps of Engineers Section 404 and DEQ Section 401 Cert	○ Yes ○ No ◉ Unknown
85. U.S. Corps of Engineers Section 10	○ Yes ◉ No ○ Unknown
86. DSL Removal/Fill	○ Yes ○ No ◉ Unknown
87. U.S. Corps of Engineers Section 408 (federal facilities)	○ Yes ◉ No ○ Unknown
88. NPDES 1200-CA permit (or 1200-C permit for local agencies)	◉ Yes ○ No ○ Unknown
89. U.S. Coast Guard New Bridge Permit	○ Yes ◉ No ○ Unknown
90. U.S. Coast Guard Permit Modification	○ Yes ◉ No ○ Unknown
91. U.S. Coast Guard Construction Plan Approval	○ Yes ◉ No ○ Unknown
92. FAHP Programmatic BO	◉ Yes ○ No ○ Unknown

93. SLOPES Programmatic BO	○ Yes	◉ No	○ Unknown
94. Individual Biological Opinion	○ Yes	◉ No	○ Unknown
95. Marine Mammal Protection Act IHA	○ Yes	◉ No	○ Unknown
96. ODFW Fish Passage Plan Approval	○ Yes	◉ No	○ Unknown
97. State Endangered Species Act	○ Yes	○ No	◉ Unknown
98. No Effect Memo	◉ Yes	○ No	○ Unknown
99. Archaeological Excavation Permit	◉ Yes	○ No	○ Unknown
100. Section 106 – State Historic Preservation Officer (Historic–Built)	◉ Yes	○ No	○ Unknown
101. Section 106 – State Historic Preservation Officer (Archaeological)	◉ Yes	○ No	○ Unknown
102. Section 4(f) temporary occupancy	○ Yes	○ No	◉ Unknown
103. Section 4(f) *de minimis*	○ Yes	○ No	◉ Unknown
104. Section 4(f) Programmatic	○ Yes	○ No	◉ Unknown
105. Section 4(f) Evaluation – Individual	○ Yes	○ No	◉ Unknown
106. Section 6(f) Temporary Occupancy or Conversion	○ Yes	○ No	◉ Unknown
107. Wild and Scenic River Section 7 Determination	○ Yes	◉ No	○ Unknown
108. Oregon Scenic Waterways	○ Yes	◉ No	○ Unknown
109. FHWA Noise	◉ Yes	○ No	○ Unknown
110. * Air Conformity	○ Yes	◉ No	○ Unknown
111. Hazardous Materials Study	◉ Yes	○ No	○ Unknown
112. DOGAMI Permit	○ Yes	◉ No	○ Unknown

113. Other (specify):

114. Other (specify):

115. Other (specify):

116. Other (specify):

117. Other (specify):

118. Other (specify):

Preliminary NEPA Classification

Based upon the answers and content above, please answer the following questions:

23 CFR 771.117(a) – Would the project involve any of the following effects:

119. Induce significant impacts to planned growth or land use for an area?	○ Yes	◉ No	○ Unknown
120. Require relocation of significant numbers of people?	○ Yes	◉ No	○ Unknown
121. Have a significant impact on any natural, cultural, recreational, historic or other resources?	○ Yes	◉ No	○ Unknown
122. Involve significant air, noise, or water quality impacts?	○ Yes	◉ No	○ Unknown
123. Have significant impacts on travel patterns?	○ Yes	◉ No	○ Unknown

23 CFR 771.117(b) – Would the project involve unusual circumstances such as:

124. Significant environmental impacts?	○ Yes	◉ No	○ Unknown
125. Substantial controversy on environmental grounds?	○ Yes	◉ No	○ Unknown
126. Significant impacts to properties protected by Section 4(f) of the DOT Act or Section 106 of the National Historic Preservation Act?	○ Yes	◉ No	○ Unknown
127. Inconsistencies with any federal, state, or local law, requirements or administrative determination relating to the environmental aspects of the project?	○ Yes	◉ No	○ Unknown

Based upon questions 119-127 and the Environmental Prospectus responses, identify the project's preliminary NEPA class of action:

- ○ Programmatic Categorical Exclusion (PCE)
- ◉ Documented Categorical Exclusion (CE)
- ○ Environmental Assessment (EA)
- ○ Environmental Impact Statement (EIS)

For preliminary PCEs and CEs, identify the up to three category(ies) of project work from the activities listed in CFR 771.117(c) and CFR771.117(d):

Show Categories

APPLICABLE CATEGORY	APPLICABLE CATEGORY	APPLICABLE CATEGORY
(c)(28)		

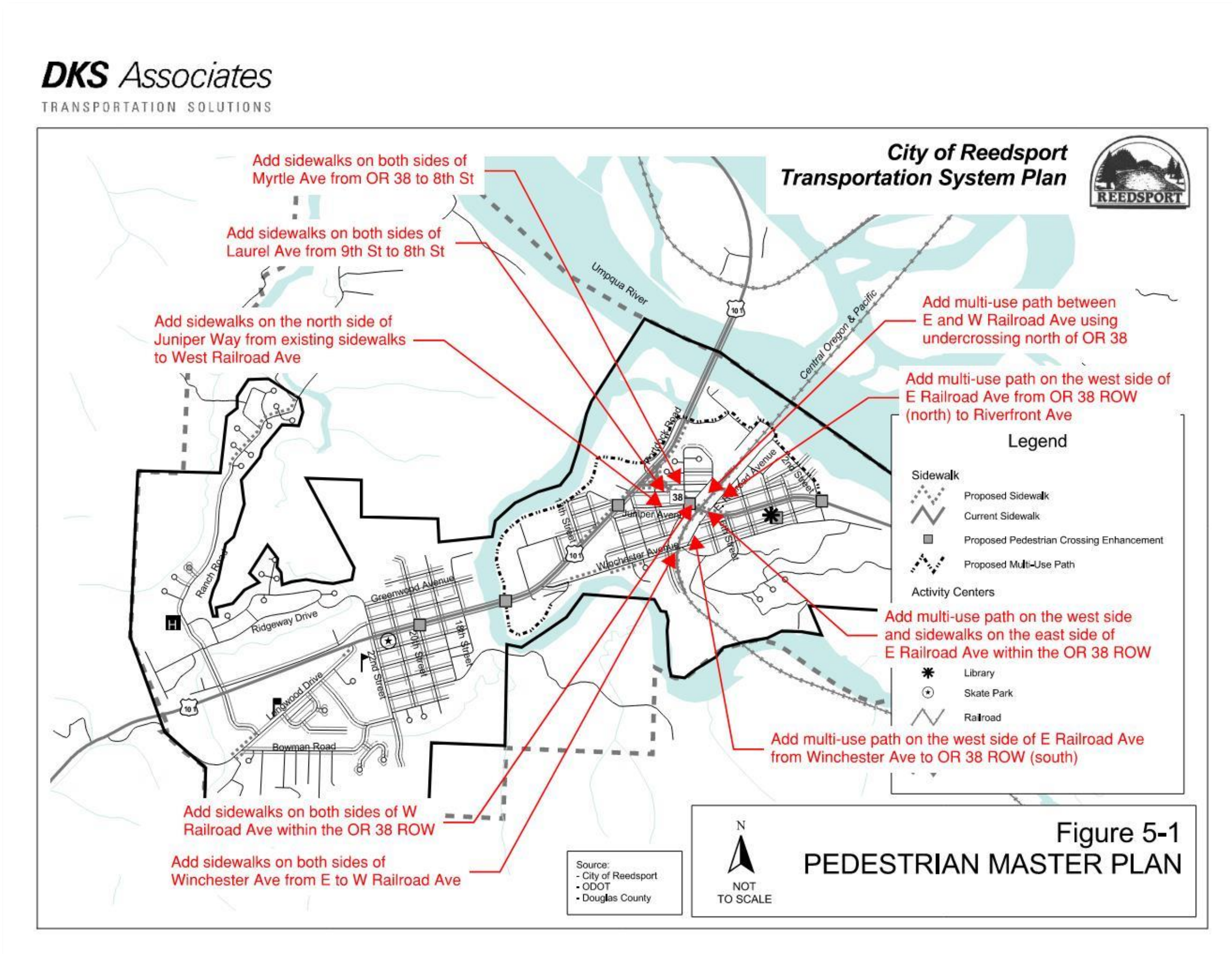
Signatures

Digital signature/date are required from the preparer and/or ODOT REC.

PREPARER NAME AND TITLE	ODOT REC NAME AND TITLE
PREPARER DIGITAL SIGNATURE AND DATE	ODOT REC DIGITAL SIGNATURE AND DATE

Attachment D: TSP Pedestrian and Bicycle Master Plan Mark-ups

See Tech Memo #8 Attachment A for final Mark-ups

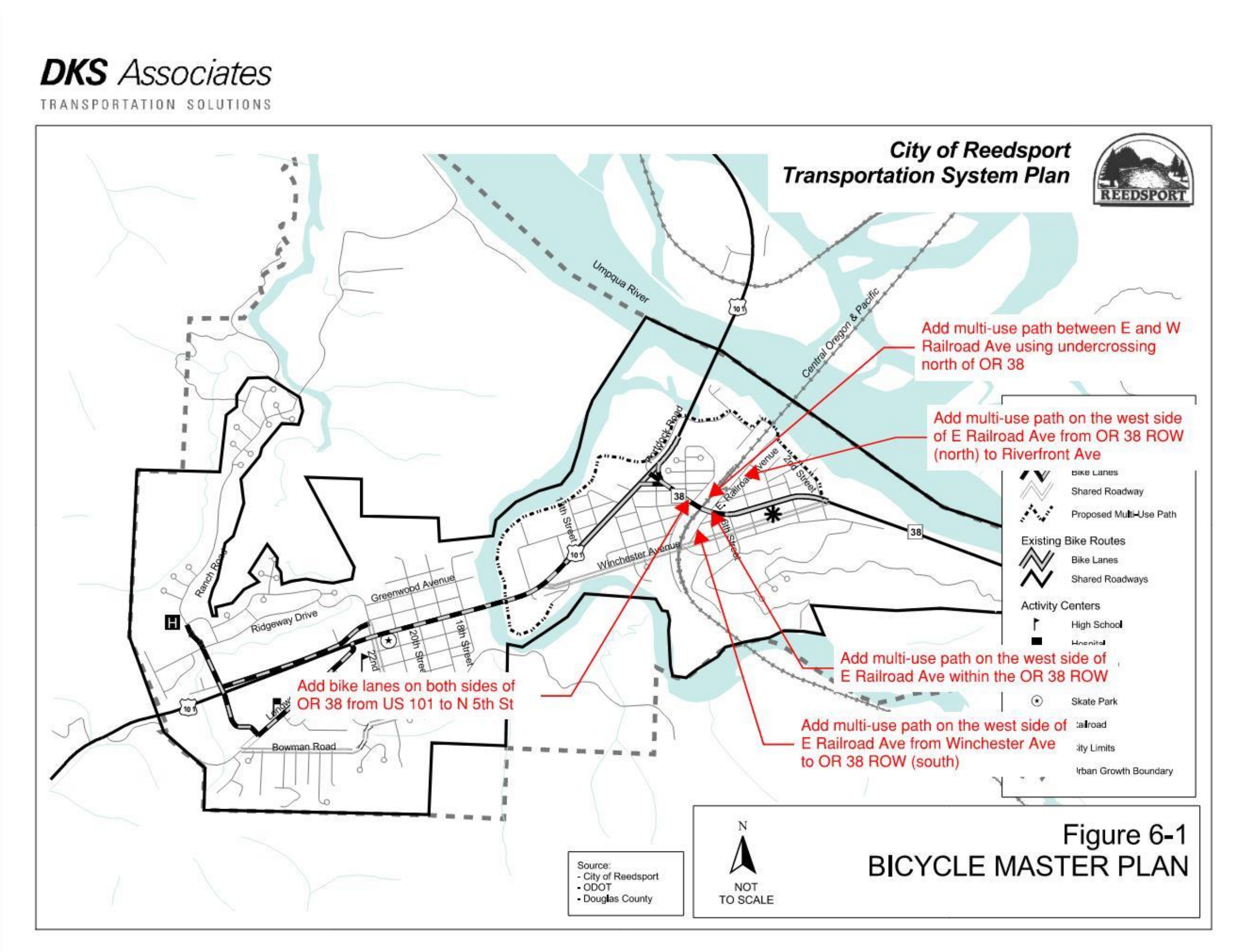


The pedestrian projects shown in Figure 5-1 (above) should be adopted along with the rail crossing refinement plan and incorporated into the next TSP update. In addition, cost estimates for all pedestrian projects should be developed along with the future TSP update. Table D1 summarizes the projects to be incorporated into the pedestrian master plan.

Table D1. Pedestrian Master Plan Projects

Location	Side	From	To	Estimated Cost ($1,000)
Complete Sidewalks				
Myrtle Avenue	Both	OR 38	8th Street	$120,000
Laurel Avenue	Both	9th Street	8th Street	$155,000
Juniper Way from to	North	Existing Sidewalks	W Railroad Avenue	$15,000
W Railroad Avenue	Both	Juniper Avenue	Laurel Avenue	$120,000
E Railroad Avenue	East	Fir Avenue	Greenwood Avenue	$80,000
Multi-Use Path				
E Railroad Avenue	West	Winchester Ave	Fir Avenue	$110,000
E Railroad Avenue	West	Fir Avenue	Greenwood Avenue	$110,000
E Railroad Avenue	West	Greenwood Avenue	Riverfront Way	$395,000
Greenwood Avenue	N/A	E Railroad Avenue	W Railroad Avenue	$85,000

See Tech Memo #8 Attachment A for final Mark-ups



The bicycle projects shown in Figure 6-1 (above) should be adopted along with the rail plan and incorporated into the next TSP update. In addition, cost estimates for all bicycle projects should be developed along with the future TSP update. Table D2 summarizes the projects to be incorporated into the bicycle master plan.

Table D2. Bicycle Master Plan Projects

Location	Side	From	To	Estimated Cost ($1,000)
Multi-Use Path				
E Railroad Avenue	West	Winchester Ave	Fir Avenue	Cost accounted for in Pedestrian Master Plan
E Railroad Avenue	West	Fir Avenue	Greenwood Avenue	Cost accounted for in Pedestrian Master Plan
E Railroad Avenue	West	Greenwood Avenue	Riverfront Way	Cost accounted for in Pedestrian Master Plan
Greenwood Avenue	N/A	E Railroad Avenue	W Railroad Avenue	Cost accounted for in Pedestrian Master Plan

See Tech Memo #8 Attachment A for final Mark-ups

TECHNICAL MEMORANDUM #8

Amendments and Implementing Measures

KITTELSON & ASSOCIATES
851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

Technical Memorandum

February 9, 2024 Project# 27003.011

To: Deanna Schafer and Kim Clardy, *City of Reedsport*
Thomas Guevara, *Oregon Department of Transportation*

From: Matt Bell and Marc Butorac, PE, PTOE

Project: City of Reedsport Rail Crossing Study and Refinement Plan

RE: Tech Memorandum #8: Amendments and Implementing Measures

TABLE OF CONTENTS

INTRODUCTION

This memorandum discusses amendments to the City of Reedsport Transportation System Plan (TSP) to incorporate the findings and recommendations of the Reedsport Rail Crossing Study.

The purpose of the Reedsport Rail Crossing Study was to evaluate the impacts of anticipated increases in rail activity along the Coos Bay Rail Line and identify improvement projects needed to maintain acceptable traffic operations and safety within the community.

The study recommends a grade-separated rail crossing on OR 38 and an enhanced four-quadrant gated at-grade rail crossing on Winchester Avenue. The study also recommends several improvements to the multimodal transportation system.

Following adoption of the Reedsport Rail Crossing Study by Reedsport City Council, the TSP will be amended to incorporate the findings of the rail crossing study. The amendments will stipulate certain pedestrian, bicycle, and motor vehicle projects which shall be constructed prior to the Port of Coos Bay completing their planned multi-modal container facility.

BACKGROUND

The Oregon International Port of Coos Bay is planning to construct a multi-modal container facility on the North Spit in Coos County. The container facility will be designed to accommodate 1.2 million twenty-foot equivalent unit (TEU) containers per year, which equates to approximately 600,000 containers per year. These containers will be received in the first carbon-free marine terminal in the United States, as well as one of the only direct ship-to-rail container facilities in the United States. Depending on the operational length of trains that serve the container facility, as well as several other factors, the number of trains traveling through downtown Reedsport could vary; the current estimate is 10 to 12 per day.

The trains will travel from the North Spit to Eugene and back. The trains will travel through downtown Reedsport, crossing OR 38 and Winchester Avenue. The increase in train activity at these crossings is expected to negatively impact traffic operations and safety on OR 38 and Winchester Avenue as well as throughout the Reedsport community.

IMPLEMENTING ORDINANCES AND MEASURES

An ordinance amending sections of the Reedsport Transportation System Plan.

Whereas, the Department of Land Conservation and Development adopted the Transportation Planning Rule to implement Statewide Planning Goal 12 and;

Whereas, the Transportation Planning Rule is implemented by Oregon Administrative Rule (OAR) 660-12 and;

Whereas, the OAR requires all Cities to have an approved Transportation System Plan and;

Whereas, the City of Reedsport is responsible for periodically reviewing and updating its Transportation System Plan to ensure that the plan remains contemporary and;

Whereas, the City partnered with the Oregon Department of Transportation (ODOT) to conduct a rail crossing study to develop and evaluate solutions to address anticipated increases in rail activity along the Coos Bay Rail Line and;

Whereas, in order to mitigate future increased rail activity associated with the proposed Port of Coos Bay Pacific Coast Intermodal Port, the Reedsport Rail Crossing Study must be adopted by reference into the Reedsport Transportation System Plan and:

Whereas, in order to implement the identified projects identified in the Reedsport Rail Crossing Study certain sections of the Reedsport Transportation System Plan must be amended.

Now, therefore, the City of Reedsport ordains as follows:

PROPOSED AMENDMENTS TO THE TSP

The proposed amendments to the TSP are organized by reference to the applicable chapters of the TSP. There are no underline or ~~strikethrough~~ text shown below as amendments to the TSP are expected to occur with the next TSP update.

These Pacific Coast Multimodal Port mitigation projects will be clearly identified as only to be implemented if the multi-modal container facility is developed.

5. Pedestrian Plan

Amendments to Chapter 5 of the TSP include the addition of sidewalk and multi-use path projects to the Pedestrian Plan Projects (Pages 5-8); these projects should be clearly identified as Pacific Coast Multimodal Port mitigations or as pedestrian system enhancements. Tables 1 and 2 summarize the pedestrian plan projects as identified in the Reedsport Rail Crossing Study.

The projects shown in Table 1 are part of the Pacific Coast Multimodal Port mitigations and intended to improve pedestrian access and circulation with implementation of the OR 38 overcrossing. All the projects shown in Table 1 should be incorporated into the TSP as an amendment or with the next TSP update. *Attachment A contains a redlined version of Figure 5-1 that shows the amendments in red.*

Table 1. Pedestrian Plan Projects – Pacific Coast Multimodal Port Mitigations

Location	Side	From	To	Estimated Cost ($1,000)
Sidewalks				
Myrtle Avenue	Both	OR 38	8th Street	$0[1]
Laurel Avenue	Both	9th Street	8th Street	$0[1]
W Railroad Avenue	Both	OR 38 ROW (south)	OR 38 ROW (north)	$0[1]
E Railroad Avenue	East	OR 38 ROW (south)	OR 38 ROW (north)	$0[1]
Winchester Avenue	Both	E Railroad Avenue	W Railroad Avenue	$0[1]
OR 38	Both	US 101	N 5th Street	$0[1]
N 6th Street	Both	OR 38	Approx 100-feet south	$0[1]
Fir Avenue	South	N 6th Street	Approx 200-feet west	$0[1]
Multi-Use Path				
E Railroad Avenue	West	OR 38 ROW (south)	OR 38 ROW (north)	$0[1]

1. Project is part of the Pacific Coast Multimodal Port mitigations, as such the project cost is included in the OR 38 overcrossing identified in the Motor Vehicle Plan.

The projects shown in Table 2 are intended to complement the mitigations and further improve pedestrian access and circulation in downtown Reedsport. All the projects shown in Table 2 should be incorporated into the TSP as an amendment or with the next TSP update. At that time, the City should determine if any of the projects should be included in the Pedestrian Action Plan. *Attachment A contains a redlined version of Figure 5-1 that shows the amendments in blue.*

Table 2. Pedestrian Plan Projects

Location	Side	From	To	Estimated Cost ($1,000)
Sidewalks				
Juniper Way	North	End of existing sidewalk	W Railroad Avenue	$15,000
Multi-Use Path				
E Railroad Avenue	West	Winchester Ave	OR 38 ROW (south)	$110,000
E Railroad Avenue	West	OR 38 ROW (north)	Riverfront Way	$395,000
Greenwood Avenue (RRCS-4)	N/A	E Railroad Avenue	W Railroad Avenue	$85,000

6. Bicycle Plan

Amendments to Chapter 6 of the TSP include the addition of multi-use path projects to the Bicycle Plan Projects (Pages 6-7); these projects should be clearly identified as Pacific Coast Multimodal Port mitigations or as bicycle system enhancements. Tables 3 and 4 summarize the bicycle plan projects as identified in the Reedsport Rail Crossing Study.

The projects shown in Table 3 are part of the Pacific Coast Multimodal Port mitigations and intended to improve bicycle access and circulation with implementation of the OR 38 overcrossing. All the projects shown in Table 3 should be incorporated into the TSP as an amendment or with the next TSP update. *Attachment A contains a redlined version of Figure 5-2 of that shows the amendments in red.*

Table 3. Bicycle Plan Projects – Pacific Coast Multimodal Port Mitigations

Location	Side	From	To	Estimated Cost ($1,000)
Bike Lanes				
OR 38	Both	US 101	N 5th Street	$0[1]
Multi-Use Path				
E Railroad Avenue	West	OR 38 ROW (south)	OR 38 ROW (north)	$0[1]

1. Project is part of the Pacific Coast Multimodal Port mitigations, as such the project cost is included in the OR 38 overcrossing identified in the Motor Vehicle Plan.

The projects shown in Table 4 are intended to complement the Pacific Cost Multimodal Port mitigations and further improve bicycle access and circulation in downtown Reedsport. All the projects shown in Table 4 should be incorporated into the TSP as an amendment or with the next TSP update. At that time, the City should determine if any of the projects should be included in the Bicycle Action Plan. *Attachment A contains a redlined version of Figure 5-2 that shows the amendments in blue.*

Table 4. Bicycle Plan Projects

Location	Side	From	To	Estimated Cost ($1,000)
Multi-Use Path				
E Railroad Avenue	West	Winchester Ave	OR 38 ROW (south)	$0[1]
E Railroad Avenue	West	OR 38 ROW (north)	Riverfront Way	$0[1]
Greenwood Avenue (RRCS-4)	N/A	E Railroad Avenue	W Railroad Avenue	$0[1]

1. Cost accounted for in Pedestrian Master Plan

7. Motor Vehicles

Amendments to Chapter 7 of the TSP include the additional of the OR 38 and Winchester Avenue rail crossing improvements and a refinement plan for US 101 to the Proposed Motor Vehicle Projects (Pages 7-31); these projects should be clearly identified as Pacific Coast Multimodal Port mitigations. Table 3 summarizes the motor vehicle plan projects as identified in the Reedsport Rail Crossing Study. The projects shown in Table 3 should be incorporated into the TSP as an amendment or with the next TSP update. At that time, the City should determine if any of the projects should be included in the Motor Vehicle Action Plan. *Attachment A contains a redlined version of Figure 7-9 of that shows the amendments.*

Table 5. Motor Vehicle Master Plan Projects

Location	Project	Estimated Cost ($1,000)
Winchester Avenue At-Grade Crossing (RRCS-1)	Install a four-quadrant gated rail crossing on Winchester Avenue at the existing at-grade rail crossing. Also, work with ODOT to install a dynamic train activity warning sign on US 101, south of Winchester Avenue (See RRCS-1 Project Sheet).	$0[1] ($335,000)

OR 38 Overcrossing (RRCS-2)	Install a grade-separated rail crossing (overcrossing) with retaining walls on OR 38 and reconfigure the US 101/OR 38-Port Dock Road intersection (see RRCS-2 Project Sheet).	$34,700,000 ($34,215,000)
US 101 Refinement Plan (RRCS-3)	Conduct a refinement plan for US 101 from the Umpqua River to Scholfield Creek to evaluate access management and, at a minimum, potential modifications to the US 101/OR 38-Port Dock Road intersection (See RRCS-3 Project Sheet).	$0[1] ($150,000)

1. Project is part of the Pacific Coast Multimodal Port mitigations, as such the project cost is included in the OR 38 overcrossing.

ATTACHMENTS

A. Redlined TSP Modal Maps
B. Project Sheet

Attachment A: Redlines TSP Figures

DKS Associates
TRANSPORTATION SOLUTIONS

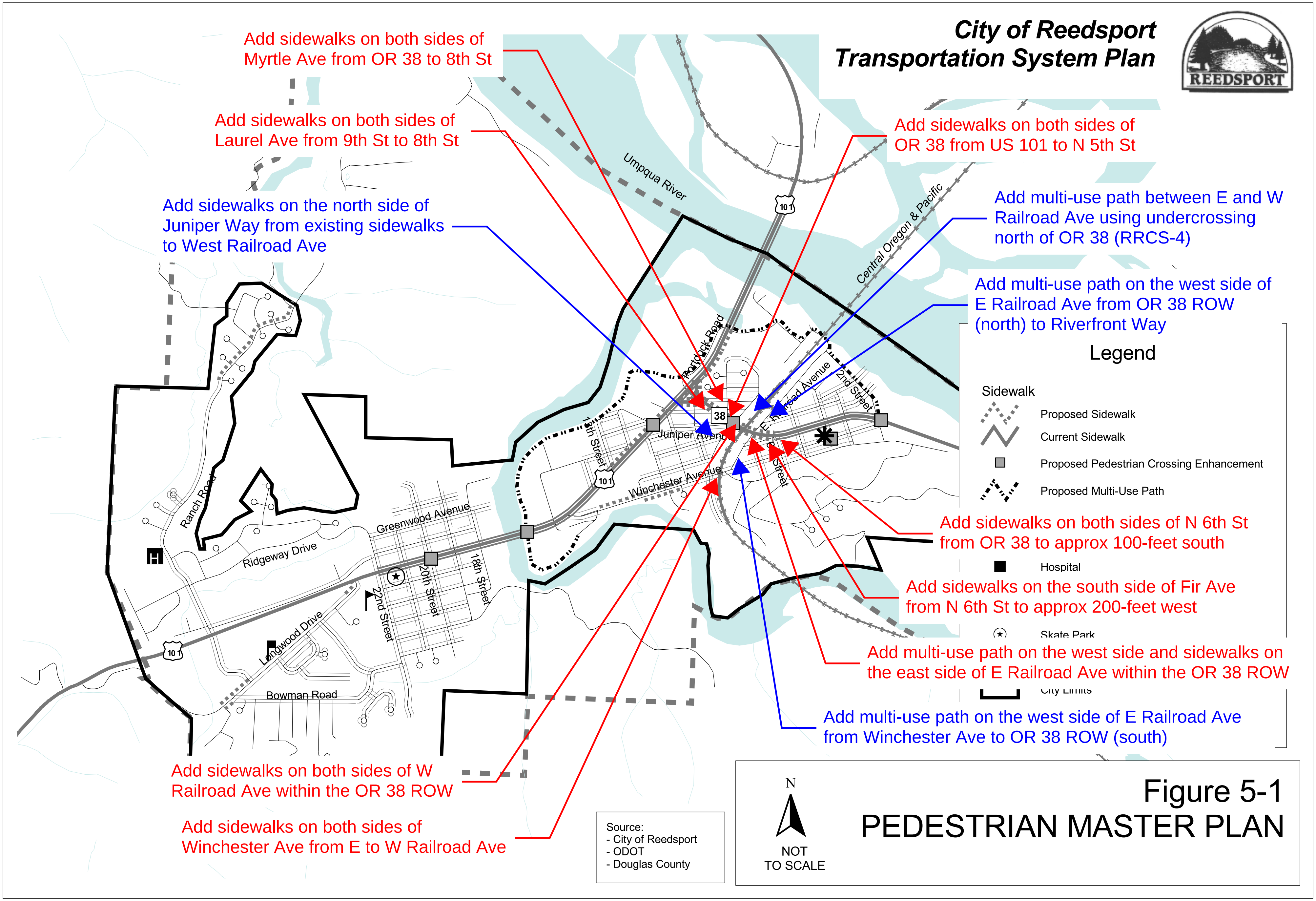


Figure 5-1
PEDESTRIAN MASTER PLAN

DKS Associates
TRANSPORTATION SOLUTIONS

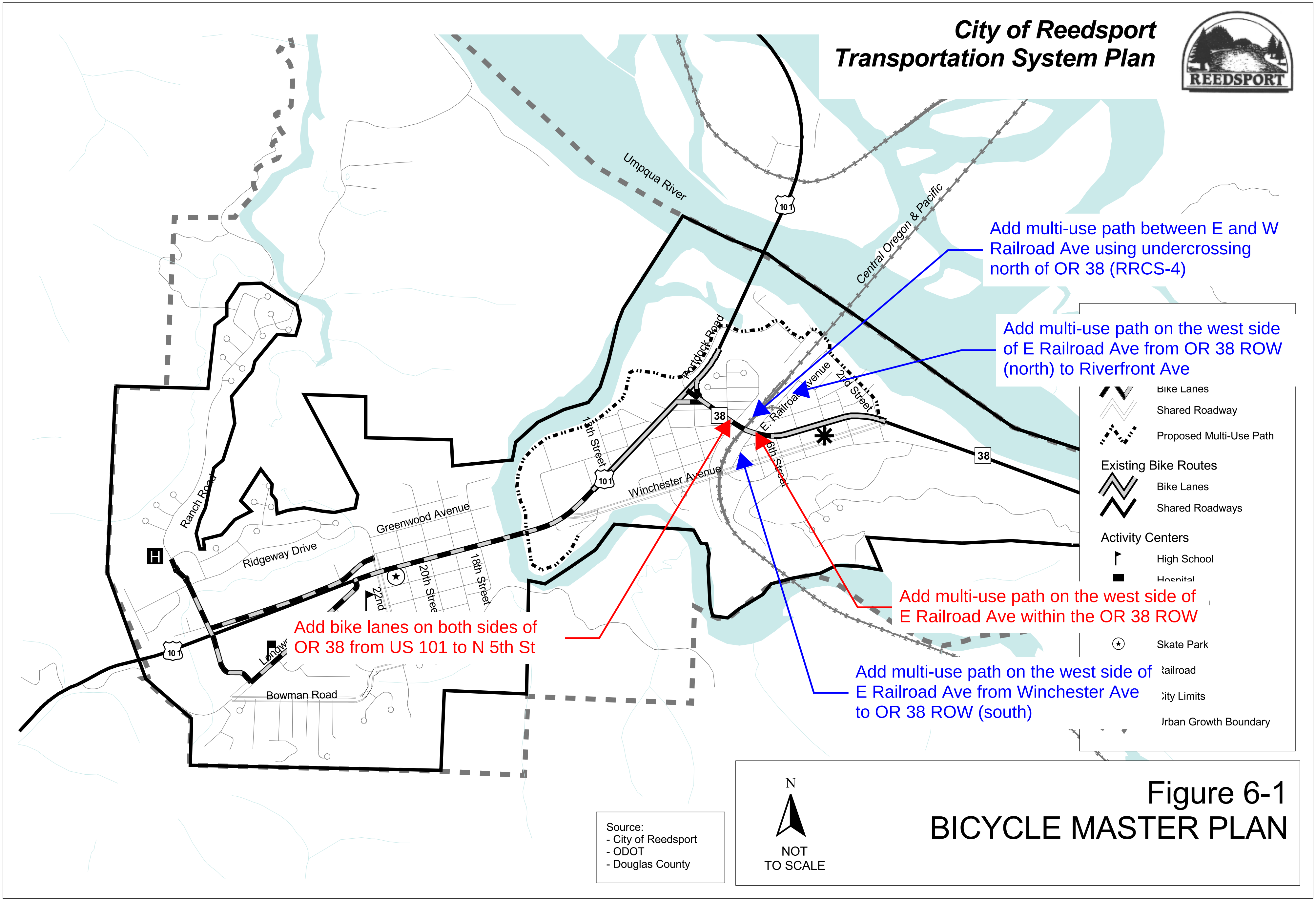


Figure 6-1
BICYCLE MASTER PLAN

DKS *Associates*
TRANSPORTATION SOLUTIONS

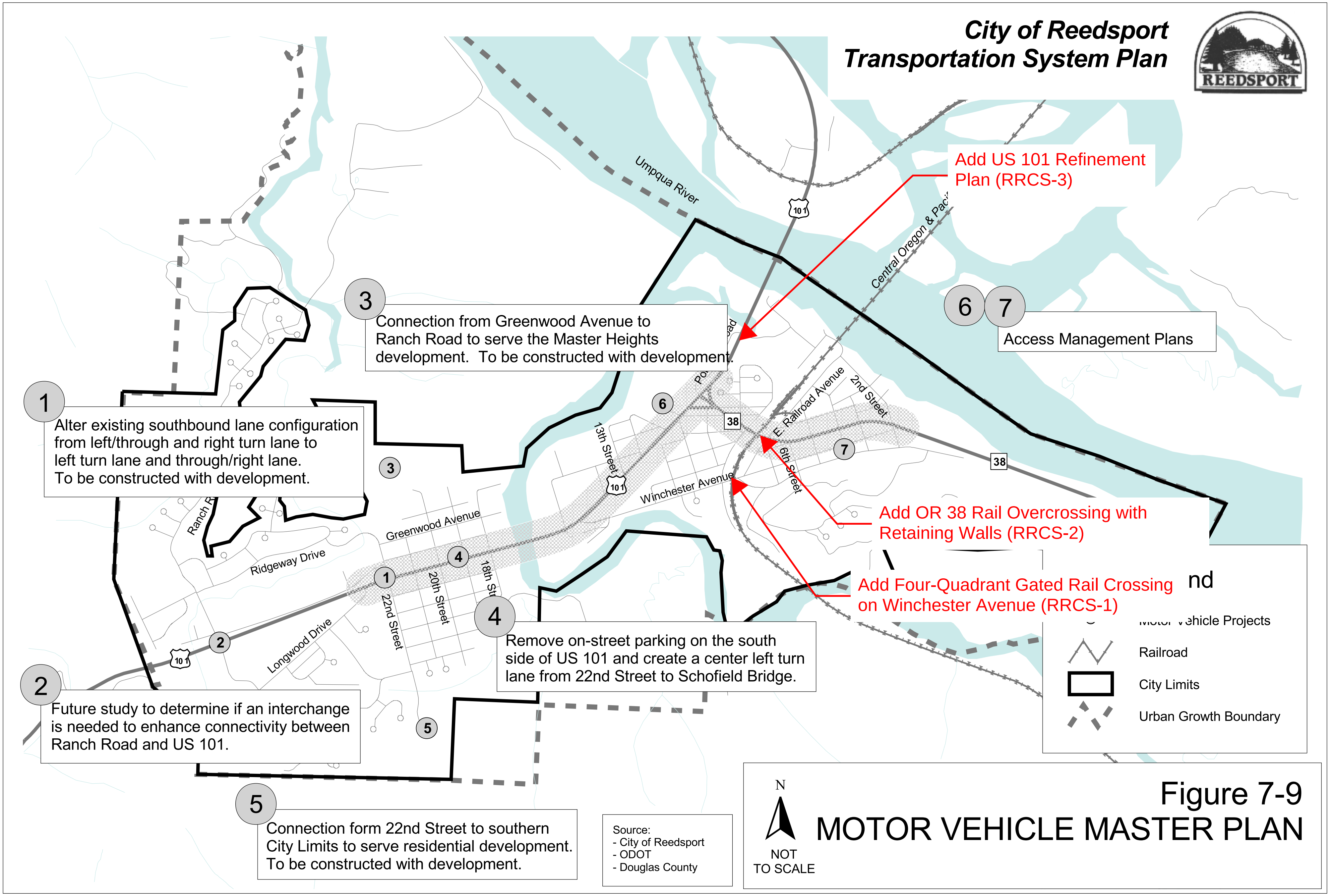


Figure 7-9
MOTOR VEHICLE MASTER PLAN

Attachment B: Project Sheets

See Reedsport Rail Crossing Study Attachment A for final project sheets

Purpose	This project is intended to address the transportation-related impacts associated with the Port of Coos Bay's Pacific Coast Intermodal Port project and the anticipated increases in rail activity along the Coos Bay Rail Line and in downtown Reedsport.	
Description	This project will involve installation of a grade-separated rail crossing (overcrossing) with retaining walls on OR 38, reconfiguration of the US 101/OR 38 intersection, as well as other intersections on OR 38 from US 101 to N 6th Street, and installation of pedestrian and bicycle facilities on OR 38 and the surrounding local street network as necessary to maintain connectivity for people walking and biking.	
Location	OR 38 from north of Laurel Street to east of N 6th Street.	
Roadway Characteristics	– **Jurisdiction:** ODOT – **Functional Classification:** Other Principal Arterial (Federal), Statewide Highway (State), Arterial (City) – **Freight Route Designation:** OHP Freight Route; Reduction Review Route – **Existing AADT:** 4,886 (Source: ODOT) – **Forecast AADT:** 5,600 (Source: ODOT)	– **Posted Speed:** 25 mph – **Pavement Width:** 34' – **Travel Lanes:** 2 (12' each way) – **Pedestrian Facilities:** Sidewalks (6' both sides) – **Bike Facilities:** Bike lanes (5' both sides) – **Transit Facilities:** None – **On-Street Parking:** None
How Improvement Addresses Deficiencies	**Existing/Future Need**: – The existing at-grade rail crossing on OR 38 is controlled by a two-quadrant gate system with flashing lights and cross buck "rail crossing" warning signs. – The Port project is expected to increase rail activity along the CBRL, including the frequency, length, and speed of trains. – The increase in rail activity will increase delays at the at-grade crossing as well as motor vehicle queues on OR 38 that block side streets and create access/ circulation issues in downtown Reedsport.	**With Improvement:** – Addresses delays and access/circulation issues. – Addresses increased train activity issues. – Addresses queuing-related impacts to upstream and downstream cross-streets on OR 38. – Partially addresses queuing-related impacts to upstream and downstream cross-streets on Winchester Avenue. – Addresses noise-related issues with increased train activity at OR 38 by eliminating the need for train horn warnings at the crossing.
Additional Considerations	Further refinements are needed to minimize potential right-of-way and/or environmental impacts, address visual impacts associated with the vertical elements of the overcrossing structures, and identify local roadway and driveway tie-ins to the modified roadway. ODOT should also consider installing a multi-use path on the south side of OR 38 from Laurel Avenue to Juniper Avenue.	
Cost Opinions	$34,215,000 (assumes retaining walls, embankment support, and bridges; 39,415,000 (assumes viaduct between east and west Railroad Avenue)	
Implementation	Implementation of this project will require closing OR 38 and re-routing traffic along Winchester Avenue during construction. Winchester Avenue will likely need to be upgraded before construction to accommodate the increase in traffic, including heavy vehicles.	

AADT = annual average daily traffic; CBRL = Coos Bay Rail Line; ODOT = Oregon Department of Transportation.

See Reedsport Rail Crossing Study Attachment A for final project sheets

Reedsport Railroad Crossing Study (RRCS-1)
Four-Quadrant Gated Rail Crossing on Winchester Avenue

City of Reedsport
Transportation System Plan

Purpose	This project will improve the safety of the existing at-grade rail crossing on Winchester Avenue as well as support implementation of a quiet zone through downtown Reedsport.	
Description	This project will provide a four-quadrant gated rail crossing on Winchester Avenue. The crossing would include two gate arms and flashers on both sides of the rail line and in both directions. The crossing would also include gate arms and flashers across the pedestrian facilities (sidewalks). This type of crossing prevents motorists from driving around the lowered gates. With this type of crossing, the entry gates will close before the exit gates to allow motorists to clear the rail line. The gates also lower long before the train arrives.	
Location	Winchester Avenue at-grade rail crossing.	
Roadway Characteristics	– **Jurisdiction:** City of Reedsport – **Functional Classification:** Rural Major Collector (Federal), Arterial (City) – **Freight Route Designation:** None – **Existing AADT:** 2,111 (Source: ODOT) – **Forecast AADT:** NA	– **Posted Speed:** 25 mph – **Pavement Width:** 40' – **Travel Lanes:** 2 (12' each way) – **Pedestrian Facilities:** Sidewalks (5' both sides) – **Bike Facilities:** None – **Transit Facilities:** None – **On-Street Parking:** (8' both sides)
How Improvement Addresses Deficiencies	**Existing/Future Need**: – The existing at-grade rail crossing on Winchester Avenue is controlled by a two-quadrant gate system with flashing lights and cross buck "rail crossing" warning signs. – The Port project is expected to increase rail activity along the CBRL, including the frequency, length, and speed of trains. – The increase in rail activity will increase delays at the at-grade crossing (OR 38 and Winchester Avenue).	**With Improvement:** – Addresses noise-related Issues with train activity at Winchester Avenue by eliminating the need for train horn warnings at the crossing. – Feasible to construct with minimal to potential zero right-of-way or environmental impacts. – Economically feasible at a magnitude cost of $285,000. – Requires grade-separated improvements on OR 38 to meet all identified needs.
Additional Considerations	The City should work with ODOT to install a dynamic train activity warning sign on US 101, south of Winchester Avenue, to alert northbound motorists that a train is approaching or present at the at-grade rail crossing on Winchester Avenue allowing them to re-route to OR 38.	
Cost Opinions	$335,000	
Implementation	This project may be implemented in tandem with Railroad Crossing Study-1: OR 38 Overcrossing with Retaining Walls.	

AADT = annual average daily traffic; CBRL = Coos Bay Rail Line; ODOT = Oregon Department of Transportation.

See Reedsport Rail Crossing Study Attachment A for final project sheets

Reedsport Railroad Crossing Study (RRCS-3) US 101 Refinement Plan		City of Reedsport Transportation System Plan

Purpose	This project will provide further evaluation of intersection improvements along US 101 from the Umpqua River to Scholfield Creek and access management improvements along OR 38 from Laurel Avenue to US 101.	
Description	The project will involve a refinement plan for US 101 from the Umpqua River to Scholfield Creek. The study should include, at a minimum, an evaluation of potential modifications to the US 101/OR 38-Port Dock Road intersection, including additional lanes at the intersection to provide additional capacity and future signal timing and phasing flexibility.	
Location	US 101 from Umpqua River to Scholfield Creek and OR 38 from Laurel Avenue to US 101	
Roadway Characteristics	– **Jurisdiction:** ODOT – **Functional Classification:** Other Principal Arterial (Federal), Statewide Highway (State), Arterial (City) – **Freight Route Designation:** OHP Freight Route; Reduction Review Route – **Existing AADT:** 13,926 (Source: ODOT) – **Forecast AADT:** 13,000 (Source: ODOT)	– **Posted Speed:** 25 mph – **Pavement Width:** 71' – **Travel Lanes:** 5 (12' travel lane, 12'median) – **Ped Facilities:** Sidewalks (5' east side, 6' west) – **Bike Facilities:** Bike lanes (5' east side, 6' west) – **Transit Facilities:** Yes – **On-Street Parking:** None
How Improvement Addresses Deficiencies	**Existing/Future Need:** – The US 101/OR 38-Port Dock Road intersection currently experiences congestion during the summer peak weekend and is anticipated to worsen over time. – The westbound left/through queue on OR 38 is also projected to extend past the right-turn slip lane at the west approach. – There are multiple access points along OR 38 from Laurel Avenue to US 101	**With Project:** – Further evaluation of intersection operations and safety at the US 101/OR 38-Port Dock Road intersection and identification of preferred improvements for implementation. – Further evaluation of access management opportunities along OR 38 and identification oof a preferred strategy for implementation.
Additional Considerations	None	
Cost Opinions	$150,000	
Implementation	This project may be implemented at any time.	

AADT = annual average daily traffic; ODOT = Oregon Department of Transportation.

See Reedsport Rail Crossing Study Attachment A for final project sheets

Purpose	This project is needed to maintain pedestrian and bicycle connectivity between areas north and south of the Coos Bay Rail Line with implementation of the OR 38 rail overcrossing.	
Description	This project will involve installation of a multi-use path north of OR 38 and between E and W Railroad Avenues. The multi-use path will follow the former Greenwood Avenue right-of-way and utilize the existing northerly OR 38 rail undercrossing.	
Location	The multi-use path will be located north of OR 38 and between E and W Railroad Avenues.	
Roadway Characteristics	– **Jurisdiction:** N/A – **Functional Classification:** N/A – **Freight Route Designation:** N/A – **Existing AADT:** 0 – **Forecast AADT:** 0	– **Posted Speed:** N/A – **Pavement Width:** 0' – **Travel Lanes:** 0 – **Ped Facilities:** None – **Bike Facilities:** None – **Transit Facilities:** None – **On-Street Parking:** None
How Improvement Addresses Deficiencies	**Existing/Future Need:** – Currently, pedestrians and bicyclists may use OR 38 to travel between E and W Railroad Avenues and between areas north and south of the Coos Bay Rail Line – Implementation of the OR 38 rail overcrossing will grade-separate OR 38 and require pedestrians and bicyclists traveling between areas north and south to travel up and over the overcrossing.	**With Project:** – The Multi-use path will maintain pedestrian and bicycle connectivity between E and W Railroad Avenue and between areas north and south of the Coos Bay Rail Line.
Additional Considerations	The former Greenwood Avenue right-of way was abandoned by the City and the rail crossing was closed. Implementation of the project would require acquiring the right-of-way and gaining approval from the rail line to install the crossing.	
Cost Opinions	$85,000	
Implementation	This project may be implemented at any time.	

AADT = annual average daily traffic; ODOT = Oregon Department of Transportation.

See Reedsport Rail Crossing Study Attachment A for final project sheets

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