2016 Scappoose Transportation System Plan: Volume 2

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Scappoose
Transportation System Plan

Prepared for:

City of Scappoose

Oregon Department of Transportation

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Volume 2 Contents

Volume 2 of the Scappoose Transportation System Plan includes all background memoranda, meeting summaries, and technical data that were the basis for its development.

Section A

Glossary

Access Management: Refers to measures regulating access to streets, roads and highways from public roads and private driveways. Measures may include but are not limited to restrictions on the type and amount of access to roadways, and use of physical controls such as signals and channelization including raised medians, to reduce impacts of approach road traffic on the main facility.

Alternative Modes: Transportation alternatives other than single-occupant automobiles such as rail, transit, bicycles and walking.

Arterial (Street): A street designated in the functional class system as providing the highest amount of connectivity and mostly uninterrupted traffic flow through an urban area.

Aspirational Plan: The entire set of investments in the TSP if funding were not a constraint.

Bicycle Facility: Any facility provided for the benefit of bicycle travel, including bikeways and parking facilities.

Bicycle Network: A system of connected bikeways that provide access to and from local and regional destinations.

Bike Lane: Area within street right-of-way designated specifically for bicycle use

Community Advisory Committee (CAC): A committee of stakeholders in Scappoose who met regularly with the project team to give input for the production of the TSP. The group included both local citizens and transportation professionals in the public sector who represent regional agencies (e.g. ODOT, Columbia County, CC Rider, the Port of St. Helens, etc.)

Capacity: The maximum number of vehicles or individuals that can traverse a given segment of a transportation facility with prevailing roadway and traffic conditions.

Collector (Street): A street designated in the functional class system that provides connectivity between local and neighborhood streets with the arterial streets serving the urban area. Usually shorter in distance than arterials, designed with lower traffic speeds and has more traffic control devises than the arterial classification.

Crosswalk: Portion of a roadway designated for pedestrian crossing and can be either marked or unmarked. Unmarked crosswalks are the national extension of the shoulder, curb line or sidewalk.

Financially Constrained Plan: The set of investments in the TSP that could be funded assuming funding levels remain constant through 2035 in Scappoose.

Level of Service (LOS): A qualitative measure describing the perception of operation conditions within the traffic steam by motorists and or passengers. An LOS rating of “A” to “F” describes the traffic flow on streets and at intersections, ranging from LOS A, representing virtually free flow conditions and no impedance to LOS F representing forced flow conditions and congestion.

Local (Street): A street designated in the functional class system that's primary purpose is to provide access to land use as opposed to enhancing mobility. These streets typically have low volumes and are very short in relation to collectors and arterials.

Mobility Targets: The level of congestion the corresponding jurisdiction has defined as acceptable. Mobility targets are in the form of LOS or v/c ratios.

Multi-Modal: Involving several modes of transportation including bus, rail, bicycle, motor vehicle etc.

National Highway System (NHS): The National Highway System is interconnected urban and rural principal arterial and highways that serve major population centers, ports, airports and other major travel destinations, meet national defense requirements and serve interstate and interregional travel.

Neighborhood Route: A street designation in the functional class system that's primary purpose is to provide access through neighborhoods and between neighborhoods and the collector/arterial street system. This classification refers to the level of connectivity, and can include commercial and/or industrial areas. These streets typically have lower volumes and are shorter in relation to collectors and arterials.

Oregon Highway Plan (OHP): The document that establishes long range policies and investment strategies for the state highway system in Oregon.

Peak Period or Peak Hour: The period of the day with the highest number of travelers. This is normally between 4-6 PM on weekdays.

Pedestrian Facility: A facility provided for the benefit of pedestrian travel, including walkways, crosswalks, signs, signals and benches.

Community Advisory Committee (CAC): A committee of stakeholders in Scappoose who met regularly with the project team to give input for the production of the TSP.

Right-Of-Way (ROW): A general term denoting publicly-owned land or property upon which public facilities and infrastructure is placed.

Safety Priority Index System (SPIS): An indexing system used by Oregon Department of Transportation to prioritize safety improvements based on crash frequency and severity on state facilities.

Shared-Use Path: Off-street route (typically recreationally focused) that can be used by several transportation modes, including bicycles, pedestrians and other non-motorized modes (i.e. skateboards, roller blades, etc.)

Traffic Calming: Traffic control devices typically used in residential neighborhoods to slow traffic or possibly reduce the volume of traffic.

Traffic Impact Analysis (TIA): A study that evaluates the potential impacts a project may have on the transportation system, and determines mitigations required to meet transportation standards. These are necessary for projects to be approved (e.g., proposed developments, roadway extensions, zone changes).

Transportation Analysis Zone (TAZ): A geographic sub-area used to assess travel demands using a travel demand forecasting model, and is often defined by the transportation network and US Census blocks.

Transportation Demand Management (TDM): A policy tool as well as any action that removes single occupant vehicle trips from the roadway network during peak travel demand periods.

Transportation System Management (TSM): Management strategies such as signal improvements, traffic signal coordination, traffic calming, access management, local street connectivity, and intelligent transportation systems

Transportation System Management and Operations (TSMO): Strategies and policies that work towards improving mobility through cost-effective methods, and can be categorized as transportation system management or transportation demand management.

Transportation System Plan (TSP): Is a comprehensive plan that is developed to provide a coordinated, seamless integration of continuity between modes at the local level as well as integration with the regional transportation system.

Urban Area: The area immediately surrounding an incorporated city or rural community that is urban in character, regardless of size.

Urban Growth Boundary (UGB): The regional boundary that encompasses zoning designations in an urban area.

Volume-to-Capacity (v/c) ratio: A decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given turn movement, approach leg, or intersection. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. At 1.00, demand is greater than capacity and the turn movement, approach leg, or intersection is oversaturated—this results in excessive queues and long delays.

Section B

Memo 1: Public Involvement Plan

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Scappoose Transportation System Plan Update

Technical Memorandum #1:
Public involvement plan

Prepared by Reah Flisakowski, P.E. and Julie Sosnovske, P.E., DKS Associates

May 29, 2013

The purpose of this memorandum is to describe the approach that will be used to involve the public in developing the Scappoose Transportation System Plan (TSP) update. Input from citizens and business owners is needed in order to identify concerns with existing facilities, to validate solutions identified through technical analysis, and to help establish funding priorities. Providing meaningful public involvement opportunities also serves to build community support for the plan.

The Role of Public Involvement

Engaging Scappoose's citizens and businesses on these and other issues will be important to the success of the TSP update process. The purpose of this Public Involvement Plan (PIP) is to ensure that the TSP update has broad community support using the following approach:

- Inform and educate stakeholders and the public so they can understand the TSP process and regulatory framework, and can provide constructive input throughout the process.
- Use a Project Management Team (PMT) to facilitate project progress. The PMT includes staff from ODOT, who is sponsoring the project, staff from the City of Scappoose, and consultant staff.
- Use a Community Advisory Committee (CAC) to directly engage a broad range of community and governmental stakeholders, including key technical, resident, and business interests to obtain a variety of perspectives.
- Engage the broader community by holding up to three public events to provide information and gather input during three key phases of the TSP update: initial issues gathering, alternatives analysis, and review of the recommendations.
- Develop a project website providing a description of the TSP update and schedule of events, access to project deliverables, the ability to collect public comments, and access to both ODOT and City of Scappoose websites.

Community Advisory Committee (CAC)

This group will assist the PMT and local decision makers in identifying and addressing community issues throughout the planning effort. At major milestones, they will be asked to review the technical work and seek consensus-based recommendations that balance the various community interests and accomplish the objectives of the update process. CAC members will also act as liaisons to the community to help inform stakeholders and the public about the process and encourage their participation in community outreach events and meetings. City staff representatives will provide oversight and assistance with interagency coordination to ensure consistency between overlapping plans.

The CAC for this project was appointed by the City Council. The CAC consists of City staff responsible for transportation-related systems within the planning area, and staff or citizens representing the following groups:

- Citizens (5)
- City of Scappoose City Councilors (2)
- City of Scappoose Planning Commissioner
- Columbia County
- Scappoose School District
- Port of St. Helens
- ODOT

It is expected that the CAC will meet eight times over the course of the project, as follows:

CAC Meeting #1	▪ Overview of Advisory Committee role and responsibilities ▪ Election of committee Chairperson and Vice-Chairperson ▪ Background information on the Transportation System Plan
CAC Meeting #2	▪ "TSP 101" – Consultant presents TSP update process, including decision points and Advisory Committee's input ▪ Relationship between TSP policies and project priorities and funding ▪ Balancing the City's transportation needs and available funding in the TSP update process ▪ City presents a status report on the projects in the 1997 TSP
CAC Meeting #3	▪ Project kick-off ▪ Consultant presents TSP process and role of CAC ▪ Review and discuss Technical Memoranda #2 - #4
CAC Meeting #4	▪ Review existing and future baseline transportation conditions ▪ Consultant presents overview of Technical Memoranda #6 - #8 ▪ Discuss developing solutions to meet the transportation system deficiencies
CAC Meeting #5	▪ Review preliminary alternatives for meeting transportation system deficiencies ▪ Choose alternatives for full analysis ▪ Consultant to present sketch level analysis (e.g. preliminary travel forecast assignments and comparison to project evaluation criteria) to guide the discussion on selecting alternatives for further evaluation.
CAC Meeting #6	▪ Consultant to present a summary of the alternatives evaluation and the results of the community outreach ▪ Review the alternatives evaluation ▪ Consider public and agency feedback to recommend a preferred system alternative
CAC Meeting #7	▪ Review Draft TSP ▪ Consider public and agency feedback
CAC Meeting #8	▪ Consultant to present a summary of Planning Commission and City Council comments ▪ Finalize committee recommendations on the Draft TSP considering Planning Commission and City Council comments.

Community Meetings

The following public involvement events will be held to involve a larger and more diverse group of participants in the TSP update planning process.

Community Events

Up to three community events will be conducted for this project. An open house format will be used for each, and City and Consultant staff will cooperatively plan and facilitate the events as outlined below.

City	▪ Schedule Community Event ▪ Provide notification to the media ▪ Provide a meeting room ▪ Distribute public information on the City website, handouts available at City offices, and through a press release
Consultant	▪ Provide media release information to the City ▪ Present key project information through use of written handouts, display boards, or other visual media (e.g., PowerPoint) ▪ Prepare a meeting summary and post to the project website

Objectives for the three events are as follows:

Community Event #1	▪ Present an overview of the project purpose
	▪ Present findings from Technical Memoranda #1 through #8
	    ▪ Public Involvement Plan
	    ▪ Background Documents
	    ▪ Regulatory Review
	    ▪ Potential Transportation Funding
	    ▪ Existing Conditions
	    ▪ Future Forecasting (including land use assumptions)
	    ▪ Future Conditions
	    ▪ Goals, Objectives & Evaluation Criteria
	▪ Seek input on the goals and objectives of the plan
	▪ Seek suggestions for transportation system alternatives to be considered in subsequent technical memoranda and the TSP

Community Event #2	▪ Present an overview of the alternatives evaluation and potential recommendations for system improvements ▪ Seek input on alternatives evaluation, potential recommended alternatives and prioritization
Community Event #3	▪ Present an overview of the Draft TSP ▪ Seek input on the Draft TSP recommendations

Additional Community Outreach

City staff may facilitate additional outreach meetings at local gathering places and with local community groups throughout the process.

Public Information

Website

The consultant team will develop and maintain a project website dedicated to the TSP update. It will include key project information, including a brief overview of the project, meeting dates and summaries, other public involvement opportunities, and project materials. The website will also provide an opportunity for public comments and questions. The website will be updated regularly to include new project materials as well as responses to frequently asked questions.

Web Surveys

The consultant will conduct up to two *Metroquest* web surveys to gather community input at key points in the TSP process. These surveys would be available on-line and would allow for greater public participation without the need for attendance at meetings and workshops. Key points in the process for use of a web survey include the following:

Topic	Timing
Prioritize Alternative Categories (Optional)	Early on – prioritize types of alternatives (e.g. pedestrian/bicycle, system management, roadway improvements, etc.)
Prioritizing Alternatives	Following CAC #5 and Community Event #2, once preliminary alternatives have been developed

News Releases and Articles

News releases will be drafted by the consultant team and issued at key points in the process, particularly in advance of community meetings. City staff will provide these releases to the local media, and City staff and consultants will respond to questions and requests from local media representatives for comments or information as needed.

Tasks and Responsibilities

Task	Description	Lead
Project Website	Prepare Website content, graphics, layout and information. Initial content should include a planning process description, schedule, opportunities for involvement, and contact information. Regular updates will include answers to frequently-asked questions and current technical and process information, including meeting notices, summaries, maps, and memos. Provide link from project Website to City Website and ODOT Website.	DKS
	Review content before posting to Website.	City and ODOT
CAC Meetings	Form CAC, provide meeting logistics and notification and distribute meeting materials.	City
	Facilitate meetings, lead presentations, prepare information and display materials, agendas, summaries, and graphics.	DKS
Community Events	Coordinate meeting logistics and set-up, provide staff, distribute/mail meeting notification information and handouts, and co-facilitate meeting discussions.	City
	Prepare meeting notification materials for distribution, develop meeting format strategy. Prepare handouts, PowerPoint presentation (as needed), and content for display materials. Prepare sign-in sheets and comment cards and co-facilitate meeting discussions.	DKS
Additional Community Outreach	Coordinate and facilitate individual meetings at local gathering places and/or with community groups as needed to supplement scheduled community events. Distribute project materials, respond to questions during meetings and prepare brief summary of results.	City

Compliance with Title VI Outreach Requirements

Implementation of this Public Involvement Plan will meet requirements and guidance found in ODOT's Title VI (1964 Civil Rights Act) Plan. Specifically, Title VI identifies measures to reach and solicit comments from disadvantaged populations within a community. Although Scappoose has relatively limited concentrations of minority and low-income residents, these populations are present throughout the city.

Based on 2010 census data, the racial makeup of the city was about 91% Caucasian and 5% Hispanic (4% from other groups). This is a higher percentage of Caucasian and lower percentages of nearly all other ethnic groups compared to Oregon as a whole.[1]

Approximately eleven percent of individuals in the City were below the poverty line in 2011, compared to 14.8 percent for the state as a whole.[2]

Outreach to low-income and minority populations will be accomplished using the following methods:

- Use a variety of communication techniques as described in the sections above, most of which are accessible to minority and low-income residents.
- Consultant to contact local agency (Community Action team in St. Helens) that works with low-income and minority populations about opportunities to enhance public involvement for these groups. City will support efforts by distributing notifications to additional locations (i.e. ethnic grocery stores, churches, etc.), if determined to be beneficial.
- Hold meetings in places that are accessible by transit, walking, or bicycling.
- Offer ADA assistance (e.g. accessibility, hearing assistance) as needed, given prior notice.

[1] Source: 2010 Demographic Profile, US Census Bureau via American FactFinder.

[2] Source: 2007-2011 American Community Survey 5-Year Estimates for Oregon and Scappoose, Oregon.

Section C

Memo 2: Background Document Review

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Scappoose Transportation System Plan Update

Technical Memorandum #2: Background document review

Prepared by Reah Flisakowski, P.E. , Mat Dolata, P.E., and Julie Sosnovske, P.E., DKS Associates

May 29, 2013

The purpose of this memorandum is to summarize various City, County and State planning documents, policies, and regulations that need to be considered in updating the Scappoose Transportation System Plan (TSP). Some documents, especially the state documents, are included in the summary because they establish the general framework and specific criteria that need to be followed in updating the TSP. Other documents, primarily City and County documents, are included in the summary because they may need to be updated when the TSP update is completed. Technical Memorandum #3 (Regulatory Review) identifies specific changes that will need to be made to the City of Scappoose Comprehensive Plan and Development Code. A list of acronyms is provided at the end of the memo.

Summary of Key Issues and Needs

Based on input from City staff, the following is a list of initial key transportation issues and needs for the City of Scappoose. These will be verified and expanded through the TSP process.

- Identifying street connections and improvements to connectivity
- Identifying geometric issues and safety improvements
- Enhancing the TSP bicycle and pedestrian plans
- Updating street improvement policies related to development
- Updating street standards (including alternate standards for existing streets) and parking policies
- Enhancing transit service quality and efficiency
- Improving truck routing
- Identifying system improvements needed to serve UGB expansion areas
- Developing a financially-constrained transportation project list
- Developing a framework for City/County coordination
- Identifying traffic calming tools

City/Local Plans, Policies, and Regulations

The following is a summary of local plans, policies, and regulations.

City of Scappoose Transportation System Plan - 1997

The current City of Scappoose Transportation System Plan (TSP) was adopted in 1997. The purpose of the TSP was to address transportation needs through 2015. The plan discussed key transportation issues, identified solutions, and categorized specific improvement projects into short, medium and long-range timeframes. The plan assumed that the City would grow from its 1995 population of approximately 4,500 residents to over 8,000 residents by the year 2015. The goals of the TSP included the following:

- Enhance Transportation User Safety
- Enhance Transportation Mobility
- Increase the Use of Alternative Travel Modes Through Improved Safety and Service
- Develop a Transportation System that Supports Planned Land Uses
- Reduce Truck Traffic Along US 30
- Develop a Transportation Facilities Capital Improvement Program (CIP) that has Identified Funding

Improvements were recommended to ensure acceptable future traffic operations through the 2015 planning horizon year. Over 60 projects were identified, but many have not been completed or are only partially completed. This is due in part to overly optimistic revenue forecasts. The City has not had the funds to construct all of the projects identified in the plan. The current TSP update will determine how to address the outstanding improvements recommended in the prior TSP, shown later in this document under the "Key Projects" section.

Key Issues

Some of the main issues raised in the previous TSP that are still outstanding or have only partially been addressed are listed below. The current TSP update will revisit these outstanding concerns and either identify means to address them or revise the expectation that they can be addressed:

- Significant barriers to east-west travel exist due to US 30, the railroad line east of US 30 and Scappoose Creek (west of US 30)
- Reliance on US 30 for intra-city trips due to limited connectivity of north-south parallel routes and east-west crossing routes
- Lack of continuous sidewalks or bicycle facilities on most arterials and collector roadways
- Pedestrian crossing opportunities across US 30
- Pedestrian and bicycle accessibility and safety near schools

- Upgrading collector roadways to urban standards
- Several intersections along US 30 were forecasted to exceed mobility standards by 2015 (based on the 1991 Oregon Highway Plan)

Key Standards

- Street design standards were defined for arterials, major collectors, minor collectors, and local streets. Different local street standards were identified for residential neighborhoods or commercial and industrial areas. Bike lanes (6 feet wide) were included in design standards for arterials and major collectors.
- Access spacing guidelines in the TSP recommend minimum spacing between driveways or streets of 500 feet on arterials, 300 feet on major collectors, 50 feet on minor collectors, and no minimum on local streets.
- Intersection (street) spacing guidelines in the TSP recommend a minimum of 2,800 feet between arterials, 600 feet between major collectors and 300 feet for all other roadway classifications.
- The City's adopted mobility standard for intersections under City jurisdiction is a minimum level of service "D" and volume-to-capacity ratio of 0.90 for signalized intersections and a minimum level of service "E" for the minor street approach at a stop-controlled intersection.[1]

Economic Opportunities Analysis - 2011

The 2011 Economic Opportunities Analysis (EOA) identified economic goals and policies that provide a vision for economic development in Scappoose. The EOA provided guidance on how to capitalize on economic opportunities while maintaining consistency with State and local planning goals and policies. Job growth forecasts estimated by industry sector were included in the analysis. The job growth was translated into commercial and industrial land needs within Scappoose.

The EOA results showed that Scappoose had a need for approximately 400 net acres of land to accommodate forecasted employment growth of approximately 8,000 jobs through 2030. The 400 net acres did not include roadways or other public facilities necessary to serve projected land development. Public facilities typically require approximately 15% of gross land need; therefore, the aggregate land need was approximately 483 gross acres. More than half of the new land need was for industrial uses and 110 total gross acres were identified for public needs, including 90 acres designated for airport expansion. The remaining land need was divided between office, commercial retail, and lodging-related uses. The EOA was the basis for an Urban Growth Boundary amendment approved by the City and Columbia County in 2011 (currently on appeal at the Court of Appeals).

Scappoose Rail Corridor Study - 2002

The 2002 Rail Corridor Study examined rail crossing opportunities and constraints in Scappoose. The study was developed to address the corridor needs of Portland & Western Railroad (PNWR), the City of

[1] Scappoose Public Works Design Standards Chapter 5 – 052902, Section 5.0013 – Traffic Analysis.

Scappoose, ODOT, and Columbia County. A preferred alternative was presented with recommendations for grade crossings along with local access and circulation improvements.

The study included safety and traffic operations analysis for several US 30 intersections through the 2025 horizon year. The study found that improvements were necessary for signalized study intersections to meet ODOT mobility standards during the forecasted 2025 PM peak hour. PNWR's weekday train movements through the City of Scappoose were expected to increase from 8 to 14 per day, and plans were identified for PNWR to construct a second track just east of the existing line track.

Many of the improvements suggested in the Plan have been implemented. The current TSP update will determine how to address the outstanding recommendations identified in the Rail Corridor Study, described later in the "Key Projects" section of this memo.

Scappoose Industrial Airpark – Airport Master Plan Update - 2004

The Airport Master Plan Update for the Scappoose Industrial Airpark was completed in 2004. The report included estimates of future airport usage through and analysis of land use compatibility for expansion. The Scappoose Industrial Airpark was forecasted to increase from 140 based aircraft in 2002 to 195 in 2022. Total annual operations were forecasted to increase from approximately 75,000 to 112,000 from 2002 to 2022.

The airport, located in northeast Scappoose, included 197 acres of public use airport zoning. To meet the anticipated expansion needs of the Airpark, an additional 60 acres of land with agricultural zoning were targeted for expansion east of the runway. The City of Scappoose and Columbia County have identified an Airport Overlay Zone to protect the airport's airspace. The designation places limitations on development to protect air operations in the area surrounding the airport.

The Port of St. Helens is currently in the process of updating the master plan.

City of Scappoose Comprehensive Plan

The City of Scappoose Comprehensive Plan was originally adopted in April 1983 and most recently amended in April 2011 to accommodate expansion of the urban growth boundary (UGB). The Comprehensive Plan provides policies and recommended implementation measures related to long-term development and growth management of the City. As an acknowledged plan, these goals, policies, and recommendations have been found to be consistent with County and State land use planning goals and policies. Plan elements include:

- Inventories
- Economy
- Scappoose Industrial Airpark Master Plan
- Public Facilities and Services
- Fire

- Health Care
- Library
- Transportation
- Housing
- Local Resources
- Goal 5 Amendments
- Air, Land, Water, and Noise Quality.

Goals and policies established in the Transportation Element of the Comprehensive Plan have been superseded by goals and policies established in the 1997 TSP. There is an exception of two policies regarding street trees and the Scappoose Industrial Airpark that were added to the Comprehensive Plan Transportation Element in 1997 and 2006, respectively, but not to the TSP. The goals and policies in the 1997 TSP will be reviewed and modified as needed during this TSP update process.

City of Scappoose Development Code

Title 17 of the Scappoose Municipal Code defines the Land Use and Development Code. The Development Code defines standards for development including requirements for land division.

Standards for Transportation Improvements

Chapter 17.154 (Street and Utility Improvements) provides regulations and design standards for streets related to development. Sections 17.154.030 and 17.154.040 establish street improvement requirements and block standards, respectively. The code establishes a maximum block length of 600 feet on all roadways other than arterials and recommends a minimum block length of 800 feet for arterials. The code defers to the City's public works design standards for street design and dimensions such as minimum street right-of-way and roadway widths.[2] Section 17.154.110 defines standards for bikeways and states that planned bikeways must be constructed as part of development and be at least four feet in paved width per travel lane and, where possible, should be separated from other travel modes.

Parking

Standards for the number of motor vehicle parking spaces according to land use, parking space dimensions, and loading areas are provided in Section 17.106.030 (Minimum Off-Street Parking Requirements) and Chapter 17.106 (Off-Street Parking and Loading Requirements). Section 17.80.050 establishes requirements for parking lots in the Downtown Overlay Zone. Section 17.106.020 address bicycle parking and requires a minimum of one rack space for every ten parking spaces in any development.

[2] Chapter 13.28 (Public Works Standards) and Chapter 13.32 (Standard Specifications for Public Works Construction) of the Scappoose Municipal Code also refer and defer to the adopted 2002 City of Scappoose Public Works Design Standards and Standard Detail Drawings as well as the ODOT/APWA 2002 Oregon Standard Specifications for Construction and 2002 Oregon Standard Drawings.

Street/Circulation Plans and Access

Site development review plan requirements and approval standards address circulation and access. Site development plans must show “public ways,” easements, circulation areas, and pedestrian and bicycle facilities (Section 17.120.120). Approval criteria include those related to access and circulation, such as the number of access points a development is allowed pursuant to public works design standards and the provision of pedestrian and bicycle ways consistent with adopted plans (Section 17.120.180).

Section 17.150.020 (General Provisions) requires subdivision proposals to include neighborhood circulation plans that identify street plans and addresses transportation system needs. Roads in proposed subdivisions must conform to neighborhood circulation plans and align with existing or planned roads of adjoining properties pursuant to subdivision plan requirements and approval standards (Section 17.150.020 and 17.150.060). Subdivision provisions require that Columbia County and ODOT be provided with a copy of the tentative subdivision plan if the proposed development is adjacent to and/or takes access on a county or state roadway.

Traffic Impact Analysis

Land use applications in the city are subject to legislative, quasi-judicial, or limited land use decision-making procedures. While not specifically required in the code to support a plan amendment or development proposal, the code provides the City authority to require a traffic impact analysis. The approval criteria for Planned Development specifically require a traffic impact analysis “when necessary” (Section 17.81.070(D)). Otherwise, existing code does not currently specify when a traffic impact analysis is required or what is required as part of the analysis. The City’s design standards do address traffic impact analysis requirements.

City of Scappoose Capital Improvement Plan

The City of Scappoose uses the Transportation System Improvements Project List from the 1997 TSP as its Capital Improvement Plan (CIP). Scappoose City Council occasionally amends this Transportation System Improvements Project List via resolution. Several of the recent planning documents have recommended projects for the City. Only a portion of the projects listed in the 1997 TSP have been completed. The current TSP update will create a new project list for the City based on updated transportation funding forecasts.

City of Scappoose Roadway Standards

The Scappoose street design standards are listed in the City's 2002 Public Works Design Standards.[3] The standards summarized in Table 1 apply to arterial, collector, and local streets under City jurisdiction. The only street classified as an arterial is US 30, which is under ODOT jurisdiction. The Design Standards also address traffic analysis requirements.

Table 1: City of Scappoose Roadway Design Standards

Classification	Right-of-way Width	Pavement Width	Parking Lanes	Bike Lanes	Sidewalks
Arterial	100 feet	74 feet	None	6 feet*	6 feet**
Minor Arterial	72 feet	44 feet	None	6 feet*	6 feet**
Major Collector	66 feet	44 feet	Both sides (may be prohibited where bike lanes exist)	6 feet*	6 feet
Minor Collector	60 feet	36 feet	Both sides	N/A	6 feet
Local (Residential Neighborhood)	54 feet	32 feet	Both sides	N/A	6 feet
Local (Commercial and Industrial Areas)	54 feet	40 feet	Both sides	N/A	6 feet
Cul-de-sac	50 feet	32 feet	Both sides	N/A	5 feet
Cul-de-sac Turnaround	55 foot radius	45 foot radius	None	N/A	5 feet
Alley	20 feet	20 feet	None	N/A	None

* A six-foot section is required unless this width is not practical because of physical or economic constraints. A minimum width of four feet may be designated as a bicycle lane.
** Sidewalks on Arterial Streets shall be buffered from the roadway to provide for the safety and comfort of pedestrians.

[3] City of Scappoose Public Works Design Standards Section: 5.0000 – Streets.

Scappoose Pavement Management Program Budget Options Report - 2009

The Scappoose Pavement Plan identified the existing conditions of pavements on roadways in the City and identified strategies to improve conditions through a five-year period from 2009 to 2013. The plan evaluated impacts to future pavement conditions under various maintenance funding levels. Recommendations from the Plan included increasing funding for road maintenance, potentially through a local street maintenance fee dedicated to street maintenance and rehabilitation.

The Pavement Condition Index (PCI) for the City was measured at an average of 74 (out of 100), in the lower range of the "Good" condition category. Over the subsequent five-year period, the cost to maintain the PCI of 74 was estimated at $600,000 while the cost to reach a target PCI of 80 was estimated to be $1.0 million. To fully reduce the maintenance backlog and achieve a PCI of 83, $1.3 million would be needed. Current funding for pavement maintenance over the same five-year span was estimated to be $215,000 in total. Without increasing maintenance funds, the PCI was expected to decrease to 69 through the horizon year (2013) and the deferred maintenance backlog was expected to increase from $669,000 to $923,000.

City of Scappoose Goal 5 Inventory

The City of Scappoose has several goal 5 resources (open spaces, scenic and historic areas, and natural resources) that must be considered when updating the TSP. The City has the following goal 5 resources:

- Structures, sites, and locations of historical significance or interest
- Parks and open spaces
- Water bodies within the Urban Growth Boundary include: Jackson Creek, Coal Creek, and Scappoose Creek. Scappoose Creek is identified as a significant fish and wildlife habitat
- Wetland and riparian areas: some wetlands on employment land within the UGB are within the 100-year floodplains of Scappoose and Jackson Creeks. There are approximately 20 acres of mapped wetlands outside the 100-year floodplain in the Northeast UGB expansion area.
- Lands that have forest cover
- Active mineral extraction operations

Recent Traffic Data

Recent traffic data was available for a few of the documents reviewed within this memorandum. A traffic impact analysis was performed for the UGB Amendment in May of 2010. That analysis included traffic counts for seven intersections of US 30 and three intersections along West Lane Road. In addition, the City provided data from a 2011 traffic study affecting the US 30/Havlik Road intersection.

City transportation projects constructed since 1997

Major transportation projects constructed in the City since 1997 include the following:

- Intersection Improvements/ Realignment for US 30 at Scappoose-Vernonia Highway/Columbia Road
- Intersection Improvements/ Realignment for US 30 at Old Portland Road
- Closure of rail crossings and US 30 access at Williams Street, Santosh Street, and Elm Street
- SE Havlik Drive Extension east of US 30, including rail crossing
- SE 2nd Street from Havlik Drive to SE Davona Drive
- SE Davona Drive
- Crown Zellerbach Road from Highway 30 to West Lane
- West Lane improvements
- NE 3rd Street Extension from Royal Drive to Crown Zellerbach Road (currently under construction)

Transportation Funding Mechanisms

The City has the current transportation funding mechanisms:

- Surface Transportation Program (STP) - the City received an average of $58,000 from this source over the past five years (2007-08 to 2011-12).
- State Gas Tax and License Fees: the City has projected revenue of about $370,000 for FY 2012-2013 from this source.
- Bikeway/Walkway (1% of State Gas Tax Fund): the City has projected revenue of about $3,740 for FY 2012-2013 from this source.
- Transportation System Development Charges (SDCs): the City has received an average of about $117,000 annually from this program over the past five years (2007-2011).
- Other grants that must be applied for but are not guaranteed funding.

County Plans, Policies, and Regulations

The following sections summarize Columbia County plans, policies, and regulations.

Columbia County Rural Transportation System Plan - 1998

The Columbia County Rural Transportation System Plan (TSP) was adopted in 1998. The goal of the TSP was the creation of an efficient, safe, and diverse transportation system to serve the needs of Columbia County residents. The plan discussed key transportation issues and identified improvements needed. Projects were prioritized for short-term, medium-term and long-term funding.

The Scappoose TSP update will determine how to address the recommended Columbia County improvements. This is discussed later in the "Key Projects" section of this memo.

Columbia County Community-Wide Transit Plan and US 30 Transit Access Plan - 2009

The Columbia County Community-Wide Transit Plan described the transit needs of the community and provided direction for planning and implementing transit services within a 10-year horizon. The US 30 Transit Access Plan was combined with the Transit Plan and adopted concurrently by Columbia County. The plan included a list of projects and policy amendments recommended to be added to local plans.

The current Scappoose TSP update will determine how to address the recommended transit improvements in the City, shown later in this document under the "Key Projects" section. The recommended policy amendments, which primarily address coordination with Columbia County regarding transit service, can be incorporated into the transportation policies in the TSP as part of the TSP update process.

State Plans, Policies, and Regulations

The following sections summarize state plans, policies, and regulations.

Oregon Transportation Plan - 2006

The Oregon Transportation Plan (OTP) is a comprehensive 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. The original version of the current plan was adopted in 1992 by the Oregon Transportation Commission (OTC). The plan was most recently updated in 2006.

The OTP policy and investment strategies are translated into plans for specific modes such as the Oregon Bicycle & Pedestrian Plan, the Oregon Highway Plan, the Oregon Public Transportation Plan, the Oregon Rail Plan, etc. (as reviewed in this memorandum)in order to implement the statewide multimodal priorities. The modes of transportation considered in the OTP include: airports, bicycle and pedestrian facilities, highways and roadways, pipelines, ports and waterway facilities, public transportation, and railroads. Together with mode-specific plans and other topical plans, the OTP forms the State of Oregon's long-range multimodal transportation system plan.

The following seven goals with associated policies and strategies are provided in the plan to address the core challenges and opportunities facing transportation in Oregon:

- 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
- Goal 7 – Coordination, Communication and Cooperation.

There are also six key initiatives identified to reflect the desired direction of the plan and to frame the plan implementation. These initiatives are:

- Maintain the existing transportation system to maximize the value of the assets. If funds are not available to maintain the system, develop a triage method for investing available funds.
- Optimize system capacity and safety through information technology and other methods.
- Integrate transportation, land use, economic development and the environment.
- Integrate the transportation system across jurisdictions, ownerships and modes.
- Create a sustainable funding plan for Oregon transportation.
- Invest strategically in capacity enhancements.

The TSP update will be consistent with the goals and policies of the OTP. It will emphasize, as the OTP does, maintaining and building upon existing investments and using system management, technology, and transportation options to maximize the existing state highway system in the City.

Oregon Highway Plan - 1999

The Oregon Highway Plan (OHP) was originally adopted in 1999 and was reaffirmed as a modal element of the 2006 OTP. The OHP defines policies and investment strategies for Oregon's state highway system. The plan contains three elements: a vision element that describes the broad goal for how the highway system should look in 20 years; a policy element that contains goals, policies, and actions to be followed by state, regional, and local jurisdictions; and a system element that includes an analysis of needs, revenues, and performance measures.

The OHP addresses the following issues:

- Efficient management of the system to increase safety, preserve the system, and extend its capacity
- Increased partnerships, particularly with regional and local governments
- Links between land use and transportation
- Access management
- Links with other transportation modes
- Environmental and scenic resources

The policy element contains several policies and actions that are particularly relevant to the Scappoose TSP, described in the following subsections.

Policy 1A (State Highway Classification System)

Action 1A.1 categorizes state highways for planning and management decisions. US 30 (No. 92) in Scappoose is classified as a Statewide Highway, part of the National Highway System (NHS), a Freight Route, and a Truck Route. According to OHP policy, statewide highways are intended to provide inter-urban and inter-regional mobility and connections to larger urban areas, ports and major recreational areas not directly served by Interstate highways. Updates to the TSP will support the existing highway classification and will enhance the ability of the highway in Scappoose to serve in their defined functions. Scappoose has not chosen to pursue any special designations for state highways under Policy 1B in the past.

Policy 1B (Land Use and Transportation)

Policy 1B recognizes the need for coordination between state and local jurisdictions. Action 1B.7 gives special highway segment designations for specific types of land use patterns to foster compact development. The three segment designations available are Special Transportation Area, Commercial Center, and Urban Business Area.

Policy 1C (State Highway Freight System)

Policy 1C addresses the need to balance the movement of goods and services with other uses. In addition, Action 1C.4 states that the timeliness of freight movements should be considered when developing and implementing plans and projects on freight routes. US 30 in Scappoose is a designated freight route.

Policy 1F (Highway Mobility Standards)

Policy 1F was revised in 2011 to set mobility targets for reliable and acceptable levels of mobility on the highway system. Pursuant to Policy 1F, Table 6:

- Statewide highways inside Urban Growth Boundaries (UGBs) in non-MPO areas that are freight routes but do not have special OHP land use designations (US 30 in Scappoose) have a mobility standard requiring that the highway operate at or below a volume to capacity (v/c) ratio of 0.80-0.85 depending on the posted speed.

Policy 1G (Major Improvements)

Policy 1G requires maintaining performance and improving safety by improving efficiency and management before adding capacity. Action 1G.1 directs agencies to make the fewest number of structural changes to a roadway system to address its identified needs and deficiencies through the 20-year planning horizon, and to protect the existing highway system before adding new facilities to it. The action ranks four priorities of projects, as follows:

1. Preserving the functionality of the existing system
2. Making minor improvements to improve the efficiency and capacity of the existing system
3. Adding capacity to the existing system
4. Building new transportation facilities.

The intent of Action 1G.2 is to ensure that major improvement projects to state highway facilities have been through a planning process that involves coordination between state, regional, and local stakeholders and the public, and that there is substantial support for the proposed improvement.

Policy 2B (Off–System Improvements)

Policy 2B establishes ODOT's interest in improvements on local roads that maintain or improve safety and mobility performance on state roadways, and supports local jurisdictions in adopting land use and access management policies. The TSP will include sections describing existing and future land use patterns, access management, and implementation measures.

Policy 2D (Public Involvement)

Public involvement in transportation and planning and project development will be a critical part of the TSP process.

Policy 2F (Traffic Safety)

Policy 2F identifies the need for projects in the state to improve safety for all users of the state highway system through engineering, education, enforcement, and emergency services. One component of the TSP is to identify existing crash patterns and rates and to develop strategies to address safety issues. Proposed improvements will aim to reduce the vehicle crash potential and/or improve bicycle and pedestrian safety by providing upgraded facilities that meet current standards.

Policy 3A (Classification and Spacing Standards)

Policy 3A sets access spacing standards for driveways and approaches to the state highway system. Action 3A.1 directs access management along state highways based on access management guidelines. Action 3A.2 relates to establishing spacing standards on state highways. Action 3A.3 calls for management of location and spacing of traffic signals along state highways.

Table 2: ODOT Access Spacing Standards Applicable through Scappoose (feet)

Speed (mph)	≤25	30 & 35	40 & 45	50	≥55
Statewide Highway - Urban *(Rural, if different)*	350 *(550)*	500 *(770)*	800 *(990)*	1,100	1,320

Source: ODOT access management spacing standards obtained from 2011 version of Table 14.

The TSP will address local access management policies and standards and will recommend traffic signal spacing guidelines.

Policy 4B, Action 4B.4 (Alternative Passenger Modes)

Action 4B.4 requires that highway projects encourage the use of alternative passenger modes to reduce local trips. The TSP will develop ways to support and increase the use of alternative passenger modes to reduce trips on highways and other facilities. This will include improvement to bicycle and pedestrian facilities and supporting transit use in the community.

Oregon Bike and Pedestrian Plan - 1995, Updated 2011

The Oregon Bike and Pedestrian Plan was adopted in 1995 and reaffirmed as an element of the Oregon Transportation Plan (OTP) in 2006. The goal of the Oregon Bicycle and Pedestrian Plan is to provide safe and accessible bicycling and walking facilities in an effort to encourage increased levels of bicycling and walking. The Plan provides actions that will assist local jurisdictions in understanding the principles and policies that ODOT follows in providing bike and walkways along state highways. In order to achieve the plan's objectives, the strategies for system design are outlined, including:

- Providing bikeway and walkway systems and integrating with other transportation systems.
- Providing a safe and accessible biking and walking environment.
- Developing educational programs that improve bicycle and pedestrian safety.

The Oregon Bike and Pedestrian Plan is comprised of two parts: (1) the *Policy and Action Plan* and (2) the *Oregon Bicycle and Pedestrian Design Guide*. The policy section provides background information, including relevant state and federal laws, and contains the goals, actions, and implementation strategies proposed by ODOT to improve bicycle and pedestrian transportation.

The plan states that bikeway and walkway systems will be established on urban highways, as follows:

- As part of modernization projects (bike lanes and sidewalks will be included);
- As part of preservation projects, where minor upgrades can be made;
- By restriping roads with bike lanes;
- With improvement betterment projects, such as completing short missing segments of sidewalks;
- As bikeway or walkway modernization projects;
- By developers as part of permit conditions, where warranted.

The Oregon Bicycle and Pedestrian Design Guide ("Design Guide") is the technical element of the plan that guides the design and management of bicycle and pedestrian facilities on state-owned facilities.[4] It has been designated as a companion piece to the Highway Design Manual and includes updated pedestrian and bicycle treatments. The design standards and guidelines in the Design Guide will inform recommended bicycle and pedestrian improvements to state facilities in Scappoose in the updated TSP.[5] The recommendations in the Design Guide will be considered as "best practices" for potential applications on City facilities as well.

Oregon Public Transportation Plan - 1997

The Oregon Public Transportation Plan (OPTP) is the transit mode component of the Oregon Transportation Plan. The plan contains goals, policies, and strategies relating to the statewide public transportation system. The plan provides guidance for ODOT and public transportation agencies regarding the development of public transportation systems. The following is the vision for public transportation set forth in the plan:

- A comprehensive, interconnected and dependable public transportation system, with stable funding, that provides access and mobility in and between communities of Oregon in a convenient, reliable, and safe manner that encourages people to ride

[4] Part Two of the Oregon Bicycle and Pedestrian Plan, the Oregon Bicycle and Pedestrian Design Guide, was last updated in 2011 and is available on ODOT's website at: http://www.oregon.gov/ODOT/HWY/BIKEPED/planproc.shtml

[5] Note that proposed design details for bicycle and pedestrian facilities on state roadways are subject to state design review and other permitting procedures for proposed projects on state roadways.

- A public transportation system that provides appropriate service in each area of the state, including service in urban areas that is an attractive alternative to the single-occupant vehicle, and high-quality, dependable service in suburban, rural, and frontier (remote) areas
- A system that enables those who do not drive to meet their daily needs
- A public transportation system that plays a critical role in improving the livability and economic prosperity for Oregonians.

The OPTP Implementation Plan directs ODOT investments towards commuter and mobility needs in larger communities and urban areas and also in smaller communities where warranted. It also directs investments towards intercity connections statewide. Long-term implementation and funding will support both modernization and preservation projects while, in the short term, funding will likely be available for preservation projects.

The TSP update process will include an assessment of existing transit conditions in Scappoose and, potentially identify proposed improvements. The transit policies, strategies, and mprovements included in the TSP will be guided by the vision and implementation plan set forth in the OPTP.

Oregon Rail Plan - 2001

The Oregon Rail Plan, the rail mode component within the OTP, addresses long-term freight and passenger rail planning in Oregon. The plan includes a freight element and passenger element that describes infrastructure and service conditions historically and at the time the plan was prepared. A Portland & Western (PNWR branch line provides freight rail service through Scappoose. There is no passenger rail currently provided to Scappoose.

Needs for rail renewal, bridge repair, cross tie renewal, and turnout renewal on the P&W short line, totaling about $46 million (2001$), are identified in the plan. However, the P&W line extends between Portland and other towns in Northwest Oregon, so repair and maintenance needs for the P&W line in or near Scappoose could be assumed to be a fraction of the total cost. Further, it is not known how outdated these needs and costs are at this time.

The Oregon Rail Plan includes a chapter on rail policies and planning. General policy is set for passenger rail: “This system shall consist of an efficient operation, reliable service, access to all potential users, and compliance with state environmental and land use standards. Convenient connections with other modes should integrate passenger train service into a network linking all areas of the state, nation, and the world.” Policies for freight rail include the following:

- Increase economic opportunities for the State by having a viable and competitive rail system.
- Strengthen the retention of local rail service where feasible.
- Protect abandoned rights-of-way for alternative or future use.
- Integrate rail freight considerations into the State’s land use planning process.

Maintaining and improving connections between rail and other modes will be important in updating the Scappoose TSP.

Transportation Planning Rule (OAR 660-012)

The Transportation Planning Rule (TPR) implements Oregon Statewide Planning Goal 12, which supports transportation facilities and systems that are safe, efficient, and cost-effective and are designed to reduce reliance on single-occupancy vehicles. The objective of the TPR is to reduce air pollution, congestion, and other livability problems, and to maximize investments made in the transportation system. The following subsections of the TPR are relevant to the Scappoose TSP update.

660-012-0020 – Elements of Transportation System Plans

Section 0020 of the TPR specifies what is required in a TSP, including an inventory and assessment of existing conditions; forecasts of transportation needs; a road system plan; a public transportation plan; a bicycle and pedestrian plan; air, rail, water, and pipeline plans as applicable; transportation system and demand management plans; a financing program; and implementing policies and land use regulations.

660-012-0035 – Evaluation and Selection of Transportation System Alternatives

Section 0035 describes standards and alternatives available to agencies evaluating and selecting transportation projects, including benefits to different modes, land use alternatives, and environmental and economic impacts.

660-012-0045 – Implementation of the Transportation System Plan

The TPR requires local governments to adopt land use regulations consistent with state and federal requirements "to protect transportation facilities, corridors and sites for their identified functions." This policy is achieved through a variety of measures, including access control measures, standards to protect future operations of roads, expanded notice requirements and coordinated review procedures for land use applications, a process to apply conditions of approval to development proposals, and regulations assuring that amendments to land use designations, densities, and design standards are consistent with the functions, capacities, and performance standards of facilities identified in the TSP.

660-012-0050 – Transportation Project Development

Section 0050 requires that transportation projects be reviewed for compliance with local and regional plans and, when applicable, undergo a NEPA environmental review process. Amendments to Section -0050 made since adoption of the 1997 Scappoose TSP protect determinations of need, mode, function and general location for projects identified in TSPs.

660-012-0060 – Plan and Land Use Regulation Amendments

Section 0060 specifies a category of facilities, improvements, and services that can be assumed to be "in-place" or committed and available to provide transportation capacity over a 20-year planning horizon. The TPR guides local jurisdictions in determining what transportation improvements are "reasonably likely to be provided by the end of the planning period" when considering amendments to local plans and land use regulations.

Amendments made to Section 0060 are among the most significant changes that have been made to the TPR since adoption of the City's 1997 TSP. The amendments require local jurisdictions to balance the need for development with the need for transportation improvements, establish the end of the planning period as the measure for determining "significant effect", define the transportation improvements that a local government can consider in determining significant effect, and identify methods to determine whether a needed transportation facility is reasonably likely to be provided within the planning horizon.

Statewide Transportation Improvement Program

There is one Scappoose project included in the 2012-2015 Statewide Transportation Improvement Program (STIP):

- Replace the J P West Bridge over South Fork Scappoose Creek (Key 17411). This project is managed by the Columbia County Road Department.

Oregon Transportation System Plan Guidelines - 2008

ODOT's Transportation System Plan Guidelines is comprised of an overview of transportation system planning; guidance for the preparation of a jurisdiction's first TSP and of TSP updates; and policy guidance on transportation and land use issues in a series of technical appendices.

The chapter on TSP updates is divided into three steps: determining if an update is needed and scoping the update project; preparing an assessment; and addressing recent regulatory and policy changes, the latter two of which are most applicable to the Scappoose TSP update.

The TSP Guidelines direct TSP updates to address recent policy and regulatory changes, and calls out recent changes to the OTP, OHP, and TPR. Since adoption of the 1997 Scappoose TSP, the OTP was updated (2006) to emphasize maintaining assets in place, optimizing existing system performance through technology and better system integration, creating sustainable funding, and investing in strategic capacity enhancements. Policy 1F (Mobility Standards) of the OHP was amended to allow for the adoption of alternative mobility standards where "practical difficulties make conformance with the highway mobility standards infeasible," as was Appendix C (Access Management Spacing Standards) to be consistent with amendments to the Access Management Rule, OAR 734-051. Amendments to the TPR are described in the section of this memorandum that reviews the TPR.

ODOT Access Management Rule (OAR 734-051, SB 1024, and SB 264)

The intention of ODOT's Access Management Rule is to balance the safety and mobility needs of travelers along state highways with the access needs of property and business owners. ODOT's rule sets guidelines for managing access to the state's highway facilities in order to maintain highway function, operations, safety, and the preservation of public investment consistent with the policies of the 1999 Oregon Highway Plan. Access management rules allow ODOT to control the issuing of permits for access to state highways, state highway rights of way and other properties under the State's jurisdiction.

In addition, the ability to close existing approaches, set spacing standards and establish a formal appeals process in relation to access issues is identified. These rules enable the State to set policy and direct location and spacing of intersections and approaches on state highways, ensuring the relevance of the functional classification system and preserving the efficient operation of state routes.

ODOT applies access spacing standards to US 30 within the Scappoose UGB. The ODOT standards vary depending on the roadway classification, posted speeds, and surrounding land uses. These standards will be used in the TSP to analyze the current access conditions, determine existing deficiencies, and provide direction for establishing a connectivity plan.

Senate Bill 1024 was passed in 2010. It revised access management rules in order to better support economic development. The bill more clearly defined the criteria and standards for granting access via direct highway approaches, changed the thresholds within which existing permits may remain valid, and required the department to establish less stringent regulations for highways with 5,000 vehicles per day or fewer.

Senate Bill 264 was passed in 2011 in response to requirements established by Senate Bill 1024, leading to further changes in ODOT's access management regulations. The Bill lessened requirements for highways in urban areas, of lower classification, and of lower volume and speed. Key areas modified include:

- Determination of "reasonable access" to property
- Shorter access spacing standards for low volume and urban highways
- Shorter access spacing standards for highways of lower classification
- Clarification of limits and types of issues requiring mitigation
- Makes non-traversable medians the "last resort", requiring all other mitigation measures to be considered first
- Simplifies permit approval criteria
- Lowers the cost for applicants

Key Projects

The following sections summarize key projects recommended from the prior plans and studies.

City of Scappoose 1997 Transportation System Plan

Motor Vehicle Improvements

- **School Area Traffic Control Improvements**
- **Maple Street, Fourth Street W to First Street W**: Widen to 36-foot-wide cross-section (partially complete; cross-section changed to 44 feet by City Council)
- **E.M. Watts Road, US 30 to Fourth Street**: Widen to 44-foot-wide urban cross-section (partially complete)
- **E.M. Watts Road, Fourth Street to Keys Road**: Widen to 36-foot-wide urban cross-section (partially complete)
- **E.M. Watts Road, Keys Road to Dutch Canyon Road**: Widen to 44-foot-wide urban cross-section
- **E.M. Watts Road Bridge Widening:** Widen bridge crossing over Scappoose Creek
- **Columbia Avenue W, US 30 to First Street W**: Reconstruct and restripe to allow two-way operation
- **Old Portland Road Extension to Walnut Street (High School Way)**: Construct new 44-foot-wide urban cross-section (partially complete to Sycamore Street)
- **J.P. West Road, US 30 to First Street W**: Widen to 36-foot-wide urban cross-section (partially complete)
- **J.P. West Road, First Street W to Fourth Street W**: Widen to 36-foot-wide urban cross-section
- **J.P. West Road, Fourth Street W to Eggleston Lane Extension**: Widen to 36-foot-wide urban cross-section (partially complete; project limits moved to Veterans Park by City Council)
- **J.P. West Road, Eggleston Lane Extension to UGB**: Widen to 36-foot-wide urban cross-section (deleted by City Council)
- **J.P. West Road Bridge Widening:** Widen bridge crossing over Scappoose Creek (construction planned in 2014)
- **Keys Road, E.M. Watts Road to J.P. West Road**: Widen to 36-foot-wide urban cross-section (partially complete)
- **Dutch Canyon Road, Old Portland Road to E.M. Watts Road**: Widen to 44-foot-wide urban cross-section
- **Callahan Road, Old Portland Road to UGB**: Widen to 44-foot-wide urban cross-section (partially complete)
- **Old Portland Road, UGB to US 30**: Widen to 44-foot-wide urban cross-section (partially complete)

- **Fourth Street W Extension to First Street W**: Construct new 36-foot-wide urban cross-section connecting from J.P. West Road (partially complete)
- **Fourth Street W, Maple Street to J.P. West Road**: Realign and widen to 36-foot-wide urban cross-section
- **Fourth Street E, Maple Street to Oak Street**: Realign and widen to 36-foot-wide urban cross-section
- **First Street W, Maple Street to J.P. West Road**: Improve to urban village standards (partially complete)
- **First Street W, J.P. West Road to E.J. Smith Road**: Improve to urban village standards
- **E.J. Smith Road, Wickstrom Drive to UGB**: Widen to 36-foot-wide urban cross-section
- **E.J. Smith Road Bridge Widening:** Widen bridge crossing over Scappoose Creek
- **Maple Street E, US 30 to Fourth Street E:** Widen to 36-foot-wide urban cross-section
- **Columbia Avenue E, US 30 to Fourth Street E**: Widen to 44-foot-wide urban cross-section (partially complete)
- **Columbia Avenue E, Fourth Street E to UGB**: Widen to 44-foot-wide urban cross-section (partially complete)
- **Sixth Street E Extension to Maple Street**: Construct new 36-foot-wide urban cross-section
- **Sixth Street E, Elm Street to Vine Street**: Widen to 36-foot-wide urban cross-section
- **Williams Street, US 30 to First Street W**: Construct new 36-foot-wide urban cross-section and install traffic signal at US 30 and Williams Street intersection (obsolete due to closure of intersection)
- **Eggleston Lane Extension**: Construct new 44-foot-wide urban cross-section from E.M. Watts Road to J.P. West Road
- **Fifth Street W, E.J Smith Road to Wheeler Street**: Widen to 44-foot-wide urban cross-section
- **Wheeler Street Extension to Scappoose-Vernonia Highway**: Construct new 44-foot-wide urban cross-section
- **Forest Road (Crown Zellerbach Road), West Lane Road to Bird Road**: Reconstruct as new 44-foot-wide urban cross-section
- **Forest Road (Crown Zellerbach Road), Bird Road to UGB:** Reconstruct as new 36-foot-wide urban cross-section
- **Scappoose-Vernonia Highway, US 30 to UGB**: Widen to 36-foot-wide urban cross-section
- **West Lane Road, Forest Road (Crown Zellerbach Road) to US 30**: Widen to 44-foot-wide urban cross-section (partially complete)
- **West Lane Road, Columbia Avenue E to Forest Road (Crown Zellerbach Road**: Widen to 44-

foot-wide urban cross-section (partially complete)

- **Maple Street E Extension**: Construct new 36-foot-wide urban cross-section extending to Bird Road extension (partially complete; project moved to Elm Street by City Council)
- **Tenth Street E Extension**: Construct new 44-foot-wide urban cross-section connecting Sixth Street E to Columbia Avenue E (partially complete; project moved to Ninth Street by City Council)

Pedestrian and Bicycle Improvements

- **Maple Street, US 30 to First Street W**: Restripe existing pavement to provide bike lanes
- **Maple Street, US 30 to First Street W**: Provide curb, gutter, and sidewalks on both sides
- **High School Drive, US 30 to Sixth Street E**: Add sidewalks and restripe with bike lanes (partially complete)
- **US 30 and Williams Street:** Provide Pedestrian Island in highway median (obsolete due to closure of intersection)
- **Walnut Road, US 30 to Old Portland Road extension**: Restripe existing pavement to provide bike lanes
- **Fourth Street West, Creekview Place to Maple Street**: Restripe existing pavement to provide bike lanes
- **Fourth Street West, E.M. Watts Road to Maple Street**: Provide curb, gutter, and sidewalks on both sides (partially complete)
- **Maple Street E, Fourth Street E to Dead End:** Add sidewalks and restripe with bike lanes
- **Fourth Street E, Oak Street to Columbia Avenue E**: Add sidewalks and restripe with bike lanes
- **Scappoose Creek Bike Path**: Construct bike path from Dutch Canyon Road to Scappoose-Vernonia Highway

Scappoose Rail Corridor Study

Motor Vehicle Improvements

- **Old Portland Road Realignment/Extension** to High School Way at US 30
- **E.M. Watts Road Extension** from US 30 to SE 4th Street
- **Maple Street Crossing Closure**
- **Wheeler Street Extension** from Scappoose-Vernonia Road to SW 5th Street
- **US 30/West Lane Road Intersection Modification**
- **US 30 Signalized Intersection Interconnect**
- **US 30/Columbia Avenue Intersection Improvements:** additional turn lanes and conversion of Columbia Avenue to two-way operations west of US 30

- **SE 3rd Street Extension** from High School Way to Elm Street

Rail Improvements

- **Various roadway and intersection modifications near rail crossings** to allow for second mainline railroad track

Columbia County Rural Transportation System Plan

Recommended Improvements

- **Shoulder improvements on Old Portland Road** from US 30 north to Scappoose
- **Park-and-Ride lot** located south of Scappoose along US 30, in cooperation with Multnomah County.
- **Access management on US 30**

Columbia County Community-Wide Transit Plan and US 30 Transit Access Plan

Transit Improvements

- **Bus shelter and amenities at Fred Meyer stop**
- **Bus shelter and amenities at Chinook Plaza stop**, including sidewalk and curb ramp construction
- **City Hall Park and Ride Facility** (5-10 year horizon)
- **City Hall Transit Center** (10-20 year horizon)

Access Improvements

- **Improve railroad crossing infrastructure** at US 30/High School Way intersection
- **Lengthen northbound right turn lane at US 30/High School Way intersection** by 100 feet
- **Improve railroad crossing infrastructure** at US 30/Maple Street intersection
- **Lengthen northbound right turn lane at US 30/Columbia Avenue intersection** by 110 feet and install tactile yellow strips at sidewalk rail crossing.

Transportation System Plan Acronyms (Alphabetical)

CIP	Capital Improvement Plan (also referred to as Capital Improvement Program)
EOA	Economic Opportunities Analysis
NEPA	National Environmental Policy Act
ODOT	Oregon Department of Transportation
OHP	Oregon Highway Plan
OPTP	Oregon Public Transportation Plan
OTC	Oregon Transportation Commission
OTP	Oregon Transportation Plan
P&W	Portland & Western Railroad (also referred to as PNWR)
PCI	Pavement Condition Index
PNWR	Portland & Western Railroad (also referred to as P&W)
SCA	Special City Allotment (ODOT Funding Program)
SDC	System Development Charges
STIP	Statewide Transportation Improvement Program (ODOT Funding Program)
STP	Surface Transportation Program (ODOT Funding Program)
TPR	Transportation Planning Rule
TSP	Transportation System Plan
UGB	Urban Growth Boundary

Section D

Memo 3: Regulatory Review

Scappoose Transportation System Plan Update

Technical Memorandum #3: [FINAL DRAFT] Regulatory Review

Prepared by Darci Rudzinski and Shayna Rehberg, Angelo Planning Group

June 19, 2013

The purpose of this memorandum is to discuss and identify City of Scappoose Comprehensive Plan and Development Code provisions that may need to be updated in order to: (1) to be consistent with and implement the updated TSP; and (2) to comply with the Oregon Transportation Plan (OTP) and the Transportation Planning Rule (TPR).

Draft Transportation System Plan (TSP)

Policy and code amendments may be needed in order to ensure that the Comprehensive Plan, Development Code, and public works design standards are consistent with the Draft TSP. These amendments are likely to be related to issues that have received state and local attention since the TSP was adopted in 1997, such as the emphasis on multimodal transportation and finding ways to better manage and maximize the existing transportation system. Policy amendments will also reflect issues identified through the TSP update. Examples include providing policy language to support infill development (i.e., appropriate street standards and investment in street improvements), enhanced coordination with other jurisdictions and agencies, and restricting large vehicles under certain conditions.[1] Development code amendments may also be necessary to implement the recommendations of the updated TSP. Examples include modifying street standards and other design standards related to transportation facilities.[2] These policy and code changes will be identified and developed as part of the TSP update.

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[1] The goals and policies in the 1997 TSP will be reviewed and modified as part of this TSP update process. As noted in Technical Memorandum #2, the City's Comprehensive Plan also has dated, but possibly relevant, transportation policies that will need to be considered and either updated or replaced by the proposed TSP policies. Upon adoption, the updated TSP will serve as the transportation element of the Comprehensive Plan and the policies in both documents should be consistent, if not identical.

[2] At the time that TSP-related amendments to the Development Code are considered for adoption, the City may wish to take the opportunity to make other procedural amendments to the Development Code.

Oregon Transportation Plan (OTP)

The OTP is the state's comprehensive transportation plan. The planning horizon of the current plan extends through 2030. Its purpose is to establish goals, policies, strategies, and initiatives for long-range transportation planning in the state. A summary of the OTP is provided in Technical Memorandum #2 (Background Document Review).

The OTP emphasizes maximizing the investment in the existing transportation system, integrating transportation and land use regulations, and integrating the transportation system across jurisdictions and modes. The following are key initiatives in the OTP:

- Maintain the existing transportation system to maximize the value of the assets. If funds are not available to maintain the system, develop a triage method for investing available funds.
- Optimize system capacity and safety through information technology and other methods.
- Integrate transportation, land use, economic development and the environment.
- Integrate the transportation system across jurisdictions, ownerships and modes.
- Create a sustainable funding plan for Oregon transportation.
- Invest strategically in capacity enhancements.

OTP policy and investment strategies are translated into plans for specific transportation modes in order to implement statewide multimodal priorities. The Oregon Highway Plan, the Oregon Bicycle and Pedestrian Plan, the Oregon Public Transportation Plan, and the Oregon Rail Plan are modal plans that have been reviewed for this project to ensure that the updated TSP will be consistent with policies, strategies, and design guidelines in these modal plans.

Transportation Planning Rule (TPR)

The Transportation Planning Rule (TPR) (OAR 660-012) implements Statewide Planning Goal 12 (Transportation), which is intended to promote the development of safe, convenient, and economic transportation systems that are designed to maximize the benefit of investment and reduce reliance on the automobile. The TPR includes direction for preparing, coordinating, and implementing TSPs. In particular, TPR Section -0045 (Implementation of the Transportation System Plan) requires local governments to amend their land use regulations to implement the TSP. It also requires local governments to adopt land use and subdivision regulations to protect transportation facilities for their identified functions.

TPR Section -0060 (Plan and Land Use Regulation Amendments) addresses amendments to plans and land use regulations. It specifies measures to be taken to ensure that allowed land uses are consistent with the identified function and capacity of existing and planned transportation facilities. These include access control measures, standards to protect future operations of roads, expanded notice requirements and coordinated review procedures for land use applications, a process to apply conditions of approval to development proposals, and regulations assuring that amendments to land use designations, densities, and design standards are consistent with the functions, capacities, and performance standards of facilities identified in the TSP. Section -0060 also establishes criteria for identifying the significant effects of plan or land use regulation amendments on transportation facilities, actions to be taken when a significant effect would occur, identification of planned facilities, and coordination with transportation facility providers.

Table 1 provides an evaluation of the City of Scappoose Development Code based on Sections -0045 and -0060 of the TPR.[3] The evaluation includes findings confirming whether existing code language complies with the TPR. Where necessary, it provides recommendations for amending the code to better address TPR requirements.

[3] Note that the focus of the TPR evaluation is on how the City implements the local transportation plan through land use and development requirements. As such, Table 1 does not include an evaluation of existing policy language. However, as stated earlier in this memorandum, a review and update of policy language will be a focus of, and outcome of, the TSP update.

Table 1: TPR Evaluation of the City of Scappoose Development Code

TPR Requirement	**Local Development Code References and Recommendations**
OAR 660-012-0045	
(1) Each local government shall amend its land use regulations to implement the TSP.	
(a) The following transportation facilities, services and improvements need not be subject to land use regulations except as necessary to implement the TSP and, under ordinary circumstances do not have a significant impact on land use: (A) Operation, maintenance, and repair of existing transportation facilities identified in the TSP, such as road, bicycle, pedestrian, port, airport and rail facilities, and major regional pipelines and terminals; (B) Dedication of right-of-way, authorization of construction and the construction of facilities and improvements, where the improvements are consistent with clear and objective dimensional standards; (C) Uses permitted outright under ORS 215.213(1)(m) through (p)[4] and 215.283(1)(k) through (n)[5], consistent with the provisions of 660-012-0065[6]; and	Existing zoning district use standards do not address transportation facilities, services, and improvements except for the uses specified in the Public Lands-Recreation and most overlay zones (primarily environmental protection zones), which address facilities that may or may not be sited in public right-of-way or easements. • Chapter 17.79 (PL-R PUBLIC LANDS—RECREATION), where multi-use trails and associated trail access points and trailheads are permitted outright subject to site development review requirements (Chapter 17.120). • Chapter 17.84 (SENSITIVE LANDS—FLOODING), Zones A, AE, and AO, where recreation uses such as bicycle and pedestrian paths and public works projects are permitted in special flood hazard areas subject to the

[4] Transportation uses in ORS 215.213(1) have shifted from (m) through (p) to (j) through (m):
(j) Climbing and passing lanes within the right of way existing as of July 1, 1987.
(k) Reconstruction or modification of public roads and highways, including the placement of utility facilities overhead and in the subsurface of public roads and highways along the public right of way, but not including the addition of travel lanes, where no removal or displacement of buildings would occur, or no new land parcels result.

TPR Requirement	Local Development Code References and Recommendations
(D) Changes in the frequency of transit, rail and airport services. (b) To the extent, if any, that a transportation facility, service, or improvement concerns the application of a comprehensive plan provision or land use regulation, it may be allowed without further land use review if it is permitted outright or if it is subject to standards that do not require interpretation or the exercise of factual, policy or legal judgment.	development permit requirements of the Chapter in addition to any applicable federal, state or county permits.. • Chapter 17.85 (SENSITIVE LANDS—WETLANDS), where alterations of a significant wetland are subject to the review standards in the chapter (Section 17.85.090) and alterations outside of a significant wetland but within a wetland buffer require a sensitive lands-wetlands overlay development permit. Alterations include: *streets, bridges, when part of an approved future street plan, subdivision plan construction, improvement, or alteration or city transportation*

(l) Temporary public road and highway detours that will be abandoned and restored to original condition or use at such time as no longer needed.
(m) Minor betterment of existing public road and highway related facilities, such as maintenance yards, weigh stations and rest areas, within right of way existing as of July 1, 1987, and contiguous public-owned property utilized to support the operation and maintenance of public roads and highways.

[5] Transportation uses in ORS 215.283(1) have shifted from (k) through (n) to (h) through (k):
(h) Climbing and passing lanes within the right of way existing as of July 1, 1987.
(i) Reconstruction or modification of public roads and highways, including the placement of utility facilities overhead and in the subsurface of public roads and highways along the public right of way, but not including the addition of travel lanes, where no removal or displacement of buildings would occur, or no new land parcels result.
(j) Temporary public road and highway detours that will be abandoned and restored to original condition or use at such time as no longer needed.
(k) Minor betterment of existing public road and highway related facilities such as maintenance yards, weigh stations and rest areas, within right of way existing as of July 1, 1987, and contiguous public-owned property utilized to support the operation and maintenance of public roads and highways.

[6] OAR 660-012-0065 (Transportation Improvements on Rural Lands); *(1) This rule identifies transportation facilities, services and improvements which may be permitted on rural lands consistent with Goals 3, 4, 11, and 14 without a goal exception.*

TPR Requirement	Local Development Code References and Recommendations
	system plan, including the installation of underground utilities and construction of roadway improvements including, but not limited to, sidewalks, curbs, streetlights, and driveway aprons; bicycle pedestrian paths; driveways or pedestrian paths where necessary to afford access between portions of private property that may be bisected by a wetland area and/or buffer. • Chapter 17.86 (SENSITIVE LANDS--SLOPE HAZARD) acknowledges that construction of roadway improvements including sidewalks, curbs, streetlights, and driveway aprons require permits from the appropriate state, county or city jurisdiction in slope hazard areas. • Chapter 17.89 (SENSITIVE LANDS--FISH AND RIPARIAN CORRIDOR OVERLAY), pursuant to Section 17.89.040, permits streets, roads, and paths within the 50-foot fish and riparian corridor boundary if intrusion into the riparian corridor is minimized, no other options or locations are feasible, and subject to the requirements of a sensitive lands-fish and riparian corridor overlay development permit. • Chapter 17.88 (AO PUBLIC USE AIRPORT SAFETY AND COMPATIBILITY OVERLAY ZONE) permits roads and

TPR Requirement	Local Development Code References and Recommendations
	parking areas outright in the Approach Area and Direct Impact Zone and are permitted in the Runway Protection Zone (RPZ) "only upon demonstration that there are no practicable alternatives. Lights, guardrails and related accessory structures are prohibited. Cost may be considered in determining whether practicable alternatives exist." **<u>Recommendation:</u> Add transportation facilities, services, and improvements as permitted uses in City zoning districts use standards, either in each district set of use standards or as a universal provision.**
(c) In the event that a transportation facility, service or improvement is determined to have a significant impact on land use or requires interpretation or the exercise of factual, policy or legal judgment, the local government shall provide a review and approval process that is consistent with 660-012-0050. To facilitate implementation of the TSP, each local government shall amend regulations to provide for consolidated review of land use decisions required to permit a transportation project.	Existing decision-making procedures for quasi-judicial and limited land use decisions allow for consolidated review (Section 17.162.021 and Section 17.164.025). Existing decision-making provisions do not require coordinated review of complete applications with affected transportation facility/service providers. Coordination with affected agencies could be strengthened through involvement in pre-application conferences, which are required for quasi-judicial and limited land use decision procedures, unless the applicant opts out. Decision-making procedures vary in requirements for notifying facility/service providers about hearings:

TPR Requirement	Local Development Code References and Recommendations
	• Legislative decisions require that "any affected governmental agency" be notified of a hearing at least 10 days in advance (Section 17.160.025(C)(2)). • Quasi-judicial decisions require that "any governmental agency affected by the decision which has entered into an intergovernmental agreement with the city which includes provision for such notice" be notified of hearings (Section 17.162.025). • Limited land use decisions require notice to be provided to nearby property owners and neighborhood/community organizations (Section 17.164.130). Subdivision requirements specify that Columbia County and/or ODOT be notified about the tentative plan when access from the subdivision is proposed onto a county and/or state facility (Section 17.150.030(C)(3)). **Recommendation:** • **Add provisions to involve transportation facility/service providers in pre-application conferences**. • **Expand notice requirements for legislative, quasi-judicial, and limited land use decisions to specify notice of completed applications (for coordinated**

TPR Requirement	Local Development Code References and Recommendations
	review) and hearings to affected transportation facility/service providers.
(2) Local governments shall adopt land use or subdivision ordinance regulations, consistent with applicable federal and state requirements, to protect transportation facilities corridors and sites for their identified functions. Such regulations shall include:	
(a) Access control measures, for example, driveway and public road spacing, median control and signal spacing standards, which are consistent with the functional classification of roads and consistent with limiting development on rural lands to rural uses and densities;	Access management standards are referenced in the code under site development review (Section 17.120.180(J)) and subdivision review (Section 17.150.030(C)(3)). The references point to either City public works design standards, or those of Columbia County or ODOT. Block length and perimeter standards are established in Section 17.154.040 (Street and Utility Improvements). **Recommendation: Include access spacing standards in the updated TSP. Ensure that the standards are consistent between the TSP and City public works design standards as well Columbia County and ODOT standards as needed.**
(b) Standards to protect the future operations of roads, transitways and major transit corridors	Legislative, quasi-judicial, and limited land use decision-making provisions include criteria about complying with the relevant approval standards found in the applicable chapter(s) of Title 17 (Land Use and Development), public works design standards, and other applicable implementing ordinances. However, mobility and other performance standards are not

TPR Requirement	Local Development Code References and Recommendations
	established or otherwise referenced in the code. All decision-making procedures allow for the City to require more information from the applicant if it is determined that "this information is needed to properly evaluate the proposed development proposal," which allows for the possibility of requiring a traffic impact analysis (Sections 17. 160.120(G), 17.162.120(I), and 17.164.030(I)). The approval criteria for Planned Development specifically allow for a traffic impact analysis (Section 17.81.070(D)). Traffic impact analysis requirements are not currently specified in the code; they are established instead in the public works design standards (Section 5.0013 – Traffic Analysis). **Recommendation:** • **Include references to mobility and other performance standards (in the TSP) in the code.** • **Add a reference to traffic impact analysis requirements in the public works design standards to the code.**
(c) Measures to protect public use airports by controlling land uses within airport noise corridors and imaginary surfaces, and by limiting physical hazards to air navigation;	Chapter 17.88 (AO PUBLIC USE AIRPORT SAFETY AND COMPATIBILITY OVERLAY ZONE) regulates and protects areas around public use airports, including provisions addressing land use compatibility and height limitations.

TPR Requirement	Local Development Code References and Recommendations
(d) A process for coordinated review of future land use decisions affecting transportation facilities, corridors or sites;	See response to -0045(1)(c).
(e) A process to apply conditions to development proposals in order to minimize impacts and protect transportation facilities, corridors or sites;	All decision-making procedures allow for the application of conditions of approval and identify "conveyances and dedications of property needed for public use" as a specific possible condition of approval (Sections 17. 160.130(D), 17.162.140(E), and 17.164.150(E)).
(f) Regulations to provide notice to public agencies providing transportation facilities and services, MPOs, and ODOT of: (A) Land use applications that require public hearings; (B) Subdivision and partition applications; (C)Other applications which affect private access to roads; and (D)Other applications within airport noise corridor and imaginary surfaces which affect airport operations.	See response to -0045(1)(c).
g) Regulations assuring amendments to land use designations, densities, and design standards are consistent with the functions, capacities and performance standards of facilities identified in the TSP.	See response related to traffic impact analysis requirements in -0045(2)(b) and plan and land use regulation amendments in -0060.
(3) Local governments shall adopt land use or subdivision regulations for urban areas and rural communities as set forth below. The purposes of this section	

TPR Requirement	Local Development Code References and Recommendations
are to provide for safe and convenient pedestrian, bicycle and vehicular circulation consistent with access management standards and the function of affected streets, to ensure that new development provides on-site streets and accessways that provide reasonably direct routes for pedestrian and bicycle travel in areas where pedestrian and bicycle travel is likely if connections are provided, and which avoids wherever possible levels of automobile traffic which might interfere with or discourage pedestrian or bicycle travel.	
(a) Bicycle parking facilities as part of new multi-family residential developments of four units or more, new retail, office and institutional developments, and all transit transfer stations and park-and-ride lots.	Scappoose code addresses bicycle parking requirements in Section 17.106.020(P): "At least one secured bicycle rack space shall be provided for each ten parking spaces in any development. Bicycle parking areas shall not be located within parking aisles, landscape areas, or pedestrian ways." City practice has been to require at least one bicycle parking space, even when less than 10 vehicle parking spaces are required. While not required by the TPR, there is not detailed guidance about bicycle parking location or design in existing City code. **<u>Recommendation:</u> Establish minimum bicycle parking space requirements. Add bicycle parking location and design standards if the City would find that helpful.**
(b) On-site facilities shall be provided which accommodate safe and convenient pedestrian and bicycle access from within new subdivisions, multi-family developments, planned developments, shopping centers, and commercial districts to adjacent residential areas and transit stops, and to	Site development review approval standards set a minimum standard for pedestrian ways and bicycle ways: "Provisions shall be made for pedestrian ways and bicycle ways if such facilities are shown on an adopted plan" (Section

TPR Requirement	Local Development Code References and Recommendations
neighborhood activity centers within one-half mile of the development. Single-family residential developments shall generally include streets and accessways. Pedestrian circulation through parking lots should generally be provided in the form of accessways. (A) "Neighborhood activity centers" includes, but is not limited to, existing or planned schools, parks, shopping areas, transit stops or employment centers; (B) Bikeways shall be required along arterials and major collectors. sidewalks shall be required along arterials, collectors and most local streets in urban areas except that sidewalks are not required along controlled access roadways, such as freeways; (C) Cul-de-sacs and other dead-end streets may be used as part of a development plan, consistent with the purposes set forth in this section; (D) Local governments shall establish their own standards or criteria for providing streets and accessways consistent with the purposes of this section. Such measures may include but are not limited to: standards for spacing of streets or accessways; and standards for excessive out-of-direction travel; (E) Streets and accessways need not be required where one or more of the following conditions exist: (i) Physical or topographic conditions make a street or accessway	17.120.180(J)(3)). Subdivision standards and associated street/public improvement standards require compliance with an approved street or neighborhood circulation plan (Section 17.154.030(D) and Section 17.150.060(A)(3)), and require that new streets provide “reasonably direct and convenient routes for walking and cycling within neighborhoods and access adjacent development” (Section 17.154.030(D)(3)). • Parking lots – Pedestrian accessways through parking lots are not explicitly addressed or required in existing off-street parking regulations. • Bikeways and sidewalks – Street requirements in the code refer/defer to the public works design standards. Bikeway widths are addressed in the public works design standards, but only generally for “public streets” and off-street paths. Otherwise, the standards refer to the TSP, the latest edition of the Bicycle and Pedestrian Plan, and the latest edition of the AASHTO Guide to the Development of Bicycle Facilities for regulation of system design, facility design, and policy (Section 5.0060 – Bikeways). The public works design standards specify sidewalks and sidewalk widths for all streets (Section 5.0050 – Sidewalks).

TPR Requirement	Local Development Code References and Recommendations
connection impracticable. Such conditions include but are not limited to freeways, railroads, steep slopes, wetlands or other bodies of water where a connection could not reasonably be provided; (ii) Buildings or other existing development on adjacent lands physically preclude a connection now or in the future considering the potential for redevelopment; or (iii) Where streets or accessways would violate provisions of leases, easements, covenants, restrictions or other agreements existing as of May 1, 1995, which preclude a required street or accessway connection.	• Street spacing standards – Block standards set a 600-foot maximum block length and 1,600-foot block perimeter for all but arterial streets. Recommended minimum block lengths for arterials are 1,800 feet (Section 17.154.040(B)). Exemptions from the block standard are allowed when overridden by other access management standards. See response related to access standards in -0045(2)(a). **Recommendation:** • **Strengthen site development standards to require not only facilities shown in an adopted plan but to provide pedestrian and bicycle access around and through a site even if not in an adopted plan.** • **Add definitions for pedestrian and bicycle facilities (e.g., accessway, bike/pedestrian access, bike/pedestrian way, walkways) in Chapter 17.26, Definitions.** • **Add requirements for pedestrian accessways through parking lots in General Provisions (Section 17.106.020).** • **Establish minimum requirements for including bikeways in roadways in TSP (cross sections).**

TPR Requirement	Local Development Code References and Recommendations
(c) Off-site road improvements are otherwise required as a condition of development approval, they shall include facilities accommodating convenient pedestrian and bicycle and pedestrian travel, including bicycle ways on arterials and major collectors	See response about conditions of approval in -0045(2)(e).
(e) Internal pedestrian circulation within new office parks and commercial developments shall be provided through clustering of buildings, construction of accessways, walkways and similar techniques.	Approval standards for site development review require that buildings "be located to preserve topography, and natural drainage; located in areas not subject to ground slumping or sliding; located to provide adequate distance between adjoining buildings for adequate light, air circulation, and fire fighting; and oriented with consideration for sun and wind" (Section 17.120.180(B)). See the response related to accessways in -0045(3)(b).
(6) In developing a bicycle and pedestrian circulation plan as required by 660-012-0020(2)(d), local governments shall identify improvements to facilitate bicycle and pedestrian trips to meet local travel needs in developed areas. Appropriate improvements should provide for more direct, convenient and safer bicycle or pedestrian travel within and between residential areas and neighborhood activity centers (i.e., schools, shopping, transit stops). Specific measures include, for example, constructing walkways between cul-de-sacs and adjacent roads, providing walkways between buildings, and providing direct access between adjacent uses.	• Walkways between cul-de-sacs and adjacent roads – There are no requirements in existing code to connect cul-de-sacs to other roads with walkways or accessways. • Walkways between buildings – See the response related to accessways in -0045(3)(b). • Access between adjacent uses – As described in the response to -0045(3)(b), street/public improvement standards require that new streets provide "reasonably direct and convenient routes for walking and cycling

TPR Requirement	Local Development Code References and Recommendations
	within neighborhoods and access adjacent development" (Section 17.154.030(D)(3)). However, these apply only to streets while accessways are not specified. **Recommendation:** **Add requirements to subdivision standards and site development standards to:** • **Connect cul-de-sacs to adjacent roads with walkways or accessways** • **Provide pedestrian and bicycle accessways between uses, in addition to or in lieu of streets.**
(7) Local governments shall establish standards for local streets and accessways that minimize pavement width and total ROW consistent with the operational needs of the facility. The intent of this requirement is that local governments consider and reduce excessive standards for local streets and accessways in order to reduce the cost of construction, provide for more efficient use of urban land, provide for emergency vehicle access while discouraging inappropriate traffic volumes and speeds, and which accommodate convenient pedestrian and bicycle circulation. Notwithstanding section (1) or (3) of this rule, local street standards adopted to meet this requirement need not be adopted as land use regulations.	The narrowest pavement width in existing public works design standards is 32 feet for local residential streets (Section 5.0011 – Right-of-way and Pavement Width). **Recommendation:** **Consider local street pavement widths of less than 32 feet, depending on whether no parking or parking on one or both sides of the street is included.**

TPR Requirement	Local Development Code References and Recommendations
OAR 660-12-0060	
Amendments to functional plans, acknowledged comprehensive plans, and land use regulations that significantly affect an existing or planned transportation facility shall assure that allowed land uses are consistent with the identified function, capacity, and performance standards of the facility.	Legislative decision standards include "applicable statewide planning goals and guidelines adopted under Oregon Revised Statutes Chapter 197" in decision criteria (Section 17.160.120(A)(1)). See response related to traffic impact analysis requirements in -0045(2)(b). **Recommendation: Expand legislative decision standards to include administrative rules and, in particular, the TPR.**

Section E

Memo 4: Funding Review

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Scappoose Transportation System Plan Update

Technical Memorandum #4:
Review of existing and potential funding sources

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May 29, 2013

The purpose of this memorandum is to examine the sources of revenue available to the City of Scappoose to fund its transportation maintenance and improvement programs. The memo describes the existing sources of revenue the City relies on, and provides a summary of recent expenditures. . The memo also identifies additional funding strategies and sources of revenue used in other Oregon jurisdictions that the City of Scappoose may want to consider.

1. Current Funding Sources and Expenditures

The City of Scappoose currently relies on several sources of revenue to fund its transportation maintenance and improvement programs. These include state gas tax-revenue share, system development charges, and grants. The following sections describe in more detail all of the City's transportation revenue sources and expenditures between 2007 and 2012. A summary of the total revenue and expenditures is provided in Table 1.

State Gas Tax-Revenue Share

The State of Oregon collects taxes on the sale of gasoline. These revenues account for approximately 22 percent of the revenue used to fund the Oregon Department of Transportation (ODOT) and its programs. (The majority of funding comes from the Federal government.) A portion of the gas tax revenue is annually distributed to cities on a per capita basis. By statute, the funds may be used by local governments for any road-related purpose. Oregon gas taxes are collected as a fixed amount per gallon of gasoline sold. The gas tax in Oregon is currently 30 cents per gallon. There is an additional 18.4 cent federal tax on gasoline (24.4 cents for diesel).Heavy trucks (more than 26,000 pounds gross vehicle weight) do not pay gas tax, but instead pay a weight-mile tax.

The tax does not vary as the price of gasoline fluctuates. There is also no adjustment for inflation. Even though the cost of maintaining roads has increased, the gas tax has not increased. Improved fuel efficiency in new vehicles has further reduced the total dollars collected from the tax. Nevertheless, revenue distributed from the state gas tax has and will continue to provide a significant portion of the funding for Scappoose's transportation improvement program. Scappoose has received between $240,000 and $360,000 annually from the gas tax over the last five years and is expected to receive more than $370,000 in 2012-13.

Surface Transportation Program (STP) Fund

The City receives a portion of federal Surface Transportation Program (STP) funds from ODOT each year. The funds are held by ODOT until the City completes a specific project, at which time the City is reimbursed. Unused funds accrue and are carried over to the following year. The amount of funding received from ODOT varies from year to year. In recent years, the City has been apportioned approximately $78,000 annually, although it only used about $58,000 annually, on average. These federal funds are converted to less restrictive state funds through ODOT's Fund Exchange program at the rate of $0.94/$1.00.

Transportation System Development Charges (SDC)

System development charges (SDC) are fees collected by local governments from new residential and commercial construction. The funds collected from SDCs are used to mitigate the impacts of the new construction on the transportation system, and on other infrastructure. Transportation SDCs are used to construct new roadways or improve portions of existing roadways, typically but not necessarily in proximity to the new development. SDCs may only be used to pay for qualified public improvements that add capacity to the transportation system. The SDC is a one-time fee. The fee is based on the type and size of the development, and is proportional to the number of vehicle trips generated. The transportation SDC rates (as of July 1, 2012) are $2,022 for a single-family dwelling and $1,420 for an apartment. The transportation SDC rates for other types of development vary depending on the specific land use.

Interest, Miscellaneous Revenue and Fees

The City of Scappoose collects interest on short term investments and also receives revenue from miscellaneous sources such as refunds and reimbursements, which are accounted for as non-assignable budgeted revenue line items that are not anticipated. Finally, the City receives revenue from fees such as right-of-way applications fees or infrastructure inspection fees. All of these revenue sources fluctuate from year to year and may not be available consistently in the future.

General Fund Revenues

At the discretion of the City Council, the City can allocate money from the General Fund to pay for its transportation maintenance and improvement program. General Fund revenues come primarily from property taxes, but also include franchise fees, state shared revenues, and other fees imposed by the City. Money from the General Fund can be allocated to the transportation program through the City's annual budget process. General Fund resources can be used to fund any aspect of the transportation program, including capital improvements, operations, maintenance, and administration. Because the General Fund is used to fund the general operation of the City, and other priority programs that cannot be funded through other means, the amount of funding available for transportation improvements is limited. The City of Scappoose has not used the General Fund for transportation-related projects in the past five years.

Expenditures

The City of Scappoose budget identifies five categories of expenditures: Personnel Services, Materials and Services, Capital Improvements, Debt Services and Transfers. Transportation expenditures over the last five years have varied from $360,000 to $720,000, averaging approximately $530,000.

Table 1: Scappoose Transportation Revenue and Expenditures Summary (2007-2012)

Funding Sources	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	Average
State Gas Tax-Revenue Share	$258,534	$241,644	$269,696	$313,096	$358,310	$288,256
State Gas Tax – 1% Bike & Ped	$2,611	$2,441	$2,724	$3,163	$3,619	$2,911
STP Funds	-	$95,906	-	$195,777	-	$58,337
Transportation SDC	$320,244	$59,152	$106,005	$19,883	$79,695	$116,996
Bike/Pedestrian Grant*	-	-	-	$15,000	-	$3,000
Interest	$54,618	$17,802	$5,887	$4,332	$4,548	$17,437
Miscellaneous & Fees	$28,192	$4,868	$539	$25,542	$3,662	$12,560
Total Revenues	**$664,199**	**$421,813**	**$384,851**	**$576,793**	**$449,834**	**$499,498**
Expenditures	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**	**Average**
Personnel Services	$155,367	$168,532	$125,812	$134,266	$144,072	$145,610
Materials & Services	$130,651	$171,946	$130,993	$118,896	$121,489	$134,795
Capital Improvements	$321,466	$106,408	$16,658	$233,404	$152,178	$166,023
Debt Service	$60,082	$57,413	$57,620	$57,621	$57,621	$58,071
Transfers	$51,577	$34,510	$27,070	$13,598	$14,045	$28,160
Total Expenditures	**$719,143**	**$538,809**	**$358,153**	**$557,785**	**$489,405**	**$532,659**
Net Revenue/(Loss)	**($54,944)**	**($116,996)**	**$26,698**	**$19,008**	**($39,571)**	**($33,161)**

Source: City of Scappoose.
* ODOT Rail grant for public crossing safety grant.

2. Potential Additional Funding Sources

There are a number of additional local sources of revenue the City could use to fund transportation improvements. These include local fuel taxes, urban renewal and local improvement districts, debt financing, street utility fees and parking charges. There are many obstacles to establishing these funding mechanisms, including the willingness of the local elected officials to burden citizens and businesses; support of the electorate (some measure would require public approval); resistance to diverting tax revenues from other competing City programs (in the case of urban renewal districts); and access to special financing programs (in the case of some types of debt financing). Nevertheless, it is important for the City to consider all of the options available to increase the funding available for transportation improvements.

The following is a more detailed description of the additional revenue sources that could be used by Scappoose to fund its capital improvement and maintenance programs. Examples are provided of other cities in Oregon that use these funding mechanisms.

Local Fuel Tax

Many cities and counties in Oregon have adopted local gas taxes ranging from one to five cents per gallon. Fuel distributors collect and pay the taxes to the city each month. A local fuel tax would need to be approved by the voters, consistent with State law as well as the Scappoose Municipal Code. However, in 2009, an Oregon law was passed prohibiting a city, county or other local government from enacting any provision taxing for motor vehicles between September 28, 2009 and January 2, 2014. Therefore, consideration of a local gas tax would need to be postponed until at least 2014.

Nearby locations with a gas tax include Washington County (one cent per gallon), Astoria (three cents per gallon), and Warrenton (three cents per gallon).

Urban Renewal District

An Urban Renewal District is a special taxing district within the City. It is formed by establishing a benefit area and preparing an Urban Renewal Plan. Improvements within the district are funded with the incremental increase in property taxes that result from the improvements. This type of tax increment financing has been used in Oregon since 1960. One criticism of urban renewal districts is that they divert tax revenues from the City's General Fund and from other underlying taxing districts.

Local Improvement Districts

Local Improvement Districts (LIDs) are used to fund transportation (or other infrastructure) projects within a defined area. LIDs provide a means for funding specific improvements that benefit a specific group of property owners. LIDs require City Council approval, must not be opposed by more than 2/3 of affected property owners, and must be used for a clearly defined purpose. Benefiting properties are assessed a special tax to pay for the improvements. LIDs can be paid in one-time or annual installments for up to 30 years. Local governments can use the future revenue stream generated by LIDs to obtain financing through loans or bonds. LID funds can be combined with other funds to construct larger projects with system-wide benefits to adjacent properties beyond the limits of the LID. LIDs are often used for sidewalks and pedestrian amenities. They can also be used for street and drainage improvements.

Street/Transportation Utility Fee Revenue

A number of Oregon cities supplement their street funds with user fees, or utility fees. Similarly sized cities with adopted street utility fees include Oregon City, Hillsboro and Lake Oswego. Establishing user fees to fund maintenance or capital construction ensures that those who create the demand for service pay for it proportionately to their use. The street utility fees are recurring monthly or bi-monthly charges that are paid by all residential, commercial, industrial, and institutional users. The fees can be assessed through the City utility billing system. Fees are charged in proportion to the amount of traffic generated, so a commercial property pays a higher rate than a residential property. Typically, there are provisions to allow reduced fees for those that can demonstrate they use less than the average rate implies. For example, an assisted living facility where a high proportion of residents do not own vehicles.

From a transportation system "health" perspective, establishing a utility fee helps to ensure the ongoing viability of the system, or other program, by providing a stable source of dedicated funding. Revenues from utility fees can be used to secure revenue bonds to finance capital construction. A street utility fee can be established by City Council without a public vote.

Parking Fees

Fees can be collected for parking on public streets. Revenues generated from parking fees could be used for a variety of transportation projects. Implement a parking fee program would require purchasing parking meters or other collection system, carefully studying where to install the meters, and assessing the appropriate fee to charge.

Local Option Levy

Most taxing districts are allowed to ask their patrons for temporary taxing authority above the permanent rate limitation (set by Measure 50 in 1997-98). This authority is known as a "local option tax." Local option taxes are limited to five years for operations and up to 10 years for capital construction purposes. A "double majority" of the voters is required to approve local option tax. This means that a ballot measure proposing a permanent rate limit must receive a majority of affirmative votes at an election in which at least 50 percent of the registered voters cast ballots. The double majority requirement does not apply to an election held in November or May of any year.[1]

ODOT Railroad Crossing Improvement Funds

ODOT has funds available to improve railroad crossings that have safety deficiencies. The determination of whether a crossing would qualify is based on the number and severity of train and car/pedestrian crashes.

ODOT Jurisdictionally Blind Safety Grants

The Jurisdictionally Blind Safety Program is a safety program to address safety needs on all public roads in Oregon. Only by working collaboratively with local road jurisdictions (cities, counties, MPO's and tribes) can ODOT expect to increase awareness of safety on all roads, promote best practices for infrastructure safety, compliment behavioral safety efforts and focus limited resources to reduce fatal and serious injury crashes in the state of Oregon. The program should be data driven to achieve the greatest benefits in crash reduction and should be blind to jurisdiction. The program is expected to start in 2017, so ODOT can maintain commitments in the current Statewide Transportation Improvement

[1] Oregon Department of Revenue, website, June 12, 2013.

Program (STIP) for 2013-2015 and since the development of the 2016-2018 STIP is well underway.[2] Principles of the program include:

- The program goal is to reduce fatal and serious injury crashes.
- The program must include all public roads.
- The program is data driven and blind to jurisdiction.

Grant and Loan Opportunities

There are many grant programs that provide funding to local governments for transportation-related purposes. Each program has specific eligibility requirements and criteria. The following are some potential grant and loan opportunities:

- ODOT Statewide Transportation Improvement Program (STIP). Redefined in 2012 to consolidate various grant programs (e.g. Transportation Enhancement, Bicycle and Pedestrian, Safe Routes to School). Program has been expanded; local roadways are now eligible.
- ODOT bridge rehabilitation and replacement program
- National Center on Senior Transportation Demonstration Grants
- Oregon Main Street
- Oregon Transportation Infrastructure Bank
- Oregon Department of Transportation – ConnectOregon program
- Jobs & Transportation Act (special legislation, may or may not occur again)
- Transportation Growth Management Grants & Incentives
- US DOT TIGER V Grant Program

3. Funding Sources Used in Other Columbia County Cities

For comparison purposes, the revenue sources relied on by other cities in Columbia County have been inventoried. The inventory is based on available information and will be updated as needed. Table 2 provides a summary of the findings.

[2] www.oregon.gov/ODOT/HWY/TRAFFIC-ROADWAY/Pages/Blind-Safety.aspx, June 12, 2013.

Table 2: Transportation Revenue Sources in Columbia County Cities

Funding Sources	System Development Charges	Local Gas Tax	Road District Tax	Urban Renewal District	Parking Fees
Clatskanie					
Columbia City	√				
Prescott					
Rainier				√	
Scappoose	√				
St. Helens	√				
Vernonia	√				

Regional funding items of interest:

- Rainier created an urban renewal district in 1995 to stimulate local economic development. The district is administered by the Rainier Economic Development Council (REDCO). REDCO projects are funded by tax increment taxes in the Rainier Urban Renewal Area.
- Columbia City's current transportation related SDC rate for a single-family dwelling unit was $4,575. Commercial rates vary.

4. Future Funding and Expenditure Forecast

The following table provides a forecast of future revenues and expenditures through 2035. The forecast is based on average revenues and expenditures reported by the City of Scappoose over the past five years. It assumes historical trends will continue in the future, which may or may not be accurate.

Table 3: Estimated Future Funding and Expenditures

Funding Sources	Annual Average	Total through 2035
State Gas Tax-Revenue Share	$288,000	$6.3 million
State Gas Tax – 1% Bike & Ped	$3,000	$66,000
STP Funds	$58,000	$1.3 million
Transportation SDC	$117,000	$2.6 million
Interest	$17,000	$374,000
Miscellaneous & Fees	$13,000	$286,000
Total Revenues	**$496,000**	**$10.9 million**
Expenditures	**Annual Average**	**Total through 2035**
Personnel Services	$146,000	$3.2 million
Materials & Services	$135,000	$3.0 million
Capital Improvements	$166,000	$3.7 million
Debt Service	$58,000	$1.3 million
Transfers	$28,000	$616,000
Total Expenditures	**$533,000**	**$11.8 million**
Net Revenue/(Loss)	**($37,000)**	**($0.9 million)**

5. Analysis of Existing System Development Charges

The City indicated interest in reviewing their current System Development Charge (SDC) rates to determine whether the rates should be updated. For comparison, Table 4 summarizes SDC rates used in similar-sized communities in Oregon (2007 data).[3] The average residential SDC is in line with Scappoose's current fees of $2,022 for a single-family dwelling unit and $1,420 for a multi-family dwelling unit. However, the average commercial SDC ($55,516) is considerably higher than Scappoose's fee of $18,600 for a comparable office building. This suggests the City could justify increasing its SDC for commercial properties.

Table 4: Transportation SDC Comparison for Nearby Cities

City	Average Residential SDC	Average Commercial SDC
Columbia City	$4,399	$107,280
Cottage Grove	$776	$41,569
Garibaldi	$3,145	$72,369
North Plains	$493	$15,506
Portland	$1,883	$84,400
Sandy	$1,943	$29,200
Stayton	$2,512	$3,443
Tigard	$3,020	$90,357
Average	**$2,271**	**$55,516**
Scappoose	**$2,022**	**$18,600**
Difference (Scappoose – Average)	**($249)**	**($36,916)**

Once future land use assumptions have been established in conjunction with developing the TSP, the City's SDC rates can be evaluated more carefully to determine the potential impact of a rate adjustment.

[3] League of Oregon Cities, System Development Charges: A Survey Conducted by The League of Oregon Cities, May, 2007. Average Residence defined as 9,000 SF lot, 2,000 SF building, $120,000 development value, $40,000 land value, 2 parking spaces. Average Commercial defined as 47,000 SF lot, 20,000 SF office building, $960,000 development value, $120,000 land value, 50 parking spaces, 96 employees.

Section F

Memo 5: Existing Conditions

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Scappoose Transportation System Plan Update

Technical Memorandum #5:
Existing Conditions

Prepared by Reah Flisakowski, P.E., and Julie Sosnovske, P.E., DKS Associates

January 8, 2014

This memorandum provides a summary of the existing transportation conditions within the City of Scappoose urban growth boundary (UGB), including areas added in the 2011 amendment. This information is intended for the Transportation System Plan (TSP) update and answers the following questions:

- What makes Scappoose unique?
- Where do people want to go?
- How do people get there?
- Where do people come from?
- What factors determine how people travel?
- What transportation infrastructure is available?
- How is the transportation system managed?
- What travel conditions do people face?

A list of TSP acronyms and a list of tables and figures with page numbers are provided at the end of the memorandum.

What Makes Scappoose Unique?

The City of Scappoose is located approximately 30 miles north of Portland on Highway 30 along the Columbia River, as shown in Figure 1. Scappoose maintains a small town feel but is still conveniently close for an easy trip into Oregon's biggest metropolitan area. The city is within a half-hour drive to Portland and an hour-and-a-half drive to the Oregon Coast. The city limits are located approximately one mile west of the Multnomah Channel of the Columbia River.

Scappoose is bordered by the Multnomah Channel on the east side and abutted by farms and rural forests on its other borders. The city lies in Columbia County and just over the West Hills from Washington County, a major employment center for the Portland metropolitan region. This setting, with its relatively short commutes to downtown Portland and the Silicon Forest of Washington County, has proved attractive to new residents as the population has grown from 4,976 in the 2000 U.S. Census to 6,592 in 2010.[1] The City of Scappoose continues to be an attractive location to visit and live.

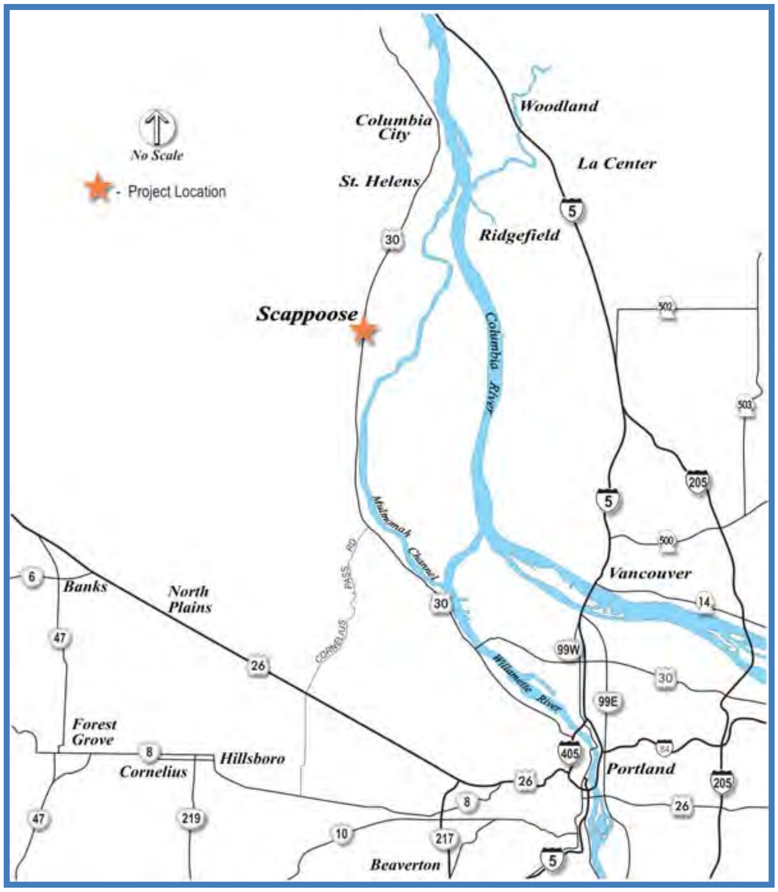


Figure 1: Scappoose Vicinity Map

Where Do People Want to Go?

The planning efforts for this Transportation System Plan (TSP) update focus on ways to enhance the City of Scappoose as a whole. City planners identified key intersections that will be evaluated as part of this TSP. These 21 intersections are shown in Figure 2, as well as the major roadways and intersections that were reviewed for motor vehicle, pedestrian, and freight activity.

[1] American Fact Finder Website, accessed April 13, 2013.

Planning for a transportation system that meets the city's needs requires an understanding of key travel destinations throughout the area—locations that create demand for travel because they are where people go to work, to school, or to take care of business or other daily needs. Destinations may also be attractions that draw travelers from around the region. These key destinations can be thought of as activity generators, or trip attractors.

The most common categories of activity generators in or near Scappoose are (examples are listed with each category):

- Recreational (trails, Multnomah Channel, Cinema, city parks, Scappoose RV Park)
- Schools (Scappoose High School, Scappoose Middle School, Grant Watts Elementary, Petersen Elementary)
- Places of employment (business and industrial locations)
- Shopping (grocery stores, restaurants)
- Public transportation (bus stops, park and ride)
- Tourist Locations (Watts House Pioneer Museum)
- Aviation (Scappoose Industrial Airpark, Chinook Ultralight Airport)

All of these activity generator types represent important starting and ending points for travel in Scappoose, and they provide a basis for assessing important travel routes.

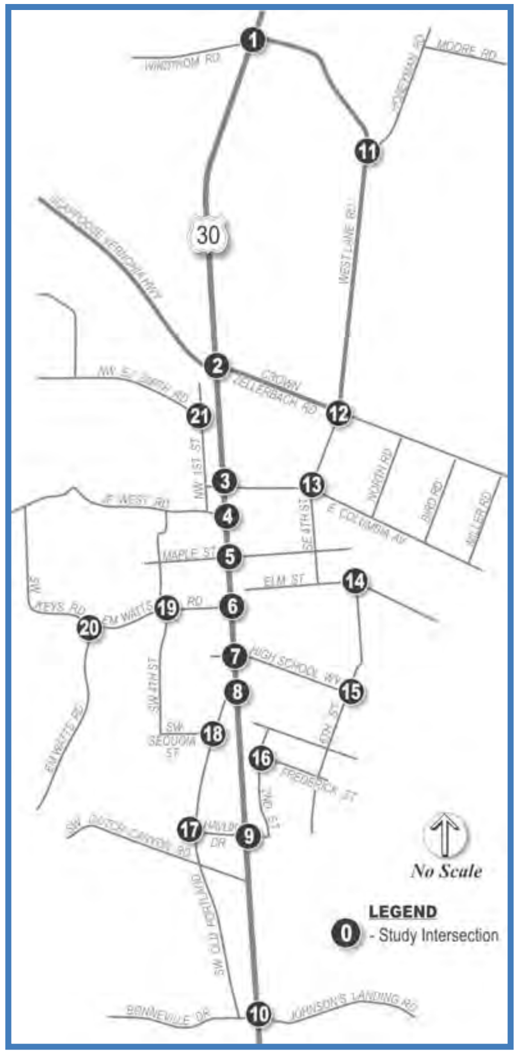


Figure 2: Study Intersections

How Do People Get There?

Planning for an effective transportation system also means understanding how Scappoose residents, workers, and students choose to travel to and from destinations—by foot, bicycle, public transportation, motor vehicle, or other mode. Understanding mode choice means assessing existing travel patterns and activity levels and looking at the underlying factors particular to Scappoose that inform mode choice.

The Commute to Work

Travel occurs for many reasons and includes school, shopping, and recreation. The trip type that people most often associate with traffic problems is their work trip, which typically occurs in peak traffic conditions. In Scappoose, 80 percent of working residents commute to work by driving alone (single occupant motor vehicle or SOV), 14 percent carpool to work, and one percent walk to work. Public transportation (<1 percent) and bicycling (<1 percent) are not common modes for the journey to work, and 4 percent to 5 percent work at home.

Table 1 compares Scappoose residents' commute to work to that of residents of Columbia County and Oregon statewide. Compared to the statewide average, the proportions of Scappoose residents driving alone and carpooling to work were both slightly higher, and the percentage commuting by transit, biking and walking is lower. Overall, the percentage for Scappoose and Columbia County is similar, although more Scappoose residents carpool than Columbia County residents.

Table 1: Commute-to-Work Mode Choice Percentage

	Residents in		
Transportation Mode	Scappoose	Columbia Co.	Oregon
Motor Vehicle – Single Occupant	80%	84%	72%
Motor vehicle - Carpool	14%	6%	11%
Walked	1%	3%	4%
Biked/Other	<1%	3%	3%
Public Transportation	<1%	1%	4%
Worked from Home	5%	3%	6%

Source: 2007-2011 American Community Survey

While data on commute-to-work mode choice is needed to understand major travel patterns, it is important not to confuse this with overall levels of activity for different travel modes. Work trips for Scappoose residents cover long distances in many cases, with over 80 percent of work trip destinations outside of Columbia County. Non-motor vehicle modes tend to be more likely for shorter non-work trips to and from other activity generators like schools, recreation, and shopping.

Existing Activity Levels

Pedestrian, bicycle, and motor vehicle activity at study intersections throughout Scappoose was reviewed for the p.m. peak period (4:00 p.m. to 6:00 p.m.) on a typical weekday in April, 2013.[2] Pedestrian and bicycle activity for the 21 study intersections during the p.m. peak hour is shown in Figure 3. The counts were taken during the school year and when the weather was not a deterrent for pedestrians and bicycles. However, in summer months, activity levels are generally higher due to pleasant weather enticing residents to venture outside. Although weekend activity levels were not measured, because of the potential for more shopping and recreational travel on weekends, pedestrian and bicycle activity would be expected to be higher.

[2] Based on count data collected at study intersections on Tuesday, April 9, 2013.

Pedestrian Volumes

Of all the study intersections reviewed, the West Lane Road/Columbia Avenue intersection had the most pedestrian activity (over 50 crossings during the evening peak hour). Several locations on Highway 30 also had notably higher levels of pedestrian crossing activity than the other study intersections; three locations—High School Way, Columbia Avenue, and Maple Street—each had 20 to 30 pedestrians during the p.m. peak hour. These higher activity locations are near commercial centers in town. Adequate sidewalks and crossings are generally provided near US 30; however, many of the side streets (e.g., Columbia Avenue and Maple Street) have missing or poor quality pedestrian facilities.

The intersection of 6th Street and High School Way also had notably high pedestrian volumes (19 during the p.m. peak hour). This intersection links Scappoose High School with adjacent neighborhoods. There are some sidewalks on the high school property, but the surrounding neighborhoods typically do not have sidewalks available. A modest number of pedestrians were observed at several other intersections in Scappoose.

Pedestrians Crossing Railroad Track near US 30

No pedestrians were observed at three of the intersections (all located at the edge of the urban growth boundary where there is very little commercial or residential development) during the p.m. peak hour.

Bicycle Volumes

During the weekday p.m. peak period, bicycle volumes are low (four bikes or less per intersection during the p.m. peak hour) in Scappoose. The intersections that had the highest bicycle volumes were at Old Portland Road/Sequoia Street, with a total of four bicycles during the p.m. peak hour, and at these three intersections—US 30/Old Portland Road/Bonneville, West Lane/Crown Zellerbach, and Eggleston Lane/E.M. Watts Road—where three bicyclists were observed during the p.m. peak hour. The majority of the study intersections had either one bicyclist or no bicycle activity during the p.m. peak hour.

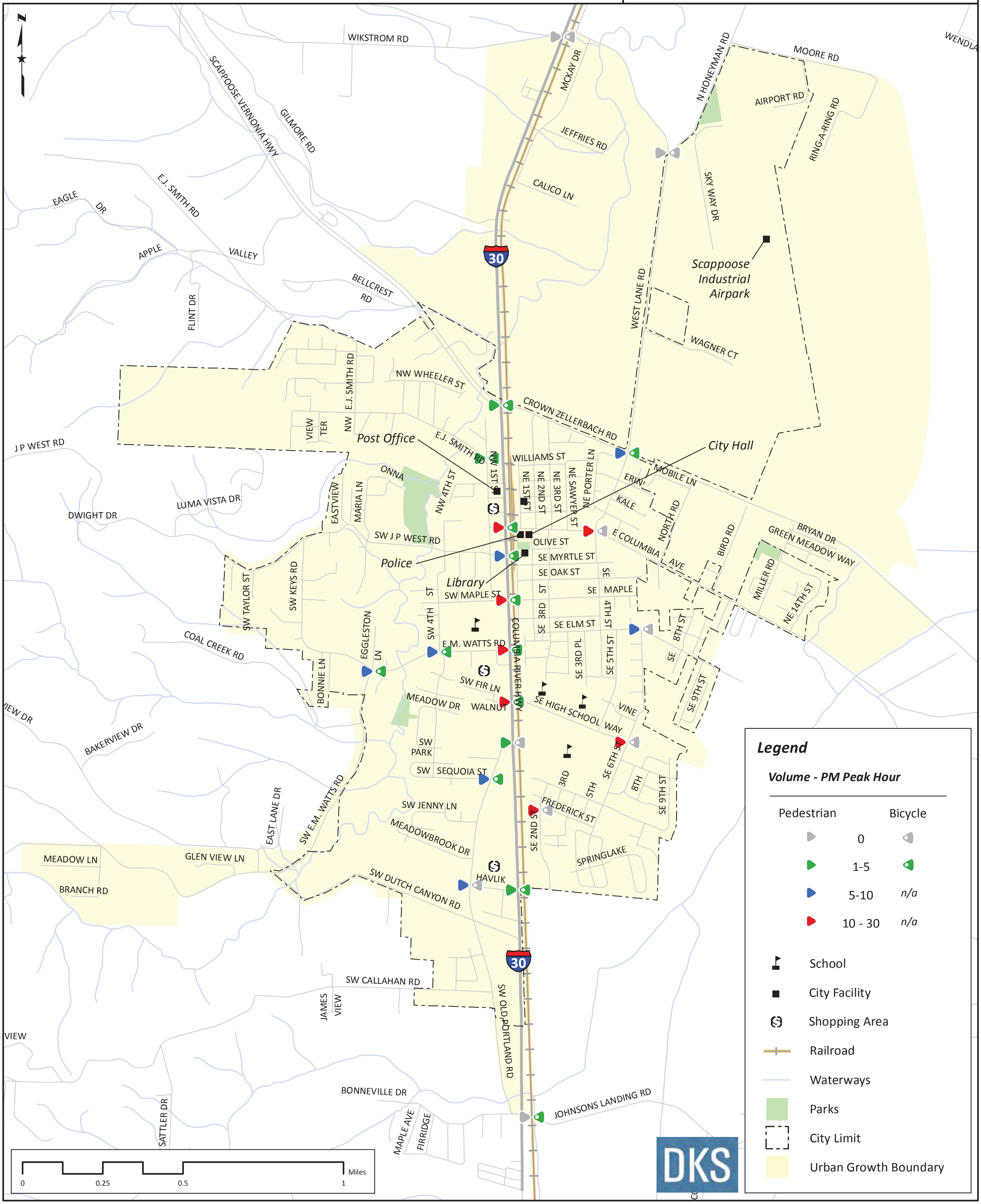
Bicycle use tends to vary seasonally, as warmer, dryer weather and longer daylight hours make it a more attractive travel mode, so it is expected that bicycle volumes would be higher in the summer months. Bicycle activity is shown at the study intersections for the p.m. peak hour in Figure 3.

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

Existing Pedestrian/Bicycle Activity Levels

FIGURE 03



Motor Vehicle Volumes

Figure 4 shows historical growth on Highway US 30 over the past six years (measured at two locations (north of E.M. Watts Road and north of north city limits). Average daily traffic (ADT) volumes have remained relatively constant north of the city limits (at approximately 25,000 vehicles daily) and declined somewhat in the middle of town (27,000 to 32,000 vehicles daily). Traffic volumes peaked in 2007, with the subsequent declining traffic volumes likely associated with the economic downturn starting in 2008.[3]

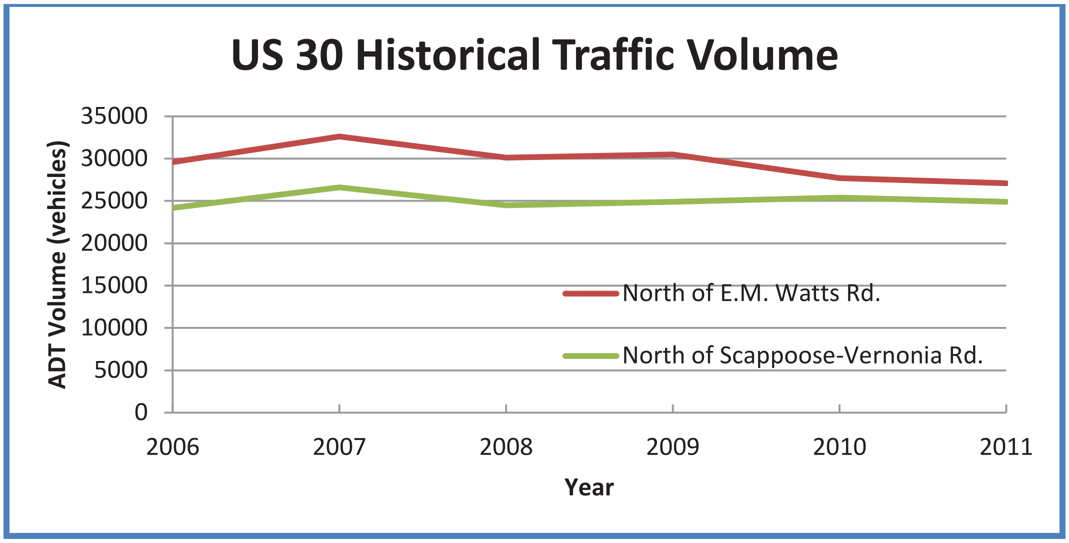


Figure 4: Historical Traffic Volumes on US 30

Figure 5 shows the volumes on US 30 for a typical weekday.[4] While traffic peaks during both the morning and evening peak periods, the evening peak is higher overall (total of both directions). This is typical in most communities due to more shopping and other trips that occur simultaneously with the evening peak commute traffic.

Review of traffic count data showed that weekday traffic volumes were highest for roadways in Scappoose between 4:45 p.m. and 5:45 p.m. Motor vehicle activity varies somewhat depending on time of year. Warmer weather brings an influx of visitors to Columbia County destinations and the Oregon Coast via US 30. Because of these important seasonal variations, traffic count data was adjusted to represent the 30th highest annual hour (30 HV). The Oregon Department of Transportation (ODOT) uses the analysis from the 30th highest annual hour as a basis for its design recommendations.

[3] ODOT Traffic Volume Tables, http://cms.oregon.gov/odot/td/tdata/pages/tsm/tvt.aspx
[4] Data collected by ODOT, May 5, 2010.

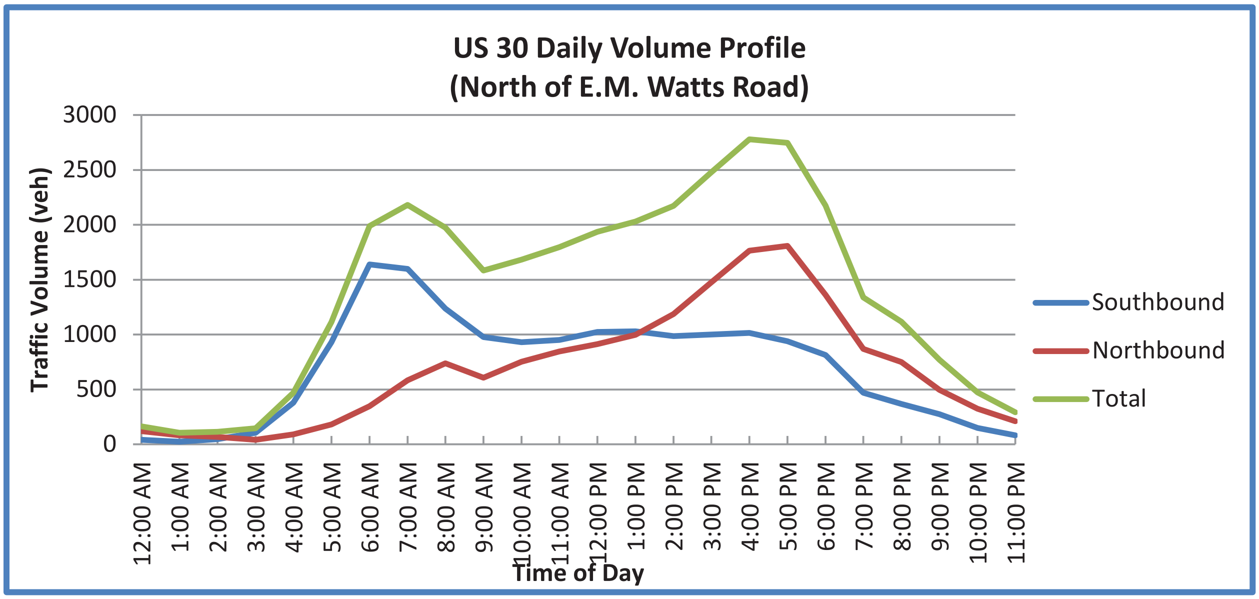


Figure 5: Hourly Traffic Volume Profile on US 30

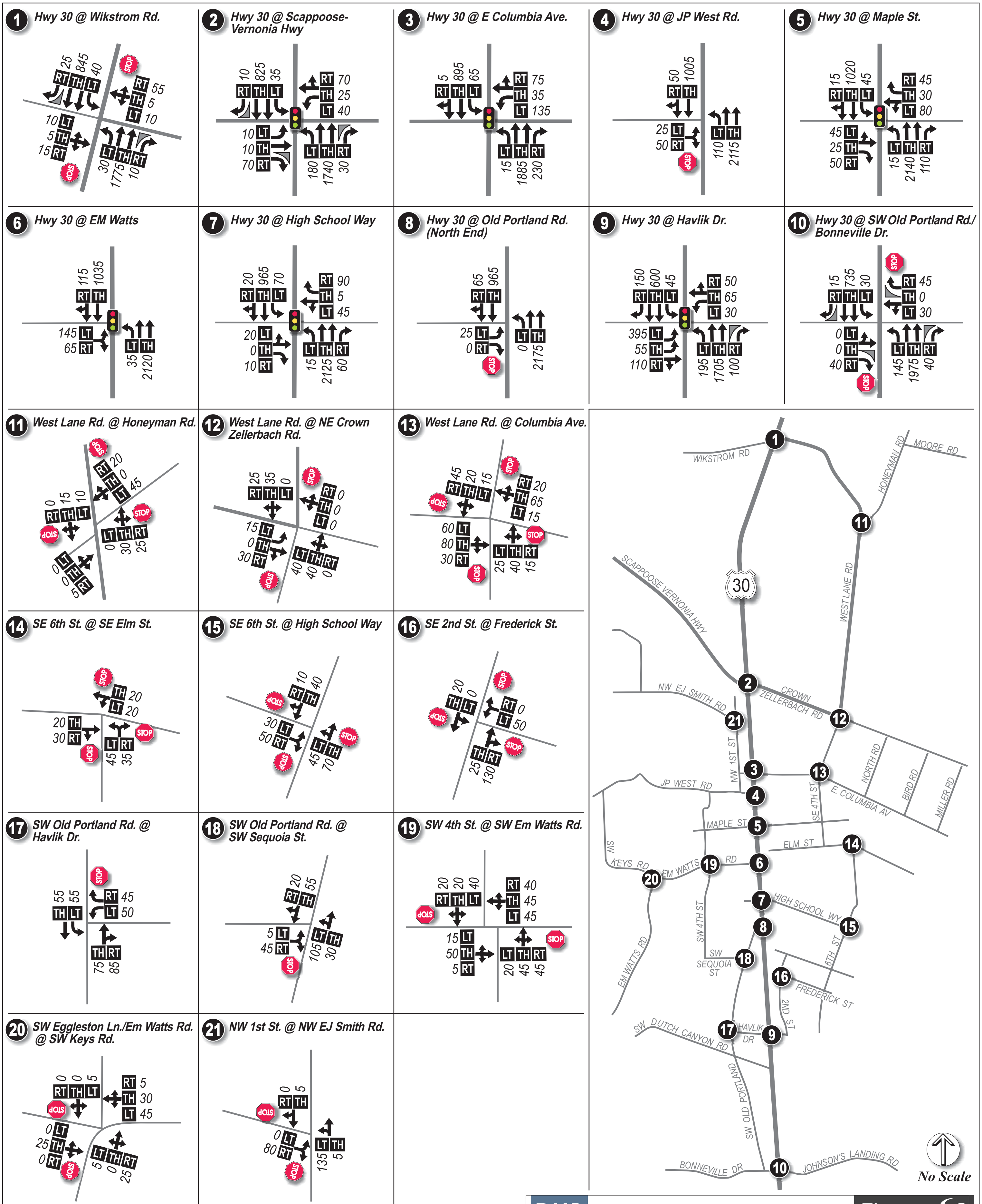
Intersection traffic count data was collected in Scappoose in the month of April and required adjustment in order to represent peak seasonal conditions using methodology from the ODOT Analysis Procedures Manual.[5] Adjustments were made based on data available for similar facilities in Oregon. The 30th highest annual hour and average weekday traffic volumes developed for the study intersections are provided in Figure 6a and 6b, respectively.

Generally, traffic volumes during the p.m. peak hour on Highway 30 are higher in the central part of Scappoose, near Maple Street and E.M. Watts Road, and through the downtown area. During the a.m. peak hour volumes along US 30 are higher in the southbound direction and, during the p.m. peak hour, higher in the northbound direction, suggesting that much of the volume is commuter traffic to and from the Portland metro area.

- **Peak Seasonal Volumes:** The collected count data was factored upward to replicate the conditions when traffic volumes are typically highest (summer). A seasonal factor was established using the Seasonal Trend Method (averaging "commuter" and "summer" trends) for intersections on US 30 and a "commuter" trend for those on local Scappoose streets. Peak seasonal motor vehicle volumes are highest on US 30 between Maple Street and E.M. Watts Road, generally ranging between 2,100 and 2,250 vehicles in the peak direction (northbound) and between 1,000 and 1,150 vehicles in the opposite direction (southbound) during the evening peak hour. The total volume of motor vehicles traveling through intersections off US 30 during the evening peak hour is generally less than 400 vehicles during the peak season.

[5] ODOT Analysis Procedures Manual, April, 2006. The Appendix contains additional information on the seasonal factoring methodology. To obtain traffic volumes that would reflect the 30th highest design hour, a factor of 1.15 was applied to the existing traffic volumes on US 30 and a factor of 1.05 was applied on local Scappoose streets. To obtain traffic volumes that would reflect the average evening peak hour, a factor of 1.0 was applied to the existing traffic volumes on US 30 and a factor of 0.95 was applied on local Scappoose streets.

- **Average Weekday Volumes:** The collected count data was factored to replicate average weekday traffic volumes for the year (typically in the spring or fall). Using the commuter/summer trend for intersections on US 30 and a commuter trend for those on local Scappoose streets, average weekday peak factors were established. During an average weekday, there are approximately 450-500 fewer vehicles traveling through intersections on US 30 intersections between Maple Street and E.M. Watts Road compared to the peak season. At most intersections reviewed off US 30, volumes generally decrease less than 40 vehicles on an average weekday compared to the peak season.



LEGEND

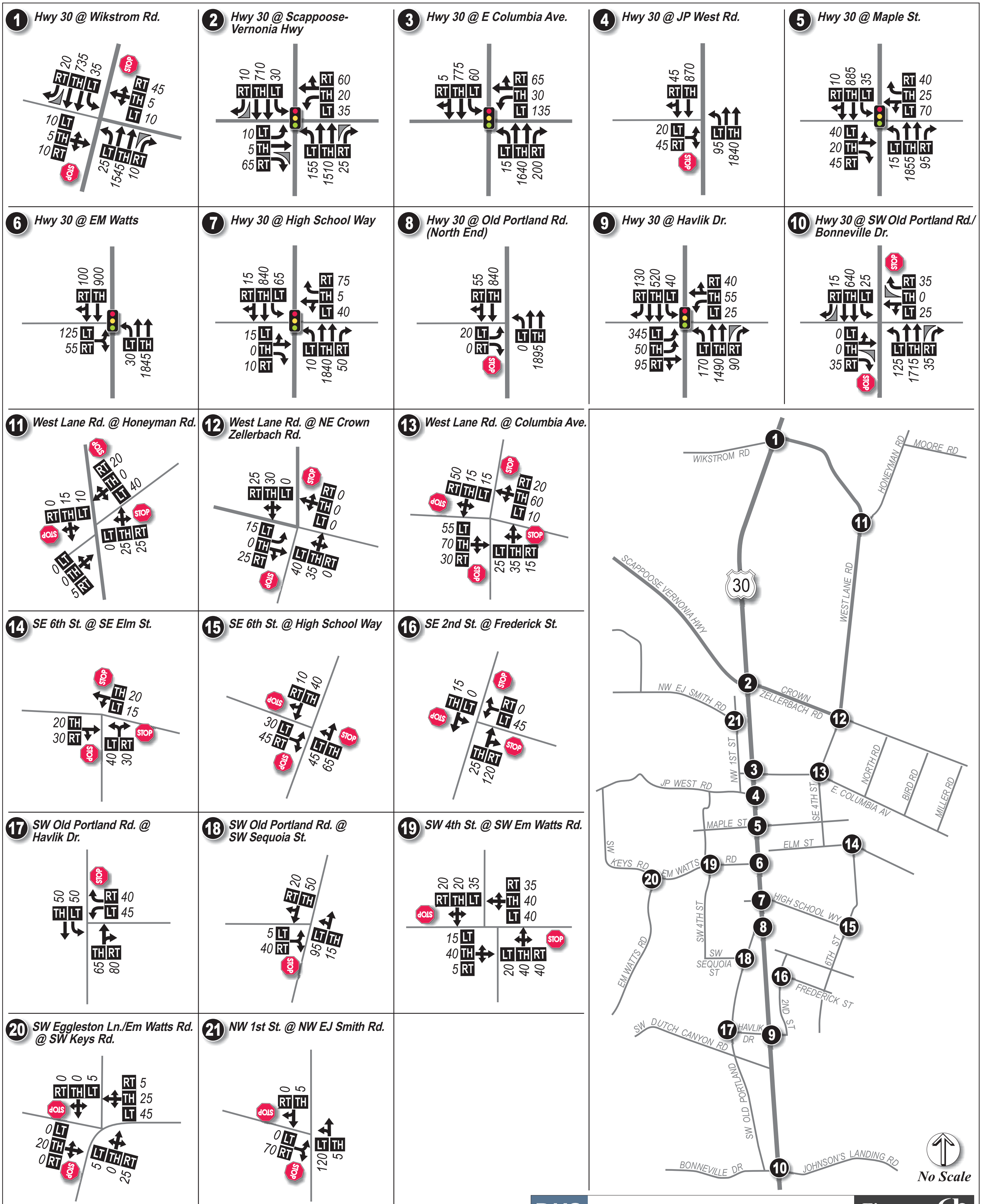
- 0 - Study Intersection
- Stop Sign
- 000 - PM Peak Hour Traffic Volumes
- Traffic Signal
- Lane Configuration
- LT TH RT (Left•Thru•Right) - Volume Turn Movement

DKS

Figure 6a

2013 EXISTING (30 HV) PM PEAK HOUR TRAFFIC VOLUMES

*Represents the 30th Highest Hour Volume of the Year



LEGEND

- 0 - Study Intersection
- Traffic Signal
- STOP - Stop Sign
- ← - Lane Configuration
- 000 - PM Peak Hour Traffic Volumes
- LT TH RT - Volume Turn Movement (Left•Thru•Right)

DKS

Figure **6b**

2013 EXISTING (Average) PM PEAK HOUR TRAFFIC VOLUMES

*Represents Average PM Peak Hour Volume

What Factors Determine How People Get There?

The choice of how to get to a destination involves a variety of factors, such as the available modes and individual habits. When considering how a trip will be taken—by motor vehicle, walking, bicycle, or transit—the factors affecting choice are typically ease and convenience of travel, travel cost, and travel time. These factors in turn depend on the particular destination, barriers to travel, and demographic characteristics such as age and income.

Where are you going?

Scappoose residents make many types of trips—to work, school, shopping, and recreation. The type of trip strongly influences the mode of transportation they choose. If the trip destination is a park or an elementary school, then it is more likely one will walk or bike because these destinations are often in one's neighborhood. Conversely, if the trip destination is work or shopping, a motor vehicle is probably more convenient.

Where do you work and how long does it take you to get there?

Scappoose residents who work outside of Scappoose are more likely to commute by motor vehicle than by walking or bicycling due to the relatively long trip distance. Table 2 shows the commute lengths Scappoose residents experience compared to county and statewide figures. The U.S. Census data confirms that a significantly higher percentage of workers in Scappoose have moderate commutes (10 to 24 miles) than typical Oregon workers since many Scappoose residents work in Portland and Washington County. This underlines the importance of vehicular travel—by SOV, carpool, or transit—to Scappoose residents.

Table 2: Commute Distance to Work

Average Commute Length	Residents in Scappoose	Residents in Columbia Co.	Residents in Oregon
Less than 10 miles	21%	26%	59%
10 to 24 miles	57%	36%	22%
25 to 50 miles	12%	26%	7%
50 miles or more	10%	12%	12%

Source: www.onthemap.ces.census.gov, retrieved 05/15/13. 2010 Census data.

Census data also reveals the commute destinations of Scappoose workers. As shown in Table 3, a majority (81%) commute to jobs outside of Columbia County, with over three-quarters of workers traveling south to the Portland metropolitan area and some beyond to Washington County, Clackamas County, Salem, and other parts of Oregon. Four percent of Scappoose residents commute to various cities in Washington State.

Table 3: Commute to Work

Scappoose Residents Who Work	Percentage of Scappoose Workers	Distance from Scappoose
In Columbia County	**19%**	**-**
Outside Columbia County	**81%**	
Portland	41%	15+ miles
Washington County	19%	20+ miles
Other Oregon	17%	30+ miles
Washington State	4%	25+ miles

Source: http://lehd.ces.census.gov/ retrieved 05/15/13. 2010 Census data.

As noted in Table 3, most Scappoose residents work outside Scappoose (over 2,500), while almost 1,300 employees working in Scappoose live elsewhere. Only about 280 people both live and work in Scappoose (see Figure 7).

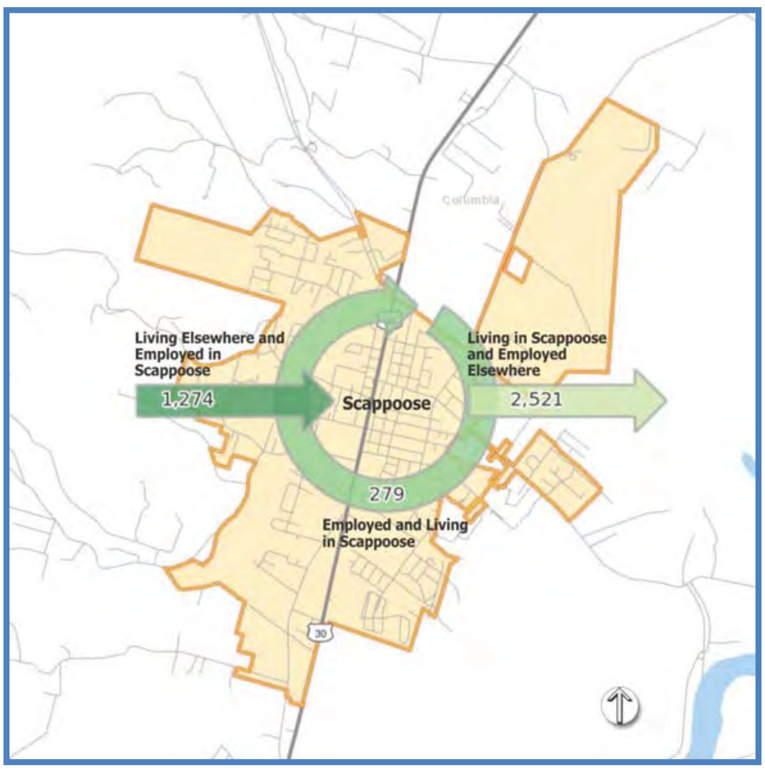


Figure 7: Scappoose Related Employment Trends

Are there Barriers to Travel?

The topography and physical features such as waterways and hills or mountains may provide obstacles to choosing different modes of travel and may also limit development potential in certain areas. Such features typically deter walking and bicycling.

Figure 8 shows the topography and other physical constraints in and around Scappoose. The city is relatively flat with hills to the west and lower elevations closer to the Columbia River on the east. There are a number of wetlands identified east of Scappoose within the UGB. Riparian zones are the interface between land and a river or stream. There are two significant riparian zones within the UGB, one in the northeast area north of Crown Zellerbach Road and east of US 30 and one along Scappoose Creek east of E.M. Watts Road.

The primary travel barriers in Scappoose include:

- US 30 is a high speed, high traffic volume arterial with a limited number of crossing opportunities.
- The Portland & Western Railroad (PNWR) operates a rail line that runs through Scappoose parallel to US 30, about 50 feet east of the highway. Trains can cause delays of several minutes, restricting access between the east and west sides of Scappoose.
- Steep grades rise on the western edge of the UGB, with a substantial elevation gain west of Scappoose. Canyons (deep drainage ways) also prevent north-south connectivity.
- Scappoose Creek, west of US 30, offers limited crossing opportunities.
- Existing land uses, such as the gravel pit and airport in the northeast part of town limit connectivity opportunities.
- Private property west of Old Portland Road between Sequoia Street and Jenny Lane limits north-south connectivity.

The availability of sidewalks, curb ramps for ADA access, crosswalks, bicycle lanes, and shared use paths increase the comfort and access of walking and biking. A lack of these facilities, particularly on high volume or high speed roadways, discourages people from using non-motorized modes of transportation.

Gaps in Sidewalks on Collector Roadway

Age and Income

Demographic characteristics such as age and income typically play a role in determining how one gets to a destination. Vehicle ownership has a strong impact on mode choice. Because residents with lower incomes are less likely to own one or more vehicles, they often account for more trips via walking, biking, and public transportation. Age is also a key factor, as the youngest residents cannot drive and the oldest residents are less likely to drive.

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 08

Transportation Physical Constraints

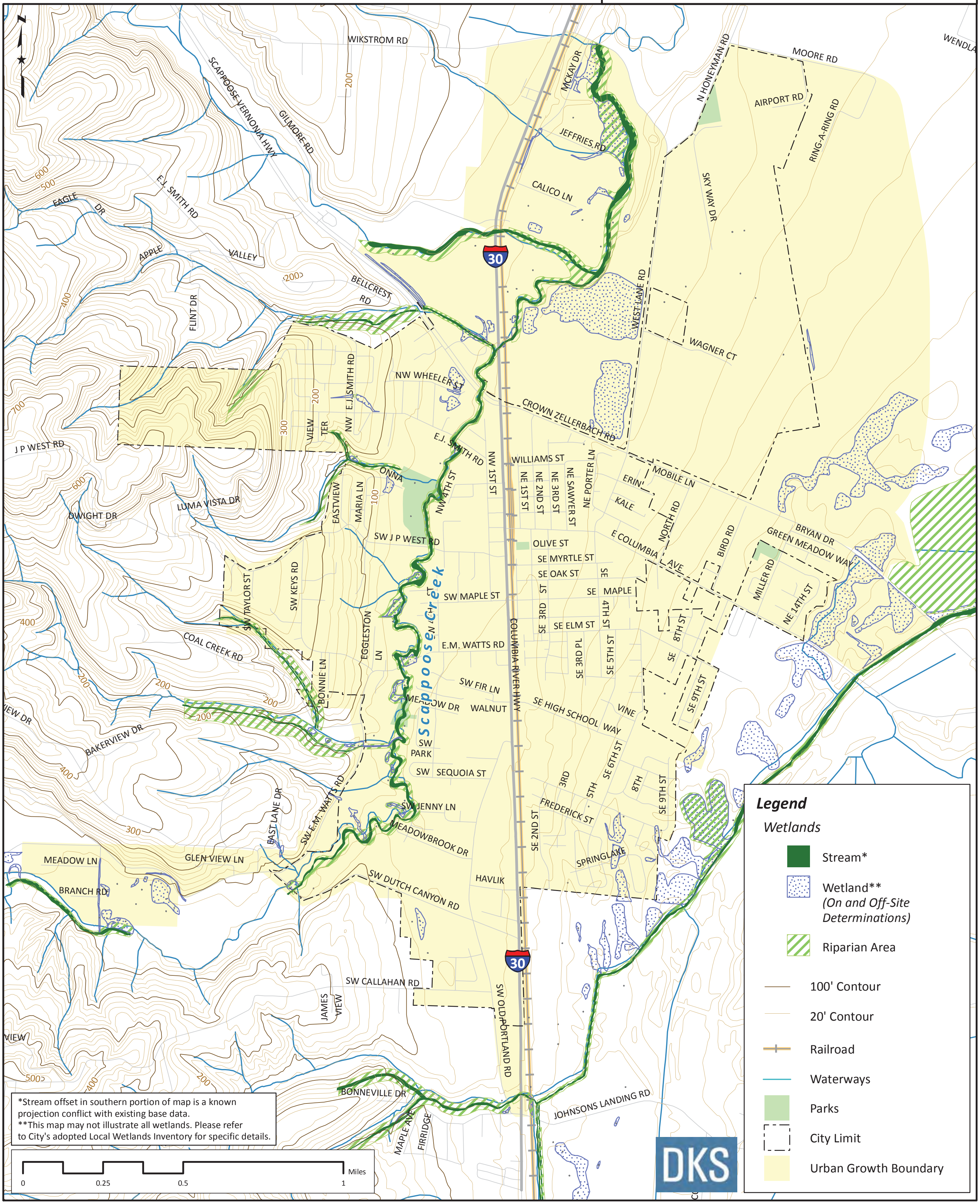


Table 4 shows that Scappoose has a slightly higher proportion of school-age children than Columbia County or the State of Oregon; 22 percent of the population is under 15 years old according to the 2010 U.S. Census. Conversely, Scappoose has a slightly lower proportion of people who are retirement age or older than in the county or state.

Table 4: Scappoose Residents Age Comparison

Age	Scappoose	Residents in Columbia Co.	Oregon
Under 5 years old	7%	6%	6%
5-14 years old	15%	13%	13%
15-64 years old	65%	67%	67%
65 years old and over	13%	14%	14%
Median age	**38**	**41**	**38**

Source: 2010 US Census

Household income can be a major determinant of travel mode as well. Table 5 shows the household income distribution in Scappoose, Columbia County, and the State of Oregon. There is a slightly lower percentage of Scappoose households earning less than $50,000 a year and a higher percentage of Scappoose households earning more than $50,000, compared to the State of Oregon. Median household income in Scappoose is significantly higher than in the county and state, which often indicates higher levels of vehicle ownership and use.

Table 5: Scappoose Residents Household Income Comparison

Income	Scappoose	Residents in Columbia Co.	Oregon
Under $25,000	19%	36%	24%
$25,000-$49,999	22%	27%	26%
$50,000-$74,999	20%	15%	19%
$75,000-$149,999	35%	18%	24%
$150,000 and over	4%	4%	7%
Median Household Income	**$61,000**	**$36,000**	**$50,000**

Source: 2007-2011 American Community Survey

What Transportation Infrastructure Is Available?

Scappoose residents rely on the city's existing transportation infrastructure to travel to work, school, recreation, and other destinations every day. The infrastructure includes sidewalks, off-street paths, bike lanes, roadways, and transit.

Pedestrian and Bicycle Facilities

People who choose to walk or bike to their destination in Scappoose may use sidewalks, shared use paths, bike lanes, or shoulders. Pedestrian and bicycle facilities also include crosswalks and curb ramps.

Sidewalks on a newer Scappoose street

Sidewalks and Crosswalks

Sidewalks on arterial and collector streets are generally available near commercial areas and in newer neighborhoods but generally are not available in older sections of town, as shown in Figure 9.

Scappoose has a variety of pedestrian facilities throughout the city:

- Sidewalks are provided in newer commercial and residential areas. These areas usually abut older areas that do not have sidewalks, leaving gaps in the pedestrian network. All newer sidewalks have Americans with Disability Act (ADA)-compliant curb ramps at intersections and at driveways.
- The majority of crosswalks throughout the city are located at intersections. The crosswalks generally provide ADA-compliant curb ramps and are in acceptable condition at improved intersections; some crosswalk locations throughout the city need new striping. Some unimproved intersections have marked crosswalks that connect to unpaved shoulders.

Typical older Scappoose street
with gaps in the pedestrian system

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 09

Existing Pedestrian Facilities/Amenities

Legend

Existing Facilities

- Sidewalk
- Crosswalk*
- Curb Ramp*
- Partial Curb Ramp*
- No Curb Ramp*
- School
- City Facility
- Shopping Area
- Railroad
- Waterways
- Parks
- City Limit
- Urban Growth Boundary

*study intersections only

- In Scappoose, pedestrian access to transit stops is mixed. While there might be good sidewalk access in the immediate vicinity of the transit stop, very few locations have an extended sidewalk network of more than a few blocks. Good pedestrian access to transit, including the availability of sidewalks or trails, improves the overall level of service provided by the transit system by allowing transit users to safely and comfortably arrive at transit stops and increasing the likelihood individuals will choose transit as a travel mode.
- Curb extensions on the west side of US 30 at Columbia Avenue enhance pedestrian visibility and shorten the distance pedestrians must travel to cross the intersection. Curb extensions often help slow traffic as well by narrowing the travel way.

The ODOT standard for sidewalk width is six feet, with a minimum width of five feet acceptable on local streets. Scappoose requires a sidewalk width of six feet on most street types. The unobstructed travel way for pedestrians on a sidewalk should be clear of utility poles, sign posts, fire hydrants, vegetation, and other street furnishings.

Roadway shoulders, such as those found on many older streets in Scappoose, often serve as pedestrian routes in rural Oregon communities. On roadways with low traffic volumes (i.e., less than 3,000 vehicles per day) roadway shoulders are not ideal but are often used for pedestrian travel and are better than roadways with adjacent ditches or no shoulder at all. These roadways should have shoulders wide enough, usually six feet or greater, so they can be used by both pedestrians and bicyclists.

Roadway shoulder wide enough for pedestrians

- A number of streets in Scappoose provide examples of roadways with shoulders wide enough to accommodate pedestrians (five feet or wider). These include SE 6th Street, SE 4th Street, Elm Street, Rose Lane, and others.

As indicated in Figure 9, Scappoose has installed crosswalks and ADA curb ramps at many intersections in areas with high pedestrian use. However, in several areas outside of the downtown core the curb ramp network is incomplete.

Shared Use Paths

Shared use paths (also referred to as multi-use paths) are used by a variety of non-motorized users, including pedestrians, bicyclists, skateboarders, and runners. Public shared use paths are typically paved (asphalt or concrete) but may also consist of an unpaved smooth surface as long as it meets ADA standards. Shared use paths are usually wider than an average sidewalk (i.e., 10 to 14 feet rather than 5 to 6 feet).

The Crown Zellerbach Trail, which runs adjacent to the Scappoose-Vernonia Highway west of US 30, becomes an on-street bike lane between US 30 and West Lane Road and returns to an off-street path just east of West Lane Road (see Figure 10). There is a parking lot approximately two miles west of US 30 on Scappoose-Vernonia Highway, which provides access to the trail. The trail is mostly flat along an old converted rail line. The terrain is slightly downhill from the trailhead at the parking lot to the Multnomah Channel at its terminus. Parts of the trail surface are paved and other parts are hard-packed gravel. The trail ranges in width from about five feet to about 12 feet. A large portion of the trail is located outside city limits.

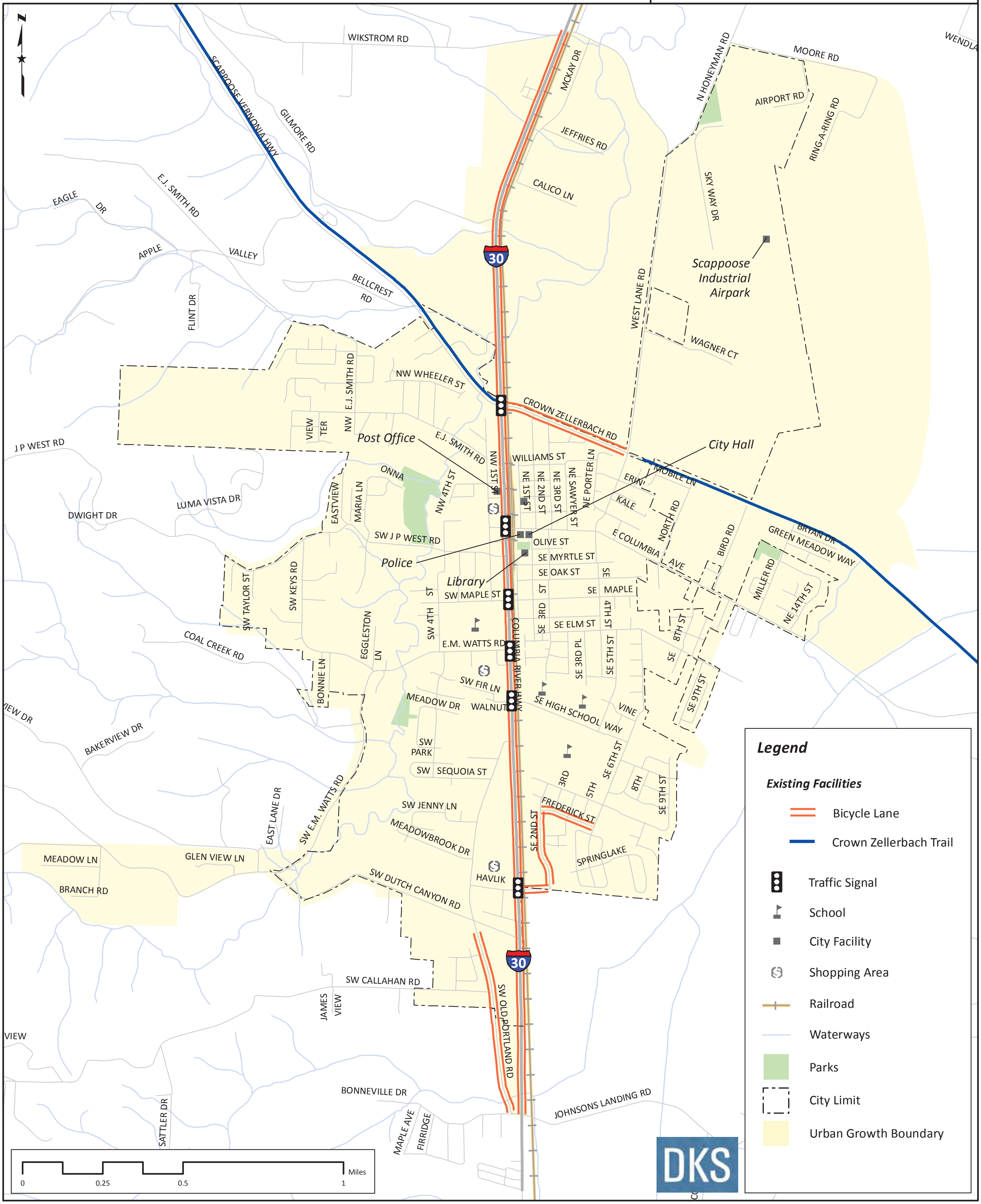

Crown Zellerbach Trailhead, just west of US 30

Currently, there are no other designated shared use paths in Scappoose.

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 10
Existing Bicycle Facilities



Bike Lanes


Bike lanes on Crown Zellerbach Road

Bike lanes are portions of the roadway that are designed specifically for bicycle travel with a striped lane and stenciling indicating bicycle use. ODOT standard width for a bike lane is six feet.[6] The minimum width of a bicycle lane against a curb or adjacent to on-street parking is five feet. A bicycle lane as narrow as four feet is allowed but only in very constrained conditions. Scappoose street standards require six-foot bike lanes with specific bikeway locations to be determined by the city. Existing bicycle facilities in Scappoose are shown in Figure 10 and described below:

- **US 30:** six-foot (minimum) bike lanes are present in both directions along US 30 through Scappoose. These existing facilities provide bicycle access to many of the attractions in town, including shopping and services. Bicyclists traveling longer distances (i.e., between Portland and the Oregon Coast) may also use these facilities.
- **Old Portland Road:** six-foot bike lanes (or greater) are provided in both directions from just south of Dutch Canyon Road to Bonneville Drive.
- **Crown Zellerbach Road:** five-foot bike lanes are present in both directions between US 30 and West Road. These bike lanes connect between the two sections of the Crown Zellerbach Trail to both the east and the west.
- **Havlik Drive/SE 2nd Street:** five-foot bike lanes are present in both directions between US 30 and Frederick Street.
- **Frederick Street:** six-foot bike lanes are present in both directions between SE 2nd Street and SE 6th Street.

Shared Roadway/Signed Shared Roadway

Shared roadways occur where bicycles and motor vehicles must use the same travel lane. The most appropriate roadways for this type of shared use are those with low speeds (25 m.p.h. or less) and low traffic volumes (3,000 vehicles per day or fewer).[7] Signed shared roadways are where facilities are designated and signage indicates the bicycle routes; these facilities provide continuity to other bicycle facilities (e.g., bicycle lanes) or are designated as a preferred route through a community. Such a route typically has signs indicating its shared street status and often has shared roadway pavement markings.

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[6] ODOT, "*Oregon Bicycle & Pedestrian Plan*" (latest edition.)

[7] The Federal Highway Administration's *Manual on Uniform Traffic Control Devices* guidance states that shared lane markings should not be placed on roadways with a speed limit above 35 m.p.h. http://mutcd.fhwa.dot.gov/

Common practice is to sign the route with standard MUTCD (Manual on Uniform Traffic Control Devices) green bicycle route signs with directional arrows. Shared roadways can also be signed with innovative signing that highlights a special touring route, such as the Oregon Coast Bike Route, or provides directional information such as bicycling minutes or distance, such as "Library, 3 minutes, ½ mile." There are currently no signed shared roadways in Scappoose. All local streets in Scappoose are relatively low speed, low volume roadways that could be classified as shared roadways.

Shoulder Bikeway

Shoulder bikeways are paved roadways with striped shoulders wide enough for bicycle travel. ODOT recommends a six-foot paved shoulder and a four-foot minimum width in constrained areas to provide adequate passage for bicyclists. Roadways with shoulders less than four feet are considered shared roadways. Sometimes shoulder bikeways are signed to alert motorists to expect bicycle travel along the roadway.

Most streets in Scappoose do not provide striping, either with a center line or a fog line. Therefore, there are no streets with adequate striped shoulders to accommodate bikes. However, many streets in Scappoose are relatively wide and can easily accommodate bikes; however, these should be grouped in the previous category as "shared roadway."

Bike Parking

Where one stores one's bike upon reaching the destination is an important part of bicycle infrastructure. If there is nowhere safe and secure to park the bike, one is less likely to ride even if the trip distance and the roadway facilities are right for cycling. Bicycle parking can be broadly defined as either short-term or long-term parking:

- **Short-term parking** is intended to accommodate visitors, customers, messengers, and others expected to depart within two hours; it requires an approved standard rack and appropriate location and placement.
- **Long-term parking** is intended to accommodate employees, students, residents, commuters, and others expected to park more than two hours. This parking should be in a secure location protected from the weather.

Very little bike parking was observed in downtown Scappoose where there is the highest concentration of activity centers and some of the most likely bicycle destinations.

Transit Facilities

Transit service is offered in Scappoose by the Columbia County Rider (CC Rider), a service of Columbia County Transit Division (CCTD). CC Rider provides fixed-route, flex-route, and dial-a-ride services within Columbia County and to adjacent counties.

Five fixed-route transit lines carry passengers to and from various locations within Columbia County and destinations popular among Columbia County residents, such as:

- St. Helens/Scappoose to Hillsboro/Beaverton
- St. Helens/Scappoose to downtown Portland
- Westport/Clatskanie, Rainier, and Longview/Kelso in Washington
- Nehalem Valley
- Columbia Connector: Westport to Portland (Saturday/Sunday only)

Portland St Helens and Way Points
(One of the first modes of bus transportation from Columbia County to the Portland area)

Source: Columbia County Transit Division

These routes run only on weekdays; there are routes south to Portland and north to Westport with limited service on weekends.

The primary transit stop in Scappoose is located at NE 1st Street between Columbia Avenue and Prairie Street, near City Hall. All CC Rider buses that stop in Scappoose use this stop. There is also a park and ride lot at this location.

Columbia County Rider Park & Ride Sign

The flex route runs on an approximate schedule to allow for minor route deviations to assist elderly or disabled passengers as well as any member of general public who may have difficulty getting to a Flex Route bus stop. Riders are asked to arrive at their stop five minutes early. The south flex route has several stops in Scappoose. Transit routes in Scappoose and Columbia County are shown in Figure 11.

Monthly ridership data is available for the Columbia County transit routes. Total ridership data for each route is provided but not separated for specific stops or portions of a route (such as exclusively in Scappoose). The south flex route served approximately 11,000 passengers in the 2011/2012 fiscal year. During the first nine months of the 2012/2013 fiscal year, the south flex route served approximately 9,400 passengers, a seven percent increase over the comparable months of the preceding fiscal year.

Transit fees vary depending on the route and distance traveled. Table 6 lists fares for each boarding as well as for monthly passes. Note that the fares listed do not apply to the Demand Responsive Service (described below).

Table 6: Columbia County Rider Fares

Route	Per Boarding		Monthly Pass	
	General Public	Seniors, Disabled, Students, Children	General Public	Seniors, Disabled, Students, Children
All Zones	$5.00	$4.00	$150	$130
1 Zone	$1.00	$1.00	$75	$60
2 Zones	$2.00	$2.00	$130	$110
Additional Zones	**Add $1 for each zone crossed**			
Flex Route	$2.50	$2.50	$75	$75

Transit Service for People with Disabilities

CC Rider provides demand responsive (dial-a-ride) service for people with disabilities who are unable to use regular fixed-route buses and for people whose origins and/or destinations are not within close proximity (generally three-quarter mile) of fixed-route or flex-route services. This curb-to-curb service, provided by smaller buses equipped with wheelchair lifts, is available Monday through Friday between 6:30 a.m. and 6:30 p.m.

Transit Access and Amenities

Scappoose has one primary transit stop at NE 1st Street/Prairie Street, which is fairly centrally located in town. The stop is accessible from the west using a signalized US 30 pedestrian crossing with curb ramps and a sidewalk on one side of Columbia Avenue. The stop is close to key activity centers, such as City Hall, the library, the Watts House Pioneer Museum, and several restaurants and local businesses. The property is owned by ODOT and continued use of this site is not guaranteed.

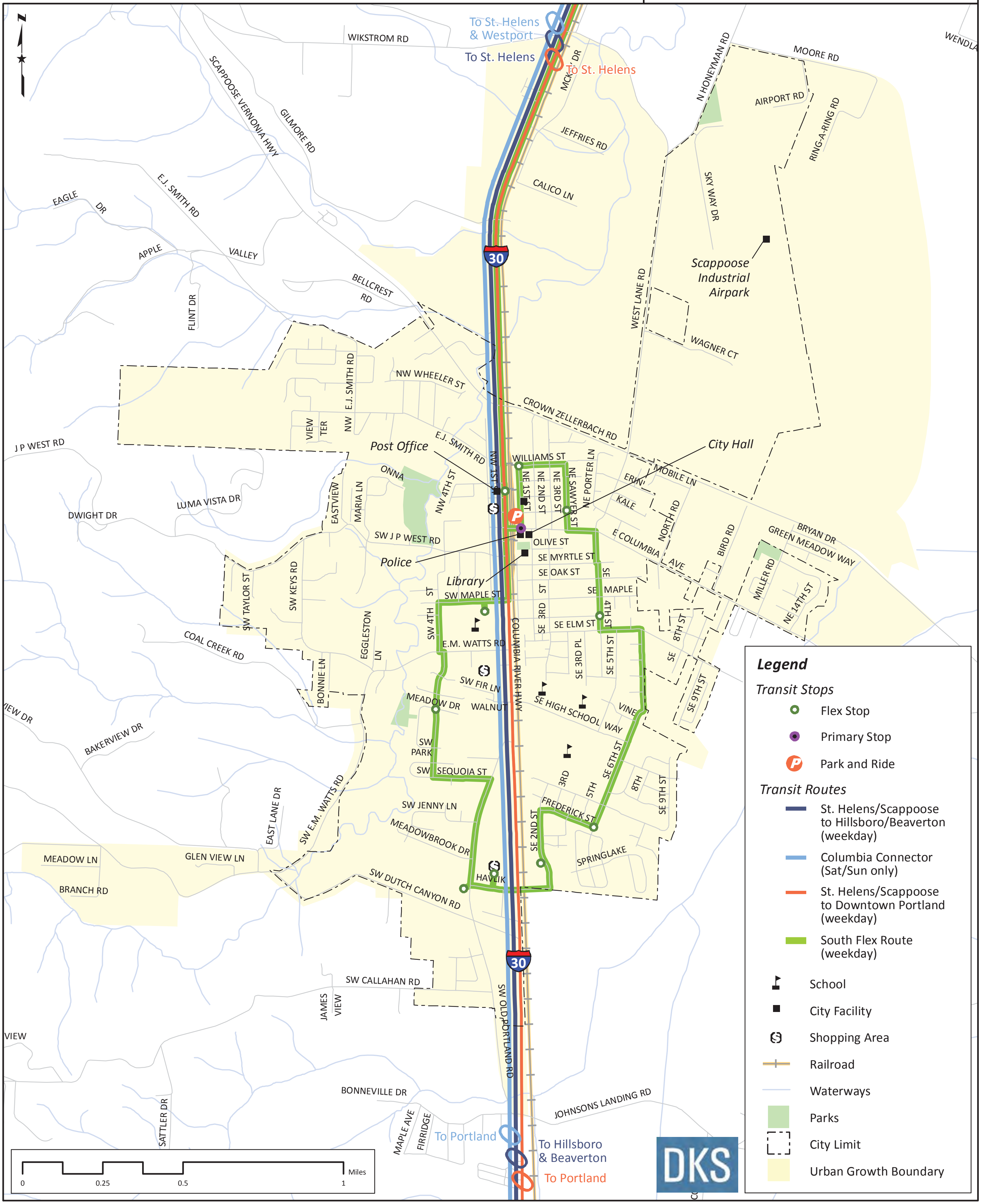
None of the transit stops (primary stop or flex stops) in the city are covered or provide benches but many are sidewalk- and bicycle-accessible. There are signs indicating some of the bus stops in town, but the signage could be improved. Transit users must have prior knowledge of stop locations as the existing signage provides inadequate direction.

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 11

Existing Transit Routes & Stops



Motor Vehicle Facilities

Within the city, roadways are under the jurisdiction of the City of Scappoose, Columbia County, or ODOT, as shown in Figure 12, along with posted speeds. Roadways are organized by functional classification, which provides a hierarchy of intended purposes as shown in Figure 13. Roadways with a higher intended usage generally have a classification and related standards that promote more efficient vehicle movement through the city, while roadways with lower intended usage are classified to provide greater access to local destinations such as businesses or residences.

In Scappoose, US 30 is the only roadway under ODOT jurisdiction and is classified as a Statewide Highway and as a Rural Principal Arterial – Other.[8] It is also part of the National Highway System (NHS), a Freight Route and a Truck Route. The major characteristics of US 30 within Scappoose are listed in Table 7.

Table 7: ODOT Roadway Characteristics

Roadway	ODOT Classification	Cross Section	Bike Lanes	Posted Speed	Sidewalks	Parking
US 30 through Scappoose	Statewide Highway, NHS, Freight Route, Truck Route	4 lanes with Center Turn Lanes (12-16 foot)	5-10 feet	35-55 mph	At least one side within city limits	West side between J.P. West Road and Laurel Street

Columbia County classifies roadways in Scappoose under the jurisdiction of the Columbia County Road Department. These are:

- **Minor Arterial**: Scappoose-Vernonia Highway
- **Major Collectors**: Columbia Avenue, West Lane Road, Dutch Canyon Road, E.M. Watts Road, Keys Road, J.P. West Road, Honeyman Road, and E.J. Smith Road
- **Rural Locals**: Callahan Road, Eastview Drive, Sandberg Road, Wheeler Street, North Road, Bird Road, and Miller Road

All of the Columbia County roads within Scappoose are typically two-lane roads with varying shoulder width. Many of the county roadways do not meet either county or City of Scappoose standards. However, county roads are more likely to have striping (centerline, fog line) than city streets (since many have no striping at all).

The City of Scappoose currently has the following classifications: Arterials, Major Collectors, Minor Collectors, and Local streets. The only arterial in the city is US 30, which easily carries the highest traffic volume in Scappoose.

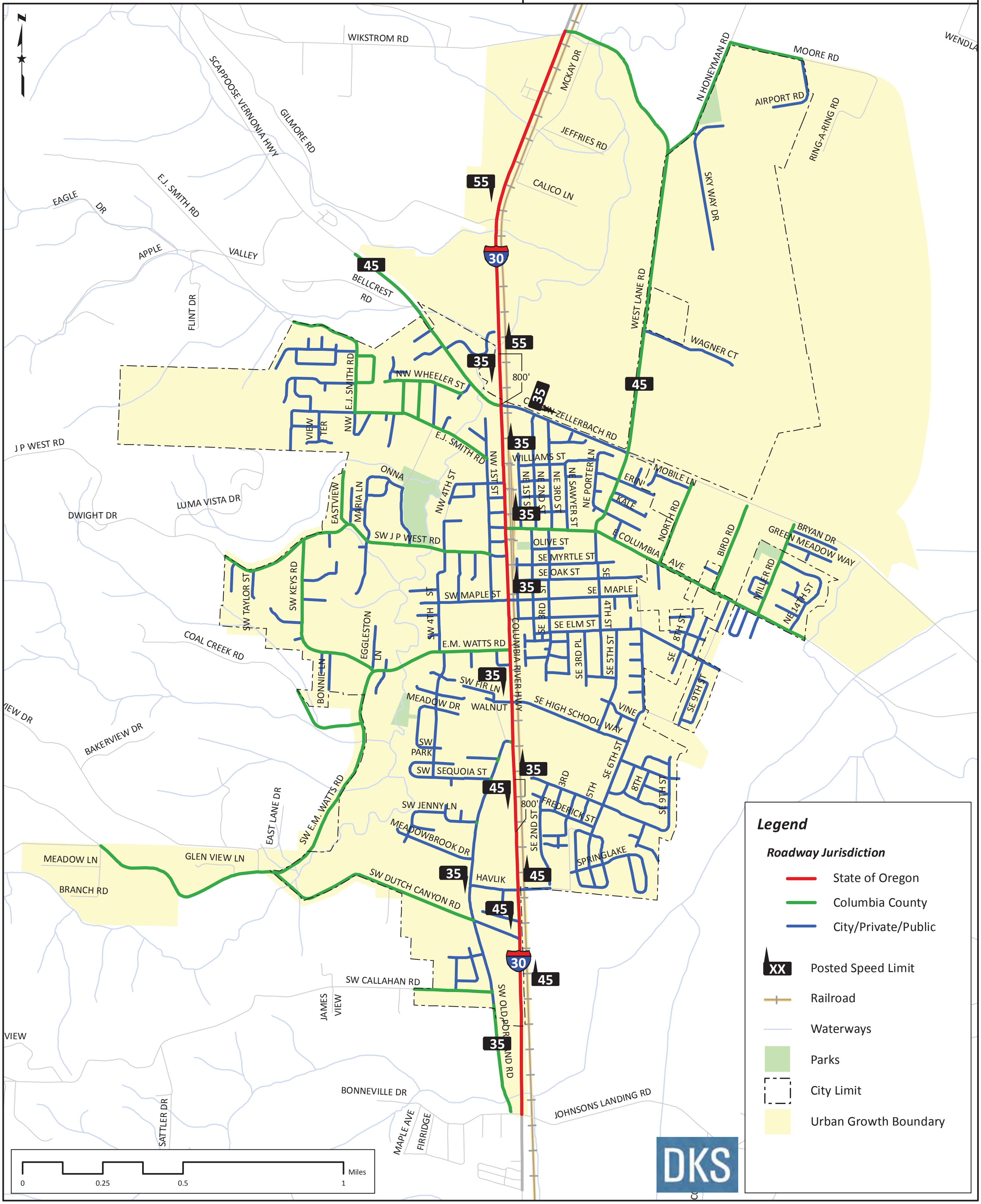
[8] Oregon Highway Plan (OHP), Appendix D, and Oregon Highway Design Manual, 2012, Appendix A.

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 12

Roadway Jurisdiction & Posted Speed Limits

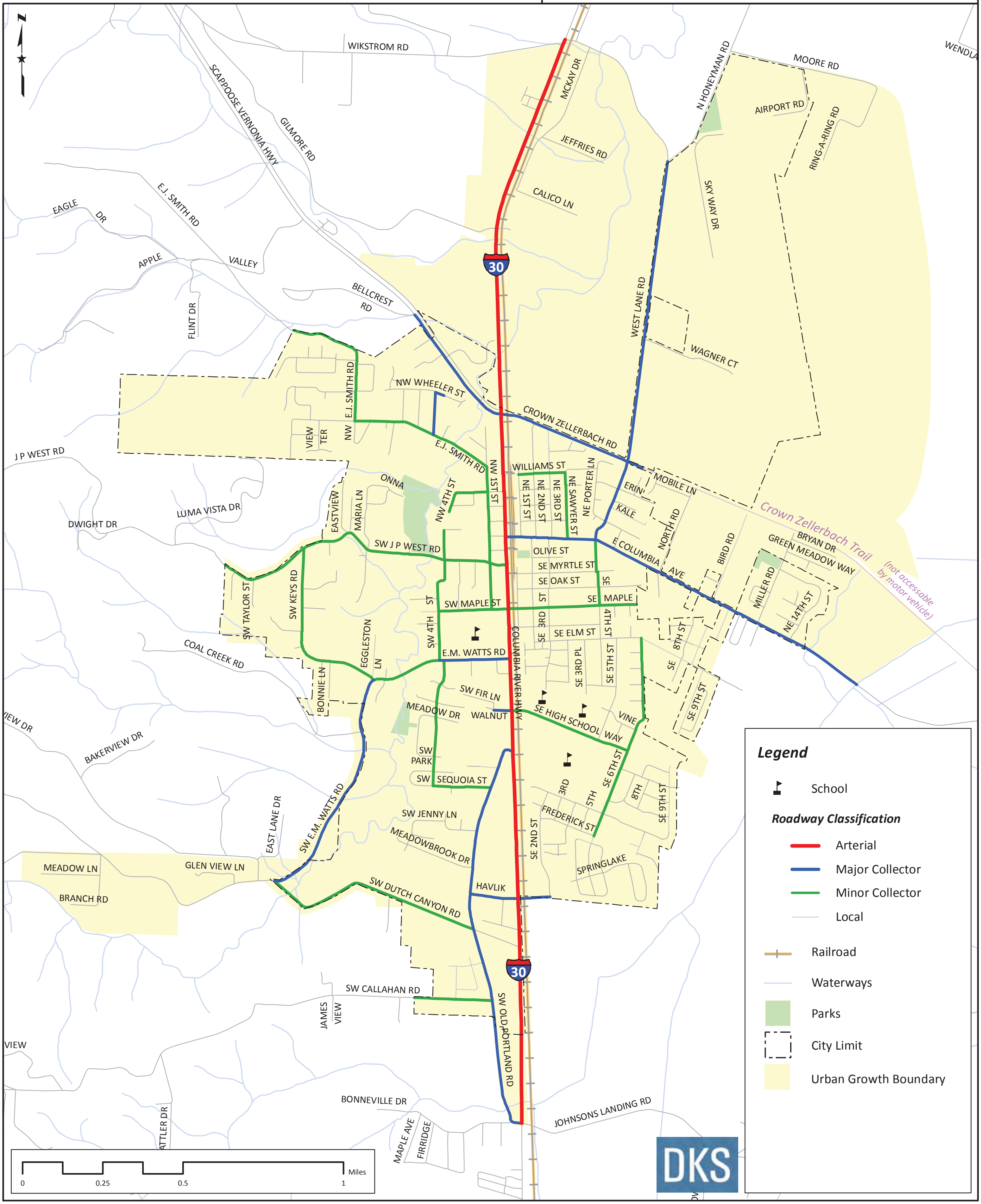


City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 13

Existing Roadway Functional Classification



Arterials generally carry some of the highest volumes in the city and are used by residents to connect to locations both in and out of the city.

Traffic on US 30 during the evening peak

Roadways that connect neighborhoods and major activity generators to arterials are generally classified as collectors. Collectors provide greater accessibility to neighborhoods than arterials and provide moderately efficient through movement for local traffic. The City of Scappoose has two classifications for collectors: Major Collectors and Minor Collectors. E.M. Watts Road and East Columbia Avenue are examples of major collector streets that provide connections between the commercial areas of town and the neighborhoods. Collectors typically have a posted speed of 25 to 35 miles per hour within Scappoose.

Roadways that provide more direct access to residential areas are typically classified as local streets. This classification is typically a low volume street, often lined with residences. Most local city streets are posted at 25 miles per hour.

Downtown Parking

The existing downtown on-street parking supply is shown in Figure 14. On the west side of downtown, parallel parking is provided along the west side of US 30, along the majority of NW 1st Street, and the majority of the cross streets between J.P. West Road and Laurel Street.

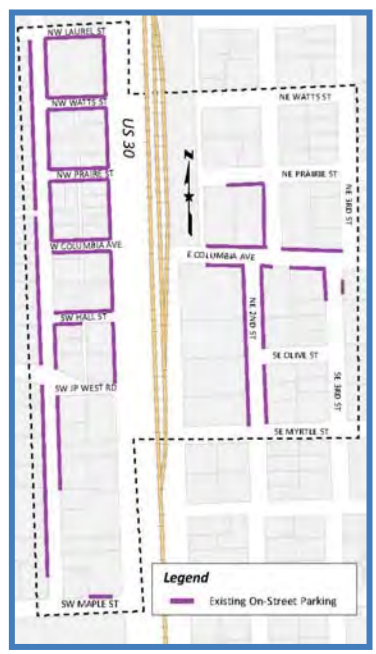


Figure 14: Downtown On-Street Parking

On-street parking in most locations downtown is not restricted to any time limit. A detailed parking survey was not conducted for the downtown area; however, field observations throughout the weekday found on-street parking had a low occupancy with a moderate number of empty spaces.

There are a number of off-street parking lots available as well, generally with access from NW 1st Street or side streets on the west side and from various streets on the east side (1st Street, Columbia Avenue, 2nd Street, etc.). Similar to on-street parking, these parking lots are not restricted to any time limit nor do they charge for parking. Off-street parking was also observed to have a moderate number of empty spaces.

Freight Facilities

ODOT classifies Highway 30 as a freight, truck, and NHS route through Scappoose (see Figure 15). Truck freight movements involve shipments both to and from locations in the city and shipments that pass through the city. Freight volumes on US 30 through the downtown are greater than 200 trucks during the evening peak period (4:00 p.m. to 6:00 p.m.), which account for roughly 3.5 percent of traffic.

The City of Scappoose has prohibited vehicles longer than 30 feet from using NE 2nd Street between NE Williams Street and NE Crown Zellerbach Road.[9] This route had provided a convenient link between heavy industrial uses in the north part of Scappoose to restaurants and services downtown, particularly at lunch time. However, this local residential street was not intended to serve large trucks, which residents find incompatible with the neighborhood character.

Rail Facilities

The PNWR operates a rail line that runs parallel to Highway 30 through Scappoose (see Figure 15). The PNWR is a 520-mile short line freight railroad that interchanges with the Albany & Eastern Railroad, Burlington Northern Santa Fe Railway, Central Oregon & Pacific Railroad, Coos Bay Rail Link, Hampton Railway, Port of Tillamook Bay Railroad, and Union Pacific Railroad. Commodities transported include aggregates, brick and cement, chemicals, construction and demolition debris, food and feed products, forest products, metallic ores and minerals, and steel and scrap.[10]

PNWR reports an average of three train movements per day during the week (Monday through Friday) and two train movements per day on the weekend (Saturday/Sunday). Trains originate and are destined for the Northwest Portland/Vancouver area and serve Scappoose and points west of Scappoose as far as Wauna.

The Federal Railroad Administration designates six classes for rail tracks to set maximum train speeds based on the conditions of the tracks. The tracks within Scappoose are designated as Class 2, which limits train speeds to 25 miles per hour. All trains are required to provide audible warning at all crossings in Scappoose, with no restrictions or exceptions.

There are seven public railroad crossings in Scappoose located at West Lane Road, Crown Zellerbach Road, Columbia Avenue, Maple Street, High School Way, Havlik Drive, and Johnsons Landing Road. The mainline railroad crossings in Scappoose are all at grade and controlled with crossing gates and flashers. There is a second railroad crossing at Columbia Avenue serving a short secondary track east of the mainline that is controlled with yield signs. These rail crossings are shown in Figure 15. All railroad crossings are located adjacent to an intersection on US 30, which can create vehicle operation issues due to the short lane lengths and setback stop bars.

[9] Scappoose Municipal Code, Sections 11.04.040-11.04.045.
[10] Genesee & Wyoming, Inc. website, Portland & Western Railroad Overview, accessed 05/10/13.

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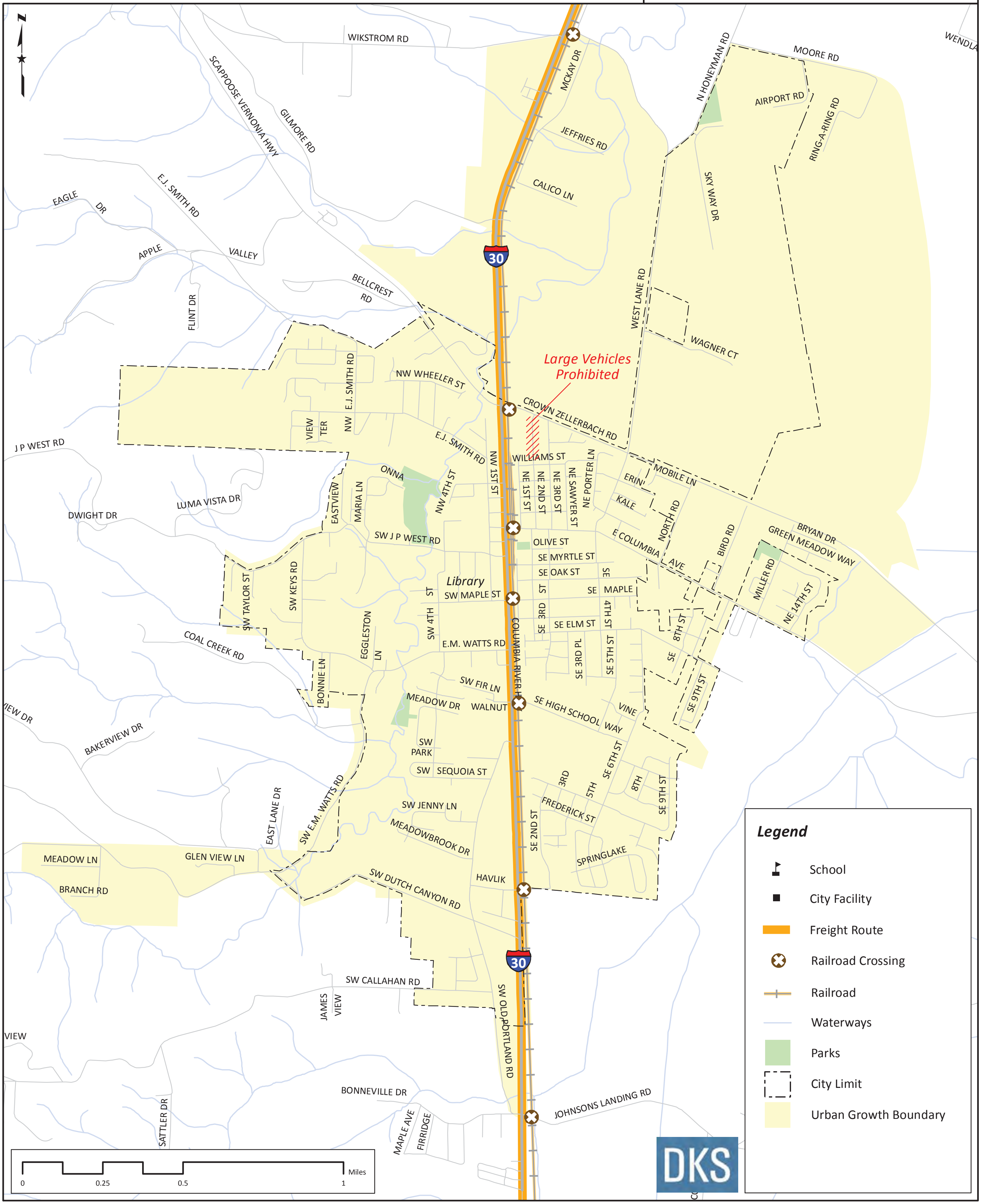
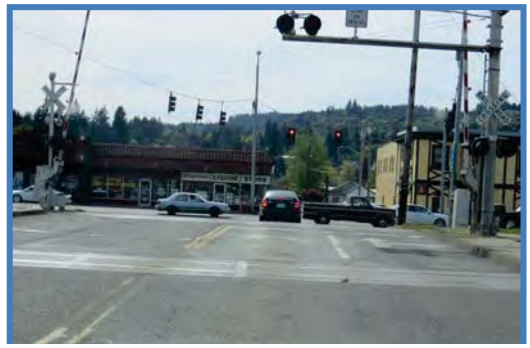
TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 15

Freight Route




Railroad Crossing on Columbia Avenue near US 30

School buses are required to open their doors prior to crossing railroad tracks. This results in additional delay at the High School Way/US 30 intersection during the morning and afternoon peak hours when there is a high volume of school buses.

There are no passenger rail services near the study area. The nearest Amtrak station, which serves passengers, is located in Portland.

Air Facilities

Within Scappoose there is one airport (Scappoose Industrial Airpark) that is owned by the Port of St. Helens (a local municipal corporation). The airpark, located in northeast Scappoose, has a paved and lighted runway that is 5,100 feet in length and 100 feet in width. Aircraft operations (takeoffs or landings) average about 210 per day or over 75,000 annually. The airpark is available for public use and offers general flight instruction and airplane rental and maintenance services, as well as private helicopter and recreational hot-air ballooning services. Approximately 57 aircraft, mostly single-engine airplanes, are based on the field, and there are 120 T-hangars and paved tie-downs. The airpark provides “reliever” capabilities to Hillsboro and Portland International airports and is also the home of several airport related business, including:

- TransWestern Aviation, Inc. (the airport’s fixed base operator)
- Oregon Aero
- Composites Unlimited
- Overall Aircraft Services (aka Evergreen Aviation)
- Northwest Antique Airplane Club
- Sherpa Aircraft
- Sport Copter
- Columbia Aviation

The Chinook Ultralight Airpark is a private ultralight flightpark located east of Scappoose.

The nearest airport with scheduled passenger service is the Portland International Airport, located approximately 16 nautical miles southeast of Scappoose. This airport is owned by the Port of Portland, has three runways (7,000 feet, 8,000 feet, and 11,000 feet), and serves over 14 million passengers and 210,000 tons of cargo annually.

Waterway Facilities

The Columbia River is located approximately one mile east of Scappoose and provides many opportunities for recreational activities. Scappoose Marine Park, operated by the Port of St. Helens, is located off Highway 30 in Warren, just north of Scappoose. It provides public access to the Columbia River and includes boat ramps and approximately 86 boat slips among other amenities. No direct access to the Columbia River is provided within Scappoose city limits.

The Multnomah Channel Yacht Club is located southeast of Scappoose on the Multnomah Channel. It is an active club with cruises and events all year round.

Pipeline Facilities

Scappoose is served by Northwest Natural Gas, which has a major natural gas distribution line that parallels US 30. No anticipated changes are expected to this line in the near future.

There are no major water or oil pipelines within Scappoose city limits, nor are there plans to install these in the future.

How is the Transportation System Managed?

Maintaining an acceptable level of performance for Scappoose's transportation infrastructure requires a variety of analytical tools and assessment types. The measures used to monitor the transportation system are described below.

Safety

The safety of the roadways and intersections in Scappoose were evaluated through collision data as part of the TSP update. The data was reviewed to identify potential patterns for motor vehicle, pedestrian, and bicyclist collisions.

Pedestrian, Bicycle, and Transit Facilities

The facilities of alternative modes to motor vehicle were reviewed as part of this TSP update to identify facility deficits or potential connectivity or access improvement opportunities.

ODOT is piloting a new bicycle measure called Bicycle Level of Traffic Stress (LTS).[11] Roadway segments are classified by LTS based on roadway and intersection traffic characteristics, which can positively or negatively influence a bicyclist's experience. LTS ranges from LTS 1 (a level most children can tolerate) to LTS 4 (a level tolerated only by those characterized as "strong and fearless"). When roadways are categorized as LTS 2, approximately two-thirds of riders would be comfortable. Some of the characteristics evaluated include the following:

- **Positive characteristics (LTS 1 or 2):** Fewer travel lanes, lower traffic speeds, bike lanes, separated paths, traffic signals, presence of medians (for refuge crossing a major roadway facility), etc.

- **Negative characteristics (LTS 3 or 4):** More travel lanes, higher traffic speeds, lack of crosswalks, right turn lanes (vehicles cross bicyclists route), presence of a parking lane, etc.

A segment or intersection is represented by its worst LTS value. According to ODOT, the desirable LTS for an effective bikeway system is 2, while school-area connectivity should use LTS 1 for elementary and no more than LTS 2 for middle/high schools. LTS can be shown graphically, in a map, and can also be summarized in tabular form (e.g. percent of roadway links LTS 2 or higher).

Roadway Jurisdiction

The standards and maintenance responsibilities depend on the roadway's jurisdiction. In Scappoose, roadways are generally under the jurisdiction of the City, Columbia County, or ODOT. There are also private streets and those which are public, but not maintained by the city, county or state. The responsible jurisdiction sets standards for each roadway to maintain its intended functional classification, which varies depending on the design speed, connectivity, and the priority for access to

[11] Bicycle Level of Traffic Stress, Peter Schuytema, MMLOS & LTS Brown Bag Session, April 8, 2013.

fronting properties. Higher speed, regional facilities are used primarily for longer trips, while lower speed local city streets are used primarily to access homes, shops, schools, and jobs.

Mobility Targets

Mobility is an important consideration because it measures how freely vehicle traffic can move toward its intended destination. In general, roadway systems have their highest degree of conflicts and associated congestion at intersections, and so the performance of a system is often defined by how well the intersections function.

There are two methods used to gauge these conditions—one is numeric, one is a letter grade. ODOT uses the numeric volume-to-capacity (v/c) ratio method (see Table 8) as outlined in the 1999 Oregon Highway Plan (OHP), while the City of Scappoose uses both v/c ratio and a letter grade derived from the level of service (LOS) method.

All intersections in Scappoose must operate at or below the adopted standards; if it does not, mitigation would be necessary to approve future growth. The adopted intersection performance targets vary by jurisdiction of the roadways. For Scappoose, the standard for signalized intersections is a v/c ratio less than 0.90 and LOS D; the standard for the side street approach of a stop-controlled intersection is LOS E. For ODOT, the target for US 30 has varying v/c ratios depending on the location of the intersection because of varying posted speeds and roadway functional classifications. The US 30 mobility target ranges from a v/c ratio of 0.80 to 0.95, as shown in Table 9.

Table 8: Mobility Targets by Jurisdiction

Jurisdiction	Performance Method	Mobility Target
ODOT	**Volume-to-capacity (v/c) ratio** is a decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used (i.e., the saturation) at a turn movement, approach leg, or an intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. If the ratio is greater than 1.00, the turn movement, approach leg, or intersection is oversaturated and usually experiences excessive queues and long delays.	The OHP v/c threshold varies by intersection based on classification and speed. See Table 9.
City of Scappoose	**Level of service (LOS):** A "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection.	**Signalized:** LOS D* v/c <= 0.90

Jurisdiction	Performance Method	Mobility Target
	LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity. This condition is typically evident in long queues and delays.	**Unsignalized:** LOS E (minor street approach)
Columbia County		No adopted standard (will be addressed with Columbia County TSP update, currently in process)

***City of Scappoose Public Works Design Standards Chapter 5 (2002)**

Table 9: Mobility Targets for ODOT Intersections

Roadway (Intersection)	Speed Limit Major/Minor (mph)	Mobility Standard (volume-to-capacity ratio)	
		Signalized or all-way stop intersections, or free movements at unsignalized intersections	Stop or yield-controlled movements at unsignalized intersections
US 30/Wikstrom Rd	55/45	0.80	0.90
US 30/Scappoose-Vernonia Highway	35/35	0.85	
US 30/East Columbia Ave	35/25	0.85	
US 30/J.P. West Rd	35/25	0.85	0.95
US 30/Maple St	35/25	0.85	
US 30/E.M. Watts Rd	35/25	0.85	
US 30/High School Wy	35/25	0.85	
US 30/Old Portland Rd (north end)	35/35	0.85	
US 30/Havlik Dr	45/25	0.80	0.95
US 30/Bonneville Dr	45/25	0.80	0.95

Source: 1999 Oregon Highway Plan, OHP Policy 1F Revisions: Adopted December 21, 2011, Table 6.

Intersection Geometrics

Roadways and intersections were assessed as part of this TSP update to identify geometric deficiencies that result in user discomfort and potential safety issues. In general, roadways and intersections should provide a clear and direct path for all modes of travel.

Roadway Connectivity

The roadway network was reviewed as part of this TSP update to identify critical gaps and opportunities for new roadways. It is typically desirable to provide arterial street spacing of about one mile and collector street spacing of about one-half mile.

Access Spacing

Access spacing is a broad set of techniques that balance the need to provide efficient, safe, and timely travel with access to individual destinations. Typically, more driveways and intersections along a roadway result in more conflict points and less efficient operations. Proper implementation of access management techniques promotes reduced congestion and collision rates, less need for additional highway capacity, increased energy conservation, and less air pollution.

ODOT has adopted access spacing standards and the City of Scappoose applies General Access Management Guidelines (see Table 10).[12,13] Separate standards are provided for driveway access and are detailed in the Scappoose Public Works Design Standards.[14]

Table 10: Spacing Standards for Scappoose Streets

Facility	Minimum Spacing between Driveways and/or Streets
ODOT Roadways*	
ODOT Statewide Highway Speeds 30 and 35 (Urban Areas)	500 feet
ODOT Statewide Highway Speeds 40 and 45 (Urban Areas)	800 feet
City of Scappoose Roadways[+]	
City of Scappoose Principal/Major Arterial	500 feet
City of Scappoose Minor Arterial City of Scappoose Major Collector	400 feet 300 feet
City of Scappoose Minor Collector	150 feet
City of Scappoose Local/Cul-de-sac	100

* http://www.oregon.gov/ODOT/HWY/ACCESSMGT/docs/tablesdiv51.pdf

[+] Scappoose Development Code references in Section 17.120.180(J). Public Works Design Standards, section 5.0014.

[12] Oregon Administrative Rules 734-52, Table 4, ODOT Statewide Highway with average annual daily traffic greater than 5,000.
[13] Scappoose Public Works Design Standards, Section 5.0014.
[14] Scappoose Public Works Design Standards, Section 5.0070.

Pavement Management

In 2009, Scappoose contracted with an outside firm to determine the condition of the existing pavement, potential repair methods and the impact of various funding levels on future network pavement conditions. This analysis determined that the average pavement condition index (PCI) was 90 for Collector streets and 74 for Residential streets (scale of 0-100), with an average PCI of 74.[15]

Revenue

The City of Scappoose funds needed improvements to the transportation system from a number of revenue sources, as listed in Table 11. These limited funds are allocated to expenditures including capital projects, maintenance, engineering design, and administration. On average, the city has approximately $166,000 per year to fund capital improvements,[16] which would total approximately $3.6 million through year 2035 if current funding levels were maintained.

Table 11: Scappoose Transportation Funding (Average over 5-year period, 2007-2012)

Funding Sources	Annual (1,000s)
State Gas Tax-Revenue Share	$288
State Gas Tax – 1% Bike and Ped	$3
Surface Transportation Program Funds	$58
Transportation System Development Charges (SDCs)	$117
Interest	$17
Miscellaneous and Fees	$13
Total Revenues	**$496**
Expenditures	**Average (1,000s)**
Personnel Services	$146
Materials and Services	$135
Capital Improvements	**$166**
Debt Service	$58
Transfers	$28
Total Expenditures	**$533**
Net Revenue/(Loss)	**($37)**

Source: City of Scappoose, 2013

[15] Pavement Management Program Budget Options Report, by Capitol Asset & Pavement Services Inc., February 2009.
[16] The City has spent approximately $166,000 per year on capital projects during the last five years.

What Conditions Do Transportation System Users Face?

This section uses the measures discussed previously to evaluate performance of the existing transportation infrastructure.

Collision Evaluation

Collision data from the most recent three years of available data (2009 to 2011) for all roadways in Scappoose were obtained from ODOT and reviewed. Over the past five years, 131 collisions occurred in Scappoose. Figure 16 shows the distribution of crash types in Scappoose for the three-year period.

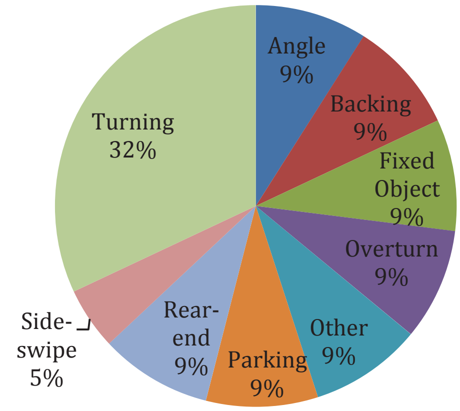


Figure 16: Scappoose Collisions by Type (2009-2011)

The severity of the collisions in Scappoose over the past three years of available data is illustrated in Figure 17. As shown, 90 percent of all crashes involved either minor injuries or were property damage only, indicating an overall low severity of collisions. No fatalities were reported over the three-year period. Of the 131 collisions, none involved pedestrians and four collisions involved a bicyclist; all were turning/angle collisions at different intersections on US 30 that resulted in injuries ranging from minor to major.

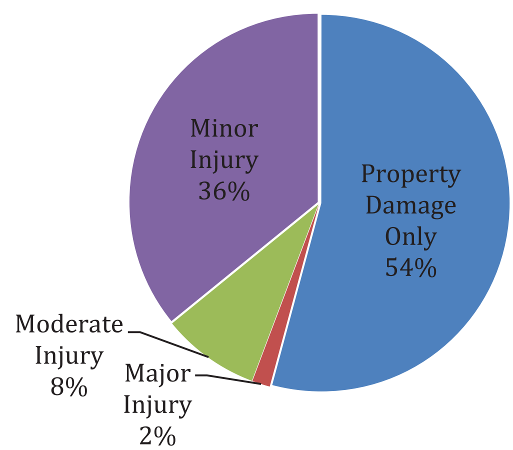


Figure 17: Scappoose Collisions by Severity (2009-2011)

Intersection Collisions

The total number of crashes experienced at an intersection is typically proportional to the number of vehicles entering it. Therefore, a crash rate describing the frequency of crashes per million entering vehicles (MEV) is used to determine if the number of crashes should be considered high. A critical crash rate that allows for a relative comparison among intersections with similar characteristics is also computed for each intersection. The sites that have a higher observed collision rate than the critical crash rate are flagged for further review.

As shown in Table 12, intersection crash rates and critical crash rates were calculated (based on the past three years of available collision data) for each of the 21 study intersections reviewed in Scappoose.

Table 12: Intersection Collision Evaluation (2009-2011)

Study Intersection	PM Peak Hour Total Entering Volume	Collision Rate	Critical Crash Rate
State Route, Signalized Intersections			
US 30/Scappoose-Vernonia Highway	2,621	0.37	0.63
US 30/Columbia Avenue	2,919	0.24	0.62
US 30/Maple Street	3,145	0.53	0.61
US 30/E.M. Watts	3,185	0.37	0.61
US 30/High School Way	2,986	0.26	0.62
US 30/Havlik Drive	**2,983**	**0.72**+	**0.62**
State Route, Unsignalized Intersections			
US 30/Wikstrom Road	2,454	0.00	0.26
US 30/J.P. West	2,927	0.20	0.25
US 30/Old Portland Road (North)	**2,797**	**0.28**+	**0.25**
US 30/Old Portland Road/Bonneville	2,657	0.00	0.25
Non-State Route, Unsignalized Intersections			
West Lane Road/Honeyman	164	0.00	1.12
West Lane Road/Crown Zellerbach	**179**	**1.10**+	**1.07**
Columbia Ave/West Lane Road/SE 4th Street	190	1.03	1.04
SE 6th St/Elm St	164	0.00	1.12
SE 6th St/High School Way	233	0.00	0.94
SE 2nd St/SE Frederick St	218	0.00	0.97
Old Portland Rd/SW Havlik Dr	344	0.00	0.78
Old Portland Rd/Sequoia St	256	0.00	0.90
SW 4th St/E.M. Watts	379	0.26	0.75
Eggleston Ln-E.M. Watts/Keys Rd	132	0.74	1.25
NW 1st St/E.J. Smith Rd	210	0.00	0.99

Source: ODOT Crash Data System

+ Intersection collision rate exceeds 2010 Highway Safety Manual critical crash rate per MEV for non-state route intersections.

Three intersections exceeded their comparative critical crash rates. The intersection of US 30/Havlik Drive is a signalized intersection on the state highway, the intersection of US 30/Old Portland Road is an unsignalized intersection on the state highway and the intersection of West Lane Road/Crown-Zellerbach is an unsignalized intersection on the local street system.

The intersection of US 30/Havlik Drive exceeded its critical crash rate. This intersection is signalized, with 22 reported crashes in the three-year period analyzed; 12 involved minor or moderate injuries and ten caused property damage only. There were nine rear-end crashes and eight turning crashes. A majority were caused by driver error, including following too close, driving too fast, careless driving, etc. At least nine of the crashes occurred prior to the intersection improvements that occurred in 2010.

The US 30/Old Portland Road intersection exceeded its critical crash rate. Of the eight crashes at this intersection, all but one were rear-end crashes; one was a turning crash. Two involved injuries, one including minor, moderate and severe injuries.

In the non-state route category, the West Lane Road/Crown Zellerbach intersection had a collision rate slightly higher than the critical crash rate. West Lane Road/Crown Zellerbach Road is an un-signalized two-way stop controlled intersection with a total of two reported crashes at this site, both resulting in property damage only. One was caused by the driver driving too fast and the other by a broken tractor-trailer connection, which resulted in a jackknife.

Roadway Segment Collisions

How does collision frequency on Highway 30 in Scappoose compare to other state highways in Oregon? Crash rates identifying the number of crashes per million vehicle-miles traveled for Highway 30, as well as statewide average crash rates for similar facilities, were obtained from ODOT's 2011 State Highway Crash Rate Tables.[17] For comparison with statewide averages, Highway 30 was categorized as a non-freeway principal arterial through a rural city. The reported crash rates are shown in Table 13.

Table 13: State Highway Collision Rate Comparison

	Crashes per Million Vehicle Miles		
Facility	**2011**	**2010**	**2009**
Highway 30 through Scappoose (1.95 mi)*	**2.03**	**1.36**	**1.99**
Similar ODOT facilities	1.39	1.28	1.17

Source: ODOT 2011 State Highway Crash Rate Tables
BOLD values indicate crash rate exceeds statewide average
* Highway 30 mile points 19.35 to 20.91

The Highway 30 segment through Scappoose is about two miles long and has greater crash rates than similar ODOT facilities in each of the last three years.

ODOT High Collision Locations

Highway 30 through Scappoose has no sites that rank among the top five or ten percent for state highways in Oregon according to the Safety Priority Index System (SPIS) for 2012.[18]

[17] *2011 State Highway Crash Rate Tables*. Retrieved April 2013 from ODOT website: http://www.oregon.gov/ODOT/TD/TDATA/car/CAR_Publications.shtml
[18] 2012 ODOT Safety Priority Index System (SPIS), provided by ODOT staff. SPIS ranks locations based on a combination of crash frequency, rate, and severity.

Pedestrian Conditions

The existing pedestrian system in Scappoose provides a variety of facilities throughout the city, as previously described. A number of conditions create challenges for pedestrians, including people in wheelchairs and those with hearing or sight limitations. These include:

Lack of sidewalks: There is a lack of sidewalks in many parts of town. This is particularly true in neighborhoods built in an era when constructing sidewalks was not required by local jurisdictions. Major roadways with significant sidewalk gaps are Old Portland Road, Columbia Avenue, and E.M. Watts Road.

Walking to schools and parks: The pedestrian system does not provide optimal connections for children and families traveling between school, parks, and nearby residential neighborhoods since many neighborhoods do not have sidewalk facilities available. Roadways with significant sidewalk gaps near schools include SW 4th Street, Maple Street, SE 3rd Street, SE 3rd Place, SE Vine Street, SE 5th Street and E.M. Watts Road. J.P. West Road has significant sidewalk gaps connecting to Veterans Park. Providing safe pedestrian and bicycle access to schools and parks is important for reducing short distance vehicle trips and encouraging active transportation.

School Pedestrian Crossing

US 30 through center of town: Sidewalks are provided on most of the west side of US 30. However, there are no sidewalks on either side north of Crown Zellerbach Road and south of the city limits to Johnsons Landing Road. Crosswalks are striped at all signalized intersections on US 30, typically spaced about a one-quarter to one-third mile apart. However, there is a gap of over one-half mile between signals at High School Way and Havlik Drive. No unsignalized marked crosswalks are available on US 30 due to the high speed and high traffic volume on US 30. There are curb extensions on US 30 at Columbia Avenue, which can improve the pedestrian experience. However, these curb extensions are relatively modest and are located only on the west side of the street, limiting their utility.

Curb ramps and Chirpers: Many intersections in Scappoose have some form of curb ramp but rarely on every corner or in compliance with current standards. Roadways serving commercial areas such as Columbia Avenue, US 30, and NW 1st Street should provide ADA-accessibile ramps that meet current standards. Traffic signal "chirpers" provide an audible walk indication for the visually impaired that the walk phase is active. No traffic signal chirpers are provided in Scappoose.

Pedestrian roadway crossings: There are pedestrian crosswalks at a number of intersections in Scappoose, particularly near schools and commercial areas where pedestrian activity is the highest. Key marked pedestrian crossings are at intersections along Columbia Avenue between US 30 and West Lane Road, on High School Way near the high school, and E.M. Watts Road near the middle school.

Bicycle Conditions

There are continuous bike lanes on US 30 through Scappoose, which are important on this high speed, high traffic volume facility. However, the bikeway network in Scappoose is incomplete, with limited roadways offering bicycle facilities. The only designated bike lanes in town are on the recently constructed Havlik Drive (east of US 30) and SE 2nd Street between Havlik Drive and Frederick Street, Frederick Street between SE 2nd Street and SE 6th Street, Crown Zellerbach Road between US 30 and West Lane Road, and Old Portland Road between Holland Drive and Bonneville Drive. The majority of the residential areas lack formally designated facilities or routes to connect them to the commercial core.

Bicycle LTS, as described in the previous section, was measured for all roadways and intersections in Scappoose and is summarized in Figure 18. In Scappoose, the majority of roadways are categorized as LTS 2 or better, ODOT's guideline for an effective bikeway system. Routes in Scappoose that are LTS 3 or LTS 4 typically include routes with more than two lanes (both directions) or higher speeds (typically above 35 m.p.h.), including the following:

- US 30 both south and north of town
- West Lane Road
- Dutch Canyon Road
- E.M. Watts Road
- Coal Creek Road
- J.P. West Road
- E.J. Smith Road
- Old Portland Road

Study intersections with crossings which are difficult for bicyclists (LTS 3 or LTS 4) include intersections on higher speed/higher number of travel lane locations where a traffic signal is not provided:

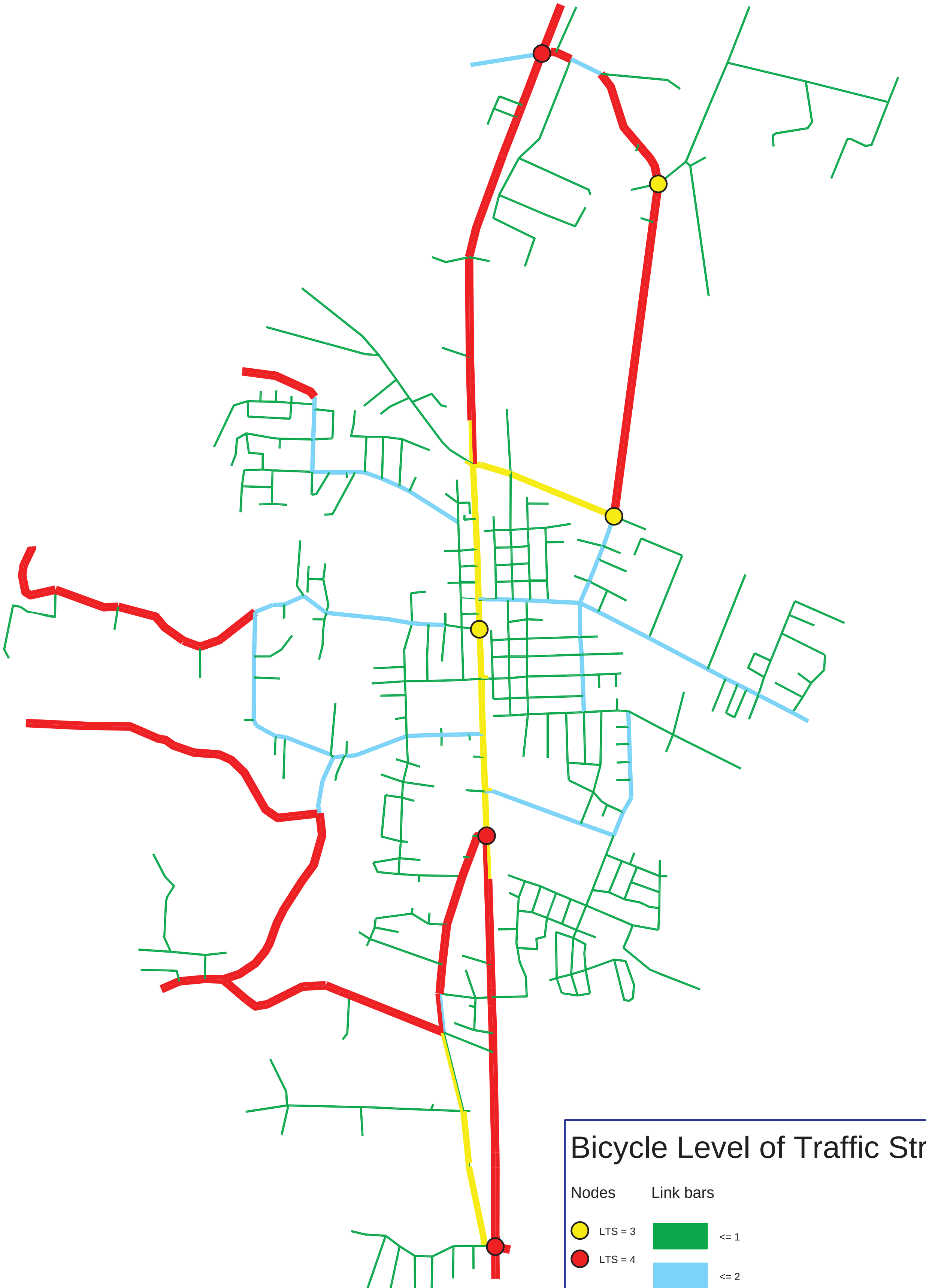
- US 30/Bonneville Road/Johnson's Landing Road
- US 30/Old Portland Road
- US 30/JP West Road
- US 30/West Lane Road
- West Lane Road/Honeyman Road
- West Lane Road/Crown Zellerbach Road

US 30 crossings: One of the most pertinent issues faced by bicyclists (and pedestrians) in Scappoose is safe and comfortable crossings of US 30. There are six signalized crossings of US 30 (most are spaced less than a quarter-mile apart, however further away from the downtown area, they are spaced up to a half-mile apart); however, the high traffic volumes and vehicle speeds typically restrict bicycle crossings to only those six locations.

Transit Conditions

Transit users are typically willing to walk up to about a quarter-mile to access transit. Relatively few Scappoose residents have pedestrian access to either the city's primary stop or the south flex route.

The park and ride at the primary stop provides access to those transit users with a motor vehicle; however, it does not serve those who do not have access to a car. In addition, the park and ride is currently located on ODOT rail property and its status is not secure.



Bicycle Level of Traffic Stress (LTS)

VISUM 13.00 PTV AG		Figure 18
Bike Stress (LTS Level)		Created on: 09.10.2013

Motor Vehicle Conditions

The motor vehicle conditions in Scappoose vary based on the time of year. Operations at the 21 study intersections, shown in Table 14, were evaluated during the p.m. peak hour of the peak seasonal period (30th highest annual hour) and the average weekday as described in the Motor Vehicle Volumes section of this document. While the average weekday v/c and LOS are provided, ODOT bases its targets on the peak seasonal values.

US 30 Evening Peak Queuing

Peak seasonal intersection operations are shown in Table 14. Capacity analysis indicates that the majority of the intersections meet ODOT's mobility standards, with a few exceptions. Five of the intersections do not meet ODOT's mobility standards. The unsignalized intersections on US 30 operate poorly for side street traffic, due to the difficulty in turning left against the high traffic volumes on US 30. Two of the signalized intersections have relatively little delay (LOS B), even though they exceed ODOT's v/c standard, and the US 30/Havlik intersection operates near capacity. While the US 30/Old Portland Road (North) intersection operates at LOS F for the minor street approach, a relatively low volume of traffic uses this approach, so the v/c ratio is relatively good. Vehicles using this approach can access US 30 via a signalized intersection at Havlik Drive; however, that intersection is approximately one-half mile away.

All intersections in Scappoose that are not on Highway 30 operate above mobility targets (LOS A or LOS B), with correspondingly low v/c ratios. Field observations and traffic count data indicate a relatively high volume of traffic traveling southbound on US 30 during the morning peak period and northbound during the evening peak period. However, since the traffic flow is fairly directional, coordinated traffic signal timing facilitates the progression of traffic through town. Therefore, delays are relatively minor and queues typically clear during each signal cycle.

Average weekday intersection operations (shown in Table 14) are generally better than the peak seasonal operations at all intersections reviewed, and two intersections that do not meet ODOT's mobility targets during peak seasonal operations do meet the targets during the average weekday peak (US 30/Maple St. and US 30/E.M. Watts Rd.). The conclusions do not change for any of the remaining intersections (i.e., the same intersections meet/do not meet mobility targets).

Table 14: Intersection Operations (2013 p.m. peak hour)

Intersection	Mobility Standard	Peak Seasonal Volumes (30 HV)		Average Weekday Volumes	
		v/c Ratio	LOS	v/c Ratio	LOS
State Route, Signalized Intersections	**V/C**				
US 30/Scappoose-Vernonia Highway	0.85	0.81	B	0.71	B
US 30/East Columbia Ave	0.85	0.83	B	0.72	B
US 30/Maple St	0.85	**0.91**	**B**	0.78	B
US 30/E.M. Watts Rd	0.85	**0.92**	**B**	0.80	A
US 30/High School Wy	0.85	0.84	B	0.73	B
US 30/Havlik Dr	0.80	**0.91**	**D**	**0.82**	**C**
State Route – Unsignalized Intersections					
US 30/Wikstrom Rd/West Lane Rd	0.90	**1.0**	**F**	**1.0**	**F**
US 30/J.P. West Rd	0.95	0.65	C	0.57	C
US 30/Old Portland Rd (north end)	0.95	0.65	F	0.57	F
US 30/Bonneville Dr/Johnsons Landing Rd	0.95	**1.0**	**F**	**1.0**	**F**
Non-State Route, Unsignalized Intersections	**LOS / V/C**				
West Lane Road/Honeyman	E / 0.90	0.08	A	0.07	A
SW Old Portland Rd/Havlik Dr	E / 0.90	0.10	B	0.09	B
SW Old Portland Rd/Sequoia St	E / 0.90	0.08	A	0.07	A
SW Eggleston Ln/E.M. Watts/Keys Rd*	E / 0.90	0.06	A	0.05	A
NW 1st St/E.J. Smith Rd	E / 0.90	0.09	A	0.08	A
West Lane Road/Crown Zellerbach	E / 0.90	0.03	A	0.03	A
SW 4th St/E.M. Watts	E / 0.90	0.19	B	0.17	B
Non-State Route, All-Way Stop Intersections	**LOS / V/C**				
E. Columbia Ave/West Lane Road/SE 4th Street	E / 0.90	0.25	A	0.22	A
SE 6th St/Elm St	E / 0.90	0.10	A	0.08	A
SE 6th St/High School Way	E / 0.90	0.15	A	0.15	A
SE 2nd St/Frederick St	E / 0.90	0.18	A	0.17	A

Notes:

Signalized intersections: v/c ratio and LOS reported for the overall intersection

Unsignalized intersections: v/c ratio and LOS reported for the worst minor street approach

All-way stop controlled intersections: v/c ratio reported for worst approach, LOS reported for overall intersection

Bolded Red and Shaded indicates intersection exceeds mobility standard.

*Intersection configuration not allowed in Highway Capacity Manual (HCM) analysis, therefore intersection configuration was modified to allow for capacity analysis.

Intersection Geometrics

Several roadways and intersections in Scappoose do not provide optimal geometrics, which results in user discomfort and potential safety issues. These include:

- **Curves on Roadways:** The alignment of SE 6th Street north of Vine Street has a horizontal curve with no advanced warning signs provided. The alignment of SW 4th Street south of J.P. West Road has a sharp horizontal curve that limits user sight distance; advanced warning signs are provided.
- **Skewed Intersections:** The E.M. Watts Road/Keys Road/Eggleston Lane intersection is skewed with horizontal and vertical curves, a residential driveway within the intersection, and unclear intersection control. The SW 4th Street approaches at E.M. Watts Road are offset approximately 30 feet; the north leg of the intersection aligns with a residential driveway. The Elm Street/SE 6th Street intersection is skewed and has two residential driveways within the intersection. The Old Portland Road/Dutch Canyon Road intersection is skewed with an unimproved east leg. J.P. West Road at Keys Road is skewed and has a horizontal curve that limits sight distance. The West Lane Road/Wikstrom Road approaches at US 30 are offset approximately 100 feet. Several other intersections in the City are also skewed.

Roadway Connectivity

Applying typical roadway connectivity guidelines, Scappoose should have at least one north-south collector roadway on each side of US 30 and about four east-west collector routes.

Currently, there are a number of constraints that limit connectivity in Scappoose. The street system has numerous short streets with offset intersections on both the west and east sides of town. The creeks on the west side and in the northeast area of town, as well as the steep topography on the west side of town, limit east-west crossing opportunities. There are a lack of stub streets (constructed as cul-de-sacs instead) that would allow future street connections.

These constraints contribute to a lack of continuous north-south and east-west connectivity to both the east and west of US 30. This connectivity is important for improving circulation in town and to limit use of US 30 to longer, through trips, which is its intended function.

Access Spacing

An access inventory was conducted along Highway 30 within the Scappoose city limits, in which the number of existing approaches (driveways and public streets) was compared to the applicable ODOT spacing standard. Table 15 shows the number of existing approaches for each segment of Highway 30 and compares it to the approximate number of driveway or public street approaches that would be allowed under full compliance with the spacing standards. As shown, the east side of Highway 30 meets access spacing standards for all segments, mainly because the railroad runs parallel to Highway 30, making access more difficult to the east. However, all segments on the west side of Highway 30 have more accesses than are allowed based on ODOT spacing standards. The portion of US 30 that is particularly access-dense (more than double the recommended driveways) is from J.P. West Road to Maple Street. It is expected that, as properties along US 30 are redeveloped, accesses will be removed or consolidated in order to move toward the standard through coordination with ODOT.

Table 15: US 30 Access Spacing Inventory

Highway 30 Roadway Segment	Spacing Standard	Segment Length	Recommended Approaches*	West Side	East Side
Wikstrom to Scappoose-Vernonia Highway	800’	6,350	7	17	2
Scappoose-Vernonia Highway to E. Columbia Ave	500’	2,000	3	7	0
E. Columbia Ave to J.P. West Rd	500’	500	0	3	0
J.P. West Rd to Maple St	500’	740	0	8	0
Maple St to E.M. Watts Rd	500’	815	0	2	0
E.M. Watts Rd to High School Way	500’	860	0	5	0
High School Way to Old Portland Rd (N)	500’	650	0	2	0
Old Portland Rd (N) to Havlik Dr	800’	2,450	2	9	0
Havlik Dr to Bonneville Dr	800’	3,700	3	6	0

* Segment length divided by 500-foot or 800-foot access spacing standard, minus existing local street approach

Summary of Existing Deficiencies

Several existing transportation system gaps and deficiencies in Scappoose were described in the previous sections and are summarized here:

- **Barriers that restrict system connectivity for all modes:** US 30 through the middle of town, the P&W rail line just east of US 30, the steep topography to the west of town, and Scappoose Creek.

Key transportation system gaps for pedestrians:

- Lack of sidewalks and enhanced pedestrian crossings along portions of US 30
- Lack of sidewalks on at least one side of Collectors to connect community destinations
- Gaps in the sidewalk network near bus stops
- Lack of sidewalks along routes to parks and schools

Key transportation system gaps for bicyclists:

- Lack of bike lanes or sufficient shoulders to provide an alternative to cycling on US 30
- Lack of bike lanes or sufficient shoulders on collectors to connect community destinations
- Limited bicycle parking near destinations
- Lack of bicycle wayfinding signage and shared-lane pavement markings

Key transportation system gaps for transit users:

- No bus stops with shelters and other amenities
- Lack of pedestrian crossings near primary bus stop and park and ride on 1st Street between Columbia Avenue and Prairie Street
- Lack of transit service

K**ey transportation system issues for drivers:**

- Over the past three years, US 30 in Scappoose has crash rate higher than comparable facilities.
- US 30/Bonneville Drive/Johnsons Landing Road and US 30/West Lane Road intersections exceed ODOT mobility targets during the average weekday and the seasonal peak.
- The number of driveways on US 30 exceeds ODOT standards, with two to four times the recommended number of driveways.
- Several intersections and roadways have geometric deficiencies and sight distance limitations.

Transportation System Plan Acronyms (Alphabetical)

30 HV	30th Highest Hour Volume
ADT	Average Daily Traffic
ATR	Automatic Traffic Recorder Station
CC Rider	Columbia County Rider (Columbia County Transit Division)
CCTD	Columbia County Transit Division
LOS	Level of Service (similar to report card rating – A-F)
NHS	National Highway System
ODOT	Oregon Department of Transportation
OHP	Oregon Highway Plan
PNWR	Portland & Western Railroad (also referred to as P&W)
SOV	Single-Occupant Vehicle
TSP	Transportation System Plan
UGB	Urban Growth Boundary
v/c	Volume-to-Capacity Ratio

Appendix

Traffic Count Data

Seasonal Factoring Methodology

Highway Capacity Analysis Results

Existing Average PM Peak Hour

Existing Seasonal Peak (30 HV)

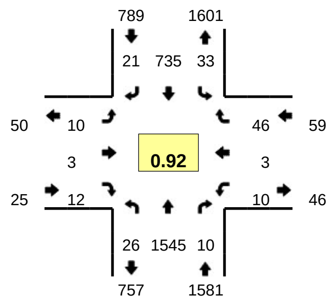
Traffic Count Data

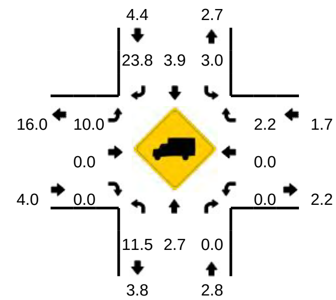
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

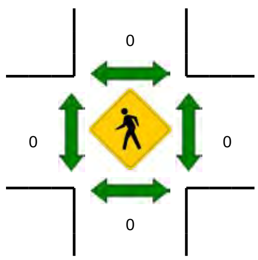
LOCATION: Hwy 30 -- Wikstrom Rd | **QC JOB #:** 10922501

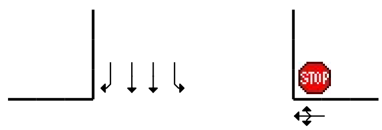
CITY/STATE: Scappoose, OR | **DATE:** Tue, Apr 09 2013

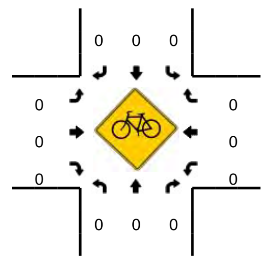
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

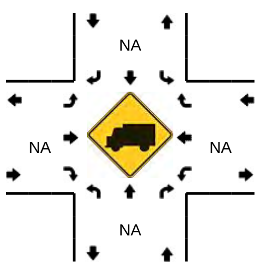


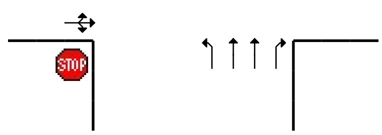


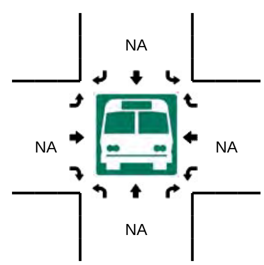












15-Min Count Period Beginning At	Hwy 30 (Northbound) Left	Thru	Right	U	Hwy 30 (Southbound) Left	Thru	Right	U	Wikstrom Rd (Eastbound) Left	Thru	Right	U	Wikstrom Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	5	307	3	0	9	159	9	0	1	0	2	0	1	1	24	0	521	
4:15 PM	7	350	3	0	14	196	9	0	7	0	5	0	3	0	18	0	612	
4:30 PM	3	377	6	0	9	161	2	0	3	0	3	0	4	1	24	0	593	
4:45 PM	6	420	1	0	8	200	4	0	4	1	2	0	3	0	19	0	668	2394
5:00 PM	8	370	3	0	7	182	6	0	2	0	3	0	1	0	12	0	594	2467
5:15 PM	8	389	4	0	9	194	7	0	3	1	2	0	4	2	8	0	631	2486
5:30 PM	4	366	2	0	9	159	4	0	1	1	5	0	2	1	7	0	561	2454
5:45 PM	4	359	2	0	6	169	9	0	5	0	4	0	0	1	9	0	568	2354

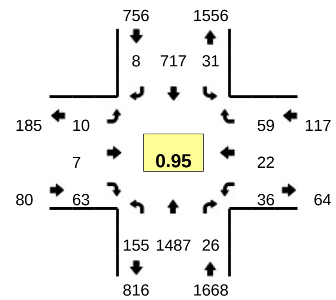
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	24	1680	4	0	32	800	16	0	16	4	8	0	12	0	76	0	2672
Heavy Trucks	0	44	0		0	28	0		4	0	0		0	0	4		80
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

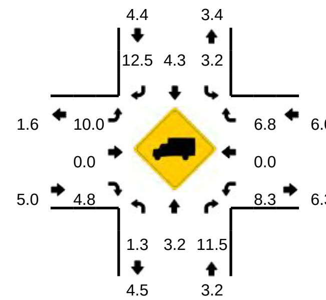
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

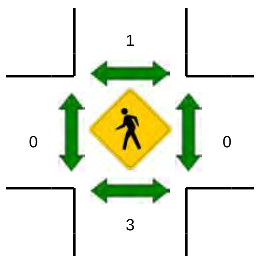
LOCATION: Hwy 30 -- Scappoose-Vernonia Hwy
CITY/STATE: Scappoose, OR

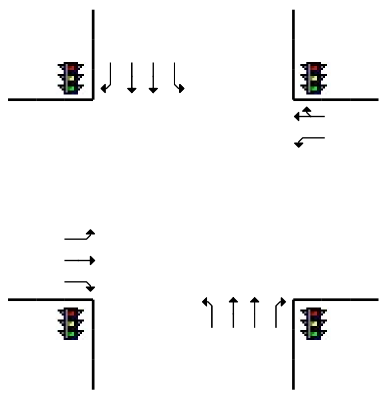
QC JOB #: 10922502
DATE: Tue, Apr 09 2013

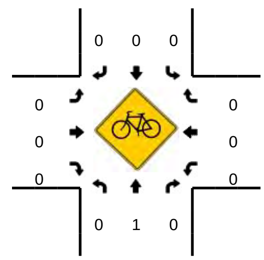


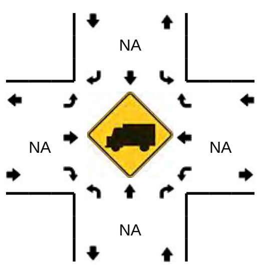
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

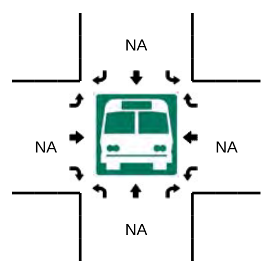












15-Min Count Period Beginning At	Hwy 30 (Northbound) Left	Thru	Right	U	Hwy 30 (Southbound) Left	Thru	Right	U	Scappoose-Vernonia Hwy (Eastbound) Left	Thru	Right	U	Scappoose-Vernonia Hwy (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	33	319	11	0	5	159	6	0	2	4	10	0	10	6	6	0	571	
4:15 PM	22	322	11	0	9	195	4	0	4	2	17	0	7	3	11	0	607	
4:30 PM	30	371	5	0	3	159	3	0	3	3	14	0	12	2	7	0	612	
4:45 PM	38	390	6	0	3	200	0	0	1	3	19	0	10	9	13	0	692	2482
5:00 PM	33	370	8	0	9	177	5	0	3	1	16	0	10	4	12	0	648	2559
5:15 PM	52	361	6	0	14	194	2	0	4	0	16	0	6	5	17	0	677	2629
5:30 PM	32	366	6	0	5	146	1	0	2	3	12	0	10	4	17	0	604	2621
5:45 PM	41	325	3	0	6	177	1	0	0	1	11	0	1	6	14	0	586	2515

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	152	1560	24	0	12	800	0	0	4	12	76	0	40	36	52	0	2768
Heavy Trucks	0	44	8		0	36	0		0	0	8		0	0	4		100
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

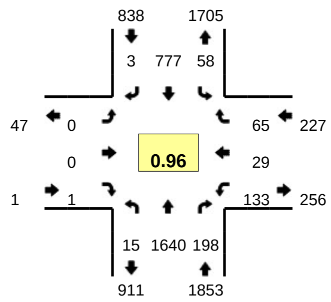
Report generated on 5/3/2013 9:38 AM

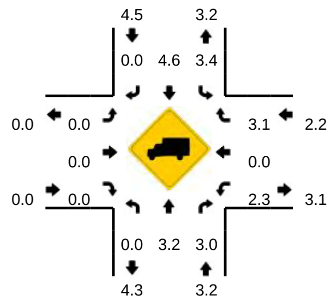
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

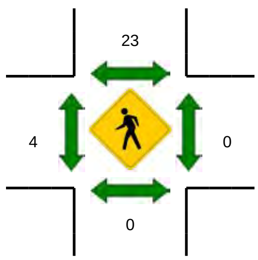
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

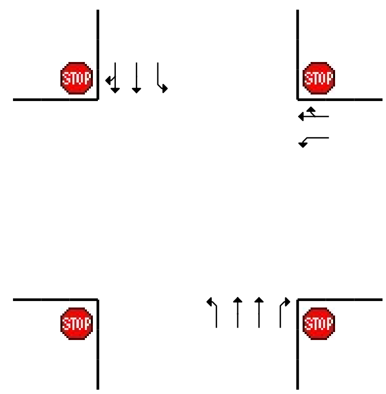
LOCATION: Hwy 30 -- E Columbia Ave | **QC JOB #:** 10922503
CITY/STATE: Scappoose, OR | **DATE:** Tue, Apr 09 2013

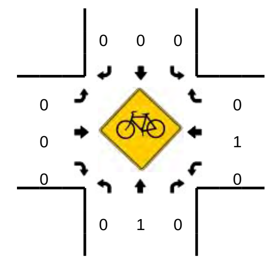
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

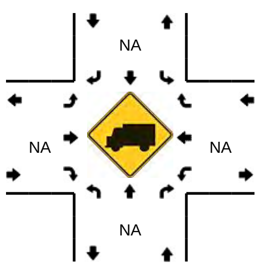


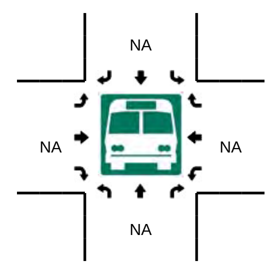












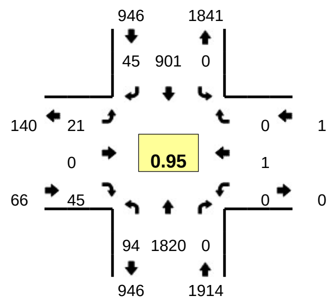
15-Min Count Period Beginning At	Hwy 30 (Northbound) Left	Thru	Right	U	Hwy 30 (Southbound) Left	Thru	Right	U	E Columbia Ave (Eastbound) Left	Thru	Right	U	E Columbia Ave (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	3	333	28	0	13	162	1	0	0	0	0	0	32	7	14	0	593	
4:15 PM	1	388	37	0	22	215	4	0	0	0	0	0	28	2	17	0	714	
4:30 PM	3	381	39	0	21	172	1	0	0	0	0	0	25	8	11	0	661	
4:45 PM	2	437	44	0	13	205	0	0	0	0	1	0	34	9	17	0	762	2730
5:00 PM	3	384	52	0	11	193	0	0	0	0	0	0	38	4	23	0	708	2845
5:15 PM	4	431	43	0	15	214	2	0	0	0	0	0	27	9	12	0	757	2888
5:30 PM	6	388	59	0	19	165	1	0	0	0	0	0	34	7	13	0	692	2919
5:45 PM	4	389	48	0	14	176	6	0	0	0	0	0	28	4	9	0	678	2835

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	8	1748	176	0	52	820	0	0	0	0	4	0	136	36	68	0	3048
Heavy Trucks	0	56	8		4	32	0		0	0	0		8	0	0		108
Pedestrians		0				24				0				0			24
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

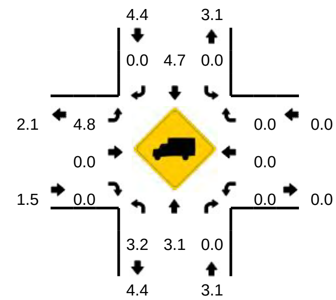
Comments:

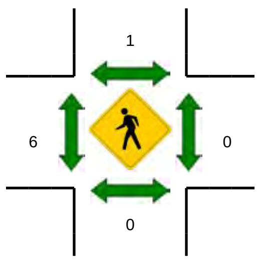
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

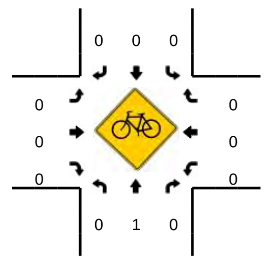
LOCATION: Hwy 30 -- JP West Rd | **QC JOB #:** 10922504
CITY/STATE: Scappoose, OR | **DATE:** Tue, Apr 09 2013

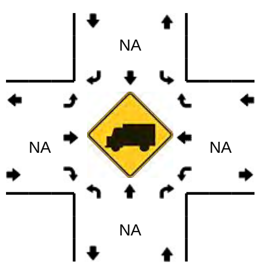


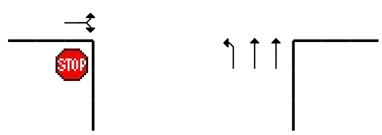
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

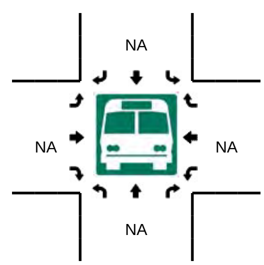










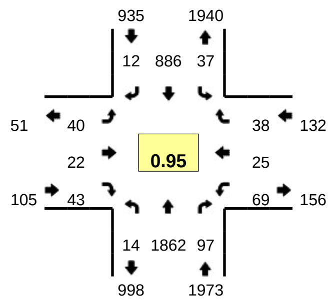


15-Min Count Period Beginning At	Hwy 30 (Northbound) Left	Thru	Right	U	Hwy 30 (Southbound) Left	Thru	Right	U	JP West Rd (Eastbound) Left	Thru	Right	U	JP West Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	19	371	0	0	0	188	11	0	3	0	12	0	0	0	0	0	604	
4:15 PM	23	432	0	0	0	238	7	0	6	0	6	0	0	0	0	0	712	
4:30 PM	14	425	0	0	0	195	10	0	4	0	19	0	0	0	0	0	667	
4:45 PM	16	472	0	0	0	239	8	0	8	0	9	0	0	0	0	0	752	2735
5:00 PM	24	429	0	0	0	228	16	0	6	0	8	0	0	0	0	0	711	2842
5:15 PM	32	468	0	0	0	241	9	0	2	0	16	0	0	1	0	0	769	2899
5:30 PM	22	451	0	0	0	193	12	0	5	0	12	0	0	0	0	0	695	2927
5:45 PM	17	437	0	0	0	198	13	0	3	0	13	0	0	0	0	0	681	2856

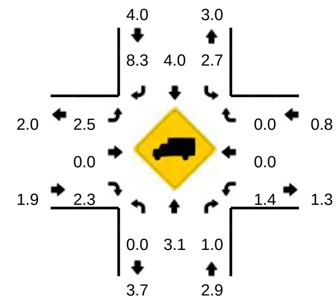
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	128	1872	0	0	0	964	36	0	8	0	64	0	0	4	0	0	3076
Heavy Trucks	4	52	0		0	48	0		0	0	0		0	0	0		104
Pedestrians		0				0				8				0			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

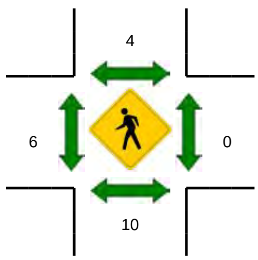
Comments:

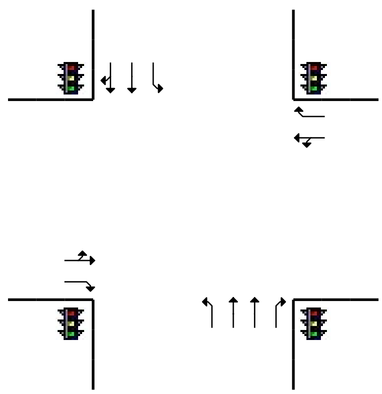
LOCATION: Hwy 30 -- SE Maple St **QC JOB #:** 10922505
CITY/STATE: Scappoose, OR **DATE:** Tue, Apr 09 2013

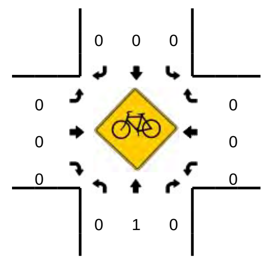


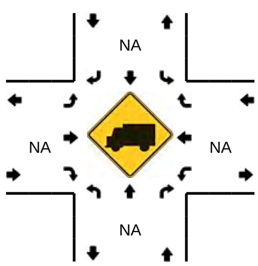
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

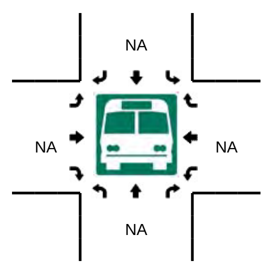












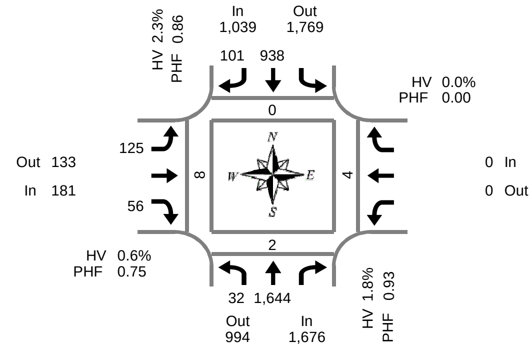
15-Min Count Period Beginning At	Hwy 30 (Northbound) Left	Thru	Right	U	Hwy 30 (Southbound) Left	Thru	Right	U	SE Maple St (Eastbound) Left	Thru	Right	U	SE Maple St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	6	390	16	0	11	204	4	0	10	7	9	0	15	4	6	0	682	
4:15 PM	5	443	28	0	10	226	4	0	14	1	10	0	19	4	12	0	776	
4:30 PM	7	433	27	0	12	199	0	0	13	9	8	0	11	6	13	0	738	
4:45 PM	6	448	24	0	6	233	2	0	14	6	11	0	20	7	14	0	791	2987
5:00 PM	4	455	26	0	11	216	5	0	10	5	9	0	17	10	8	0	776	3081
5:15 PM	1	497	23	0	13	238	1	0	6	4	16	0	16	7	6	0	828	3133
5:30 PM	3	462	24	0	7	199	4	0	10	7	7	0	16	1	10	0	750	3145
5:45 PM	2	417	26	0	8	182	6	0	13	3	8	0	16	4	4	0	689	3043

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	4	1988	92	0	52	952	4	0	24	16	64	0	64	28	24	0	3312
Heavy Trucks	0	64	0		0	40	0		0	0	0		0	0	0		104
Pedestrians		8				0				8				0			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

Hwy 30 & Em Watts Rd

Wednesday, January 27, 2010
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval	Northbound				Southbound				Eastbound				Westbound				Interval	Pedestrians			
Start	Hwy 30				Hwy 30				Em Watts Rd				Em Watts Rd				Interval	Crosswalk			
Time	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes	Total	North	South	East	West
4:00 PM	0	151		0		63	7	0	7		0	0				0	228	0	0	1	1
4:05 PM	0	127		0		75	5	0	17		3	0				0	227	0	0	0	1
4:10 PM	0	133		0		81	4	0	13		6	0				0	237	0	0	0	1
4:15 PM	5	115		0		70	9	0	13		7	0				0	219	0	0	0	0
4:20 PM	1	160		0		78	7	0	7		3	0				0	256	0	0	0	0
4:25 PM	1	139		0		73	6	0	6		2	0				1	227	0	0	0	0
4:30 PM	0	138		0		68	6	0	8		6	0				0	226	0	0	0	0
4:35 PM	2	133		0		59	3	0	9		0	0				0	206	0	1	1	0
4:40 PM	0	153		0		68	8	0	11		2	0				0	242	0	1	0	0
4:45 PM	3	119		0		79	6	0	10		2	0				0	219	0	0	0	1
4:50 PM	2	168		0		61	4	1	6		1	0				0	242	0	0	0	1
4:55 PM	5	141		0		67	12	0	14		2	0				0	241	0	0	0	1
5:00 PM	1	125		0		73	6	0	8		2	0				0	215	0	0	0	2
5:05 PM	3	119		0		80	4	0	10		2	0				0	218	0	0	0	0
5:10 PM	2	147		0		103	13	0	10		2	0				0	277	0	0	1	0
5:15 PM	3	123		0		83	10	0	11		3	0				0	233	0	0	1	0
5:20 PM	1	155		0		82	11	0	11		11	0				0	271	0	1	2	0
5:25 PM	5	139		0		83	10	0	10		7	0				0	254	0	1	0	0
5:30 PM	1	151		0		86	10	0	8		8	0				0	264	0	0	0	0
5:35 PM	5	122		0		49	8	0	19		8	0				0	211	0	0	0	3
5:40 PM	1	135		0		92	7	0	8		8	0				0	251	0	0	0	0
5:45 PM	4	102		0		63	5	0	15		4	0				0	193	0	1	1	0
5:50 PM	2	131		0		98	5	0	7		3	0				0	246	0	0	0	0
5:55 PM	4	102		0		80	4	0	5		3	0				0	198	1	0	0	0
Total Survey	51	3,228		0		1,814	170	1	243		95	0				1	5,601	1	5	7	11

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval	Northbound				Southbound				Eastbound				Westbound				Interval	Pedestrians			
Start	Hwy 30				Hwy 30				Em Watts Rd				Em Watts Rd				Interval	Crosswalk			
Time	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes	Total	North	South	East	West
4:00 PM	0	411		0		219	16	0	37		9	0				0	692	0	0	1	3
4:15 PM	7	414		0		221	22	0	26		12	0				1	702	0	0	0	0
4:30 PM	2	424		0		195	17	0	28		8	0				0	674	0	2	1	0
4:45 PM	10	428		0		207	22	1	30		5	0				0	702	0	0	0	3
5:00 PM	6	391		0		256	23	0	28		6	0				0	710	0	0	1	2
5:15 PM	9	417		0		248	31	0	32		21	0				0	758	0	2	3	0
5:30 PM	7	408		0		227	25	0	35		24	0				0	726	0	0	0	3
5:45 PM	10	335		0		241	14	0	27		10	0				0	637	1	1	1	0
Total Survey	51	3,228		0		1,814	170	1	243		95	0				1	5,601	1	5	7	11

Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound				Southbound				Eastbound				Westbound				Total
	Hwy 30				Hwy 30				Em Watts Rd				Em Watts Rd				
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	1,676	994	2,670	0	1,039	1,769	2,808	1	181	133	314	0	0	0	0	0	2,896
%HV	1.8%				2.3%				0.6%				0.0%				1.9%
PHF	0.93				0.86				0.75				0.00				0.92

Pedestrians			
Crosswalk			
North	South	East	West
0	2	4	8

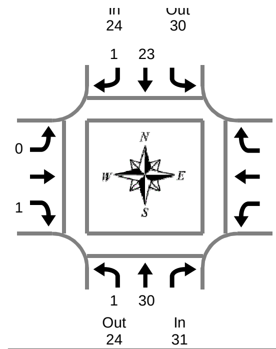
By Movement	Northbound				Southbound				Eastbound				Westbound				Total
	Hwy 30				Hwy 30				Em Watts Rd				Em Watts Rd				
	L	T		Total		T	R	Total	L		R	Total				Total	
Volume	32	1,644		1,676		938	101	1,039	125		56	181				0	2,896
%HV	3.1%	1.8%	NA	1.8%	NA	2.5%	1.0%	2.3%	0.0%	NA	1.8%	0.6%	NA	NA	NA	0.0%	1.9%
PHF	0.73	0.92		0.93		0.88	0.74	0.86	0.84		0.54	0.75				0.00	0.92

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval	Northbound				Southbound				Eastbound				Westbound				Interval	Pedestrians			
Start	Hwy 30				Hwy 30				Em Watts Rd				Em Watts Rd				Interval	Crosswalk			
Time	L	T		Bikes		T	R	Bikes	L		R	Bikes				Bikes	Total	North	South	East	West
4:00 PM	19	1,677		0		842	77	1	121		34	0				1	2,770	0	2	2	6
4:15 PM	25	1,657		0		879	84	1	112		31	0				1	2,788	0	2	2	5
4:30 PM	27	1,660		0		906	93	1	118		40	0				0	2,844	0	4	5	5
4:45 PM	32	1,644		0		938	101	1	125		56	0				0	2,896	0	2	4	8
5:00 PM	32	1,551		0		972	93	0	122		61	0				0	2,831	1	3	5	5

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

Hwy 30 & Em Watts Rd

Wednesday, January 27, 2010
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 30				Southbound Hwy 30				Eastbound Em Watts Rd				Westbound Em Watts Rd				Interval Total
	L	T		Total		T	R	Total	L		R	Total				Total	
4:00 PM	0	5		5		1	0	1	1		0	1				0	7
4:05 PM	0	4		4		5	0	5	1		1	2				0	11
4:10 PM	0	3		3		1	0	1	3		0	3				0	7
4:15 PM	0	2		2		2	0	2	0		0	0				0	4
4:20 PM	0	3		3		3	0	3	0		0	0				0	6
4:25 PM	0	2		2		1	0	1	0		0	0				0	3
4:30 PM	0	2		2		1	0	1	0		0	0				0	3
4:35 PM	0	6		6		1	0	1	1		0	1				0	8
4:40 PM	0	6		6		1	0	1	0		0	0				0	7
4:45 PM	0	3		3		4	0	4	0		0	0				0	7
4:50 PM	0	6		6		2	0	2	0		0	0				0	8
4:55 PM	0	3		3		2	0	2	0		0	0				0	5
5:00 PM	0	1		1		2	0	2	0		0	0				0	3
5:05 PM	0	2		2		3	0	3	0		0	0				0	5
5:10 PM	0	0		0		2	1	3	0		0	0				0	3
5:15 PM	1	1		2		0	0	0	0		0	0				0	2
5:20 PM	0	1		1		3	0	3	0		0	0				0	4
5:25 PM	0	4		4		1	0	1	0		1	1				0	6
5:30 PM	0	6		6		1	0	1	0		0	0				0	7
5:35 PM	0	1		1		1	0	1	0		0	0				0	2
5:40 PM	0	2		2		2	0	2	0		0	0				0	4
5:45 PM	0	2		2		1	0	1	1		0	1				0	4
5:50 PM	0	1		1		3	0	3	0		0	0				0	4
5:55 PM	0	0		0		0	0	0	0		0	0				0	0
Total Survey	1	66		67		43	1	44	7		2	9				0	120

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Hwy 30				Southbound Hwy 30				Eastbound Em Watts Rd				Westbound Em Watts Rd				Interval Total
	L	T		Total		T	R	Total	L		R	Total				Total	
4:00 PM	0	12		12		7	0	7	5		1	6				0	25
4:15 PM	0	7		7		6	0	6	0		0	0				0	13
4:30 PM	0	14		14		3	0	3	1		0	1				0	18
4:45 PM	0	12		12		8	0	8	0		0	0				0	20
5:00 PM	0	3		3		7	1	8	0		0	0				0	11
5:15 PM	1	6		7		4	0	4	0		1	1				0	12
5:30 PM	0	9		9		4	0	4	0		0	0				0	13
5:45 PM	0	3		3		4	0	4	1		0	1				0	8
Total Survey	1	66		67		43	1	44	7		2	9				0	120

Heavy Vehicle Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound Hwy 30				Southbound Hwy 30				Eastbound Em Watts Rd				Westbound Em Watts Rd				Total
	In	Out	Total		In	Out	Total		In	Out	Total		In	Out	Total		
Volume	31	24	55		24	30	54		1	2	3		0	0	0		56
PHF	0.65				0.75				0.25				0.00				0.70

By Movement	Northbound Hwy 30				Southbound Hwy 30				Eastbound Em Watts Rd				Westbound Em Watts Rd				Total
	L	T		Total		T	R	Total	L		R	Total				Total	
Volume	1	30		31		23	1	24	0		1	1				0	56
PHF	0.25	0.63		0.65		0.72	0.25	0.75	0.00		0.25	0.25				0.00	0.70

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

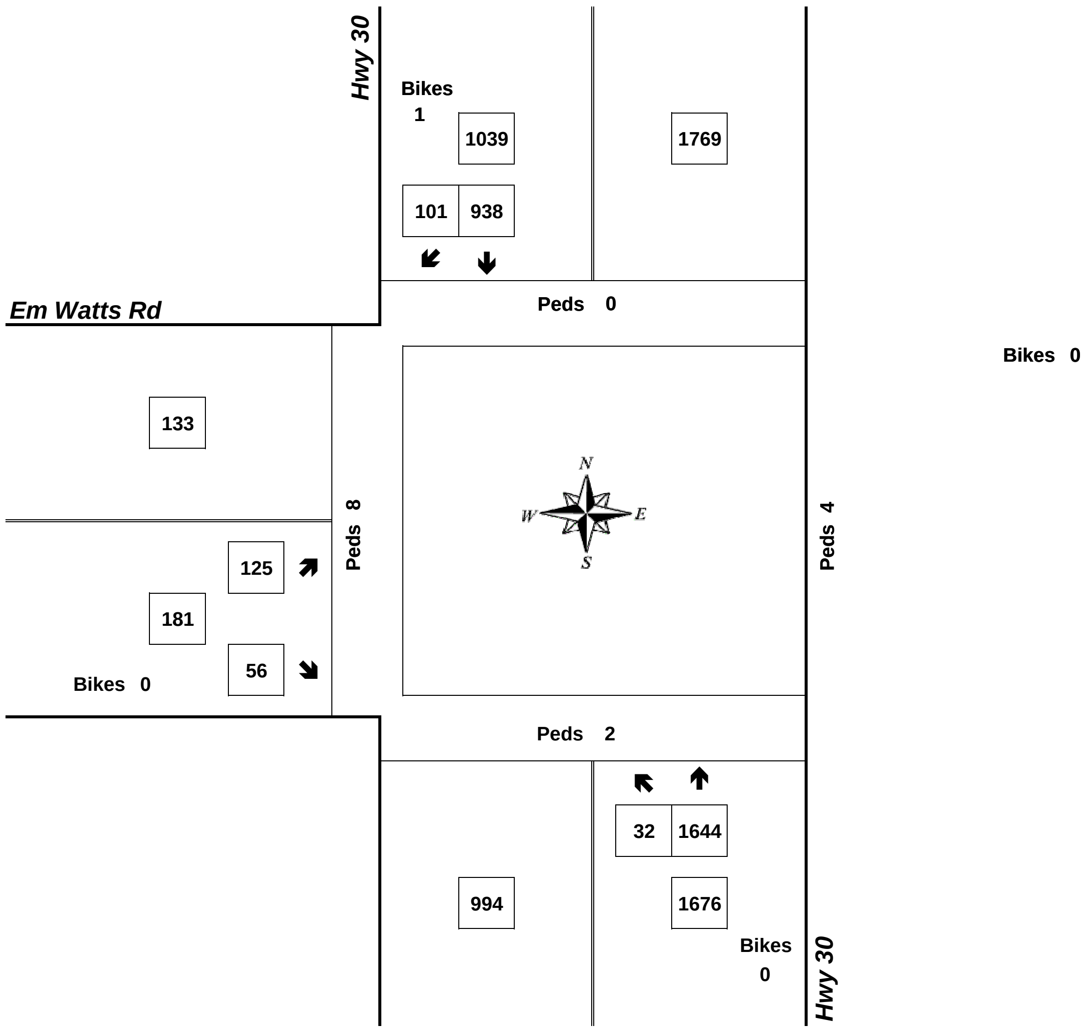
Interval Start Time	Northbound Hwy 30				Southbound Hwy 30				Eastbound Em Watts Rd				Westbound Em Watts Rd				Interval Total
	L	T		Total		T	R	Total	L		R	Total				Total	
4:00 PM	0	45		45		24	0	24	6		1	7				0	76
4:15 PM	0	36		36		24	1	25	1		0	1				0	62
4:30 PM	1	35		36		22	1	23	1		1	2				0	61
4:45 PM	1	30		31		23	1	24	0		1	1				0	56
5:00 PM	1	21		22		19	1	20	1		1	2				0	44

Peak Hour Summary

Clay Carney
(503) 833-2740

Hwy 30 & Em Watts Rd

4:45 PM to 5:45 PM
Wednesday, January 27, 2010



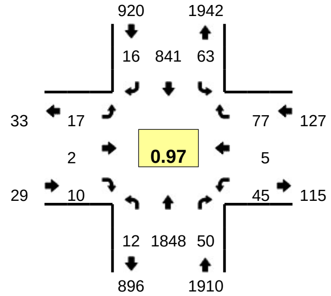
Approach	PHF	HV%	Volume
EB	0.75	0.6%	181
WB	0.00	0.0%	0
NB	0.93	1.8%	1,676
SB	0.86	2.3%	1,039
Intersection	0.92	1.9%	2,896

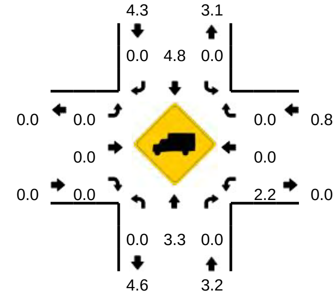
Count Period: 4:00 PM to 6:00 PM

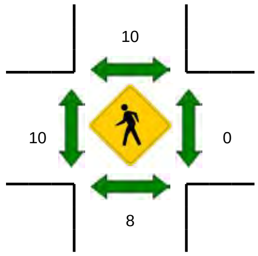
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

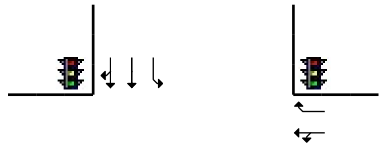
LOCATION: Hwy 30 -- High School Way | **QC JOB #:** 10922507
CITY/STATE: Scappoose, OR | **DATE:** Tue, Apr 09 2013

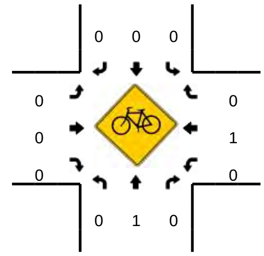
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

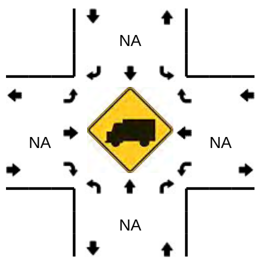


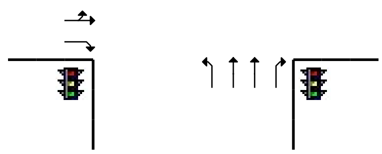


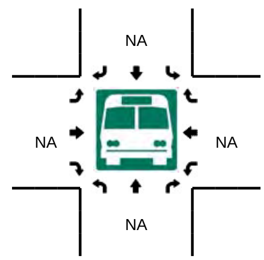












15-Min Count Period Beginning At	Hwy 30 (Northbound) Left	Thru	Right	U	Hwy 30 (Southbound) Left	Thru	Right	U	High School Way (Eastbound) Left	Thru	Right	U	High School Way (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	2	396	7	0	7	189	0	0	4	0	6	0	17	0	20	0	648	
4:15 PM	1	433	9	0	14	221	3	0	3	0	5	0	9	0	11	0	709	
4:30 PM	2	442	11	0	9	194	2	0	3	0	1	0	7	1	16	0	688	
4:45 PM	3	461	12	0	8	223	2	0	3	1	3	0	13	1	23	0	753	2798
5:00 PM	1	467	13	0	17	209	3	0	6	0	2	0	10	1	8	0	737	2887
5:15 PM	5	457	14	0	26	222	7	0	1	1	2	0	13	3	19	0	770	2948
5:30 PM	3	463	11	0	12	187	4	0	7	0	3	0	9	0	27	0	726	2986
5:45 PM	5	430	17	0	11	178	0	0	5	0	1	0	12	0	21	0	680	2913

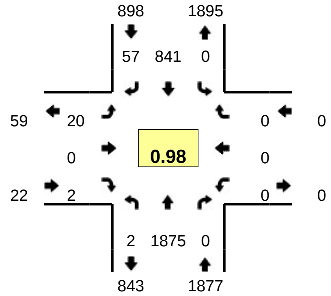
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	20	1828	56	0	104	888	28	0	4	4	8	0	52	12	76	0	3080
Heavy Trucks	0	56	0		0	48	0		0	0	0		0	0	0		104
Pedestrians		12				0				4				0			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

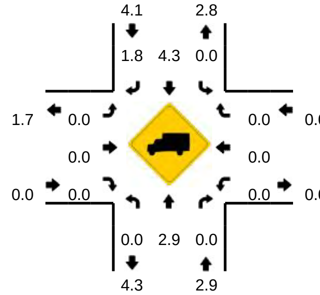
Report generated on 5/3/2013 9:38 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

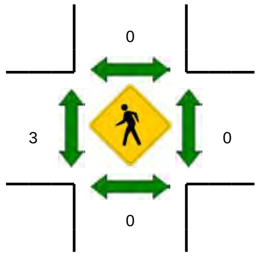
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

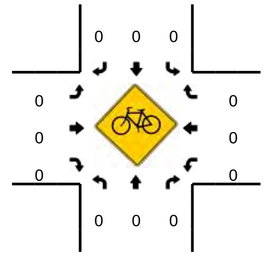
LOCATION: Hwy 30 -- Old Portland Rd (North End) **QC JOB #:** 10922521
CITY/STATE: Scappoose, OR **DATE:** Tue, Apr 09 2013

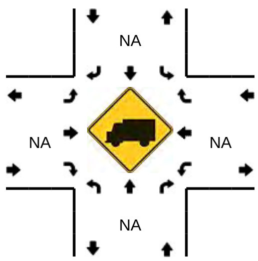


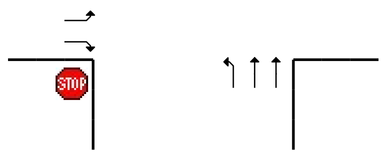
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

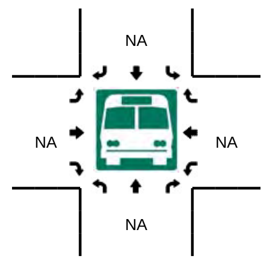












15-Min Count Period Beginning At	Hwy 30 (Northbound)				Hwy 30 (Southbound)				Old Portland Rd (North End) (Eastbound)				Old Portland Rd (North End) (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	2	384	0	0	0	191	21	0	10	0	0	0	0	0	0	0	608	
4:15 PM	0	445	0	0	0	222	10	0	11	0	0	0	0	0	0	0	688	
4:30 PM	0	444	0	0	0	187	10	0	3	0	2	0	0	0	0	0	646	
4:45 PM	0	461	0	0	0	230	17	0	5	0	0	0	0	0	0	0	713	2655
5:00 PM	0	479	0	0	0	203	13	0	4	0	2	0	0	0	0	0	701	2748
5:15 PM	2	468	0	0	0	224	17	0	5	0	0	0	0	0	0	0	716	2776
5:30 PM	0	467	0	0	0	184	10	0	6	0	0	0	0	0	0	0	667	2797
5:45 PM	0	434	0	0	0	173	22	0	5	0	0	0	0	0	0	0	634	2718

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	1872	0	0	0	896	68	0	20	0	0	0	0	0	0	0	2864
Heavy Trucks	0	60	0		0	44	0		0	0	0		0	0	0		104
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

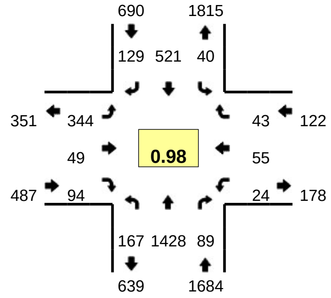
Report generated on 5/3/2013 9:38 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

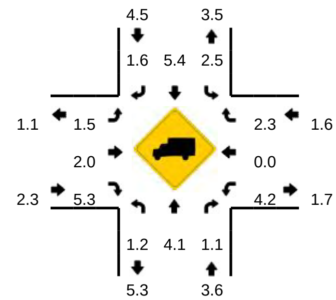
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

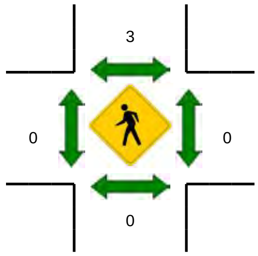
LOCATION: Hwy 30 -- Havlik Dr
CITY/STATE: Scappoose, OR

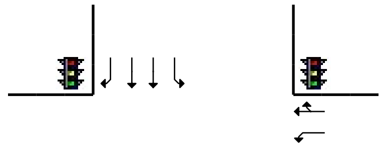
QC JOB #: 10922508
DATE: Tue, Apr 09 2013

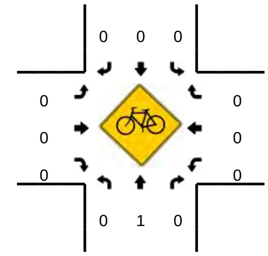
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

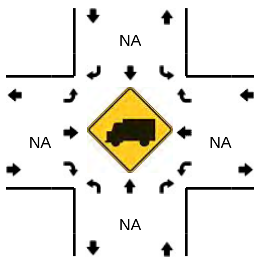


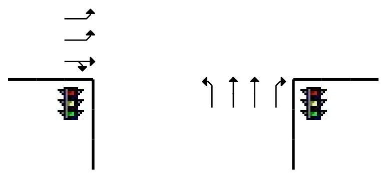


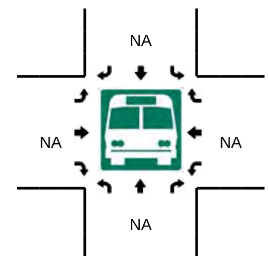












15-Min Count Period Beginning At	Hwy 30 (Northbound) Left	Thru	Right	U	Hwy 30 (Southbound) Left	Thru	Right	U	Havlik Dr (Eastbound) Left	Thru	Right	U	Havlik Dr (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	48	309	19	0	10	139	27	0	73	13	13	0	6	13	11	0	681	
4:15 PM	30	352	22	0	9	122	34	0	80	15	23	0	2	10	3	0	702	
4:30 PM	37	344	19	0	15	120	37	0	61	16	21	0	3	13	16	0	702	
4:45 PM	42	362	22	0	12	134	42	0	79	13	24	0	5	17	11	0	763	2848
5:00 PM	44	377	26	0	12	117	28	0	79	12	27	0	7	14	11	0	754	2921
5:15 PM	40	342	17	0	8	155	37	0	90	9	25	0	5	13	9	0	750	2969
5:30 PM	41	347	24	0	8	115	22	0	96	15	18	0	7	11	12	0	716	2983
5:45 PM	53	351	27	0	16	113	35	0	60	11	20	0	7	9	10	0	712	2932

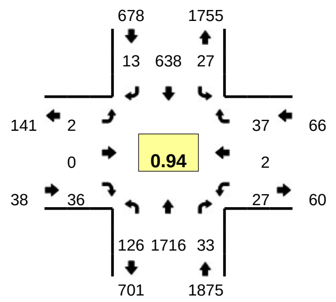
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	168	1448	88	0	48	536	168	0	316	52	96	0	20	68	44	0	3052
Heavy Trucks	4	60	0		0	32	4		4	0	4		0	0	0		108
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

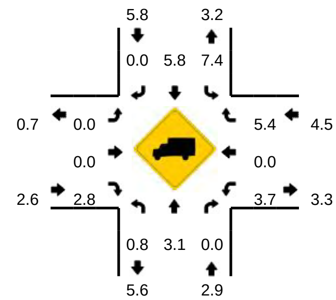
Report generated on 5/3/2013 9:38 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

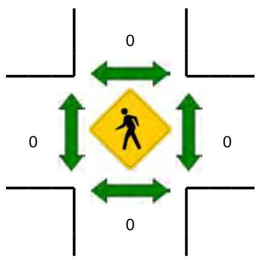
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

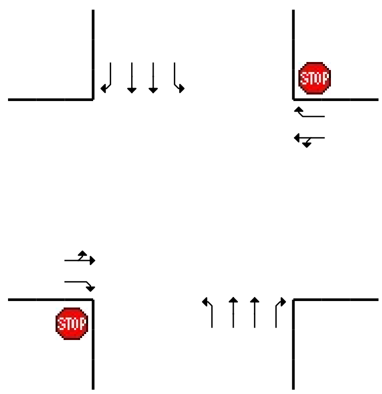
LOCATION: Hwy 30 -- SW Old Portland Rd/Bonneville Dr | **QC JOB #:** 10922509
CITY/STATE: Scappoose, OR | **DATE:** Tue, Apr 09 2013

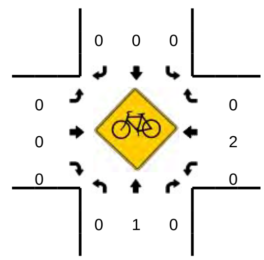


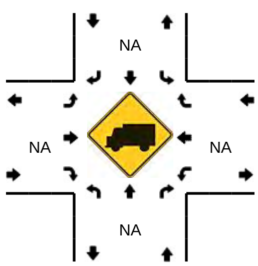
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

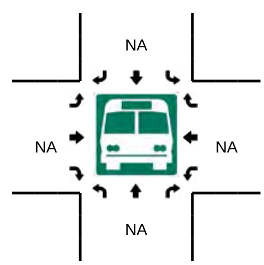












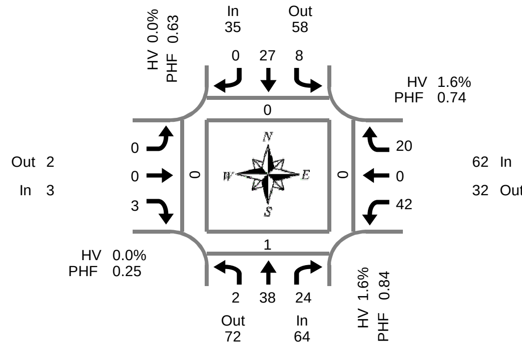
15-Min Count Period Beginning At	Hwy 30 (Northbound) Left	Thru	Right	U	Hwy 30 (Southbound) Left	Thru	Right	U	SW Old Portland Rd/Bonneville Dr (Eastbound) Left	Thru	Right	U	SW Old Portland Rd/Bonneville Dr (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	28	393	12	0	5	141	4	0	1	1	5	0	3	0	3	0	596	
4:15 PM	37	389	7	0	6	162	5	0	0	0	10	0	3	0	3	0	622	
4:30 PM	31	431	11	0	3	140	3	0	0	0	8	0	3	0	2	0	632	
4:45 PM	36	437	10	0	6	150	3	0	1	0	7	0	5	0	10	0	665	2515
5:00 PM	36	444	13	0	3	174	4	0	0	0	11	0	8	0	15	0	708	2627
5:15 PM	31	401	6	0	8	165	5	0	0	0	5	0	10	1	7	0	639	2644
5:30 PM	23	434	4	0	10	149	1	0	1	0	13	0	4	1	5	0	645	2657
5:45 PM	30	392	5	0	6	121	4	0	0	0	12	0	4	0	5	0	579	2571

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	144	1776	52	0	12	696	16	0	0	0	44	0	32	0	60	0	2832
Heavy Trucks	4	56	0		0	40	0		0	0	4		0	0	0		104
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	2	0		2
Railroad																	
Stopped Buses																	

Comments:

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:00 PM to 5:00 PM

Westlane Rd & Honeyman Rd

Wednesday, January 27, 2010
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Honeyman Rd				Westbound Honeyman Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	3	4	0	0	2	0	0	0	0	0	0	5	0	7	0	21	0	1	0	0
4:05 PM	0	1	2	0	0	3	0	0	0	0	0	0	4	0	2	0	12	0	0	0	0
4:10 PM	0	4	4	0	0	0	0	0	0	0	0	0	2	0	1	0	11	0	0	0	0
4:15 PM	0	3	2	0	0	3	0	0	0	0	0	0	5	0	3	0	16	0	0	0	0
4:20 PM	0	5	1	0	2	1	0	0	0	0	0	0	6	0	0	0	15	0	0	0	0
4:25 PM	0	4	3	0	0	5	0	0	0	0	0	0	1	0	0	0	13	0	0	0	0
4:30 PM	0	5	1	0	2	4	0	0	0	0	0	0	3	0	2	0	17	0	0	0	0
4:35 PM	1	4	1	0	0	2	0	0	0	0	0	0	5	0	1	0	14	0	0	0	0
4:40 PM	1	3	2	0	0	0	0	0	0	0	0	0	5	0	1	0	12	0	0	0	0
4:45 PM	0	2	1	0	1	1	0	0	0	0	1	0	2	0	0	0	8	0	0	0	0
4:50 PM	0	2	1	0	0	5	0	0	0	0	0	0	3	0	2	0	13	0	0	0	0
4:55 PM	0	2	2	0	3	1	0	0	0	0	2	0	1	0	1	0	12	0	0	0	0
5:00 PM	0	1	1	0	0	3	0	0	0	0	0	0	4	0	3	0	12	0	0	0	0
5:05 PM	0	4	3	0	4	1	0	0	0	0	1	0	1	0	3	0	17	0	0	0	0
5:10 PM	1	4	0	0	0	1	0	0	0	0	0	0	3	0	5	0	14	0	0	0	0
5:15 PM	0	2	0	0	0	2	0	0	0	0	0	0	2	0	0	0	6	0	0	0	0
5:20 PM	0	5	1	0	1	2	0	0	0	0	0	0	5	0	0	0	14	0	0	0	0
5:25 PM	0	1	1	0	0	3	0	0	0	0	0	0	2	0	2	0	9	0	0	0	0
5:30 PM	0	2	3	0	0	0	0	0	0	0	0	0	3	0	1	0	9	0	0	0	0
5:35 PM	0	1	2	0	0	1	0	0	0	0	0	0	3	0	0	0	7	0	0	0	0
5:40 PM	0	4	0	0	0	0	0	0	0	0	0	0	3	0	0	0	7	0	0	0	0
5:45 PM	0	1	2	0	0	4	0	0	0	0	0	0	0	0	2	0	9	0	0	0	0
5:50 PM	1	2	5	0	0	4	0	0	0	0	1	0	0	0	3	0	16	0	0	0	0
5:55 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0
Total Survey	4	65	43	0	13	48	0	0	0	0	5	0	68	0	40	0	286	0	1	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Honeyman Rd				Westbound Honeyman Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	8	10	0	0	5	0	0	0	0	0	0	11	0	10	0	44	0	1	0	0
4:15 PM	0	12	6	0	2	9	0	0	0	0	0	0	12	0	3	0	44	0	0	0	0
4:30 PM	2	12	4	0	2	6	0	0	0	0	0	0	13	0	4	0	43	0	0	0	0
4:45 PM	0	6	4	0	4	7	0	0	0	0	3	0	6	0	3	0	33	0	0	0	0
5:00 PM	1	9	4	0	4	5	0	0	0	0	1	0	8	0	11	0	43	0	0	0	0
5:15 PM	0	8	2	0	1	7	0	0	0	0	0	0	9	0	2	0	29	0	0	0	0
5:30 PM	0	7	5	0	0	1	0	0	0	0	0	0	9	0	1	0	23	0	0	0	0
5:45 PM	1	3	8	0	0	8	0	0	0	0	1	0	0	0	6	0	27	0	0	0	0
Total Survey	4	65	43	0	13	48	0	0	0	0	5	0	68	0	40	0	286	0	1	0	0

Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Honeyman Rd				Westbound Honeyman Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	64	72	136	0	35	58	93	0	3	2	5	0	62	32	94	0	164	0	1	0	0
%HV	1.6%				0.0%				0.0%				1.6%				1.2%				
PHF	0.84				0.63				0.25				0.74				0.91				

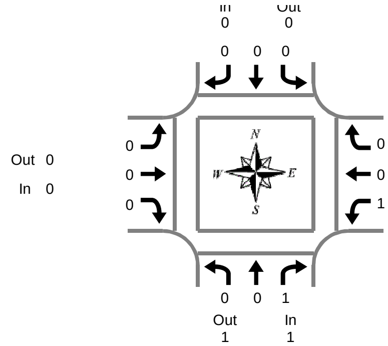
By Movement	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Honeyman Rd				Westbound Honeyman Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	2	38	24	64	8	27	0	35	0	0	3	3	42	0	20	62	164
%HV	0.0%	0.0%	4.2%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	0.0%	0.0%	1.6%	1.2%
PHF	0.25	0.68	0.60	0.84	0.50	0.61	0.00	0.63	0.00	0.00	0.25	0.25	0.81	0.00	0.50	0.74	0.91

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Honeyman Rd				Westbound Honeyman Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	2	38	24	0	8	27	0	0	0	0	3	0	42	0	20	0	164	0	1	0	0
4:15 PM	3	39	18	0	12	27	0	0	0	0	4	0	39	0	21	0	163	0	0	0	0
4:30 PM	3	35	14	0	11	25	0	0	0	0	4	0	36	0	20	0	148	0	0	0	0
4:45 PM	1	30	15	0	9	20	0	0	0	0	4	0	32	0	17	0	128	0	0	0	0
5:00 PM	2	27	19	0	5	21	0	0	0	0	2	0	26	0	20	0	122	0	0	0	0

Heavy Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:00 PM to 5:00 PM

Westlane Rd & Honeyman Rd

Wednesday, January 27, 2010
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Honeyman Rd				Westbound Honeyman Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
4:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:35 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	1	1	2	0	0	0	0	0	0	0	0	1	0	0	1	3

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Honeyman Rd				Westbound Honeyman Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	1	1	2	0	0	0	0	0	0	0	0	1	0	0	1	3

Heavy Vehicle Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound Westlane Rd			Southbound Westlane Rd			Eastbound Honeyman Rd			Westbound Honeyman Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	1	1	2	0	0	0	0	0	0	1	1	2	2
PHF	0.25			0.00			0.00			0.25			0.25

By Movement	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Honeyman Rd				Westbound Honeyman Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	2
PHF	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.25	0.25

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Honeyman Rd				Westbound Honeyman Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1

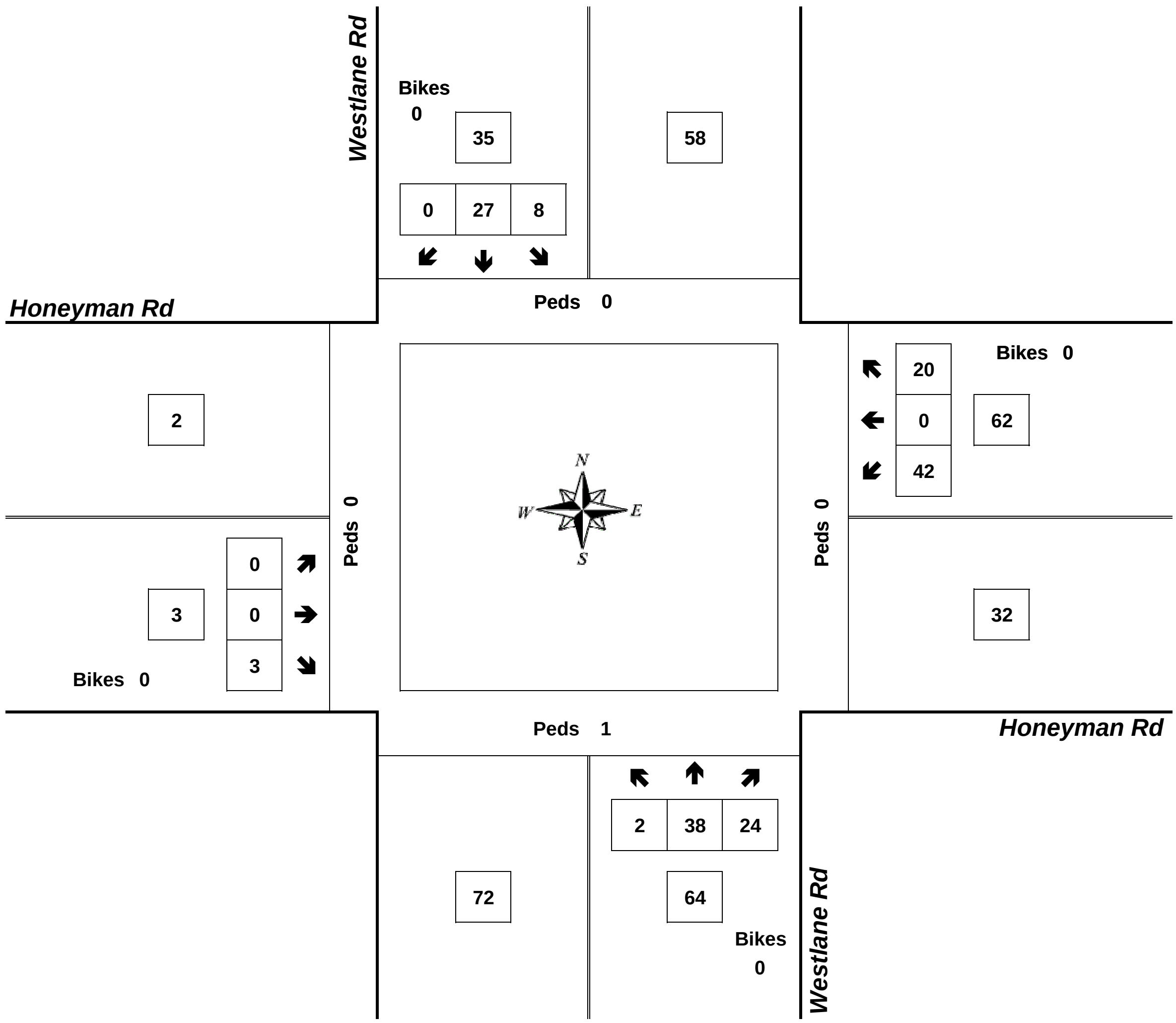
Peak Hour Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740

Westlane Rd & Honeyman Rd

4:00 PM to 5:00 PM
Wednesday, January 27, 2010



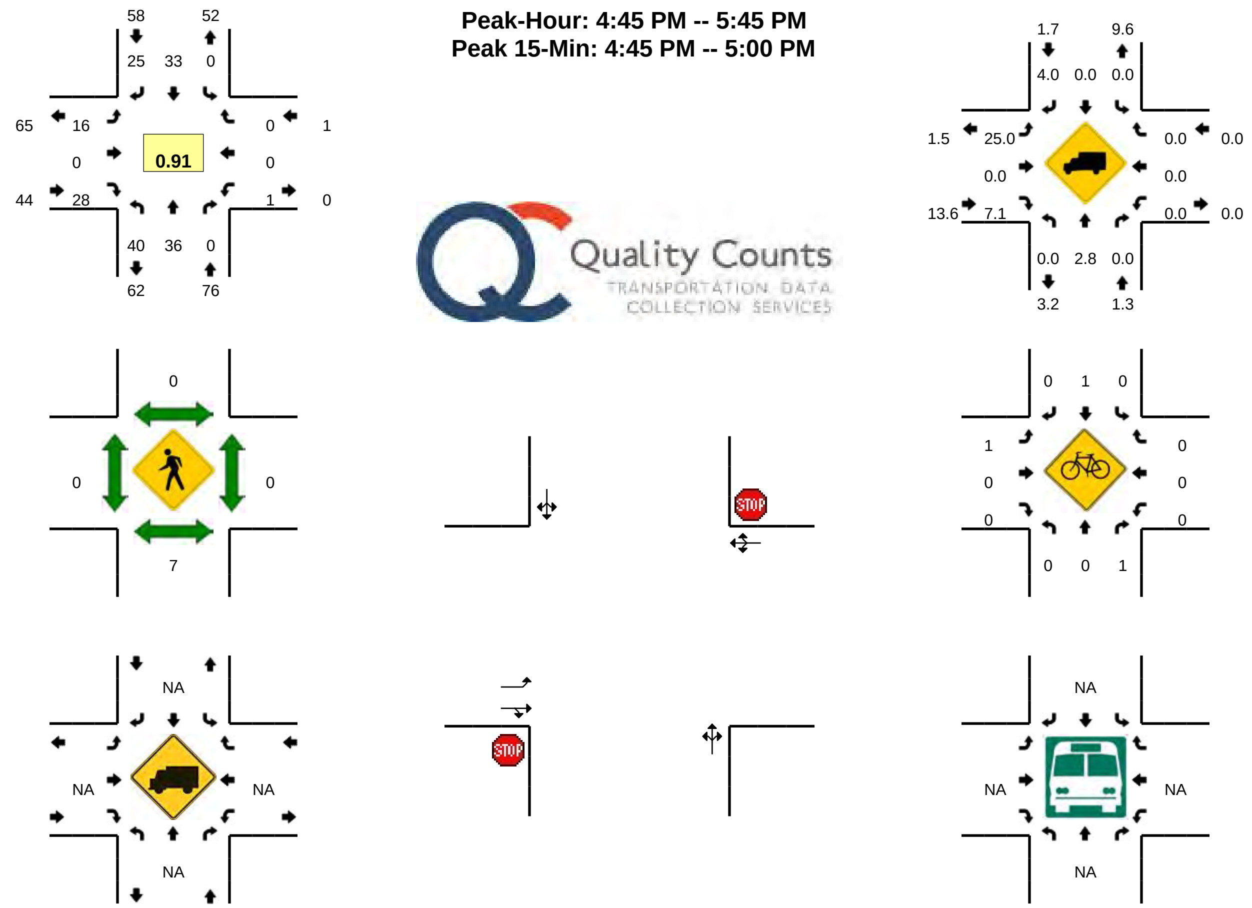
Approach	PHF	HV%	Volume
EB	0.25	0.0%	3
WB	0.74	1.6%	62
NB	0.84	1.6%	64
SB	0.63	0.0%	35
Intersection	0.91	1.2%	164

Count Period: 4:00 PM to 6:00 PM

Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

LOCATION: W Lane Rd -- NE Crown Zellerbach Rd | **QC JOB #:** 10922511
CITY/STATE: Scappoose, OR | **DATE:** Tue, Apr 09 2013

Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:45 PM -- 5:00 PM



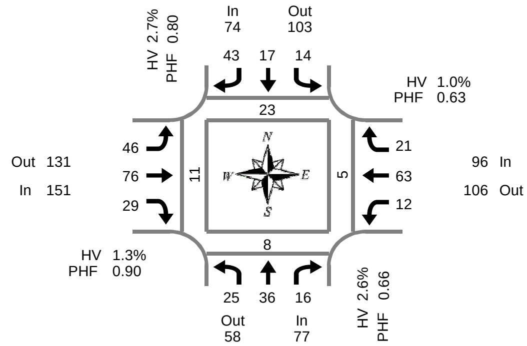
15-Min Count Period Beginning At	W Lane Rd (Northbound) Left	Thru	Right	U	W Lane Rd (Southbound) Left	Thru	Right	U	NE Crown Zellerbach Rd (Eastbound) Left	Thru	Right	U	NE Crown Zellerbach Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	7	12	0	0	0	6	6	0	11	0	7	0	0	0	0	0	49	
4:15 PM	8	11	0	0	0	13	5	0	12	0	5	0	0	0	0	0	54	
4:30 PM	7	9	0	0	0	13	16	0	7	0	3	0	0	0	0	0	55	
4:45 PM	10	9	0	0	0	7	12	0	7	0	3	0	1	0	0	0	49	207
5:00 PM	13	9	0	0	0	6	6	0	3	0	9	0	0	0	0	0	46	204
5:15 PM	9	9	0	0	0	11	3	0	4	0	12	0	0	0	0	0	48	198
5:30 PM	8	9	0	0	0	9	4	0	2	0	4	0	0	0	0	0	36	179
5:45 PM	3	5	0	0	0	3	0	0	1	0	3	0	0	0	0	0	15	145

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	40	36	0	0	0	28	48	0	28	0	12	0	4	0	0	0	196
Heavy Trucks	0	0	0		0	0	0		12	0	0		0	0	0		12
Pedestrians		4				0				0				0			4
Bicycles	0	0	1		0	0	0		0	0	0		0	0	0		1
Railroad																	
Stopped Buses																	

Comments:

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
4:15 PM to 5:15 PM

Westlane Rd & Columbia Ave

Wednesday, January 27, 2010
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Columbia Ave				Westbound Columbia Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	2	4	1	0	3	4	2	0	1	10	0	0	0	7	2	0	36	5	0	0	2
4:05 PM	4	1	1	0	0	1	2	0	1	6	2	0	1	6	4	0	29	1	0	0	2
4:10 PM	0	3	1	0	3	3	3	0	6	7	4	0	1	4	0	0	35	1	0	2	0
4:15 PM	1	5	3	0	0	1	0	0	5	11	2	0	1	6	0	0	35	3	0	0	0
4:20 PM	2	2	2	0	2	3	7	0	4	9	1	0	0	6	4	0	42	3	0	0	5
4:25 PM	2	3	0	0	2	0	3	0	5	3	2	0	2	4	3	0	29	0	0	1	1
4:30 PM	5	3	0	0	2	3	1	0	4	10	2	0	0	1	1	0	32	1	1	0	0
4:35 PM	4	7	0	0	0	1	5	0	3	5	1	0	1	1	3	0	31	0	1	0	1
4:40 PM	3	4	3	0	0	2	2	0	3	8	6	0	0	3	2	0	36	0	0	0	1
4:45 PM	0	3	2	0	0	1	4	0	5	6	3	0	0	4	1	0	29	0	1	0	2
4:50 PM	1	2	1	0	1	0	5	0	0	2	2	0	1	3	1	0	19	1	4	0	1
4:55 PM	0	1	1	0	2	2	2	0	3	6	2	0	2	8	0	0	29	2	0	0	0
5:00 PM	3	3	2	0	3	1	2	0	6	5	4	0	2	9	3	0	43	3	1	3	0
5:05 PM	1	1	2	0	0	3	6	0	4	5	2	0	0	7	1	0	32	8	0	0	0
5:10 PM	3	2	0	0	2	0	6	0	4	6	2	0	3	11	2	0	41	2	0	1	0
5:15 PM	1	3	1	0	2	1	3	0	2	4	0	0	1	7	2	0	27	0	0	2	0
5:20 PM	1	1	1	0	3	1	3	0	4	13	1	0	1	1	0	0	30	10	0	1	0
5:25 PM	1	3	1	0	0	1	2	0	3	7	0	0	3	5	1	0	27	0	0	0	2
5:30 PM	2	5	1	0	0	0	5	0	7	6	2	0	2	1	1	0	32	6	0	0	0
5:35 PM	2	2	0	0	2	1	3	0	3	8	0	0	1	11	3	0	36	0	0	0	0
5:40 PM	2	2	1	0	0	2	4	0	10	5	1	0	0	0	0	0	27	5	0	0	0
5:45 PM	3	1	1	0	1	0	1	0	4	5	0	0	1	5	1	0	23	0	1	0	1
5:50 PM	3	2	0	0	2	2	3	0	7	6	0	0	1	8	1	0	35	0	0	0	0
5:55 PM	4	2	1	0	1	2	3	0	3	4	2	0	2	3	3	0	30	0	0	0	0
Total Survey	50	65	26	0	31	35	77	0	97	157	41	0	26	121	39	0	765	51	9	10	18

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Columbia Ave				Westbound Columbia Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	6	8	3	0	6	8	7	0	8	23	6	0	2	17	6	0	100	7	0	2	4
4:15 PM	5	10	5	0	4	4	10	0	14	23	5	0	3	16	7	0	106	6	0	1	6
4:30 PM	12	14	3	0	2	6	8	0	10	23	9	0	1	5	6	0	99	1	2	0	2
4:45 PM	1	6	4	0	3	3	11	0	8	14	7	0	3	15	2	0	77	3	5	0	3
5:00 PM	7	6	4	0	5	4	14	0	14	16	8	0	5	27	6	0	116	13	1	4	0
5:15 PM	3	7	3	0	5	3	8	0	9	24	1	0	5	13	3	0	84	10	0	3	2
5:30 PM	6	9	2	0	2	3	12	0	20	19	3	0	3	12	4	0	95	11	0	0	0
5:45 PM	10	5	2	0	4	4	7	0	14	15	2	0	4	16	5	0	88	0	1	0	1
Total Survey	50	65	26	0	31	35	77	0	97	157	41	0	26	121	39	0	765	51	9	10	18

Peak Hour Summary
4:15 PM to 5:15 PM

By Approach	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Columbia Ave				Westbound Columbia Ave				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	77	58	135	0	74	103	177	0	151	131	282	0	96	106	202	0	398	23	8	5	11
%HV	2.6%				2.7%				1.3%				1.0%				1.8%				
PHF	0.66				0.80				0.90				0.63				0.86				

By Movement	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Columbia Ave				Westbound Columbia Ave				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	25	36	16	77	14	17	43	74	46	76	29	151	12	63	21	96	398
%HV	0.0%	5.6%	0.0%	2.6%	0.0%	5.9%	2.3%	2.7%	0.0%	1.3%	3.4%	1.3%	0.0%	1.6%	0.0%	1.0%	1.8%
PHF	0.52	0.64	0.67	0.66	0.58	0.71	0.77	0.80	0.82	0.83	0.66	0.90	0.60	0.58	0.66	0.63	0.86

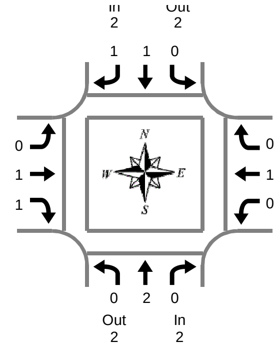
Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Columbia Ave				Westbound Columbia Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	24	38	15	0	15	21	36	0	40	83	27	0	9	53	21	0	382	17	7	3	15
4:15 PM	25	36	16	0	14	17	43	0	46	76	29	0	12	63	21	0	398	23	8	5	11
4:30 PM	23	33	14	0	15	16	41	0	41	77	25	0	14	60	17	0	376	27	8	7	7
4:45 PM	17	28	13	0	15	13	45	0	51	73	19	0	16	67	15	0	372	37	6	7	5
5:00 PM	26	27	11	0	16	14	41	0	57	74	14	0	17	68	18	0	383	34	2	7	3

Heavy Vehicle Summary

All Traffic Data Services Inc.

Clay Carney
(503) 833-2740



Out 2
In 2

Peak Hour Summary
4:15 PM to 5:15 PM

Westlane Rd & Columbia Ave

Wednesday, January 27, 2010
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Columbia Ave				Westbound Columbia Ave				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	1	0	0	1	0	0	0	0	1	1	0	2	0	0	0	0	3
4:05 PM	1	0	0	1	0	0	0	0	0	1	1	2	0	0	0	0	3
4:10 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
4:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4:20 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
4:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:40 PM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:50 PM	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
4:55 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	1	0	0	1	2	0	0	2	0	0	0	0	3
5:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	3	3	0	6	1	1	1	3	3	4	2	9	0	2	1	3	21

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Columbia Ave				Westbound Columbia Ave				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	2	0	0	2	0	0	0	0	1	3	1	5	0	0	0	0	7
4:15 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	1	0	1	3
4:30 PM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
4:45 PM	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	2
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	2	3
5:45 PM	0	0	0	0	1	0	0	1	2	0	0	2	0	0	0	0	3
Total Survey	3	3	0	6	1	1	1	3	3	4	2	9	0	2	1	3	21

Heavy Vehicle Peak Hour Summary
4:15 PM to 5:15 PM

By Approach	Northbound Westlane Rd			Southbound Westlane Rd			Eastbound Columbia Ave			Westbound Columbia Ave			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	2	2	4	2	2	4	2	2	4	1	1	2	7
PHF	0.50			0.50			0.50			0.25			0.58

By Movement	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Columbia Ave				Westbound Columbia Ave				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	2	0	2	0	1	1	2	0	1	1	2	0	1	0	1	7
PHF	0.00	0.50	0.00	0.50	0.00	0.25	0.25	0.50	0.00	0.25	0.25	0.50	0.00	0.25	0.00	0.25	0.58

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

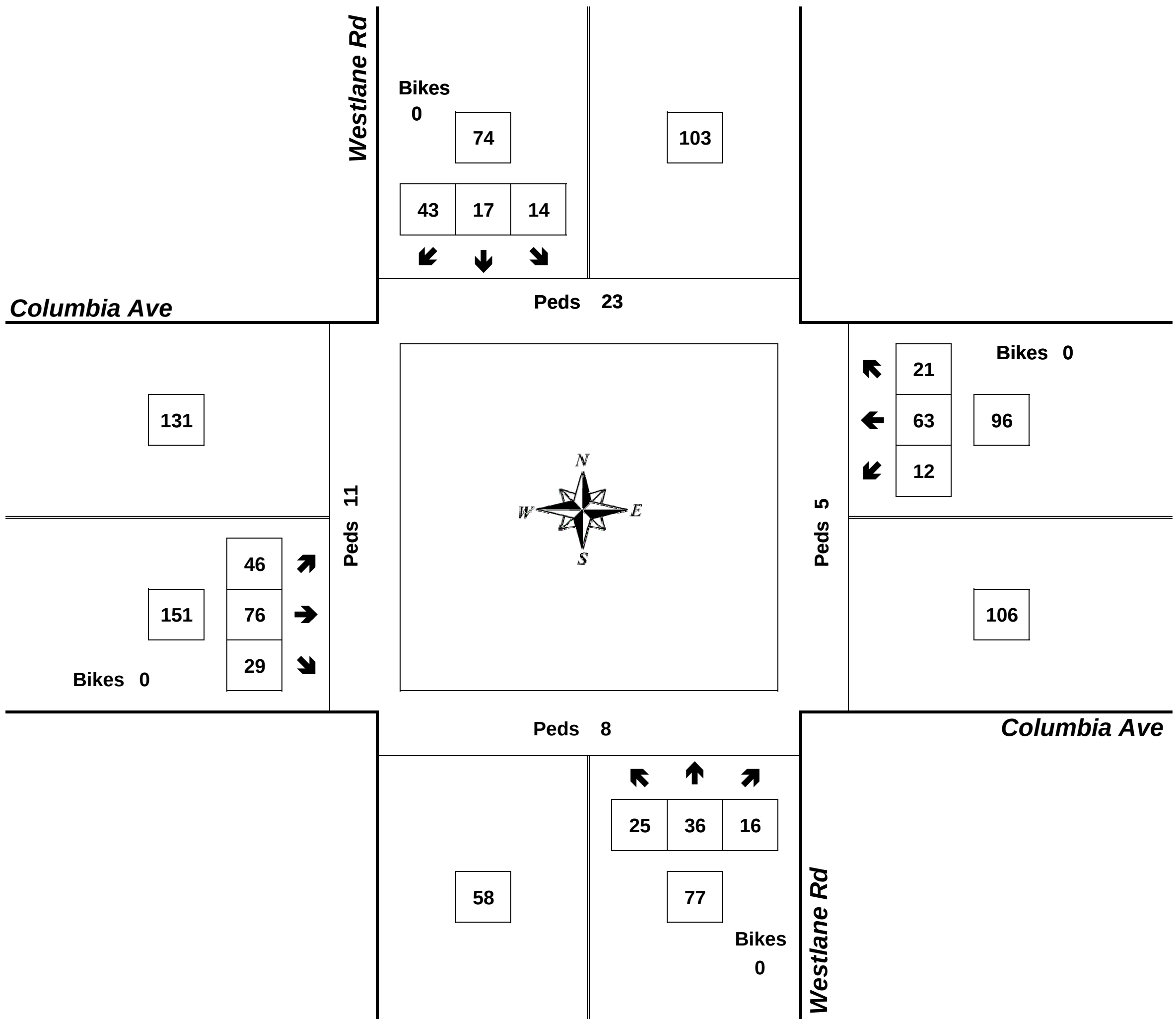
Interval Start Time	Northbound Westlane Rd				Southbound Westlane Rd				Eastbound Columbia Ave				Westbound Columbia Ave				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	2	2	0	4	0	1	1	2	1	4	2	7	0	1	0	1	14
4:15 PM	0	2	0	2	0	1	1	2	0	1	1	2	0	1	0	1	7
4:30 PM	1	1	0	2	0	0	1	1	0	1	1	2	0	0	0	0	5
4:45 PM	1	1	0	2	0	0	1	1	0	0	1	1	0	1	1	2	6
5:00 PM	1	1	0	2	1	0	0	1	2	0	0	2	0	1	1	2	7

Peak Hour Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740

Westlane Rd & Columbia Ave

4:15 PM to 5:15 PM
Wednesday, January 27, 2010

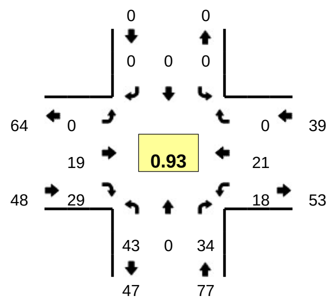


Approach	PHF	HV%	Volume
EB	0.90	1.3%	151
WB	0.63	1.0%	96
NB	0.66	2.6%	77
SB	0.80	2.7%	74
Intersection	0.86	1.8%	398

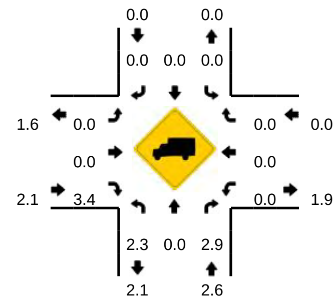
Count Period: 4:00 PM to 6:00 PM

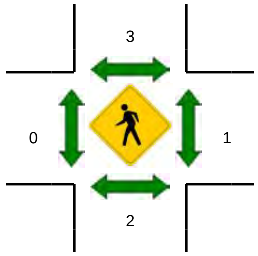
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

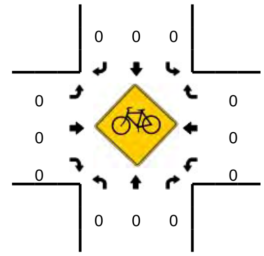
LOCATION: SE 6th St -- SE Elm St | **QC JOB #:** 10922513
CITY/STATE: Scappoose, OR | **DATE:** Tue, Apr 09 2013

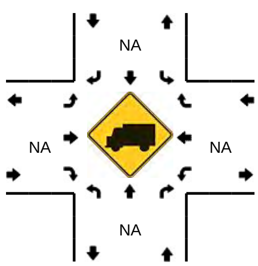


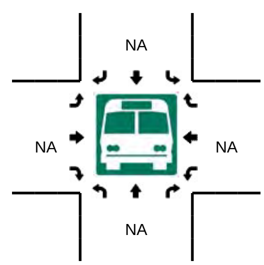
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:30 PM -- 5:45 PM











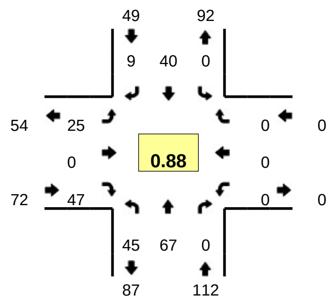
15-Min Count Period Beginning At	SE 6th St (Northbound) Left	Thru	Right	U	SE 6th St (Southbound) Left	Thru	Right	U	SE Elm St (Eastbound) Left	Thru	Right	U	SE Elm St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	11	0	5	0	0	0	0	0	0	7	9	0	3	4	0	0	39	
4:15 PM	12	0	6	0	0	0	0	0	0	7	9	0	2	4	0	0	40	
4:30 PM	3	0	5	0	0	0	0	0	0	6	7	0	6	1	0	0	28	
4:45 PM	13	0	4	0	0	0	0	0	0	7	4	0	6	5	0	0	39	146
5:00 PM	7	0	9	0	0	0	0	0	0	8	6	0	4	7	0	0	41	148
5:15 PM	12	0	15	0	0	0	0	0	0	0	6	0	5	2	0	0	40	148
5:30 PM	11	0	6	0	0	0	0	0	0	4	13	0	3	7	0	0	44	164
5:45 PM	8	0	7	0	0	0	0	0	0	7	8	0	5	7	0	0	42	167

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	44	0	24	0	0	0	0	0	0	16	52	0	12	28	0	0	176
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				4				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

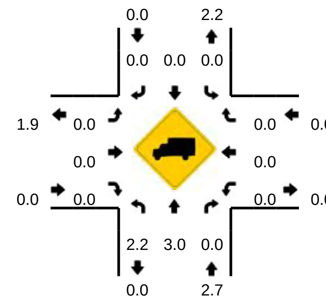
Comments:

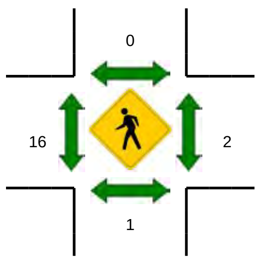
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

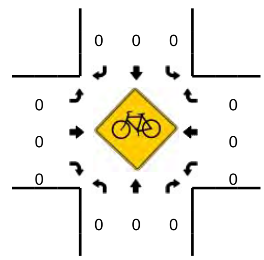
LOCATION: SW 6th St -- High School Way | **QC JOB #:** 10922514
CITY/STATE: Scappoose, OR | **DATE:** Tue, Apr 09 2013

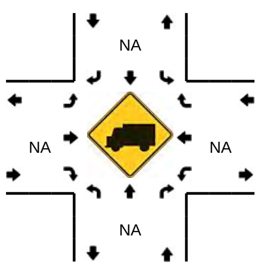


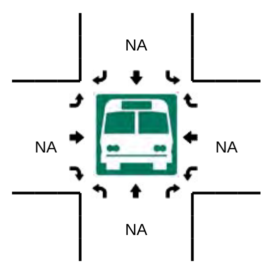
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:30 PM -- 5:45 PM











15-Min Count Period Beginning At	SW 6th St (Northbound) Left	Thru	Right	U	SW 6th St (Southbound) Left	Thru	Right	U	High School Way (Eastbound) Left	Thru	Right	U	High School Way (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	10	15	0	0	0	9	2	0	3	0	8	0	0	0	0	0	47	
4:15 PM	10	19	0	0	0	10	4	0	1	0	8	0	0	0	0	0	52	
4:30 PM	11	7	0	0	0	7	1	0	3	0	13	0	0	0	0	0	42	
4:45 PM	11	15	0	0	0	12	4	0	3	0	9	0	0	0	0	0	54	195
5:00 PM	10	21	0	0	0	5	2	0	5	0	12	0	0	0	0	0	55	203
5:15 PM	11	13	0	0	0	9	2	0	13	0	10	0	0	0	0	0	58	209
5:30 PM	13	18	0	0	0	14	1	0	4	0	16	0	0	0	0	0	66	233
5:45 PM	13	18	0	0	0	10	3	0	3	0	7	0	0	0	0	0	54	233

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	52	72	0	0	0	56	4	0	16	0	64	0	0	0	0	0	264
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				0				40				4			44
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Type of peak hour being reported: User-Defined

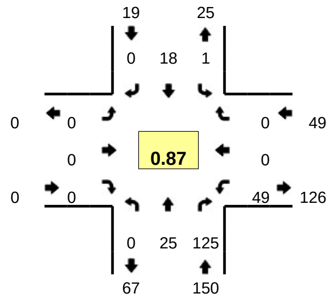
Method for determining peak hour: Total Entering Volume

LOCATION: SE 2nd St -- Frederick St

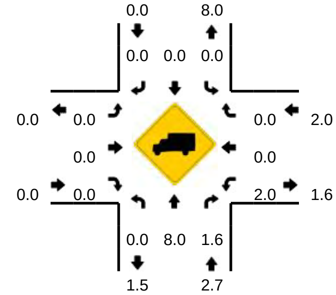
CITY/STATE: Scappoose, OR

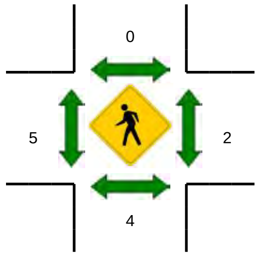
QC JOB #: 10922515

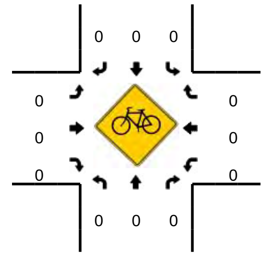
DATE: Tue, Apr 09 2013

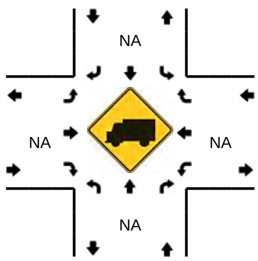


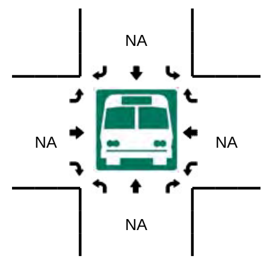
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM











15-Min Count Period Beginning At	SE 2nd St (Northbound) Left	Thru	Right	U	SE 2nd St (Southbound) Left	Thru	Right	U	Frederick St (Eastbound) Left	Thru	Right	U	Frederick St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	6	22	0	0	1	0	0	0	0	0	0	7	0	0	0	36	
4:15 PM	0	4	23	0	0	2	0	0	0	0	0	0	10	0	0	0	39	
4:30 PM	0	1	33	0	0	5	0	0	0	0	0	0	3	0	0	0	42	
4:45 PM	0	4	23	0	0	5	0	0	0	0	0	0	14	0	0	0	46	163
5:00 PM	0	9	34	0	0	7	0	0	0	0	0	0	13	0	0	0	63	190
5:15 PM	0	5	29	0	1	3	0	0	0	0	0	0	9	0	0	0	47	198
5:30 PM	0	7	39	0	0	3	0	0	0	0	0	0	13	0	0	0	62	218
5:45 PM	0	5	34	0	0	7	0	0	0	0	0	0	9	0	1	0	56	228

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	36	136	0	0	28	0	0	0	0	0	0	52	0	0	0	252
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		16				0				0				0			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

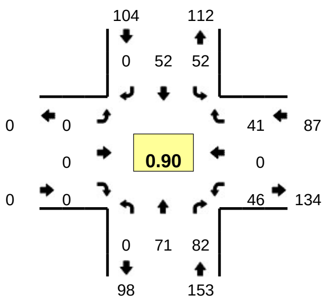
Comments:

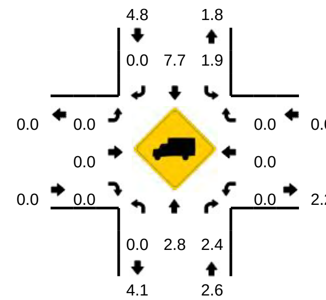
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

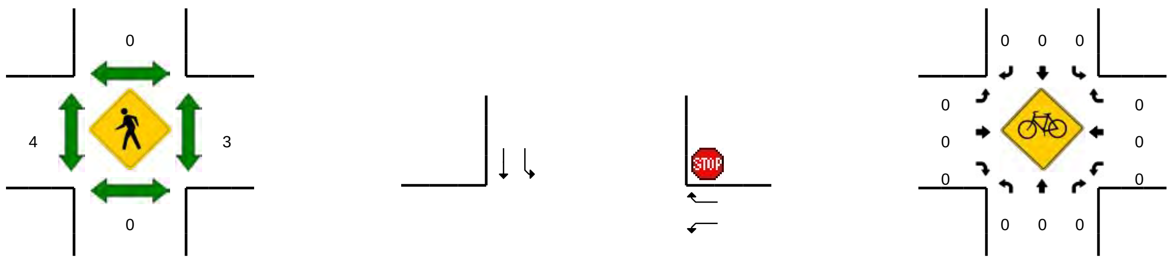
LOCATION: SW Old Portland Rd -- Havlik Dr
CITY/STATE: Scappoose, OR

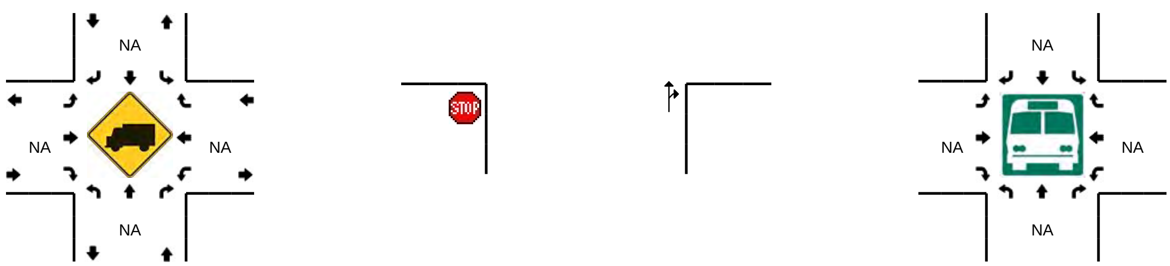
QC JOB #: 10922516
DATE: Tue, Apr 09 2013

Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:15 PM -- 5:30 PM









15-Min Count Period Beginning At	SW Old Portland Rd (Northbound) Left	Thru	Right	U	SW Old Portland Rd (Southbound) Left	Thru	Right	U	Havlik Dr (Eastbound) Left	Thru	Right	U	Havlik Dr (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	20	24	0	8	14	0	0	0	0	0	0	12	0	5	0	83	
4:15 PM	0	18	28	0	11	9	0	0	0	0	0	0	14	0	9	0	89	
4:30 PM	0	16	20	0	12	7	0	0	0	0	0	0	5	0	13	0	73	
4:45 PM	0	17	24	0	15	13	0	0	0	0	0	0	13	0	9	0	91	336
5:00 PM	0	18	13	0	15	15	0	0	0	0	0	0	13	0	9	0	83	336
5:15 PM	0	22	26	0	13	13	0	0	0	0	0	0	9	0	13	0	96	343
5:30 PM	0	14	19	0	9	11	0	0	0	0	0	0	11	0	10	0	74	344
5:45 PM	0	18	16	0	5	18	0	0	0	0	0	0	21	0	11	0	89	342

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	88	104	0	52	52	0	0	0	0	0	0	36	0	52	0	384
Heavy Trucks	0	4	0		0	0	0		0	0	0		0	0	0		4
Pedestrians		0				0				4				4			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

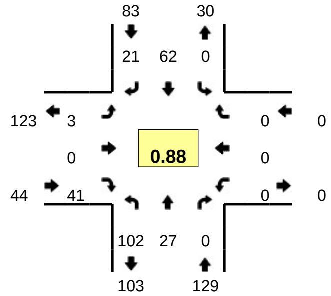
Comments:

Report generated on 5/3/2013 9:38 AM

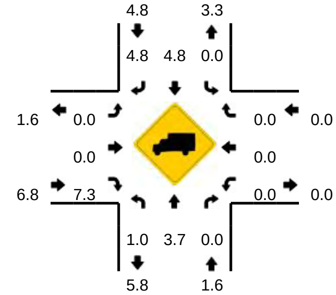
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

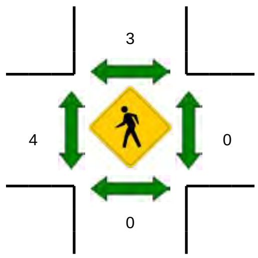
Type of peak hour being reported: User-Defined Method for determining peak hour: Total Entering Volume

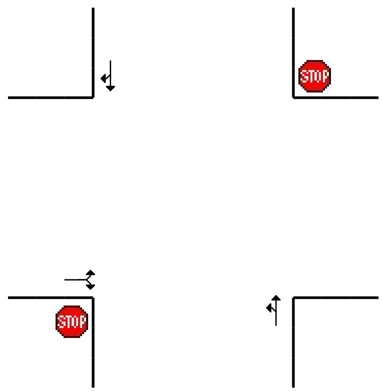
LOCATION: SW Old Portland Rd -- SW Sequoia St **QC JOB #:** 10922517
CITY/STATE: Scappoose, OR **DATE:** Tue, Apr 09 2013

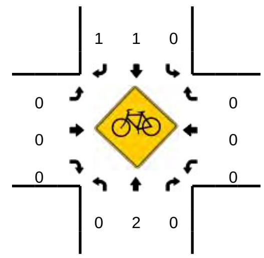


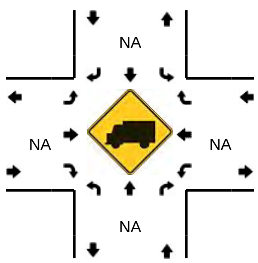
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

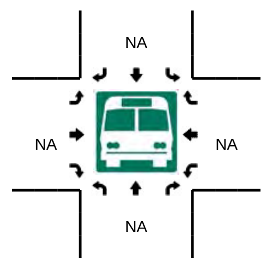












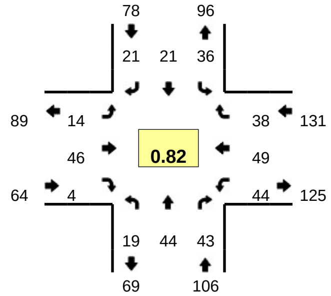
15-Min Count Period Beginning At	SW Old Portland Rd (Northbound) Left	Thru	Right	U	SW Old Portland Rd (Southbound) Left	Thru	Right	U	SW Sequoia St (Eastbound) Left	Thru	Right	U	SW Sequoia St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	25	13	0	0	0	16	5	0	0	0	12	0	0	0	0	0	71	
4:15 PM	28	9	0	0	0	12	2	0	0	0	10	0	0	0	0	0	61	
4:30 PM	26	7	0	0	0	12	4	0	0	0	8	0	0	0	0	0	57	
4:45 PM	26	7	0	0	0	15	10	0	0	0	11	0	0	0	0	0	69	258
5:00 PM	24	6	0	0	0	14	5	0	2	0	10	0	0	0	0	0	61	248
5:15 PM	28	8	0	0	0	22	3	0	0	0	12	0	0	0	0	0	73	260
5:30 PM	24	6	0	0	0	11	3	0	1	0	8	0	0	0	0	0	53	256
5:45 PM	26	8	0	0	0	21	5	0	0	0	4	0	0	0	0	0	64	251

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	112	32	0	0	0	88	12	0	0	0	48	0	0	0	0	0	292
Heavy Trucks	4	0	0		0	0	0		0	0	0		0	0	0		4
Pedestrians		0				12				4				0			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

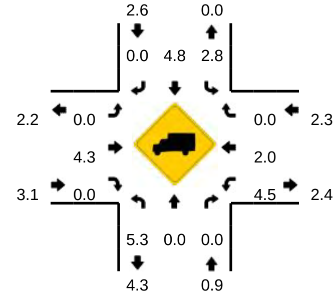
Comments:

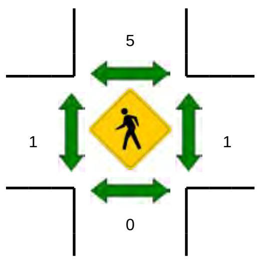
LOCATION: SW 4th St -- SW Em Watts Rd
CITY/STATE: Scappoose, OR

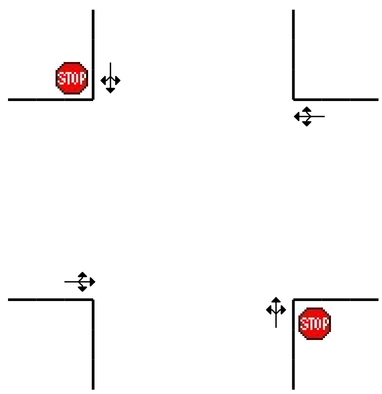
QC JOB #: 10922518
DATE: Tue, Apr 09 2013

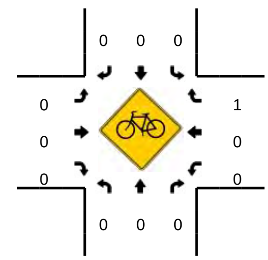


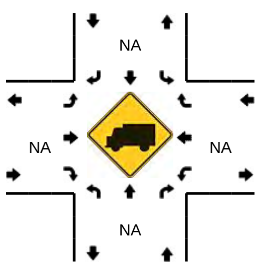
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

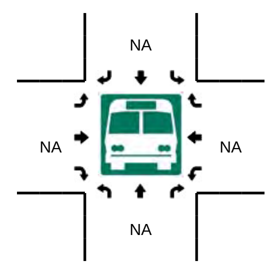












15-Min Count Period Beginning At	SW 4th St (Northbound) Left	Thru	Right	U	SW 4th St (Southbound) Left	Thru	Right	U	SW Em Watts Rd (Eastbound) Left	Thru	Right	U	SW Em Watts Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	6	13	2	0	3	7	5	0	1	5	1	0	6	7	7	0	63	
4:15 PM	6	9	13	0	5	2	3	0	1	8	1	0	7	8	6	0	69	
4:30 PM	5	17	10	0	3	7	2	0	6	7	1	0	7	8	9	0	82	
4:45 PM	3	11	12	0	12	7	9	0	2	10	1	0	8	8	6	0	89	303
5:00 PM	4	15	13	0	7	4	8	0	2	16	0	0	15	18	14	0	116	356
5:15 PM	5	12	6	0	11	7	3	0	4	8	3	0	10	17	9	0	95	382
5:30 PM	7	6	12	0	6	3	1	0	6	12	0	0	11	6	9	0	79	379
5:45 PM	4	9	11	0	11	3	3	0	3	12	0	0	6	9	13	0	84	374

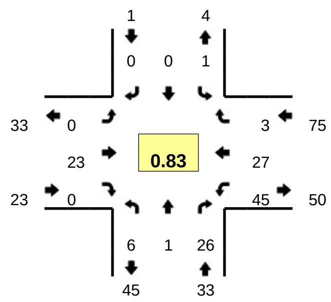
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	16	60	52	0	28	16	32	0	8	64	0	0	60	72	56	0	464
Heavy Trucks	0	0	0		4	0	0		0	0	0		8	4	0		16
Pedestrians		0				12				0				4			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

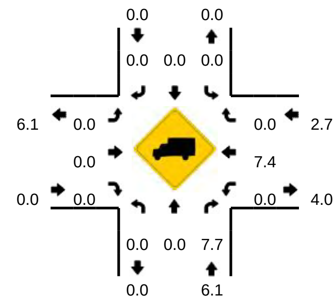
Comments:

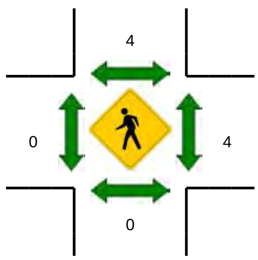
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

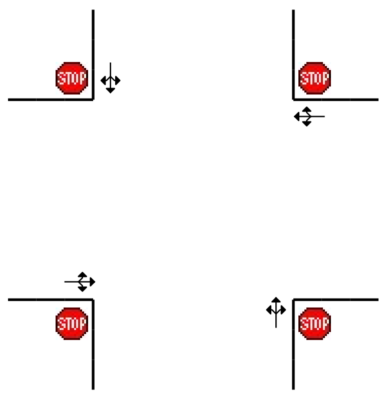
LOCATION: SW Eggleston Ln/Em Watts Rd -- SW Keys Rd | **QC JOB #:** 10922519
CITY/STATE: Scappoose, OR | **DATE:** Tue, Apr 09 2013

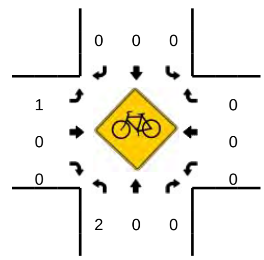
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

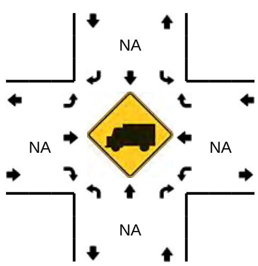


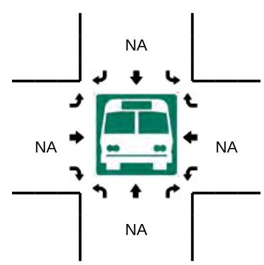












15-Min Count Period Beginning At	SW Eggleston Ln/Em Watts Rd (Northbound) Left	Thru	Right	U	SW Eggleston Ln/Em Watts Rd (Southbound) Left	Thru	Right	U	SW Keys Rd (Eastbound) Left	Thru	Right	U	SW Keys Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	0	4	1	0	0	0	0	0	3	0	0	4	11	2	0	25	
4:15 PM	0	0	4	0	0	0	0	0	0	5	0	0	7	4	1	0	21	
4:30 PM	1	0	7	0	1	0	0	0	0	3	1	0	9	3	0	0	25	
4:45 PM	2	0	5	0	0	0	0	0	0	4	0	0	12	5	1	0	29	100
5:00 PM	1	0	4	0	0	0	0	0	0	12	0	0	14	9	0	0	40	115
5:15 PM	3	1	5	0	1	0	0	0	0	4	0	0	14	8	0	0	36	130
5:30 PM	0	0	12	0	0	0	0	0	0	3	0	0	5	5	2	0	27	132
5:45 PM	3	0	8	0	1	0	0	0	0	5	0	0	11	4	0	0	32	135

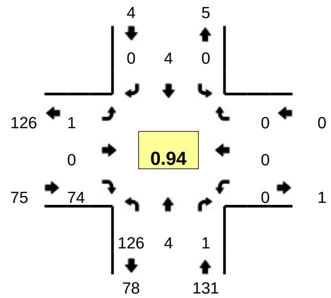
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	4	0	16	0	0	0	0	0	0	48	0	0	56	36	0	0	160
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

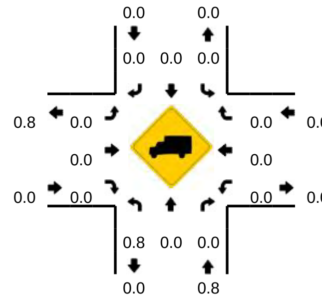
Type of peak hour being reported: User-Defined — Method for determining peak hour: Total Entering Volume

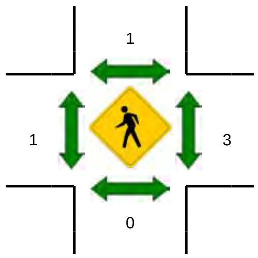
LOCATION: NW 1st St -- NW EJ Smith Rd — **QC JOB #:** 10922520

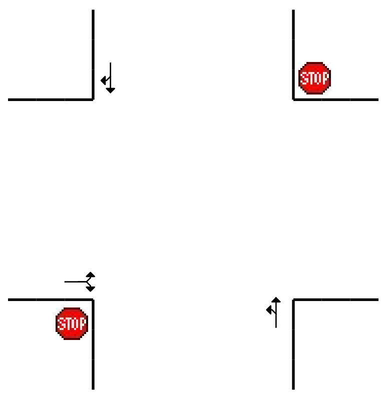
CITY/STATE: Scappoose, OR — **DATE:** Tue, Apr 09 2013

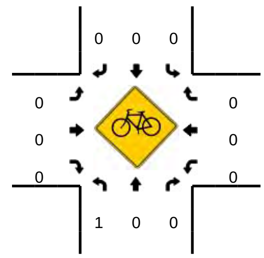


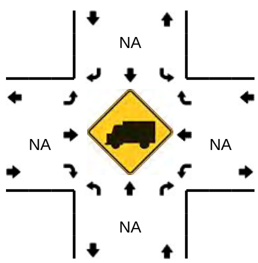
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

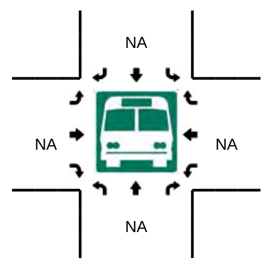












15-Min Count Period Beginning At	NW 1st St (Northbound) Left	Thru	Right	U	NW 1st St (Southbound) Left	Thru	Right	U	NW EJ Smith Rd (Eastbound) Left	Thru	Right	U	NW EJ Smith Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	28	2	0	1	0	2	0	0	0	0	17	0	0	0	0	0	50	
4:15 PM	35	2	0	1	0	2	0	0	0	0	18	0	0	0	0	0	58	
4:30 PM	29	2	0	0	0	2	0	0	0	0	39	0	0	0	0	0	72	
4:45 PM	28	2	0	0	0	4	0	0	1	0	14	0	0	0	0	0	49	229
5:00 PM	28	0	1	0	0	0	0	0	0	0	21	0	0	0	0	0	50	229
5:15 PM	31	2	0	0	0	0	0	0	0	0	23	0	0	0	0	0	56	227
5:30 PM	39	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	55	210
5:45 PM	33	0	0	0	0	1	0	0	0	0	23	0	0	0	0	0	57	218

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	124	8	0	0	0	0	0	0	0	0	92	0	0	0	0	0	224
Heavy Trucks	4	0	0		0	0	0		0	0	0		0	0	0		4
Pedestrians		0				4				0				12			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Seasonal Factoring Methodology

Seasonal Factors

ODOT's Analysis Procedures Manual (APM) calls for adjustment of raw traffic counts to 30th highest hour volumes to account for seasonal variation through the course of a year. Counts used in this analysis were collected in early April 2013. Since no ATRs are located on US 30 in the vicinity of Scappoose, the Seasonal Trend method was used. Based on input from ODOT, the average of the Commuter and Summer trends was used (see attached spreadsheet).

State Highway (US 30) Intersections:

Average weekday factor = (April 9th/average month) = average(0.95, 1.05)/1.0 = **1.0**

Seasonal factor = (April 9th/peak month) = average(0.95, 1.05)/average(0.90, 0.84) = **1.15**

For raw traffic counts on Scappoose's local street system, the Seasonal Trend method was used. The Commuter trend was selected.

Local Street System Intersections:

Average weekday factor = (April 9th/average month) = 0.95/1.0 = **0.95**

Seasonal factor = (April 9th/peak month) = 0.95/0.90 = **1.05**

with an April 9th/peak month growth factor of 0.95/0.90 = **1.05**, and an April 9th/average month factor of 0.95/1.0 = **0.95.**

2012 SEASONAL TREND TABLE (Printed: 12/14/12)

TREND	1-Jan	15-Jan	1-Feb	15-Feb	1-Mar	15-Mar	1-Apr	15-Apr	1-May	15-May	1-Jun	15-Jun	1-Jul	15-Jul	1-Aug	15-Aug	1-Sep	15-Sep	1-Oct	15-Oct	1-Nov	15-Nov	1-Dec	15-Dec	Peak Period Seasonal Factor	Count Data Interpolation 9-Apr
INTERSTATE URBANIZED	0.9983	1.0130	1.0083	1.0036	0.9855	0.9675	0.9600	0.9525	0.9541	0.9558	0.9337	0.9115	0.9146	0.9176	0.9142	0.9107	0.9301	0.9494	0.9572	0.9650	0.9811	0.9972	0.9958	0.9944	0.9107	
INTERSTATE NONURBANIZED	1.2324	1.3111	1.2742	1.2374	1.1663	1.0952	1.0847	1.0741	1.0453	1.0164	0.9604	0.9044	0.8755	0.8467	0.8446	0.8425	0.8892	0.9359	0.9839	1.0320	1.0560	1.0800	1.1051	1.1303	0.8425	
COMMUTER	0.9994	1.0053	0.9995	0.9937	0.9831	0.9724	0.9559	0.9395	0.9394	0.9392	0.9234	0.9075	0.9134	0.9193	0.9099	0.9004	0.9150	0.9296	0.9312	0.9329	0.9565	0.9802	0.9906	1.0009	0.9004	0.946
COASTAL DESTINATION	1.1751	1.1889	1.1743	1.1597	1.1249	1.0900	1.0895	1.0890	1.0681	1.0473	0.9987	0.9501	0.8988	0.8475	0.8397	0.8319	0.8771	0.9222	0.9829	1.0436	1.1041	1.1645	1.1644	1.1643	0.8319	
COASTAL DESTINATION ROUTE	1.4566	1.5062	1.4881	1.4700	1.3821	1.2942	1.2841	1.2740	1.2096	1.1452	1.0618	0.9784	0.8798	0.7811	0.7778	0.7746	0.8350	0.8954	1.0302	1.1650	1.2402	1.3153	1.3338	1.3522	0.7746	
AGRICULTURE	1.2435	1.2256	1.2131	1.2006	1.1742	1.1477	1.1001	1.0526	0.9962	0.9398	0.9024	0.8651	0.8372	0.8094	0.8108	0.8123	0.8019	0.7915	0.8389	0.8864	0.9694	1.0524	1.1259	1.1993	0.7915	
RECREATIONAL SUMMER	1.7082	1.7357	1.7112	1.6868	1.6056	1.5245	1.4673	1.4101	1.2425	1.0749	0.9735	0.8720	0.8041	0.7362	0.7408	0.7453	0.7881	0.8309	0.9392	1.0476	1.2114	1.3753	1.4126	1.4499	0.7362	
RECREATIONAL SUMMER WINTER	1.2634	1.4998	1.3979	1.2959	1.3576	1.4194	1.5630	1.7066	1.6539	1.6012	1.3670	1.1328	0.9849	0.8370	0.8483	0.8596	1.0479	1.2362	1.4940	1.7517	1.8491	1.9465	1.5528	1.1590	0.8370	
RECREATIONAL WINTER	0.9766	1.2467	1.0548	0.8629	0.9922	1.1215	1.3537	1.5859	2.2353	2.8847	2.2595	1.6344	1.3977	1.1610	1.1473	1.1337	1.2792	1.4247	1.5433	1.6619	2.0128	2.3636	1.7692	1.1748	0.8629	
SUMMER	1.1678	1.1820	1.1722	1.1623	1.1293	1.0963	1.0663	1.0362	1.0079	0.9796	0.9401	0.9006	0.8736	0.8466	0.8435	0.8404	0.8758	0.9113	0.9481	0.9849	1.0329	1.0810	1.0973	1.1136	0.8404	1.048
SUMMER < 2500	1.1804	1.2031	1.1946	1.1861	1.1430	1.0999	1.0391	0.9782	0.9402	0.9023	0.8939	0.8857	0.8693	0.8530	0.8476	0.8421	0.8540	0.8659	0.9009	0.9359	0.9870	1.0382	1.0813	1.1245	0.8421	

***Seasonal Trend Table factors are based on previous year ATR data. The table is updated yearly.**
***Grey shading indicates months were seasonal factor is greater than 30%**

Average Weekday Factor
Avg (Commuter, Summer)
9-Apr 1.00

Seasonal Factors- 30 HV
Avg (Commuter, Summer)
9-Apr 1.15

Highway Capacity Analysis Results

Existing Conditions – 30 HV

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	5	15	10	5	55	30	1775	10	40	845	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	5	16	11	5	60	33	1929	11	43	918	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2098	3000	459	2560	3000	965	918			1929		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2098	3000	459	2560	3000	965	918			1929		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	10	50	97	0	50	77	96			85		
cM capacity (veh/h)	12	11	549	7	11	255	739			294		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	33	76	33	965	965	11	43	459	459	27
Volume Left	11	11	33	0	0	0	43	0	0	0
Volume Right	16	60	0	0	0	11	0	0	0	27
cSH	23	33	739	1700	1700	1700	294	1700	1700	1700
Volume to Capacity	1.43	2.31	0.04	0.57	0.57	0.01	0.15	0.27	0.27	0.02
Queue Length 95th (ft)	104	217	3	0	0	0	13	0	0	0
Control Delay (s)	594.5	855.0	10.1	0.0	0.0	0.0	19.4	0.0	0.0	0.0
Lane LOS	F	F	B				C			
Approach Delay (s)	594.5	855.0	0.2				0.9			
Approach LOS	F	F								

Intersection Summary			
Average Delay	27.9		
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	10	70	40	25	70	180	1740	30	35	825	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1525	1750	1468	1661	1506		1646	3260	1297	1599	3228	1457
Flt Permitted	0.69	1.00	1.00	0.75	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1112	1750	1468	1312	1506		1646	3260	1297	1599	3228	1457
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	11	74	42	26	74	189	1832	32	37	868	11
RTOR Reduction (vph)	0	0	67	0	67	0	0	0	11	0	0	5
Lane Group Flow (vph)	11	11	7	42	33	0	189	1832	21	37	868	6
Confl. Peds. (#/hr)			1	1					2	2		
Confl. Bikes (#/hr)						1						1
Heavy Vehicles (%)	9%	0%	0%	0%	0%	3%	1%	2%	12%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8					6			2
Actuated Green, G (s)	6.0	6.0	6.0	6.0	6.0		11.2	40.4	40.4	2.2	31.4	31.4
Effective Green, g (s)	6.0	6.0	6.0	6.0	6.0		11.2	40.4	40.4	2.2	31.4	31.4
Actuated g/C Ratio	0.10	0.10	0.10	0.10	0.10		0.18	0.65	0.65	0.04	0.50	0.50
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	2.3	2.3		2.3	4.8	4.8	2.3	4.8	4.8
Lane Grp Cap (vph)	106	167	140	125	144		294	2103	837	56	1619	730
v/s Ratio Prot		0.01			0.02		c0.11	c0.56		0.02	0.27	
v/s Ratio Perm	0.01		0.00	c0.03					0.02			0.00
v/c Ratio	0.10	0.07	0.05	0.34	0.23		0.64	0.87	0.02	0.66	0.54	0.01
Uniform Delay, d1	25.8	25.8	25.7	26.4	26.2		23.8	9.0	4.0	29.8	10.6	7.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.2	0.2	0.9	0.5		4.0	4.6	0.0	22.1	0.6	0.0
Delay (s)	26.3	25.9	25.9	27.4	26.6		27.8	13.6	4.0	51.9	11.2	7.8
Level of Service	C	C	C	C	C		C	B	A	D	B	A
Approach Delay (s)		25.9			26.9			14.7			12.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	62.6	Sum of lost time (s)	14.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	155	35	75	15	1885	230	65	895	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes				1.00	0.98		1.00	1.00	0.93	1.00	1.00	
Flpb, ped/bikes				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt				1.00	0.90		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1646	1515		1662	3260	1363	1614	3257	
Flt Permitted				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1646	1515		1662	3260	1363	1614	3257	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	161	36	78	16	1964	240	68	932	5
RTOR Reduction (vph)	0	0	0	0	65	0	0	0	28	0	0	0
Lane Group Flow (vph)	0	0	0	161	49	0	16	1964	212	68	937	0
Confl. Peds. (#/hr)	17					17	2		16	16		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	0%	2%	0%	2%	2%	3%	2%	0%
Turn Type				Perm	NA		Prot	NA	Perm	Prot	NA	
Protected Phases					4		1	6		5	2	
Permitted Phases				4					6			
Actuated Green, G (s)				14.4	14.4		2.9	84.5	84.5	8.6	90.2	
Effective Green, g (s)				14.4	14.4		2.9	84.5	84.5	8.6	90.2	
Actuated g/C Ratio				0.12	0.12		0.02	0.70	0.70	0.07	0.75	
Clearance Time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)				3.0	3.0		2.3	4.1	4.1	2.3	4.1	
Lane Grp Cap (vph)				197	181		40	2295	959	115	2448	
v/s Ratio Prot					0.03		0.01	c0.60		c0.04	0.29	
v/s Ratio Perm				c0.10					0.16			
v/c Ratio				0.82	0.27		0.40	0.86	0.22	0.59	0.38	
Uniform Delay, d1				51.5	48.0		57.7	13.2	6.2	54.0	5.2	
Progression Factor				1.00	1.00		1.22	1.23	0.82	1.00	1.00	
Incremental Delay, d2				22.4	0.8		1.5	1.7	0.2	6.1	0.5	
Delay (s)				73.9	48.8		71.7	18.0	5.3	60.1	5.6	
Level of Service				E	D		E	B	A	E	A	
Approach Delay (s)		0.0			63.5			17.0			9.3	
Approach LOS		A			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: US 30 & JP West

10/9/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	50	110	2115	1005	50
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	26	53	116	2226	1058	53
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				474	300	
pX, platoon unblocked	0.36	0.90	0.90			
vC, conflicting volume	2429	555	1111			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	188	297	911			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	92	83			
cM capacity (veh/h)	231	633	672			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	79	116	1113	1113	705	405
Volume Left	26	116	0	0	0	0
Volume Right	53	0	0	0	0	53
cSH	400	672	1700	1700	1700	1700
Volume to Capacity	0.20	0.17	0.65	0.65	0.41	0.24
Queue Length 95th (ft)	18	15	0	0	0	0
Control Delay (s)	16.2	11.5	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	16.2	0.6			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	25	50	80	30	45	15	2140	110	45	1020	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.97		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1582	1450		1674	1463	1583	3260	1420	1662	3250	
Flt Permitted		0.59	1.00		0.71	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		968	1450		1238	1463	1583	3260	1420	1662	3250	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	47	26	53	84	32	47	16	2253	116	47	1074	16
RTOR Reduction (vph)	0	0	47	0	0	42	0	0	23	0	0	0
Lane Group Flow (vph)	0	73	6	0	116	5	16	2253	93	47	1090	0
Confl. Peds. (#/hr)	4		12	12		4	1		2	2		1
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	8%	5%	0%	0%	0%	0%	5%	2%	2%	0%	2%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		13.9	13.9		13.9	13.9	3.0	86.4	86.4	7.2	90.6	
Effective Green, g (s)		13.9	13.9		13.9	13.9	3.0	86.4	86.4	7.2	90.6	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.02	0.72	0.72	0.06	0.75	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		3.0	3.0	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		112	167		143	169	39	2347	1022	99	2453	
v/s Ratio Prot							0.01	c0.69		c0.03	0.34	
v/s Ratio Perm		0.08	0.00		c0.09	0.00			0.07			
v/c Ratio		0.65	0.04		0.81	0.03	0.41	0.96	0.09	0.47	0.44	
Uniform Delay, d1		50.7	47.1		51.8	47.1	57.6	15.2	5.0	54.6	5.4	
Progression Factor		1.00	1.00		1.00	1.00	1.11	0.62	0.37	0.98	0.80	
Incremental Delay, d2		11.5	0.1		28.2	0.1	1.9	6.0	0.0	2.0	0.5	
Delay (s)		62.2	47.2		80.0	47.2	65.9	15.4	1.9	55.4	4.9	
Level of Service		E	D		F	D	E	B	A	E	A	
Approach Delay (s)		55.9			70.5			15.1			7.0	
Approach LOS		E			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	94.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	145	65	35	2120	1035	115
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		5.0	4.5	4.5	
Lane Util. Factor	1.00		1.00	0.95	0.95	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.96		1.00	1.00	0.98	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1604		1614	3260	3204	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	1604		1614	3260	3204	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	153	68	37	2232	1089	121
RTOR Reduction (vph)	14	0	0	0	5	0
Lane Group Flow (vph)	207	0	37	2232	1205	0
Confl. Peds. (#/hr)		2	4			4
Confl. Bikes (#/hr)						1
Heavy Vehicles (%)	0%	2%	3%	2%	2%	1%
Turn Type	NA		Prot	NA	NA	
Protected Phases	8		1	6	2	
Permitted Phases						
Actuated Green, G (s)	17.3		5.4	94.2	83.8	
Effective Green, g (s)	17.3		5.4	94.2	83.8	
Actuated g/C Ratio	0.14		0.05	0.79	0.70	
Clearance Time (s)	4.0		5.0	4.5	4.5	
Vehicle Extension (s)	2.3		2.3	4.2	4.2	
Lane Grp Cap (vph)	231		72	2559	2237	
v/s Ratio Prot	c0.13		0.02	c0.68	0.38	
v/s Ratio Perm						
v/c Ratio	0.90		0.51	0.87	0.54	
Uniform Delay, d1	50.5		56.0	8.8	8.8	
Progression Factor	1.00		1.32	0.36	0.65	
Incremental Delay, d2	32.5		1.9	2.3	0.9	
Delay (s)	83.0		75.6	5.5	6.5	
Level of Service	F		E	A	A	
Approach Delay (s)	83.0			6.6	6.5	
Approach LOS	F			A	A	

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	0	10	45	5	90	15	2125	60	70	965	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1657	1458		1663	1422	1662	3292	1421	1630	3250	
Flt Permitted		0.72	1.00		0.73	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1262	1458		1272	1422	1662	3292	1421	1630	3250	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	0	10	46	5	93	15	2191	62	72	995	21
RTOR Reduction (vph)	0	0	9	0	0	85	0	0	13	0	1	0
Lane Group Flow (vph)	0	21	1	0	51	8	15	2191	49	72	1015	0
Confl. Peds. (#/hr)	3		7	7		3			2	2		
Confl. Bikes (#/hr)									2			1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	1%	2%	2%	2%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		9.7	9.7		9.7	9.7	2.9	87.8	87.8	10.0	94.9	
Effective Green, g (s)		9.7	9.7		9.7	9.7	2.9	87.8	87.8	10.0	94.9	
Actuated g/C Ratio		0.08	0.08		0.08	0.08	0.02	0.73	0.73	0.08	0.79	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		2.5	2.5	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		102	117		102	114	40	2408	1039	135	2570	
v/s Ratio Prot							0.01	c0.67		c0.04	0.31	
v/s Ratio Perm		0.02	0.00		c0.04	0.01			0.03			
v/c Ratio		0.21	0.01		0.50	0.07	0.38	0.91	0.05	0.53	0.40	
Uniform Delay, d1		51.5	50.7		52.8	51.0	57.7	12.9	4.5	52.8	3.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.93	0.78	
Incremental Delay, d2		0.7	0.0		2.8	0.2	3.4	6.5	0.1	2.3	0.1	
Delay (s)		52.3	50.7		55.6	51.1	61.1	19.4	4.6	51.4	3.1	
Level of Service		D	D		E	D	E	B	A	D	A	
Approach Delay (s)		51.8			52.7			19.3			6.3	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	0	0	2175	965	65
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	26	0	0	2219	985	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					426	
pX, platoon unblocked	0.91	0.91	0.91			
vC, conflicting volume	2128	526	1051			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2045	291	867			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	43	100	100			
cM capacity (veh/h)	44	644	706			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	26	0	1110	1110	656	395
Volume Left	26	0	0	0	0	0
Volume Right	0	0	0	0	0	66
cSH	44	1700	1700	1700	1700	1700
Volume to Capacity	0.58	0.00	0.65	0.65	0.39	0.23
Queue Length 95th (ft)	54	0	0	0	0	0
Control Delay (s)	167.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	F					
Approach Delay (s)	167.7	0.0			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	395	55	110	30	65	50	195	1705	100	45	600	150
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5		4.0	4.5		4.0	5.4		4.0	5.4	5.4
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	0.93		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3193	1544		1662	1636		1662	3236		1662	3228	1488
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3193	1544		1662	1636		1662	3236		1662	3228	1488
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	403	56	112	31	66	51	199	1740	102	46	612	153
RTOR Reduction (vph)	0	54	0	0	21	0	0	2	0	0	0	70
Lane Group Flow (vph)	403	114	0	31	96	0	199	1840	0	46	612	83
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	0%	2%	0%	0%	3%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases												2
Actuated Green, G (s)	17.0	26.6		4.1	13.7		19.7	77.1		4.0	61.4	61.4
Effective Green, g (s)	17.0	26.6		4.1	13.7		19.7	77.1		4.0	61.4	61.4
Actuated g/C Ratio	0.13	0.21		0.03	0.11		0.15	0.59		0.03	0.47	0.47
Clearance Time (s)	4.0	4.5		4.0	4.5		4.0	5.4		4.0	5.4	5.4
Vehicle Extension (s)	2.3	2.3		2.3	2.3		2.3	4.4		2.3	4.4	4.4
Lane Grp Cap (vph)	418	316		52	172		252	1923		51	1528	704
v/s Ratio Prot	c0.13	0.07		0.02	c0.06		c0.12	c0.57		0.03	0.19	
v/s Ratio Perm												0.06
v/c Ratio	0.96	0.36		0.60	0.56		0.79	0.96		0.90	0.40	0.12
Uniform Delay, d1	56.0	44.3		62.0	55.1		53.0	24.7		62.7	22.2	19.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	34.4	0.4		13.3	2.7		14.4	12.0		89.3	0.3	0.1
Delay (s)	90.5	44.7		75.3	57.8		67.4	36.7		152.0	22.5	19.2
Level of Service	F	D		E	E		E	D		F	C	B
Approach Delay (s)		77.0			61.5			39.7			29.2	
Approach LOS		E			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	44.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	129.7	Sum of lost time (s)	17.9
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑	↱	↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	0	0	40	30	0	45	145	1975	40	30	735	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	0	43	32	0	48	154	2101	43	32	782	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1			1						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2205	3255	391	2864	3255	1051	782			2101		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2205	3255	391	2864	3255	1051	782			2101		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	93	0	100	79	81			88		
cM capacity (veh/h)	15	6	608	5	6	223	832			258		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	43	80	154	1051	1051	43	32	391	391	16
Volume Left	0	32	154	0	0	0	32	0	0	0
Volume Right	43	48	0	0	0	43	0	0	0	16
cSH	456	13	832	1700	1700	1700	258	1700	1700	1700
Volume to Capacity	0.09	6.03	0.19	0.62	0.62	0.03	0.12	0.23	0.23	0.01
Queue Length 95th (ft)	8	Err	17	0	0	0	10	0	0	0
Control Delay (s)	13.7	Err	10.3	0.0	0.0	0.0	20.9	0.0	0.0	0.0
Lane LOS	B	F	B				C			
Approach Delay (s)	13.7	Err	0.7				0.8			
Approach LOS	B	F								

Intersection Summary			
Average Delay	246.3		
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	5	45	0	20	0	30	25	10	15	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	0	5	49	0	22	0	33	27	11	16	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	5	71	60	27
Volume Left (vph)	0	49	0	11
Volume Right (vph)	5	22	27	0
Hadj (s)	-0.57	-0.02	-0.24	0.08
Departure Headway (s)	3.6	4.1	3.9	4.2
Degree Utilization, x	0.01	0.08	0.06	0.03
Capacity (veh/h)	969	863	905	835
Control Delay (s)	6.6	7.4	7.1	7.3
Approach Delay (s)	6.6	7.4	7.1	7.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.3		
Level of Service	A		
Intersection Capacity Utilization	25.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	0	30	0	0	0	40	40	0	0	35	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	16	0	33	0	0	0	44	44	0	0	38	27
Pedestrians		1			4			4			5	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	190	189	57	225	203	53	67			48		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	190	189	57	225	203	53	67			48		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	97	100	100	100	97			100		
cM capacity (veh/h)	751	686	1010	688	674	1013	1527			1567		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	16	33	0	88	66
Volume Left	16	0	0	44	0
Volume Right	0	33	0	0	27
cSH	751	1010	1700	1527	1567
Volume to Capacity	0.02	0.03	0.00	0.03	0.00
Queue Length 95th (ft)	2	3	0	2	0
Control Delay (s)	9.9	8.7	0.0	3.8	0.0
Lane LOS	A	A	A	A	
Approach Delay (s)	9.1		0.0	3.8	0.0
Approach LOS	A		A		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	60	80	30	15	65	20	25	40	15	15	20	45
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	70	93	35	17	76	23	29	47	17	17	23	52

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	198	116	93	93
Volume Left (vph)	70	17	29	17
Volume Right (vph)	35	23	17	52
Hadj (s)	-0.02	-0.07	0.00	-0.26
Departure Headway (s)	4.5	4.5	4.8	4.5
Degree Utilization, x	0.25	0.15	0.12	0.12
Capacity (veh/h)	772	749	704	736
Control Delay (s)	8.9	8.3	8.4	8.1
Approach Delay (s)	8.9	8.3	8.4	8.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.5		
Level of Service	A		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	20	30	20	20	45	35
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	22	32	22	22	48	38

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	54	43	86
Volume Left (vph)	0	22	48
Volume Right (vph)	32	0	38
Hadj (s)	-0.33	0.13	-0.12
Departure Headway (s)	3.8	4.3	4.0
Degree Utilization, x	0.06	0.05	0.10
Capacity (veh/h)	919	821	873
Control Delay (s)	7.0	7.5	7.4
Approach Delay (s)	7.0	7.5	7.4
Approach LOS	A	A	A

Intersection Summary			
Delay	7.3		
Level of Service	A		
Intersection Capacity Utilization	20.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
15: 6th St & High School Way

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	30	50	45	70	40	10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	34	57	51	80	45	11

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	91	131	57
Volume Left (vph)	34	51	0
Volume Right (vph)	57	0	11
Hadj (s)	-0.27	0.11	-0.09
Departure Headway (s)	4.0	4.3	4.1
Degree Utilization, x	0.10	0.15	0.07
Capacity (veh/h)	848	817	841
Control Delay (s)	7.5	8.0	7.4
Approach Delay (s)	7.5	8.0	7.4
Approach LOS	A	A	A

Intersection Summary			
Delay	7.7		
Level of Service	A		
Intersection Capacity Utilization	25.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	50	0	25	130	0	20
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	57	0	29	149	0	23

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	57	178	23
Volume Left (vph)	57	0	0
Volume Right (vph)	0	149	0
Hadj (s)	0.23	-0.47	0.03
Departure Headway (s)	4.5	3.6	4.2
Degree Utilization, x	0.07	0.18	0.03
Capacity (veh/h)	760	976	829
Control Delay (s)	7.9	7.4	7.3
Approach Delay (s)	7.9	7.4	7.3
Approach LOS	A	A	A

Intersection Summary			
Delay	7.5		
Level of Service	A		
Intersection Capacity Utilization	20.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	50	45	75	85	55	55
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	56	50	83	94	61	61
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	314	131			178	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	314	131			178	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	95			96	
cM capacity (veh/h)	649	919			1398	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	56	50	178	61	61
Volume Left	56	0	0	61	0
Volume Right	0	50	94	0	0
cSH	649	919	1700	1398	1700
Volume to Capacity	0.09	0.05	0.10	0.04	0.04
Queue Length 95th (ft)	7	4	0	3	0
Control Delay (s)	11.1	9.1	0.0	7.7	0.0
Lane LOS	B	A		A	
Approach Delay (s)	10.2		0.0	3.8	
Approach LOS	B				

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	45	105	30	55	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	51	119	34	62	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	347	74	85			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	347	74	85			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	95	92			
cM capacity (veh/h)	599	988	1511			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	57	153	85
Volume Left	6	119	0
Volume Right	51	0	23
cSH	928	1511	1700
Volume to Capacity	0.06	0.08	0.05
Queue Length 95th (ft)	5	6	0
Control Delay (s)	9.1	6.0	0.0
Lane LOS	A	A	
Approach Delay (s)	9.1	6.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	24.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	50	5	45	45	40	20	45	45	40	20	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	18	61	6	55	55	49	24	55	55	49	24	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					725							
pX, platoon unblocked												
vC, conflicting volume	104			67			326	314	64	372	293	79
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	104			67			326	314	64	372	293	79
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			96	90	95	90	96	98
cM capacity (veh/h)	1488			1534			571	573	1000	494	589	981

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	85	159	134	98
Volume Left	18	55	24	49
Volume Right	6	49	55	24
cSH	1488	1534	694	591
Volume to Capacity	0.01	0.04	0.19	0.17
Queue Length 95th (ft)	1	3	18	15
Control Delay (s)	1.7	2.8	11.4	12.3
Lane LOS	A	A	B	B
Approach Delay (s)	1.7	2.8	11.4	12.3
Approach LOS			B	B

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	25	45	35	30	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	6	30	54	42	36	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	96				117	75
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	96				117	75
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				96	100
cM capacity (veh/h)	1497				875	986

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	36	96	36
Volume Left	6	0	36
Volume Right	0	42	0
cSH	1497	1700	875
Volume to Capacity	0.00	0.06	0.04
Queue Length 95th (ft)	0	0	3
Control Delay (s)	1.3	0.0	9.3
Lane LOS	A		A
Approach Delay (s)	1.3	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	16.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (veh/h)	130	5	5	0	0	80
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	138	5	5	0	0	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	5				287	5
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5				287	5
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				100	92
cM capacity (veh/h)	1616				643	1078

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	144	5	85
Volume Left	138	0	0
Volume Right	0	0	85
cSH	1616	1700	1078
Volume to Capacity	0.09	0.00	0.08
Queue Length 95th (ft)	7	0	6
Control Delay (s)	7.2	0.0	8.6
Lane LOS	A		A
Approach Delay (s)	7.2	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	26.8%	ICU Level of Service	A
Analysis Period (min)	15		

Highway Capacity Analysis Results

Existing Conditions – Average PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	5	10	10	5	45	25	1545	10	35	735	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	5	11	11	5	49	27	1679	11	38	799	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1821	2609	399	2223	2609	840	799			1679		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1821	2609	399	2223	2609	840	799			1679		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	63	74	98	37	74	84	97			90		
cM capacity (veh/h)	29	21	600	17	21	309	819			369		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	27	65	27	840	840	11	38	399	399	22
Volume Left	11	11	27	0	0	0	38	0	0	0
Volume Right	11	49	0	0	0	11	0	0	0	22
cSH	42	62	819	1700	1700	1700	369	1700	1700	1700
Volume to Capacity	0.65	1.04	0.03	0.49	0.49	0.01	0.10	0.23	0.23	0.01
Queue Length 95th (ft)	60	128	3	0	0	0	9	0	0	0
Control Delay (s)	188.7	237.7	9.5	0.0	0.0	0.0	15.9	0.0	0.0	0.0
Lane LOS	F	F	A				C			
Approach Delay (s)	188.7	237.7	0.2				0.7			
Approach LOS	F	F								

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	5	65	35	20	60	155	1510	25	30	710	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1525	1750	1468	1661	1503		1646	3260	1297	1599	3228	1457
Flt Permitted	0.70	1.00	1.00	0.75	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1128	1750	1468	1319	1503		1646	3260	1297	1599	3228	1457
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	5	68	37	21	63	163	1589	26	32	747	11
RTOR Reduction (vph)	0	0	62	0	57	0	0	0	9	0	0	5
Lane Group Flow (vph)	11	5	6	37	27	0	163	1589	17	32	747	6
Confl. Peds. (#/hr)			1	1					2	2		
Confl. Bikes (#/hr)						1						1
Heavy Vehicles (%)	9%	0%	0%	0%	0%	3%	1%	2%	12%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8					6			2
Actuated Green, G (s)	5.7	5.7	5.7	5.7	5.7		10.3	40.4	40.4	2.2	32.3	32.3
Effective Green, g (s)	5.7	5.7	5.7	5.7	5.7		10.3	40.4	40.4	2.2	32.3	32.3
Actuated g/C Ratio	0.09	0.09	0.09	0.09	0.09		0.17	0.65	0.65	0.04	0.52	0.52
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	2.3	2.3		2.3	4.8	4.8	2.3	4.8	4.8
Lane Grp Cap (vph)	103	160	134	120	137		272	2114	841	56	1673	755
v/s Ratio Prot		0.00			0.02		c0.10	c0.49		0.02	0.23	
v/s Ratio Perm	0.01		0.00	c0.03					0.01			0.00
v/c Ratio	0.11	0.03	0.05	0.31	0.20		0.60	0.75	0.02	0.57	0.45	0.01
Uniform Delay, d1	26.0	25.8	25.8	26.5	26.2		24.1	7.5	3.9	29.6	9.4	7.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.1	0.1	0.9	0.4		2.7	1.8	0.0	10.0	0.4	0.0
Delay (s)	26.4	25.9	26.0	27.3	26.6		26.8	9.3	3.9	39.6	9.8	7.3
Level of Service	C	C	C	C	C		C	A	A	D	A	A
Approach Delay (s)		26.0			26.8			10.8			10.9	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	62.3	Sum of lost time (s)	14.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	135	30	65	15	1640	200	60	775	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes				1.00	0.98		1.00	1.00	0.93	1.00	1.00	
Flpb, ped/bikes				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt				1.00	0.90		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1646	1514		1662	3260	1363	1614	3257	
Flt Permitted				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1646	1514		1662	3260	1363	1614	3257	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	141	31	68	16	1708	208	62	807	5
RTOR Reduction (vph)	0	0	0	0	60	0	0	0	28	0	0	0
Lane Group Flow (vph)	0	0	0	141	39	0	16	1708	180	62	812	0
Confl. Peds. (#/hr)	17					17	2		16	16		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	0%	2%	0%	2%	2%	3%	2%	0%
Turn Type				Perm	NA		Prot	NA	Perm	Prot	NA	
Protected Phases					4		1	6		5	2	
Permitted Phases				4					6			
Actuated Green, G (s)				14.5	14.5		2.9	84.8	84.8	8.2	90.1	
Effective Green, g (s)				14.5	14.5		2.9	84.8	84.8	8.2	90.1	
Actuated g/C Ratio				0.12	0.12		0.02	0.71	0.71	0.07	0.75	
Clearance Time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)				3.0	3.0		2.3	4.1	4.1	2.3	4.1	
Lane Grp Cap (vph)				198	182		40	2303	963	110	2445	
v/s Ratio Prot					0.03		0.01	c0.52		c0.04	0.25	
v/s Ratio Perm				c0.09					0.13			
v/c Ratio				0.71	0.22		0.40	0.74	0.19	0.56	0.33	
Uniform Delay, d1				50.7	47.6		57.7	10.8	6.0	54.2	5.0	
Progression Factor				1.00	1.00		1.24	1.05	0.67	1.00	1.00	
Incremental Delay, d2				11.4	0.6		2.4	1.4	0.3	4.7	0.4	
Delay (s)				62.2	48.2		74.0	12.8	4.3	58.9	5.3	
Level of Service				E	D		E	B	A	E	A	
Approach Delay (s)		0.0			56.4			12.4			9.1	
Approach LOS		A			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: US 30 & JP West

10/9/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	45	95	1840	870	45
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	21	47	100	1937	916	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				474	300	
pX, platoon unblocked	0.62	0.92	0.92			
vC, conflicting volume	2108	482	963			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1008	274	795			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	83	93	87			
cM capacity (veh/h)	128	669	760			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	68	100	968	968	611	353
Volume Left	21	100	0	0	0	0
Volume Right	47	0	0	0	0	47
cSH	290	760	1700	1700	1700	1700
Volume to Capacity	0.24	0.13	0.57	0.57	0.36	0.21
Queue Length 95th (ft)	22	11	0	0	0	0
Control Delay (s)	21.2	10.5	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	21.2	0.5			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	20	45	70	25	40	15	1855	95	35	885	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.97		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1579	1450		1672	1463	1583	3260	1420	1662	3252	
Flt Permitted		0.65	1.00		0.74	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1060	1450		1286	1463	1583	3260	1420	1662	3252	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	21	47	74	26	42	16	1953	100	37	932	11
RTOR Reduction (vph)	0	0	42	0	0	37	0	0	21	0	0	0
Lane Group Flow (vph)	0	63	5	0	100	5	16	1953	79	37	943	0
Confl. Peds. (#/hr)	4		12	12		4	1		2	2		1
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	8%	5%	0%	0%	0%	0%	5%	2%	2%	0%	2%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		13.1	13.1		13.1	13.1	3.0	89.1	89.1	5.3	91.4	
Effective Green, g (s)		13.1	13.1		13.1	13.1	3.0	89.1	89.1	5.3	91.4	
Actuated g/C Ratio		0.11	0.11		0.11	0.11	0.02	0.74	0.74	0.04	0.76	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		3.0	3.0	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		115	158		140	159	39	2420	1054	73	2476	
v/s Ratio Prot							0.01	c0.60		c0.02	0.29	
v/s Ratio Perm		0.06	0.00		c0.08	0.00			0.06			
v/c Ratio		0.55	0.03		0.71	0.03	0.41	0.81	0.07	0.51	0.38	
Uniform Delay, d1		50.6	47.8		51.6	47.8	57.6	9.9	4.2	56.1	4.8	
Progression Factor		1.00	1.00		1.00	1.00	1.13	0.61	0.35	1.00	0.82	
Incremental Delay, d2		4.2	0.1		15.9	0.1	2.6	1.5	0.0	3.1	0.4	
Delay (s)		54.8	47.8		67.5	47.8	68.0	7.5	1.5	59.0	4.4	
Level of Service		D	D		E	D	E	A	A	E	A	
Approach Delay (s)		51.8			61.7			7.7			6.4	
Approach LOS		D			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	125	55	30	1845	900	100
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		5.0	4.5	4.5	
Lane Util. Factor	1.00		1.00	0.95	0.95	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.96		1.00	1.00	0.99	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1605		1614	3260	3204	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	1605		1614	3260	3204	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	58	32	1942	947	105
RTOR Reduction (vph)	13	0	0	0	5	0
Lane Group Flow (vph)	177	0	32	1942	1047	0
Confl. Peds. (#/hr)		2	4			4
Confl. Bikes (#/hr)						1
Heavy Vehicles (%)	0%	2%	3%	2%	2%	1%
Turn Type	NA		Prot	NA	NA	
Protected Phases	8		1	6	2	
Permitted Phases						
Actuated Green, G (s)	16.9		5.1	94.6	84.5	
Effective Green, g (s)	16.9		5.1	94.6	84.5	
Actuated g/C Ratio	0.14		0.04	0.79	0.70	
Clearance Time (s)	4.0		5.0	4.5	4.5	
Vehicle Extension (s)	2.3		2.3	4.2	4.2	
Lane Grp Cap (vph)	226		68	2569	2256	
v/s Ratio Prot	c0.11		0.02	c0.60	0.33	
v/s Ratio Perm						
v/c Ratio	0.78		0.47	0.76	0.46	
Uniform Delay, d1	49.8		56.1	6.7	7.8	
Progression Factor	1.00		1.23	0.39	0.84	
Incremental Delay, d2	15.4		2.1	1.5	0.6	
Delay (s)	65.2		71.0	4.1	7.2	
Level of Service	E		E	A	A	
Approach Delay (s)	65.2			5.2	7.2	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	0	10	40	5	75	10	1840	50	65	840	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1657	1458		1664	1422	1662	3292	1421	1630	3251	
Flt Permitted		0.73	1.00		0.74	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1268	1458		1283	1422	1662	3292	1421	1630	3251	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	15	0	10	41	5	77	10	1897	52	67	866	15
RTOR Reduction (vph)	0	0	9	0	0	72	0	0	13	0	0	0
Lane Group Flow (vph)	0	15	1	0	46	5	10	1897	39	67	881	0
Confl. Peds. (#/hr)	3		7	7		3			2	2		
Confl. Bikes (#/hr)									2			1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	1%	2%	2%	2%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		8.0	8.0		8.0	8.0	1.4	88.9	88.9	10.6	98.1	
Effective Green, g (s)		8.0	8.0		8.0	8.0	1.4	88.9	88.9	10.6	98.1	
Actuated g/C Ratio		0.07	0.07		0.07	0.07	0.01	0.74	0.74	0.09	0.82	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		2.5	2.5	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		84	97		85	94	19	2438	1052	143	2657	
v/s Ratio Prot							0.01	c0.58		c0.04	0.27	
v/s Ratio Perm		0.01	0.00		c0.04	0.00			0.03			
v/c Ratio		0.18	0.01		0.54	0.05	0.53	0.78	0.04	0.47	0.33	
Uniform Delay, d1		52.9	52.3		54.2	52.5	59.0	9.5	4.1	52.0	2.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.96	0.70	
Incremental Delay, d2		0.7	0.0		5.5	0.2	15.8	2.5	0.1	1.3	0.1	
Delay (s)		53.6	52.3		59.7	52.6	74.8	12.0	4.2	51.2	2.0	
Level of Service		D	D		E	D	E	B	A	D	A	
Approach Delay (s)		53.1			55.3			12.2			5.5	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
8: US 30 & Old Portland Rd

10/9/2013

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	0	0	1895	840	55
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	20	0	0	1934	857	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					426	
pX, platoon unblocked	0.95	0.95	0.95			
vC, conflicting volume	1852	457	913			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1786	311	794			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	70	100	100			
cM capacity (veh/h)	69	648	779			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	20	0	967	967	571	342
Volume Left	20	0	0	0	0	0
Volume Right	0	0	0	0	0	56
cSH	68	1700	1700	1700	1700	1700
Volume to Capacity	0.30	0.00	0.57	0.57	0.34	0.20
Queue Length 95th (ft)	27	0	0	0	0	0
Control Delay (s)	79.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	F					
Approach Delay (s)	79.9	0.0			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	345	50	95	25	55	45	170	1490	90	40	520	130
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5		4.0	4.5		4.0	5.4		4.0	5.4	5.4
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	0.93		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3193	1548		1662	1632		1662	3236		1662	3228	1488
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3193	1548		1662	1632		1662	3236		1662	3228	1488
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	352	51	97	26	56	46	173	1520	92	41	531	133
RTOR Reduction (vph)	0	58	0	0	23	0	0	2	0	0	0	72
Lane Group Flow (vph)	352	90	0	26	79	0	173	1610	0	41	531	61
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	0%	2%	0%	0%	3%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases												2
Actuated Green, G (s)	17.2	25.8		3.5	12.1		16.5	65.2		4.0	52.7	52.7
Effective Green, g (s)	17.2	25.8		3.5	12.1		16.5	65.2		4.0	52.7	52.7
Actuated g/C Ratio	0.15	0.22		0.03	0.10		0.14	0.56		0.03	0.45	0.45
Clearance Time (s)	4.0	4.5		4.0	4.5		4.0	5.4		4.0	5.4	5.4
Vehicle Extension (s)	2.3	2.3		2.3	2.3		2.3	4.4		2.3	4.4	4.4
Lane Grp Cap (vph)	471	343		49	169		235	1812		57	1461	673
v/s Ratio Prot	c0.11	0.06		0.02	c0.05		c0.10	c0.50		0.02	0.16	
v/s Ratio Perm												0.04
v/c Ratio	0.75	0.26		0.53	0.47		0.74	0.89		0.72	0.36	0.09
Uniform Delay, d1	47.5	37.4		55.6	49.1		47.9	22.4		55.6	20.9	18.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.9	0.2		7.2	1.2		10.4	6.0		31.9	0.3	0.1
Delay (s)	53.4	37.7		62.8	50.3		58.3	28.4		87.5	21.1	18.3
Level of Service	D	D		E	D		E	C		F	C	B
Approach Delay (s)		48.7			52.8			31.3			24.4	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	33.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	116.4	Sum of lost time (s)	17.9
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	35	25	0	35	125	1715	35	25	640	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	0	37	27	0	37	133	1824	37	27	681	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1			1						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1912	2824	340	2484	2824	912	681			1824		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1912	2824	340	2484	2824	912	681			1824		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	94	0	100	87	85			92		
cM capacity (veh/h)	30	14	655	12	14	276	908			331		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	37	64	133	912	912	37	27	340	340	16
Volume Left	0	27	133	0	0	0	27	0	0	0
Volume Right	37	37	0	0	0	37	0	0	0	16
cSH	492	27	908	1700	1700	1700	331	1700	1700	1700
Volume to Capacity	0.08	2.38	0.15	0.54	0.54	0.02	0.08	0.20	0.20	0.01
Queue Length 95th (ft)	6	193	13	0	0	0	6	0	0	0
Control Delay (s)	12.9	937.2	9.6	0.0	0.0	0.0	16.8	0.0	0.0	0.0
Lane LOS	B	F	A				C			
Approach Delay (s)	12.9	937.2	0.6				0.6			
Approach LOS	B	F								

Intersection Summary			
Average Delay	22.0		
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	5	40	0	20	0	25	25	10	15	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	0	5	44	0	22	0	27	27	11	16	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	5	66	55	27
Volume Left (vph)	0	44	0	11
Volume Right (vph)	5	22	27	0
Hadj (s)	-0.57	-0.04	-0.27	0.08
Departure Headway (s)	3.6	4.0	3.8	4.2
Degree Utilization, x	0.01	0.07	0.06	0.03
Capacity (veh/h)	976	871	915	840
Control Delay (s)	6.6	7.4	7.0	7.3
Approach Delay (s)	6.6	7.4	7.0	7.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.2		
Level of Service	A		
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	0	25	0	0	0	40	35	0	0	30	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	16	0	27	0	0	0	44	38	0	0	33	27
Pedestrians		1			4			4			5	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	179	178	52	209	192	47	61			42		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	179	178	52	209	192	47	61			42		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	97	100	100	100	97			100		
cM capacity (veh/h)	764	696	1018	710	684	1020	1534			1574		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	16	27	0	82	60
Volume Left	16	0	0	44	0
Volume Right	0	27	0	0	27
cSH	764	1018	1700	1534	1574
Volume to Capacity	0.02	0.03	0.00	0.03	0.00
Queue Length 95th (ft)	2	2	0	2	0
Control Delay (s)	9.8	8.6	0.0	4.1	0.0
Lane LOS	A	A	A	A	
Approach Delay (s)	9.1		0.0	4.1	0.0
Approach LOS	A		A		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	55	70	30	10	60	20	25	35	15	15	15	50
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	64	81	35	12	70	23	29	41	17	17	17	58

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	180	105	87	93
Volume Left (vph)	64	12	29	17
Volume Right (vph)	35	23	17	58
Hadj (s)	-0.03	-0.09	-0.01	-0.30
Departure Headway (s)	4.4	4.4	4.7	4.4
Degree Utilization, x	0.22	0.13	0.11	0.11
Capacity (veh/h)	780	761	720	760
Control Delay (s)	8.7	8.1	8.3	7.9
Approach Delay (s)	8.7	8.1	8.3	7.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.3		
Level of Service	A		
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	20	30	15	20	40	30
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	22	32	16	22	43	32

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	54	38	75
Volume Left (vph)	0	16	43
Volume Right (vph)	32	0	32
Hadj (s)	-0.33	0.12	-0.11
Departure Headway (s)	3.8	4.2	4.0
Degree Utilization, x	0.06	0.04	0.08
Capacity (veh/h)	928	830	875
Control Delay (s)	7.0	7.4	7.3
Approach Delay (s)	7.0	7.4	7.3
Approach LOS	A	A	A

Intersection Summary			
Delay	7.2		
Level of Service	A		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	30	45	45	65	40	10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	34	51	51	74	45	11

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	85	125	57
Volume Left (vph)	34	51	0
Volume Right (vph)	51	0	11
Hadj (s)	-0.25	0.12	-0.09
Departure Headway (s)	4.1	4.3	4.1
Degree Utilization, x	0.10	0.15	0.07
Capacity (veh/h)	848	820	846
Control Delay (s)	7.5	8.0	7.4
Approach Delay (s)	7.5	8.0	7.4
Approach LOS	A	A	A

Intersection Summary			
Delay	7.7		
Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	45	0	25	120	0	15
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	52	0	29	138	0	17

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	52	167	17
Volume Left (vph)	52	0	0
Volume Right (vph)	0	138	0
Hadj (s)	0.23	-0.46	0.03
Departure Headway (s)	4.5	3.6	4.2
Degree Utilization, x	0.06	0.17	0.02
Capacity (veh/h)	769	981	836
Control Delay (s)	7.8	7.3	7.3
Approach Delay (s)	7.8	7.3	7.3
Approach LOS	A	A	A

Intersection Summary			
Delay	7.4		
Level of Service	A		
Intersection Capacity Utilization	19.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	45	40	65	80	50	50
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	50	44	72	89	56	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	283	117			161	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	283	117			161	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	95			96	
cM capacity (veh/h)	679	935			1418	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	50	44	161	56	56
Volume Left	50	0	0	56	0
Volume Right	0	44	89	0	0
cSH	679	935	1700	1418	1700
Volume to Capacity	0.07	0.05	0.09	0.04	0.03
Queue Length 95th (ft)	6	4	0	3	0
Control Delay (s)	10.7	9.0	0.0	7.6	0.0
Lane LOS	B	A		A	
Approach Delay (s)	9.9		0.0	3.8	
Approach LOS	A				

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	40	95	15	50	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	45	108	17	57	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	301	68	80			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	301	68	80			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	95	93			
cM capacity (veh/h)	641	995	1518			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	51	125	80
Volume Left	6	108	0
Volume Right	45	0	23
cSH	938	1518	1700
Volume to Capacity	0.05	0.07	0.05
Queue Length 95th (ft)	4	6	0
Control Delay (s)	9.1	6.6	0.0
Lane LOS	A	A	
Approach Delay (s)	9.1	6.6	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	23.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	40	5	40	40	35	20	40	40	35	20	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	18	49	6	49	49	43	24	49	49	43	24	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					725							
pX, platoon unblocked												
vC, conflicting volume	91			55			293	277	52	329	259	70
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	91			55			293	277	52	329	259	70
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			96	92	95	92	96	98
cM capacity (veh/h)	1503			1550			603	603	1016	539	617	993

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	73	140	122	91
Volume Left	18	49	24	43
Volume Right	6	43	49	24
cSH	1503	1550	720	638
Volume to Capacity	0.01	0.03	0.17	0.14
Queue Length 95th (ft)	1	2	15	12
Control Delay (s)	1.9	2.7	11.0	11.6
Lane LOS	A	A	B	B
Approach Delay (s)	1.9	2.7	11.0	11.6
Approach LOS			B	B

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	26.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	25	45	30	25	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	6	30	54	36	30	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	90				114	72
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	90				114	72
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1505				878	990

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	36	90	30
Volume Left	6	0	30
Volume Right	0	36	0
cSH	1505	1700	878
Volume to Capacity	0.00	0.05	0.03
Queue Length 95th (ft)	0	0	3
Control Delay (s)	1.3	0.0	9.2
Lane LOS	A		A
Approach Delay (s)	1.3	0.0	9.2
Approach LOS			A

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	16.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (veh/h)	125	5	5	0	0	70
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	133	5	5	0	0	74
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	5				277	5
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5				277	5
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				100	93
cM capacity (veh/h)	1616				654	1078

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	138	5	74
Volume Left	133	0	0
Volume Right	0	0	74
cSH	1616	1700	1078
Volume to Capacity	0.08	0.00	0.07
Queue Length 95th (ft)	7	0	6
Control Delay (s)	7.2	0.0	8.6
Lane LOS	A		A
Approach Delay (s)	7.2	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	25.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	5	10	10	5	45	25	1545	10	35	735	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	5	11	11	5	49	27	1679	11	38	799	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1821	2609	399	2223	2609	840	799			1679		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1821	2609	399	2223	2609	840	799			1679		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	63	74	98	37	74	84	97			90		
cM capacity (veh/h)	29	21	600	17	21	309	819			369		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	27	65	27	840	840	11	38	399	399	22
Volume Left	11	11	27	0	0	0	38	0	0	0
Volume Right	11	49	0	0	0	11	0	0	0	22
cSH	42	62	819	1700	1700	1700	369	1700	1700	1700
Volume to Capacity	0.65	1.04	0.03	0.49	0.49	0.01	0.10	0.23	0.23	0.01
Queue Length 95th (ft)	60	128	3	0	0	0	9	0	0	0
Control Delay (s)	188.7	237.7	9.5	0.0	0.0	0.0	15.9	0.0	0.0	0.0
Lane LOS	F	F	A				C			
Approach Delay (s)	188.7	237.7	0.2				0.7			
Approach LOS	F	F								

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	10	5	65	35	20	60	155	1510	25	30	710	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.89		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1525	1750	1468	1661	1503		1646	3260	1297	1599	3228	1457
Flt Permitted	0.70	1.00	1.00	0.75	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1128	1750	1468	1319	1503		1646	3260	1297	1599	3228	1457
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	5	68	37	21	63	163	1589	26	32	747	11
RTOR Reduction (vph)	0	0	62	0	57	0	0	0	9	0	0	5
Lane Group Flow (vph)	11	5	6	37	27	0	163	1589	17	32	747	6
Confl. Peds. (#/hr)			1	1					2	2		
Confl. Bikes (#/hr)						1						1
Heavy Vehicles (%)	9%	0%	0%	0%	0%	3%	1%	2%	12%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8					6			2
Actuated Green, G (s)	5.7	5.7	5.7	5.7	5.7		10.3	40.4	40.4	2.2	32.3	32.3
Effective Green, g (s)	5.7	5.7	5.7	5.7	5.7		10.3	40.4	40.4	2.2	32.3	32.3
Actuated g/C Ratio	0.09	0.09	0.09	0.09	0.09		0.17	0.65	0.65	0.04	0.52	0.52
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	2.3	2.3		2.3	4.8	4.8	2.3	4.8	4.8
Lane Grp Cap (vph)	103	160	134	120	137		272	2114	841	56	1673	755
v/s Ratio Prot		0.00			0.02		c0.10	c0.49		0.02	0.23	
v/s Ratio Perm	0.01		0.00	c0.03					0.01			0.00
v/c Ratio	0.11	0.03	0.05	0.31	0.20		0.60	0.75	0.02	0.57	0.45	0.01
Uniform Delay, d1	26.0	25.8	25.8	26.5	26.2		24.1	7.5	3.9	29.6	9.4	7.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.1	0.1	0.9	0.4		2.7	1.8	0.0	10.0	0.4	0.0
Delay (s)	26.4	25.9	26.0	27.3	26.6		26.8	9.3	3.9	39.6	9.8	7.3
Level of Service	C	C	C	C	C		C	A	A	D	A	A
Approach Delay (s)		26.0			26.8			10.8			10.9	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	62.3	Sum of lost time (s)	14.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	135	30	65	15	1640	200	60	775	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes				1.00	0.98		1.00	1.00	0.93	1.00	1.00	
Flpb, ped/bikes				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt				1.00	0.90		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1646	1514		1662	3260	1363	1614	3257	
Flt Permitted				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1646	1514		1662	3260	1363	1614	3257	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	141	31	68	16	1708	208	62	807	5
RTOR Reduction (vph)	0	0	0	0	60	0	0	0	28	0	0	0
Lane Group Flow (vph)	0	0	0	141	39	0	16	1708	180	62	812	0
Confl. Peds. (#/hr)	17					17	2		16	16		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	0%	2%	0%	2%	2%	3%	2%	0%
Turn Type				Perm	NA		Prot	NA	Perm	Prot	NA	
Protected Phases					4		1	6		5	2	
Permitted Phases				4					6			
Actuated Green, G (s)				14.5	14.5		2.9	84.8	84.8	8.2	90.1	
Effective Green, g (s)				14.5	14.5		2.9	84.8	84.8	8.2	90.1	
Actuated g/C Ratio				0.12	0.12		0.02	0.71	0.71	0.07	0.75	
Clearance Time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)				3.0	3.0		2.3	4.1	4.1	2.3	4.1	
Lane Grp Cap (vph)				198	182		40	2303	963	110	2445	
v/s Ratio Prot					0.03		0.01	c0.52		c0.04	0.25	
v/s Ratio Perm				c0.09					0.13			
v/c Ratio				0.71	0.22		0.40	0.74	0.19	0.56	0.33	
Uniform Delay, d1				50.7	47.6		57.7	10.8	6.0	54.2	5.0	
Progression Factor				1.00	1.00		1.24	1.05	0.67	1.00	1.00	
Incremental Delay, d2				11.4	0.6		2.4	1.4	0.3	4.7	0.4	
Delay (s)				62.2	48.2		74.0	12.8	4.3	58.9	5.3	
Level of Service				E	D		E	B	A	E	A	
Approach Delay (s)		0.0			56.4			12.4			9.1	
Approach LOS		A			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	45	95	1840	870	45
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	21	47	100	1937	916	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				474	300	
pX, platoon unblocked	0.62	0.92	0.92			
vC, conflicting volume	2108	482	963			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1008	274	795			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	83	93	87			
cM capacity (veh/h)	128	669	760			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	68	100	968	968	611	353
Volume Left	21	100	0	0	0	0
Volume Right	47	0	0	0	0	47
cSH	290	760	1700	1700	1700	1700
Volume to Capacity	0.24	0.13	0.57	0.57	0.36	0.21
Queue Length 95th (ft)	22	11	0	0	0	0
Control Delay (s)	21.2	10.5	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	21.2	0.5			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	20	45	70	25	40	15	1855	95	35	885	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.97		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1579	1450		1672	1463	1583	3260	1420	1662	3252	
Flt Permitted		0.65	1.00		0.74	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1060	1450		1286	1463	1583	3260	1420	1662	3252	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	21	47	74	26	42	16	1953	100	37	932	11
RTOR Reduction (vph)	0	0	42	0	0	37	0	0	21	0	0	0
Lane Group Flow (vph)	0	63	5	0	100	5	16	1953	79	37	943	0
Confl. Peds. (#/hr)	4		12	12		4	1		2	2		1
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	8%	5%	0%	0%	0%	0%	5%	2%	2%	0%	2%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		13.1	13.1		13.1	13.1	3.0	89.1	89.1	5.3	91.4	
Effective Green, g (s)		13.1	13.1		13.1	13.1	3.0	89.1	89.1	5.3	91.4	
Actuated g/C Ratio		0.11	0.11		0.11	0.11	0.02	0.74	0.74	0.04	0.76	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		3.0	3.0	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		115	158		140	159	39	2420	1054	73	2476	
v/s Ratio Prot							0.01	c0.60		c0.02	0.29	
v/s Ratio Perm		0.06	0.00		c0.08	0.00			0.06			
v/c Ratio		0.55	0.03		0.71	0.03	0.41	0.81	0.07	0.51	0.38	
Uniform Delay, d1		50.6	47.8		51.6	47.8	57.6	9.9	4.2	56.1	4.8	
Progression Factor		1.00	1.00		1.00	1.00	1.13	0.61	0.35	1.00	0.82	
Incremental Delay, d2		4.2	0.1		15.9	0.1	2.6	1.5	0.0	3.1	0.4	
Delay (s)		54.8	47.8		67.5	47.8	68.0	7.5	1.5	59.0	4.4	
Level of Service		D	D		E	D	E	A	A	E	A	
Approach Delay (s)		51.8			61.7			7.7			6.4	
Approach LOS		D			E			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	125	55	30	1845	900	100
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		5.0	4.5	4.5	
Lane Util. Factor	1.00		1.00	0.95	0.95	
Frpb, ped/bikes	1.00		1.00	1.00	1.00	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.96		1.00	1.00	0.99	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1605		1614	3260	3204	
Flt Permitted	0.97		0.95	1.00	1.00	
Satd. Flow (perm)	1605		1614	3260	3204	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	132	58	32	1942	947	105
RTOR Reduction (vph)	13	0	0	0	5	0
Lane Group Flow (vph)	177	0	32	1942	1047	0
Confl. Peds. (#/hr)		2	4			4
Confl. Bikes (#/hr)						1
Heavy Vehicles (%)	0%	2%	3%	2%	2%	1%
Turn Type	NA		Prot	NA	NA	
Protected Phases	8		1	6	2	
Permitted Phases						
Actuated Green, G (s)	16.9		5.1	94.6	84.5	
Effective Green, g (s)	16.9		5.1	94.6	84.5	
Actuated g/C Ratio	0.14		0.04	0.79	0.70	
Clearance Time (s)	4.0		5.0	4.5	4.5	
Vehicle Extension (s)	2.3		2.3	4.2	4.2	
Lane Grp Cap (vph)	226		68	2569	2256	
v/s Ratio Prot	c0.11		0.02	c0.60	0.33	
v/s Ratio Perm						
v/c Ratio	0.78		0.47	0.76	0.46	
Uniform Delay, d1	49.8		56.1	6.7	7.8	
Progression Factor	1.00		1.23	0.39	0.84	
Incremental Delay, d2	15.4		2.1	1.5	0.6	
Delay (s)	65.2		71.0	4.1	7.2	
Level of Service	E		E	A	A	
Approach Delay (s)	65.2			5.2	7.2	
Approach LOS	E			A	A	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	0	10	40	5	75	10	1840	50	65	840	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1657	1458		1664	1422	1662	3292	1421	1630	3251	
Flt Permitted		0.73	1.00		0.74	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1268	1458		1283	1422	1662	3292	1421	1630	3251	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	15	0	10	41	5	77	10	1897	52	67	866	15
RTOR Reduction (vph)	0	0	9	0	0	72	0	0	13	0	0	0
Lane Group Flow (vph)	0	15	1	0	46	5	10	1897	39	67	881	0
Confl. Peds. (#/hr)	3		7	7		3			2	2		
Confl. Bikes (#/hr)									2			1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	1%	2%	2%	2%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		8.0	8.0		8.0	8.0	1.4	88.9	88.9	10.6	98.1	
Effective Green, g (s)		8.0	8.0		8.0	8.0	1.4	88.9	88.9	10.6	98.1	
Actuated g/C Ratio		0.07	0.07		0.07	0.07	0.01	0.74	0.74	0.09	0.82	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		2.5	2.5	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		84	97		85	94	19	2438	1052	143	2657	
v/s Ratio Prot							0.01	c0.58		c0.04	0.27	
v/s Ratio Perm		0.01	0.00		c0.04	0.00			0.03			
v/c Ratio		0.18	0.01		0.54	0.05	0.53	0.78	0.04	0.47	0.33	
Uniform Delay, d1		52.9	52.3		54.2	52.5	59.0	9.5	4.1	52.0	2.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.96	0.70	
Incremental Delay, d2		0.7	0.0		5.5	0.2	15.8	2.5	0.1	1.3	0.1	
Delay (s)		53.6	52.3		59.7	52.6	74.8	12.0	4.2	51.2	2.0	
Level of Service		D	D		E	D	E	B	A	D	A	
Approach Delay (s)		53.1			55.3			12.2			5.5	
Approach LOS		D			E			B			A	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	0	0	1895	840	55
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	20	0	0	1934	857	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					426	
pX, platoon unblocked	0.95	0.95	0.95			
vC, conflicting volume	1852	457	913			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1786	311	794			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	70	100	100			
cM capacity (veh/h)	69	648	779			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	20	0	967	967	571	342
Volume Left	20	0	0	0	0	0
Volume Right	0	0	0	0	0	56
cSH	68	1700	1700	1700	1700	1700
Volume to Capacity	0.30	0.00	0.57	0.57	0.34	0.20
Queue Length 95th (ft)	27	0	0	0	0	0
Control Delay (s)	79.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	F					
Approach Delay (s)	79.9	0.0			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	345	50	95	25	55	45	170	1490	90	40	520	130
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.5		4.0	4.5		4.0	5.4		4.0	5.4	5.4
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	0.93		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3193	1548		1662	1632		1662	3236		1662	3228	1488
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3193	1548		1662	1632		1662	3236		1662	3228	1488
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	352	51	97	26	56	46	173	1520	92	41	531	133
RTOR Reduction (vph)	0	58	0	0	23	0	0	2	0	0	0	72
Lane Group Flow (vph)	352	90	0	26	79	0	173	1610	0	41	531	61
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	0%	2%	0%	0%	3%	0%
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases												2
Actuated Green, G (s)	17.2	25.8		3.5	12.1		16.5	65.2		4.0	52.7	52.7
Effective Green, g (s)	17.2	25.8		3.5	12.1		16.5	65.2		4.0	52.7	52.7
Actuated g/C Ratio	0.15	0.22		0.03	0.10		0.14	0.56		0.03	0.45	0.45
Clearance Time (s)	4.0	4.5		4.0	4.5		4.0	5.4		4.0	5.4	5.4
Vehicle Extension (s)	2.3	2.3		2.3	2.3		2.3	4.4		2.3	4.4	4.4
Lane Grp Cap (vph)	471	343		49	169		235	1812		57	1461	673
v/s Ratio Prot	c0.11	0.06		0.02	c0.05		c0.10	c0.50		0.02	0.16	
v/s Ratio Perm												0.04
v/c Ratio	0.75	0.26		0.53	0.47		0.74	0.89		0.72	0.36	0.09
Uniform Delay, d1	47.5	37.4		55.6	49.1		47.9	22.4		55.6	20.9	18.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.9	0.2		7.2	1.2		10.4	6.0		31.9	0.3	0.1
Delay (s)	53.4	37.7		62.8	50.3		58.3	28.4		87.5	21.1	18.3
Level of Service	D	D		E	D		E	C		F	C	B
Approach Delay (s)		48.7			52.8			31.3			24.4	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	33.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	116.4	Sum of lost time (s)	17.9
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	35	25	0	35	125	1715	35	25	640	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	0	37	27	0	37	133	1824	37	27	681	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1			1						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1912	2824	340	2484	2824	912	681			1824		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1912	2824	340	2484	2824	912	681			1824		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	94	0	100	87	85			92		
cM capacity (veh/h)	30	14	655	12	14	276	908			331		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	37	64	133	912	912	37	27	340	340	16
Volume Left	0	27	133	0	0	0	27	0	0	0
Volume Right	37	37	0	0	0	37	0	0	0	16
cSH	492	27	908	1700	1700	1700	331	1700	1700	1700
Volume to Capacity	0.08	2.38	0.15	0.54	0.54	0.02	0.08	0.20	0.20	0.01
Queue Length 95th (ft)	6	193	13	0	0	0	6	0	0	0
Control Delay (s)	12.9	937.2	9.6	0.0	0.0	0.0	16.8	0.0	0.0	0.0
Lane LOS	B	F	A				C			
Approach Delay (s)	12.9	937.2	0.6				0.6			
Approach LOS	B	F								

Intersection Summary			
Average Delay	22.0		
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	5	40	0	20	0	25	25	10	15	0
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	0	5	44	0	22	0	27	27	11	16	0

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	5	66	55	27
Volume Left (vph)	0	44	0	11
Volume Right (vph)	5	22	27	0
Hadj (s)	-0.57	-0.04	-0.27	0.08
Departure Headway (s)	3.6	4.0	3.8	4.2
Degree Utilization, x	0.01	0.07	0.06	0.03
Capacity (veh/h)	976	871	915	840
Control Delay (s)	6.6	7.4	7.0	7.3
Approach Delay (s)	6.6	7.4	7.0	7.3
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.2		
Level of Service	A		
Intersection Capacity Utilization	25.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	0	25	0	0	0	40	35	0	0	30	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	16	0	27	0	0	0	44	38	0	0	33	27
Pedestrians		1			4			4			5	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	179	178	52	209	192	47	61			42		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	179	178	52	209	192	47	61			42		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	97	100	100	100	97			100		
cM capacity (veh/h)	764	696	1018	710	684	1020	1534			1574		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	16	27	0	82	60
Volume Left	16	0	0	44	0
Volume Right	0	27	0	0	27
cSH	764	1018	1700	1534	1574
Volume to Capacity	0.02	0.03	0.00	0.03	0.00
Queue Length 95th (ft)	2	2	0	2	0
Control Delay (s)	9.8	8.6	0.0	4.1	0.0
Lane LOS	A	A	A	A	
Approach Delay (s)	9.1		0.0	4.1	0.0
Approach LOS	A		A		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	55	70	30	10	60	20	25	35	15	15	15	50
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	64	81	35	12	70	23	29	41	17	17	17	58

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	180	105	87	93
Volume Left (vph)	64	12	29	17
Volume Right (vph)	35	23	17	58
Hadj (s)	-0.03	-0.09	-0.01	-0.30
Departure Headway (s)	4.4	4.4	4.7	4.4
Degree Utilization, x	0.22	0.13	0.11	0.11
Capacity (veh/h)	780	761	720	760
Control Delay (s)	8.7	8.1	8.3	7.9
Approach Delay (s)	8.7	8.1	8.3	7.9
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.3		
Level of Service	A		
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	20	30	15	20	40	30
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	22	32	16	22	43	32

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	54	38	75
Volume Left (vph)	0	16	43
Volume Right (vph)	32	0	32
Hadj (s)	-0.33	0.12	-0.11
Departure Headway (s)	3.8	4.2	4.0
Degree Utilization, x	0.06	0.04	0.08
Capacity (veh/h)	928	830	875
Control Delay (s)	7.0	7.4	7.3
Approach Delay (s)	7.0	7.4	7.3
Approach LOS	A	A	A

Intersection Summary			
Delay	7.2		
Level of Service	A		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	30	45	45	65	40	10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	34	51	51	74	45	11

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	85	125	57
Volume Left (vph)	34	51	0
Volume Right (vph)	51	0	11
Hadj (s)	-0.25	0.12	-0.09
Departure Headway (s)	4.1	4.3	4.1
Degree Utilization, x	0.10	0.15	0.07
Capacity (veh/h)	848	820	846
Control Delay (s)	7.5	8.0	7.4
Approach Delay (s)	7.5	8.0	7.4
Approach LOS	A	A	A

Intersection Summary			
Delay	7.7		
Level of Service	A		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	45	0	25	120	0	15
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	52	0	29	138	0	17

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	52	167	17
Volume Left (vph)	52	0	0
Volume Right (vph)	0	138	0
Hadj (s)	0.23	-0.46	0.03
Departure Headway (s)	4.5	3.6	4.2
Degree Utilization, x	0.06	0.17	0.02
Capacity (veh/h)	769	981	836
Control Delay (s)	7.8	7.3	7.3
Approach Delay (s)	7.8	7.3	7.3
Approach LOS	A	A	A

Intersection Summary			
Delay	7.4		
Level of Service	A		
Intersection Capacity Utilization	19.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	45	40	65	80	50	50
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	50	44	72	89	56	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	283	117			161	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	283	117			161	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	95			96	
cM capacity (veh/h)	679	935			1418	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	50	44	161	56	56
Volume Left	50	0	0	56	0
Volume Right	0	44	89	0	0
cSH	679	935	1700	1418	1700
Volume to Capacity	0.07	0.05	0.09	0.04	0.03
Queue Length 95th (ft)	6	4	0	3	0
Control Delay (s)	10.7	9.0	0.0	7.6	0.0
Lane LOS	B	A		A	
Approach Delay (s)	9.9		0.0	3.8	
Approach LOS	A				

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	40	95	15	50	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	45	108	17	57	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	301	68	80			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	301	68	80			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	95	93			
cM capacity (veh/h)	641	995	1518			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	51	125	80
Volume Left	6	108	0
Volume Right	45	0	23
cSH	938	1518	1700
Volume to Capacity	0.05	0.07	0.05
Queue Length 95th (ft)	4	6	0
Control Delay (s)	9.1	6.6	0.0
Lane LOS	A	A	
Approach Delay (s)	9.1	6.6	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	23.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	15	40	5	40	40	35	20	40	40	35	20	20
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	18	49	6	49	49	43	24	49	49	43	24	24

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	73	140	122	91
Volume Left (vph)	18	49	24	43
Volume Right (vph)	6	43	49	24
Hadj (s)	0.03	-0.08	-0.17	-0.03
Departure Headway (s)	4.6	4.4	4.3	4.5
Degree Utilization, x	0.09	0.17	0.15	0.11
Capacity (veh/h)	731	770	783	748
Control Delay (s)	8.1	8.3	8.1	8.1
Approach Delay (s)	8.1	8.3	8.1	8.1
Approach LOS	A	A	A	A

Intersection Summary			
Delay	8.2		
Level of Service	A		
Intersection Capacity Utilization	26.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	25	45	30	25	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	6	30	54	36	30	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	90				114	72
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	90				114	72
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1505				878	990

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	36	90	30
Volume Left	6	0	30
Volume Right	0	36	0
cSH	1505	1700	878
Volume to Capacity	0.00	0.05	0.03
Queue Length 95th (ft)	0	0	3
Control Delay (s)	1.3	0.0	9.2
Lane LOS	A		A
Approach Delay (s)	1.3	0.0	9.2
Approach LOS			A

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	16.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (veh/h)	125	5	5	0	0	70
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	133	5	5	0	0	74
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	5				277	5
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5				277	5
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				100	93
cM capacity (veh/h)	1616				654	1078

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	138	5	74
Volume Left	133	0	0
Volume Right	0	0	74
cSH	1616	1700	1078
Volume to Capacity	0.08	0.00	0.07
Queue Length 95th (ft)	7	0	6
Control Delay (s)	7.2	0.0	8.6
Lane LOS	A		A
Approach Delay (s)	7.2	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	25.8%	ICU Level of Service	A
Analysis Period (min)	15		

Section G

Memo 6: Future Forecasting

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Scappoose Transportation System Plan Update

Technical Memorandum #6: Future Forecasting

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December 23, 2013

Future forecasting is an important step in the transportation planning process and provides estimates of future travel demand. This memorandum documents the forecasting methodology and results associated with the enhanced cumulative analysis tool developed for the Scappoose Transportation System Plan (TSP) Update. The enhanced cumulative analysis tool (also referred to as the Small Community tool), in conjunction with post-processing, results in study intersection turn movement volumes for the 2035 TSP horizon year.

Introduction

The forecasting methodology associated with the enhanced cumulative analysis tool expands upon a cumulative analysis approach, as defined in the Oregon Department of Transportation (ODOT) Transportation Planning Analysis Unit's (TPAU's) *Analysis Procedures Manual*.[1] In the context of the traditional 4-step travel demand model approach, the typical cumulative analysis is used for trip generation and trip distribution purposes only. The result is a trip table (for growth increment only) that is used as an input into traffic assignment where analysis is completed by manually assigning the new trips to a street network and then adding them to existing traffic volumes to estimate future volumes.

The enhanced cumulative analysis tool uses the same trip generation and trip distribution methodology as the typical cumulative analysis, but it applies the methodology to all land uses within the city (i.e., both existing uses as well as any future development based on a land use inventory). The enhanced tool

[1] *Analysis Procedures Manual (APM)*, Oregon Department of Transportation (ODOT) Transportation Planning Analysis Unit (TPAU), Last Updated August, 2013, pgs. 4-30 through 4-40.

then uses VISUM modeling software[2] and incorporates intersection node delay to complete the equilibrium trip assignment. The result is an improved traffic volume forecasting tool that dynamically assigns both new and existing trips to the transportation network using an equilibrium assignment procedure that represents routing choice more accurately than manual assignment because it is responsive to varying levels of congestion and delay as traffic patterns change. This tool enables a more comprehensive analysis of future conditions and potential TSP alternatives.

The following sections of this memorandum detail each component of the travel forecast methodology associated with the enhanced cumulative analysis tool. These components include the roadway network, transportation analysis zones (TAZs), land use, and travel demand. The resulting 2035 future projected volumes are also provided.

Roadway Network

The roadway network included in the Scappoose TSP VISUM forecast tool consists of all local, collector, and arterial streets within the Scappoose Urban Growth Boundary (UGB). In addition, because there are TSP study intersections near the border of the Scappoose UGB, the forecast tool includes the key roadways just outside Scappoose that provide access to those study intersections.

An existing roadway network was built using NAVTEQ files as the initial base.[3] Then, details were added based on an existing conditions inventory that included posted speeds, traffic control, lane geometries, and number of travel lanes. Many of the elements of the existing conditions inventory are provided in Technical Memorandum #5 (Existing Conditions). The purpose of the existing conditions network was to configure the forecast tool and act as a base in the development of the future tool.

The 2035 future year baseline roadway network was then developed to use for the 2035 No-Build analysis. The following capacity-related improvement that was recently constructed was included:

- NE 3rd Street between Royal Drive and Crown Zellerbach Road

The 2035 future year network will be further refined as it is used to perform analysis of the various transportation alternatives and improvements to be analyzed for the Scappoose TSP Update.

Transportation Analysis Zones

For transportation forecasting purposes, the Scappoose UGB was divided into 53 transportation analysis zones (TAZs), which represent the sources of vehicle trip generation within the city. These TAZ boundaries were determined based on geographical and physical features allowing the best representation of access for an area, along with maintaining homogenous land use types as much as possible (e.g. residential, commercial, etc.). Centroid connectors were located to best represent access

[2] VISUM is a transportation travel demand modeling software developed by PTV Vision.

[3] NAVTEQ is a company that provides map data that is continuously updated.

to the street network. The Scappoose TSP VISUM network also includes 12 external TAZs at the key gateways into and out of the city to account for vehicle trips that enter and exit the Scappoose UGB. The internal TAZs are shown in Figure 1. The next sections of this memorandum discuss the land use and trip generation estimates associated with each TAZ and with the city as a whole.

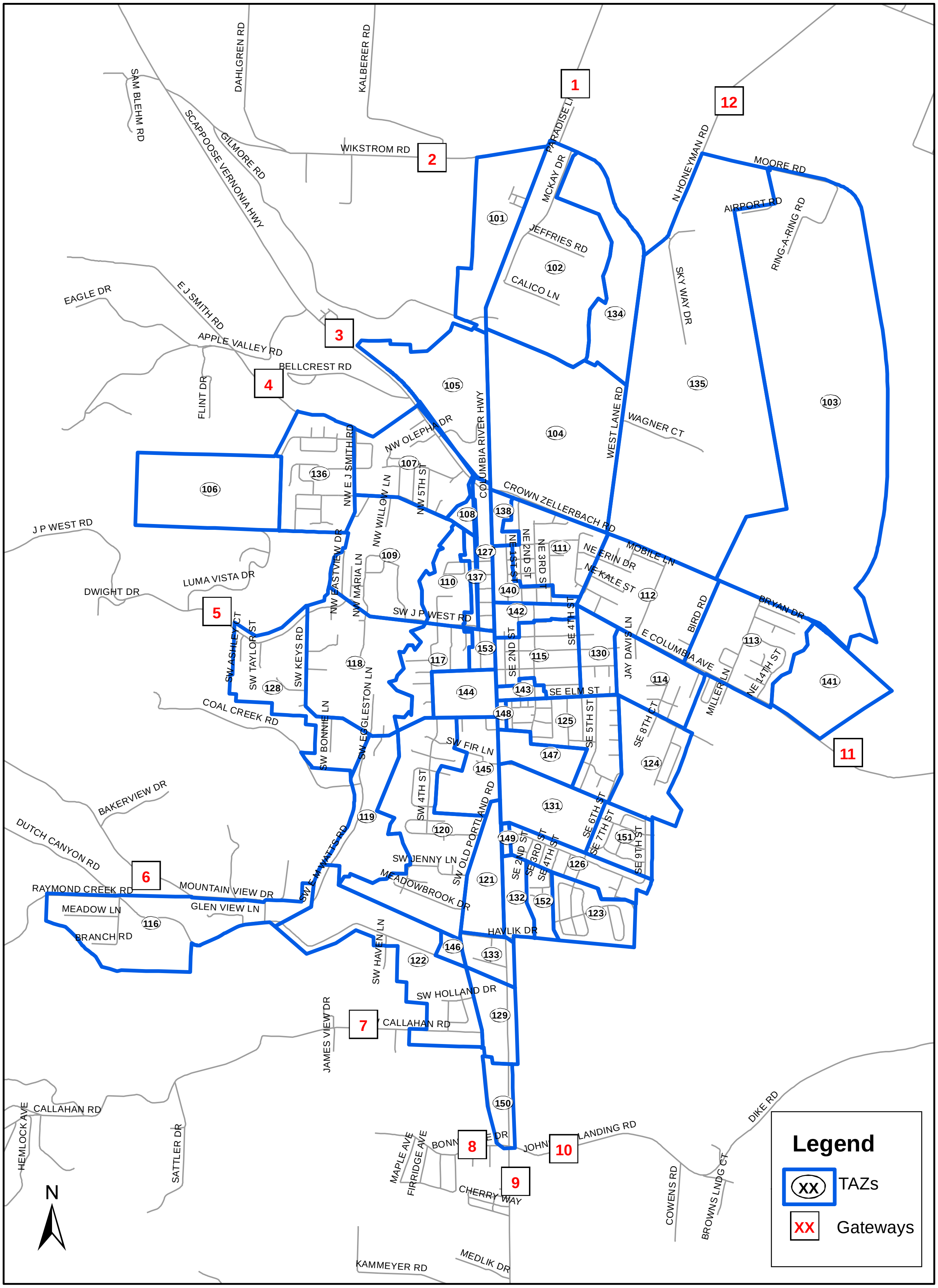


Figure 1: Forecast Tool TAZs and Gateways

Land Use

Land use is a key factor affecting the traffic demands placed on Scappoose's transportation system. The location, density, type, and mixture of land uses have a direct impact on traffic levels and patterns. An existing 2013 land use inventory and future 2035 land use projection were performed for each TAZ in the Scappoose UGB based on zoning and assumed development patterns.

The housing and employment forecasts used for this TSP analysis relied heavily on two key sources of data. The Portland State University Population Research Center prepared the *2008 Population Forecasts for Columbia County Oregon, its Cities and Unincorporated Area, 2010 to 2030,* which provided the housing forecast data. The *City of Scappoose Economic Opportunities Analysis,* prepared by a consultant, provided employment data. Both of these forecasts were adopted (specifically the Medium Growth Forecast of the PSU study) and the Urban Growth Boundary was amended by the City of Scappoose in April 2011.[4]

The base 2013 land use inventory approximated the number of households and the amount of retail employment, service employment, educational employment, and other employment that currently exist in each TAZ. Existing land uses within Scappoose were obtained from tax assessor data, census data, and zoning data and compared with existing aerial photography. The existing land uses correspond to a population of 7,091 residents, which was estimated using Columbia County population forecast data described previously.[5]

The future 2035 land use projection is an estimate of the amount of each land use (household and employment) that the TAZ could accommodate at expected build-out of vacant or underdeveloped lands assuming Comprehensive Plan zoning. The projected land uses correspond to a year 2035 population projection of approximately 11,065 residents.[6]

Detailed land use data by TAZ are provided as supplementary material to this memorandum, and a summary of the existing land use estimates and future projections for the entire Scappoose UGB is listed in Table 1.

[4] Population forecast based on February 2008 Population Forecasts for Columbia County Oregon, its Cities and Unincorporated Area 2010 to 2030, prepared by Portland State University (Medium Growth Forecast). Employment forecast based on City of Scappoose Economic Opportunities Analysis, by Johnson Reid, 2011. Both documents were adopted by the City of Scappoose, Ordinance No. 816, April 18, 2011.

[5] Ibid. Interpolation between 2010 and 2015 data was used to determine base year 2013 data.

[6] Ibid.

Table 1: Scappoose UGB Land Use Summary

Land Use	2010 Land Use	Existing 2013 Land Use	Projected Growth 2013 to 2033	Projected Growth 2033 to 2035	Total Growth 2013 to 2035	2035 Land Use
Growth Assumptions	PSU	Interpolated from 2010-2030 PSU Forecasts				
Population						
Population	**6,601**	**7,091**			**3,974**	**11,065**
Households						
Households	**2,554**	**2,773**			**1,717 (+62%)**	**4,490**
Growth Assumptions	EOA Inventory	Assumed average annual 2% growth (2010 – 2013)	Consistent with UGB Expansion EOA (shifted from 2010 – 2030 to 2013 – 2033)	Assumed average annual 2% growth (2033 – 2035)		
Employees						
Retail	519	550	1,179 (+214%)	69	1,248 (+227%)	1,798
Service	815	864	3,538 (+410%)	176	3,714 (+430%)	4,578
Other	1,091	1,156	3,353 (+290%)	181	3,533 (+306%)	4,690
Total	**2,425**	**2,570**	**8,070 (+314%)**	**426**	**8,496 (+331%)**	**11,066**

Sources (both documents adopted by City of Scappoose, Ordinance No. 816, April 18, 2011):

PSU – Portland State University Medium Growth Forecast from Population Forecasts for Columbia County Oregon, its Cities and Unincorporated Area, 2010 to 2030, dated February 2008

EOA – City of Scappoose Economic Opportunities Analysis (prepared by Johnson Reid, January 10, 2011)

Travel Demand

Travel demand on roadways and at intersections in Scappoose was estimated using methodology similar to that specified by the ODOT Procedures Manual for cumulative analysis models (often referred to as Level 2 models).[7] Adjustments made to the methodology include estimating all vehicle trips (not just growth increment), adjusting the trip distribution to reduce household-to-household trips, and using VISUM modeling software to perform the trip assignment. Travel forecasting was performed for both Average PM peak hour and 30th highest hour conditions for both 2013 and 2035. The 30 HV condition assumes a higher volume of through traffic on the US 30 corridor relative to average conditions. The purpose of the 2013 forecast tool was to calibrate the network in preparation for developing the 2035 forecast tool network, which would then be used for the future analysis.

The travel forecasting analysis includes the translation of City land use information into motor vehicle trips. This was done for each of the Scappoose TAZs based on the existing and projected land uses described previously in the Land Use section of this memorandum. Trips traveling to and from the external TAZs were also estimated for both the 2013 and 2035 analysis years. This section of the memorandum describes the methodology used to determine the different trip types and how the trips were distributed and assigned to the roadway network. Calibration analysis is also provided.

Trip Types

Travel forecast projections involve the determination of three distinct types of trips, which are categorized based on whether their origin and/or destination (i.e., the trip ends) are internal or external to the Scappoose UGB. The three trip types and how they apply to Scappoose are described in the list below.

External-External (E-E) Trips do not have an origin or destination in Scappoose and either do not stop or only make a very minor stop while passing through the Scappoose UGB. These trips are typically referred to as through traffic.

Internal-External (I-E) Trips originate in Scappoose and are traveling to a location outside of the Scappoose UGB and **External-Internal (E-I) Trips** originate outside of the Scappoose UGB and are traveling to a location within Scappoose.

Internal-Internal (I-I) Trips travel from one location within the Scappoose UGB to another location within the UGB.

[7] *Analysis Procedures Manual (APM)*, Oregon Department of Transportation (ODOT) Transportation Planning Analysis Unit (TPAU), Last Updated August, 2013, pgs. 4- 30 through 4-40.

External Trip Ends

External trip ends are the origin and/or destination of E-E, I-E, or E-I trips and were estimated for both 2013 and 2035 and for both Average PM peak hour and 30th highest hour conditions at each of the gateways shown in Figure 1. The number of 2013 external trip ends was based on existing traffic volumes (i.e., Average PM peak or 30th highest hour conditions) at key gateways to the City, bluetooth (collected from electronic devices such as laptops or cell phones) data collected at the north and south City limits on US 30[8] and estimates about through traffic at the remaining gateways. The Bluetooth data was used to determine the amount of through traffic compared to the portion of traffic with either an origin or destination within Scappoose. Observed existing bluetooth data is summarized in Table 2.

Table 2: Bluetooth Data Summary (PM peak hour - average over five week days)

Location	Through Traffic Percent of NB Traffic	Through Traffic Percent of SB Traffic
North City Limits	36%	38%
South City Limits	31%	43%

Growth estimates were applied to each gateway to determine 2035 external trip ends for through traffic. Since the difference between 30 HV traffic volumes and average PM peak hour traffic volumes is largely due to the amount of through traffic on US 30, the relative percentage and magnitude of through traffic is expected to be higher for the 30 HV condition than for the average PM peak hour condition.

External trip ends consist of through trips (i.e., E-E trips) as well as trips that enter and leave Scappoose (i.e., I-E and E-I trips). The proportion of each external trip type was estimated.

Future external trip end quantities for through traffic (E-E trips) were estimated based on the forecasted growth at the external gateways using ODOTs Future Volume Tables and data provided by ODOT TPAU staff.[9] The growth rates applied to entering and exiting trips at external locations on US 30 were 1.3% per year by direction (compounded growth rate).

Since the projected number of jobs in Scappoose in 2035 is expected to be significantly more than the number of available workers in Scappoose[10], additional employment and shopping related trips are expected to be served by residents outside of Scappoose. Since a portion of the trip generation associated with each retail and service employee is attributed to customers, rather than the employee themselves, the following assumptions were made:

[8] Bluetooth data collected week of April 8 through 13, 2013.

[9] ODOT Future Volume Tables, provided July, 2013, with refinements provided by ODOT TPAU staff in email dated July 12, 2013.

[10] Assuming up to 1.25 workers per household, Census Transportation Planning Products.

- Employee trips beyond those that can be served by Scappoose residents (e.g. people that commute to Scappoose) were assumed to travel to/from the south on US 30 (75%), the north on US 30 (23%) and the northwest on Scappoose-Vernonia Highway (2%).[11]
- Non-Employee trips:
  - Service trips were assumed to be made by Scappoose residents.
  - Shopping related trips (retail) were assumed to be made by both Scappoose residents (70%) and residents to the north and west of Scappoose (30%).

Internal Trip Ends

The number of internal trip ends in Scappoose was determined using land use trip generation methodology, which translates land use quantities (number of dwelling units or number of employees) into vehicle trip ends (number of vehicles entering or leaving a TAZ) using land use specific trip generation rates. PM peak hour trip generation rates are listed in Table 3 for the applicable land uses. These rates were developed based on the Institute of Transportation Engineers *Trip Generation Manual* and existing and anticipated land use in Scappoose.[12]

Table 3: PM Peak Hour Trip Generation Rates by Land Use (Averages for each Land Use Category)

Land Use	Trips In	Trips Out	Total Trip Ends
Households (per dwelling unit)	0.63	0.37	0.94
Retail (per employee)	2.04	1.96	4.00
Service (per employee)	0.28	0.68	0.96
Education (per employee)	0.89	0.86	1.75
Other (per employee)	0.21	0.38	0.59

By applying these trip generation rates to the TAZ land uses, the number of trips entering and exiting each TAZ in Scappoose was estimated. These internal trip estimates were obtained for both the existing 2013 land uses and the projected 2035 land uses, and the detailed results are provided in the appendix. For the entire City of Scappoose, existing land uses in 2013 are estimated to generate approximately 6,400 internal trip ends, and future land uses in 2035 are expected to generate approximately 18,400 internal trip ends. Therefore, Scappoose is estimated to have traffic growth of 12,000 internal trip ends between 2013 and 2035.

Trip Distribution

Trip distribution was performed to estimate how many trips travel between each of the internal and external TAZs. The external trips passing through Scappoose were distributed based on the bluetooth

[11] Based on employment patterns (census data) and traffic volume data at key gateways to Scappoose.

[12] The rates used national ITE data based on existing and planned land uses in Scappoose.

data discussed previously in the External Trip Ends section of this memorandum as well as estimates using traffic count data and engineering judgment for some the lower volume external gateways. Distribution for trips traveling to and from internal zones (i.e., trips having at least one internal trip end) was based on weighting the attractiveness of each zone, as measured by the number of trip ends generated by the zone. Separate weighting percentages (based on a simple gravity model) were used for household and non-household trip ends because otherwise household-to-household trips would be higher than expected for the PM peak hour. A detailed trip table showing the number of trips traveling between each of the internal and external zones is provided electronically as supplementary material to this memorandum.

Trip Assignment

Trip assignment involves the determination of the specific travel routes taken by all of the trips within the transportation network. This step was performed using VISUM modeling software. Forecast tool inputs included the transportation network (i.e., road and intersection locations and characteristics, as determined from maps and field inventories) and a trip distribution table (described above). Iterated equilibrium assignment was then performed using estimated travel times along roadways and delays at intersection movements.[13] The path choice for each trip was based on minimal travel times between locations. Forecast tool outputs include traffic volumes on roadway segments and at intersections.

Calibration

Calibration was performed on the 2013 base year forecast tools by comparing forecast tool volumes at the Scappoose TSP study intersections with existing 2013 traffic volumes (for both 30th highest hour and Average PM Peak Hour conditions). Plots comparing the existing traffic volumes and the base year forecast tool volumes for all study intersection turn movements were analyzed to evaluate the accuracy of each forecast tool and are shown in Figure 2 and 3. The calibration results for both forecast tools are summarized in Table 4.

[13] Roadway travel times were calculated based on distance and travel speed. Intersection movement delays were calculated using Highway Capacity Manual (HCM 2000) methodology for signalized and unsignalized intersections. Detailed lane geometry, traffic control, roadway cross-section, and roadway travel speed information is required for model accuracy.

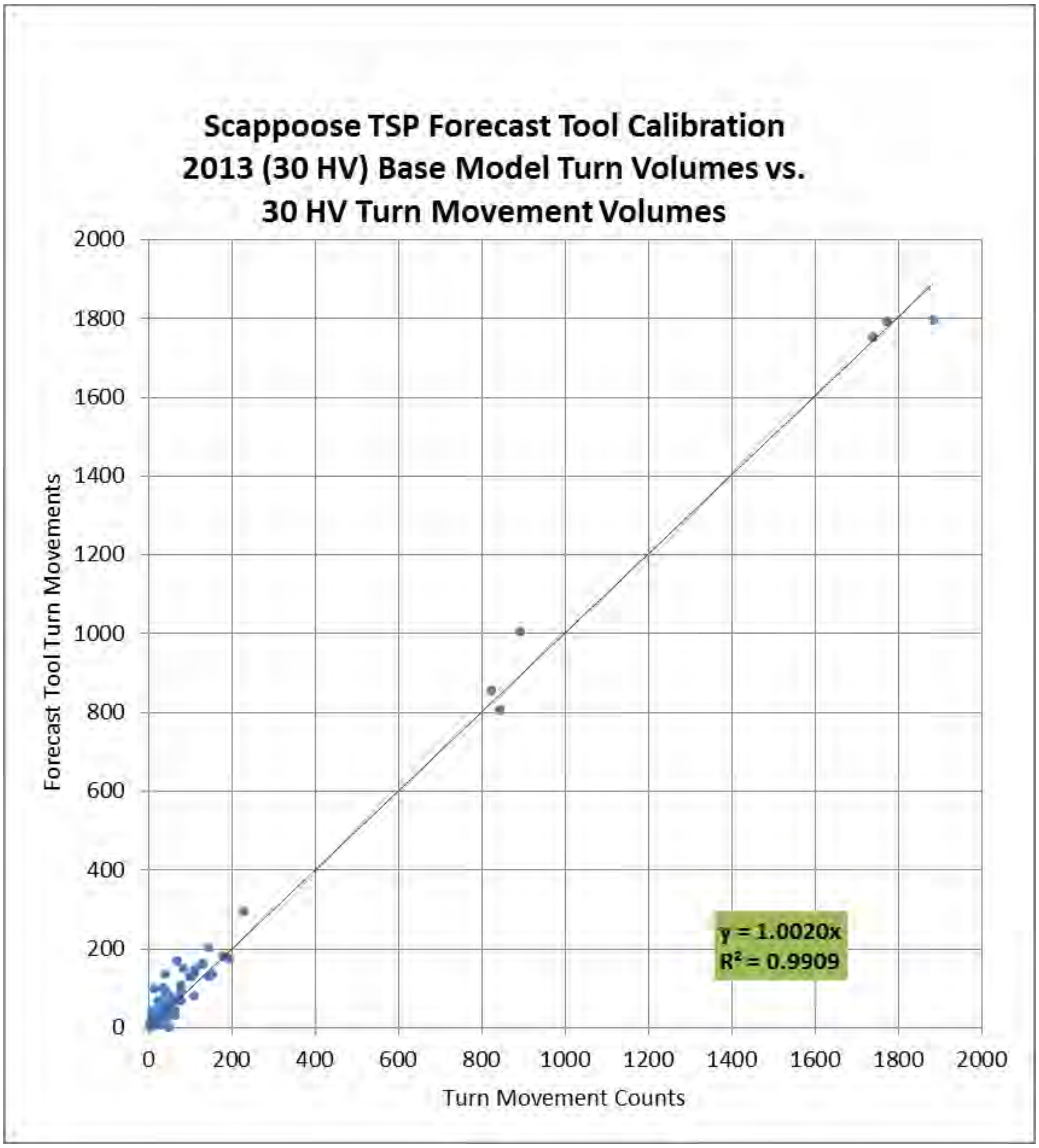


Figure 2: 2013 30 HV Forecast vs. 2013 30 HV Turn Movements with Linear Trendline

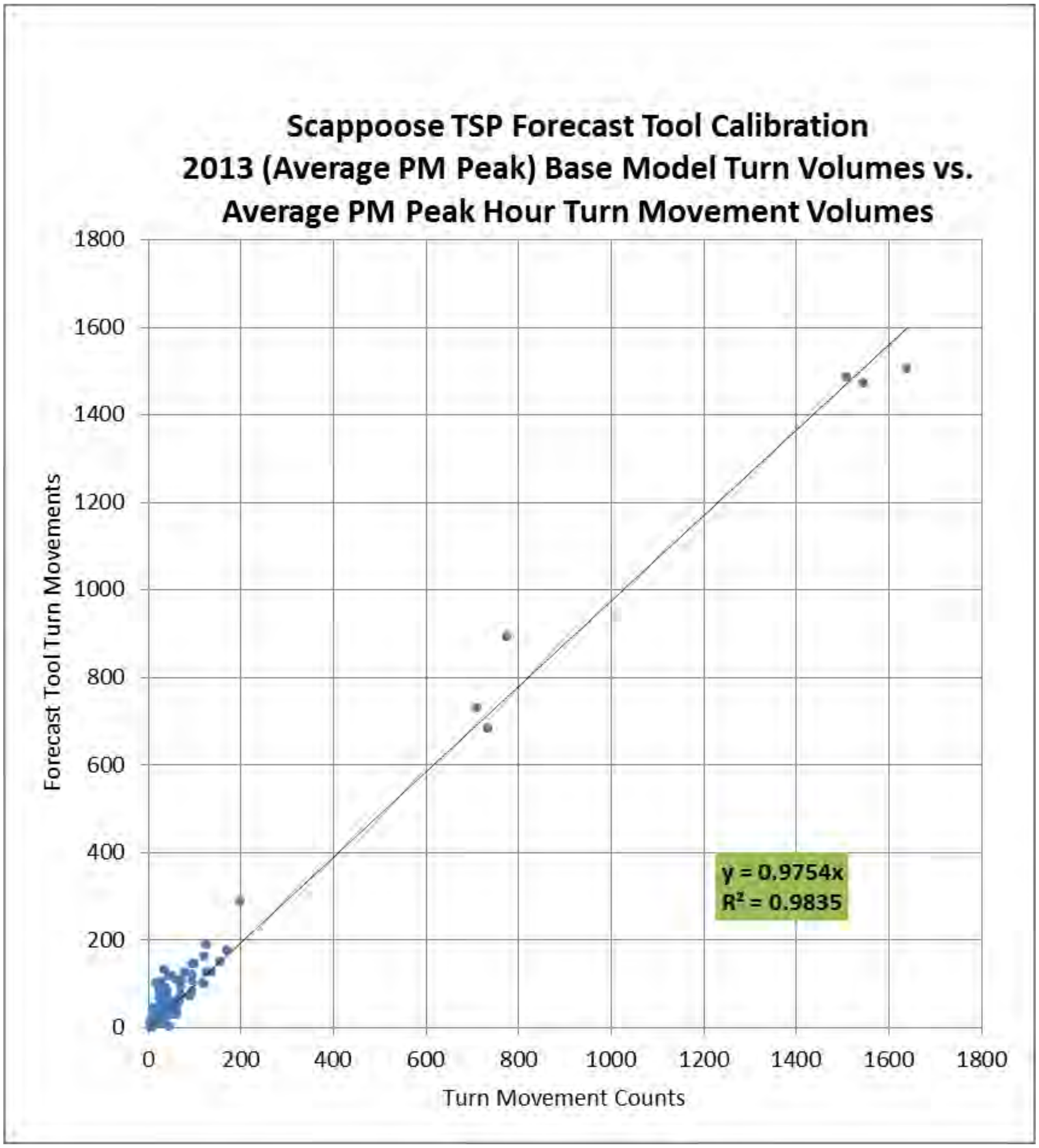


Figure 3: 2013 Average PM Peak Hour Forecast vs. 2013 Average PM Peak Hour Turn Movements with Linear Trendline

Table 4: Forecast tool Calibration Results

Calibration Tool	Measures	30 HV Forecast tool	Average PM Peak Hour Forecast tool
R^2	How well the forecast tool predicts traffic volumes	0.99	0.98
Y-value	Slope of the fitted curve	1.00	0.98

The slopes of the fitted curves are 1.00 (30 HV) and 0.98 (average PM peak), indicating that the forecast tool volumes are only up to two percent different than the existing counts and that the trip generation is appropriate and does not require further refinement. Furthermore, the R^2 values of 0.99 (30 HV) and 0.98 (average PM peak) indicate that the forecast tool volumes are consistent with the target volumes.

The calibration analysis for both of the 2013 base year forecast tools indicates that the forecast tools reasonably predict trip patterns and volumes. Therefore, the 2035 future year forecast tools are expected to reasonably forecast future year traffic volumes for the following reasons:

- The 2035 future year forecast tools were created using the 2013 base year forecast tools as a starting point.
- Roadway network changes assumed for the future year are not expected to significantly alter travel patterns.
- Future land use projections for the year 2035 were prepared using methodology consistent with the 2013 base year land use estimates.

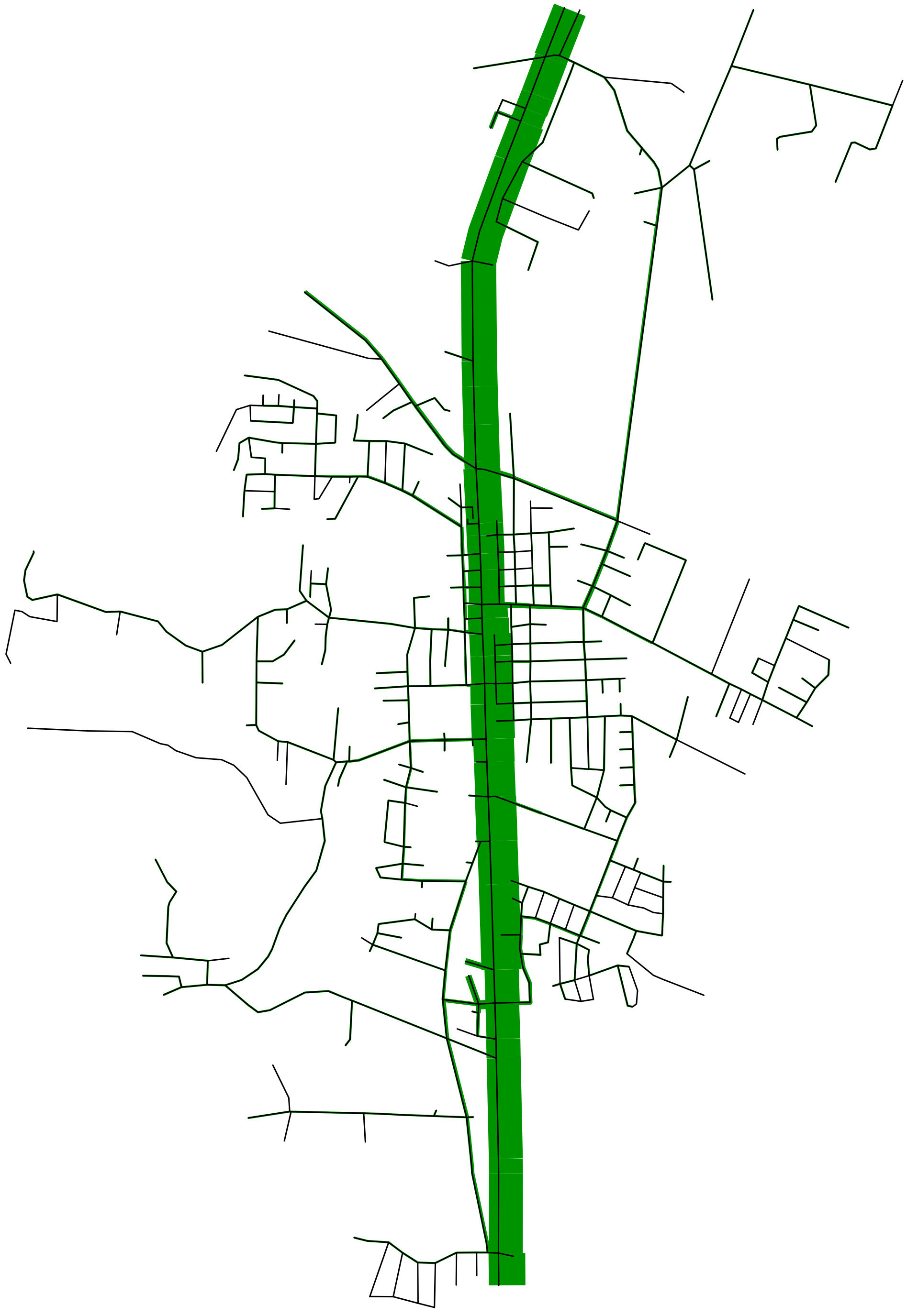
Forecast Tool Volumes

Forecast tool output volume plots for the 30 HV forecast tool are shown in Figure 4 for the 2013 base year and in Figure 5 for the 2035 future year. Figure 6 shows the increment of traffic growth between 2013 and 2035 during the PM peak hour. Similar plots for the Average PM Peak forecast tool are shown in Figures 7 through 9.

Post-Processing

While the travel demand forecast tools were calibrated to local conditions and volumes, raw volumes from the tools were not used for capacity analysis. Rather, motor vehicle turn movement volume forecasts were developed using post-processing methods consistent with the ODOT Procedures Manual. This approach is derived from methodologies outlined in the National Cooperative Highway Research Program (NCHRP) Report 255, *Highway Traffic Data for Urbanized Area Project Planning and Design*.

The post-processing methodology involves estimating trip growth (i.e., volume differences between base and future forecast tools), scaling the growth by the number of forecast years (i.e., forecast years divided by difference in forecast tool years), and adding these volumes to existing traffic counts. Engineering judgment is used as part of the post-processing methodology, with the routing decisions identified by the forecasting tool serving as a helpful starting point in making volume adjustments. The results of this process are future year forecasts derived from the Scappoose enhanced cumulative analysis forecasting tool that are calibrated to observed data. These forecasts will be presented in technical memorandum #7 (Future Needs) and will serve as a future base volume forecast.



Legend

Streets

Volume PrT [veh] (AP)

Volume capacity ratio PrT (AP)

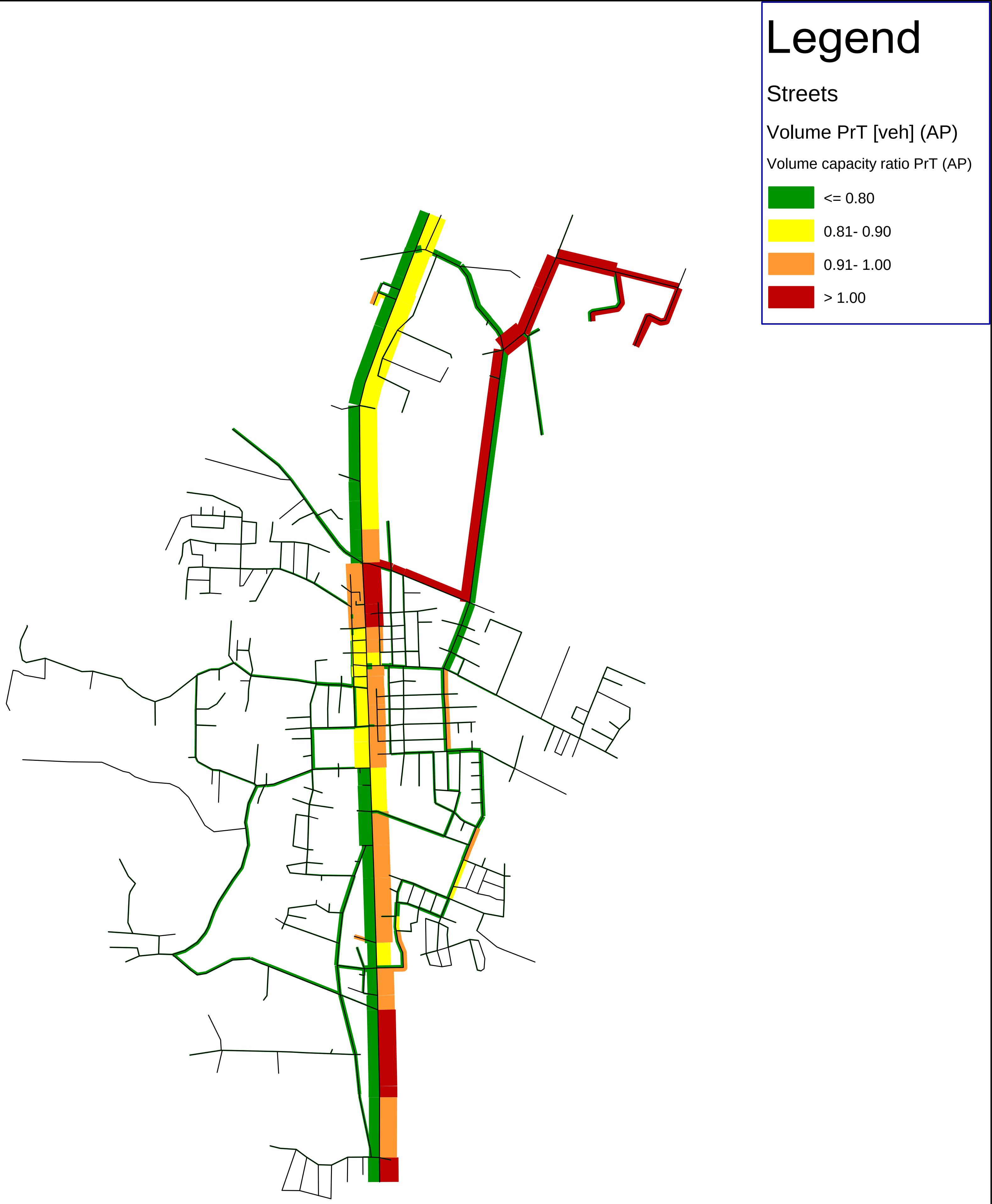
<= 0.80

0.81- 0.90

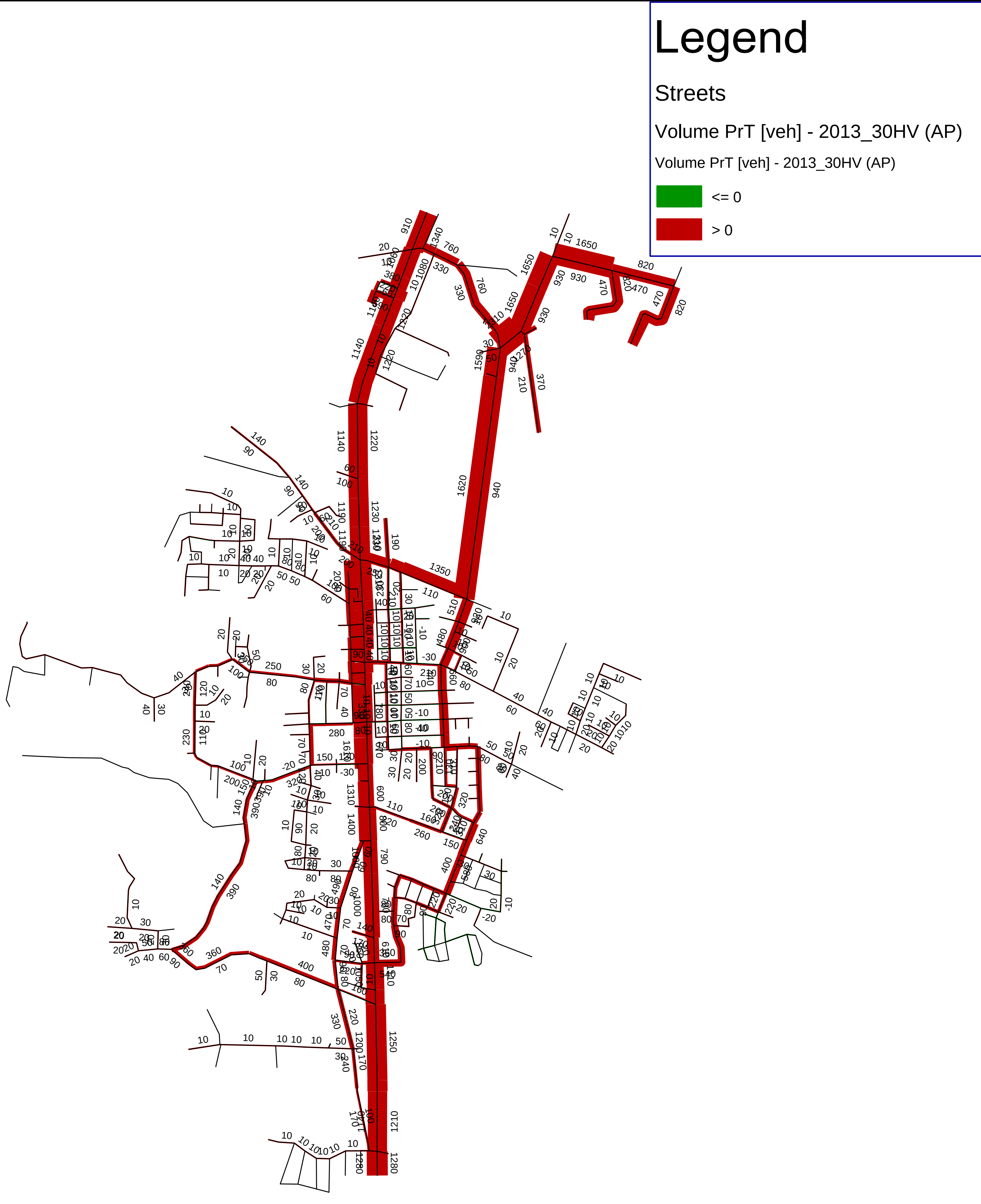
0.91- 1.00

> 1.00

Created on: 23.12.2013	2013 30 HV Base	Figure 4
Scappoose TSP	PM Peak Hour Link Volumes and V/C	DKS Associates

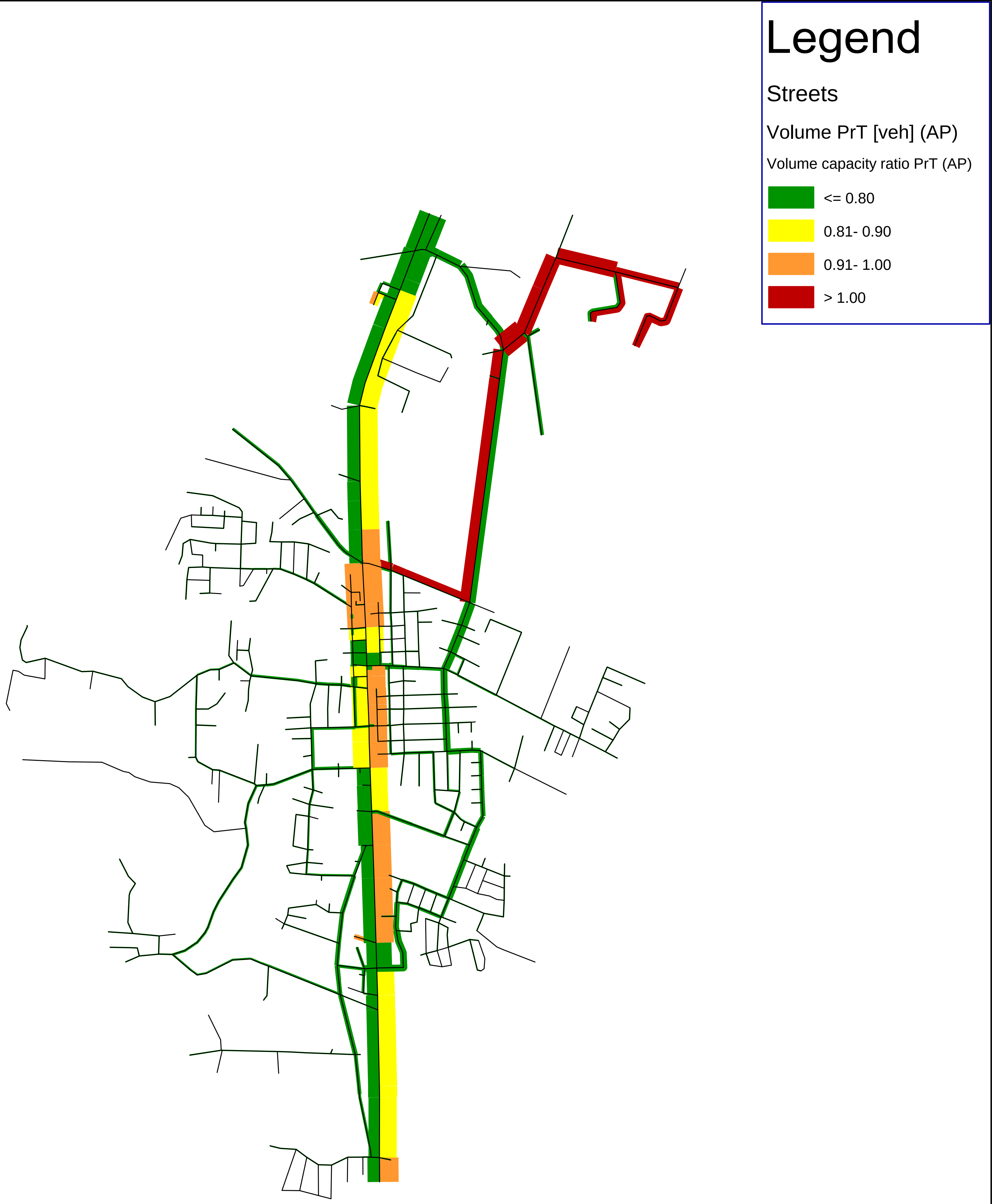


Created on: 23.12.2013	2035 30 HV Base	Figure 5
Scappoose TSP	PM Peak Hour Link Volumes and V/C	DKS Associates

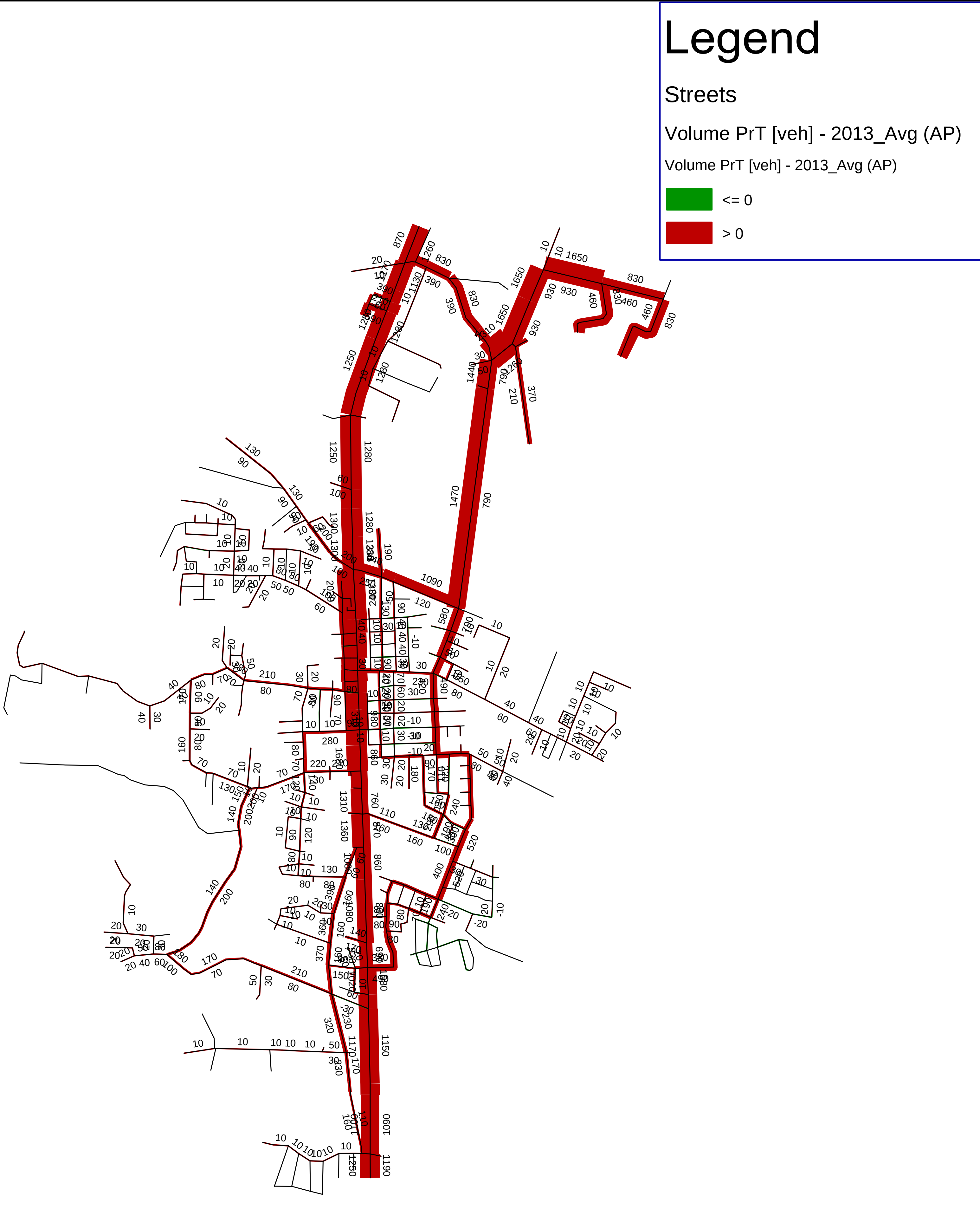


Created on: 23.12.2013	Growth (2013 - 2035) 30 HV	Figure 6
Scappoose TSP	PM Peak Hour Link Volumes and V/C	DKS Associates

Created on: 23.12.2013	2013 Average PM Peak Hour	Figure 7
Scappoose TSP	PM Peak Hour Link Volumes and V/C	DKS Associates



Created on: 23.12.2013	2035 Average PM Peak Hour Base	Figure 8
Scappoose TSP	PM Peak Hour Link Volumes and V/C	DKS Associates



Created on: 23.12.2013	Growth (2013 - 2035) Average PM Peak	Figure 9
Scappoose TSP	PM Peak Hour Link Volumes and V/C	DKS Associates

Appendix

Forecast Tool Network

VISUM Network

Land Use Data

Land Use Summary by TAZ

Household Land Use Growth

Retail Employment Land Use Growth

Service Employment Land Use Growth

Other Employment Land Use Growth

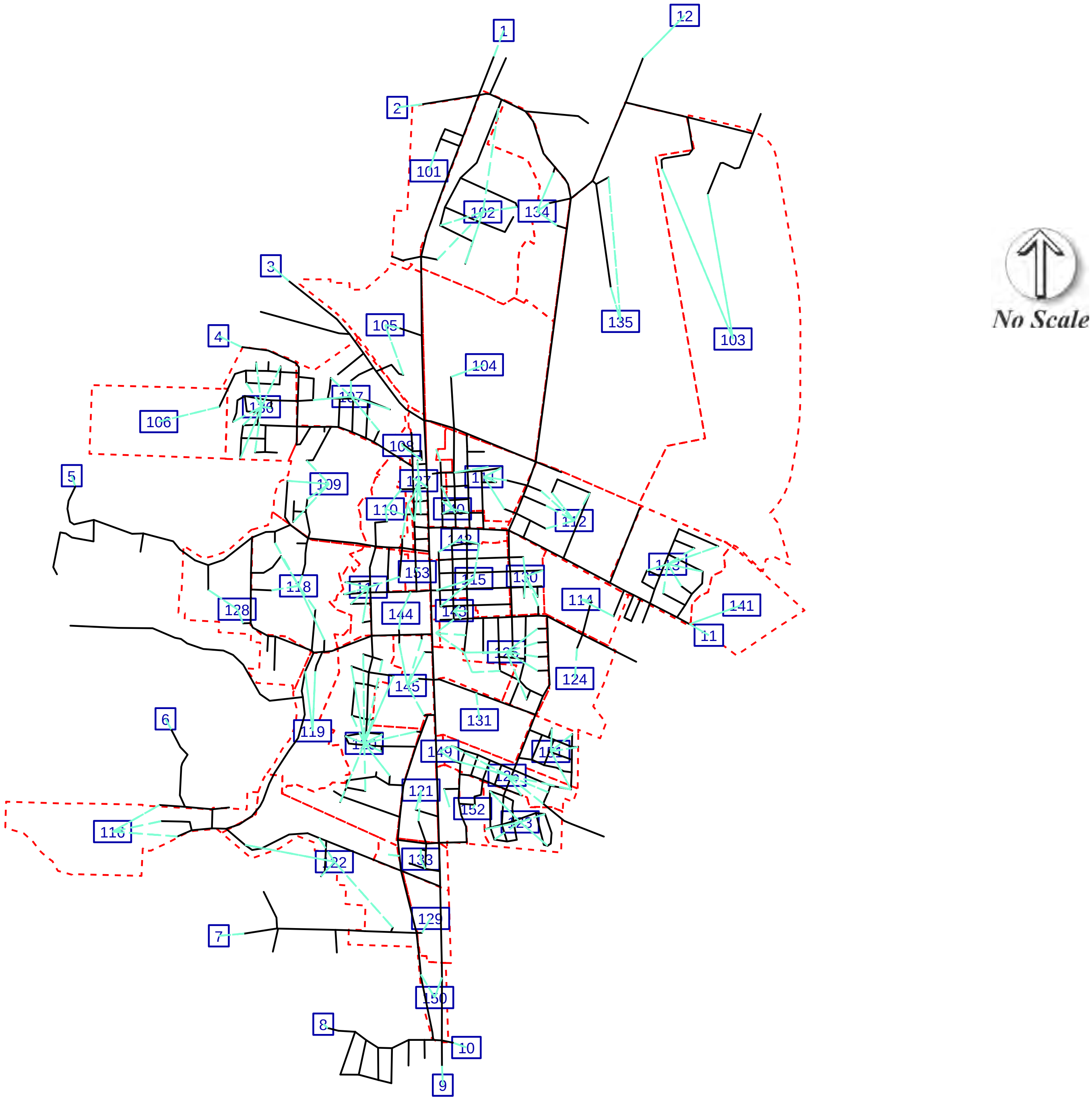
Trip Table Summary (Trip Generation by TAZ)

30 HV Trip Generation by TAZ

Average PM Peak Hour Trip Generation by TAZ

Forecast Tool Network

VISUM Network



06.11.2013/11:24:02		
Scappoose TSP Network		

Land Use Data

Land Use Summary by TAZ

Household Land Use Growth

Retail Employment Land Use Growth

Service Employment Land Use Growth

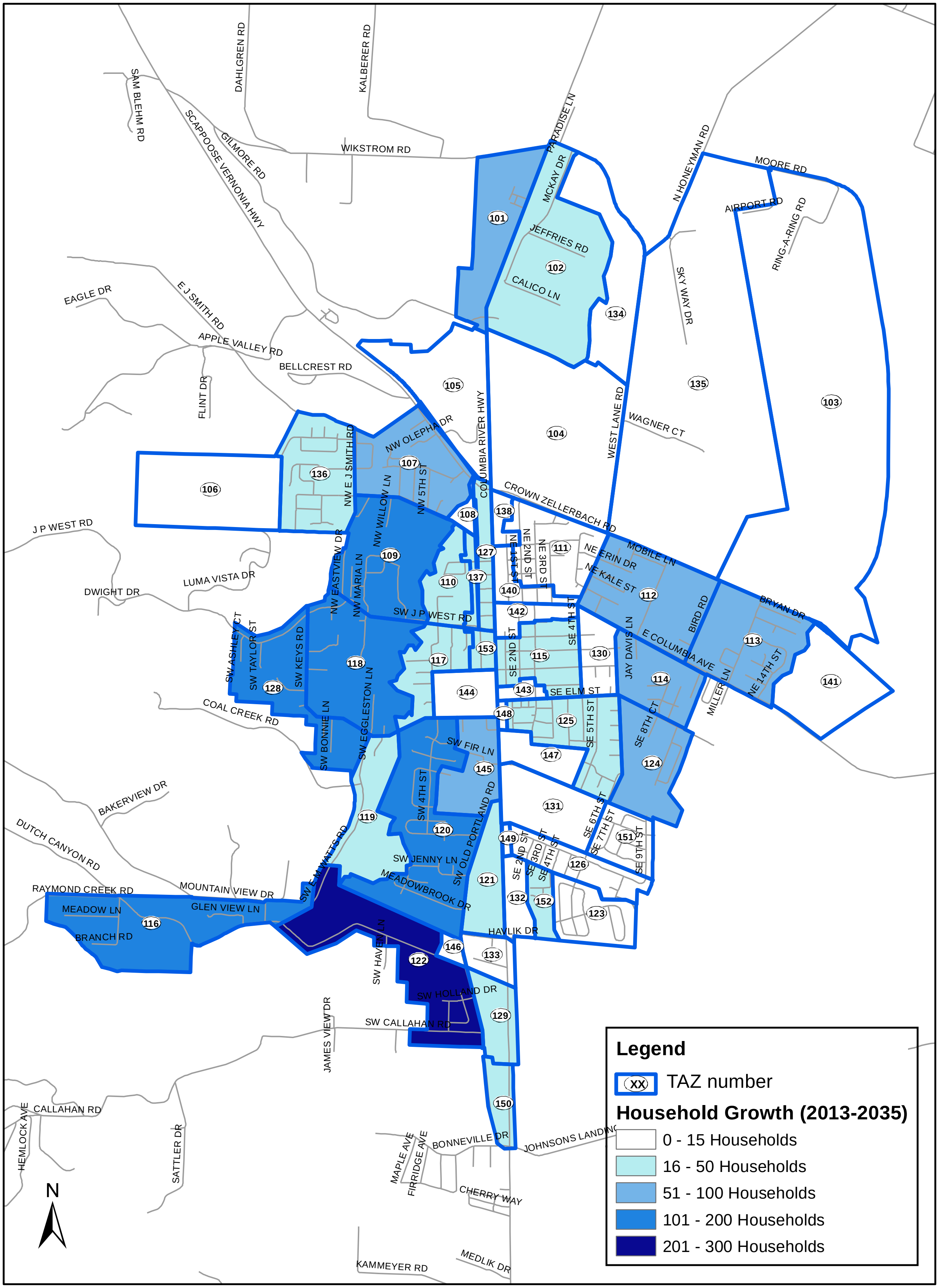
Other Employment Land Use Growth

Scappoose Land Use Summary

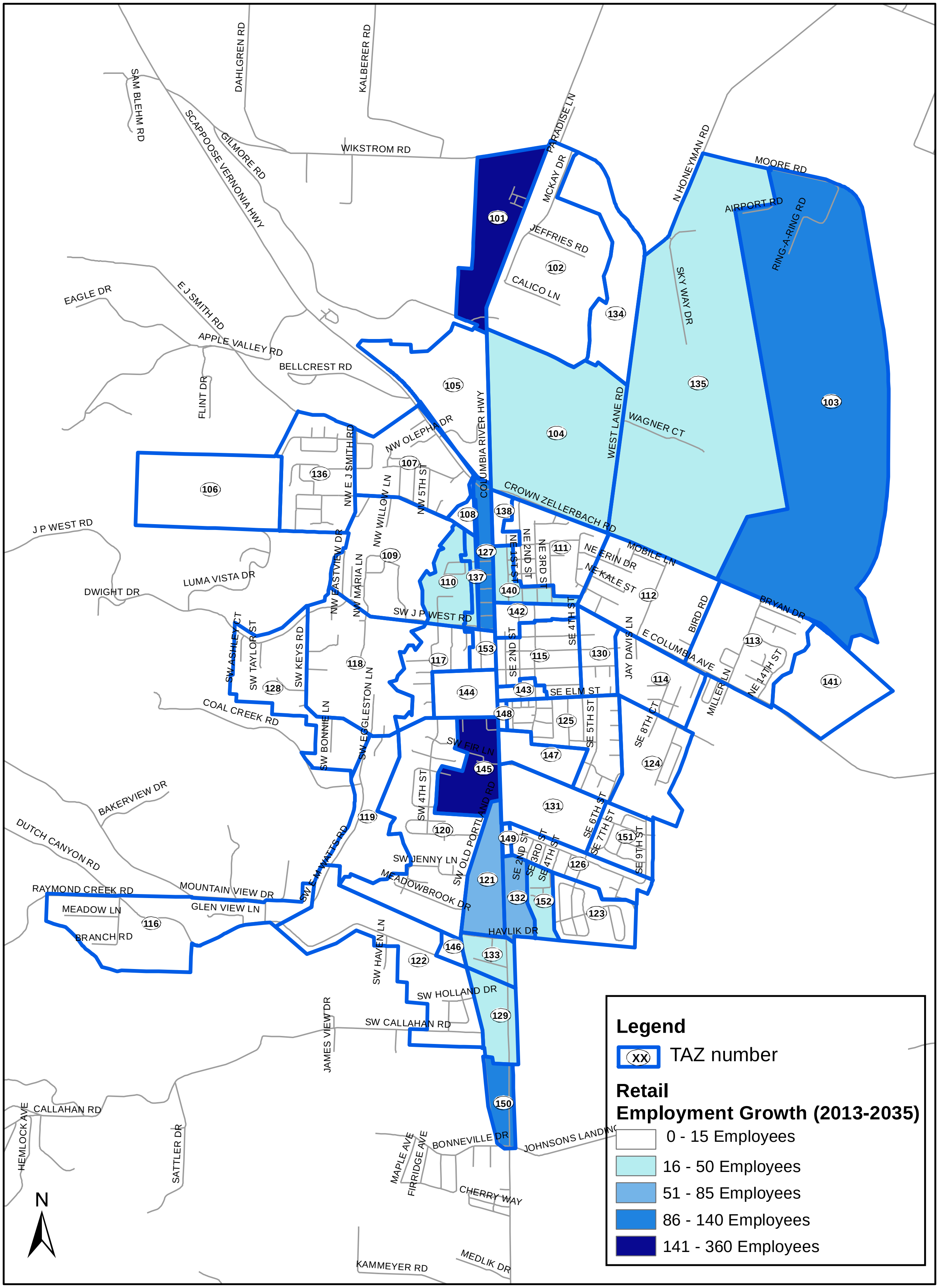
	Existing Land Use						Growth						Reduction for Redevelopment (LU that would be replaced)					2035 Land Use					
TAZ	HH	RET EMP	SER EMP	OTH EMP	EDU	EMP Total	HH	RET EMP	SER EMP	OTH EMP	EDU	EMP Total	HH	RET EMP	SER EMP	OTH EMP	TOT EMP	HH	RET EMP	SER EMP	OTH EMP	EDU	TOT EMP
101	60	58	22	80	0	160	78	276	131	54	0	461	26	30	0	23	53	112	305	153	111	0	568
102	31	0	19	24	0	44	21	0	5	1	0	6	1	0	0	0	0	51	0	24	25	0	49
103	8	0	6	31	0	37	0	89	1448	1668	0	3206	0	0	4	8	13	8	89	1450	1691	0	3230
104	0	0	27	137	0	164	0	28	334	321	0	683	0	0	53	107	160	0	28	308	352	0	687
105	0	0	16	59	0	74	0	11	206	199	0	416	0	0	21	43	64	0	11	200	215	0	426
106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107	112	0	8	10	0	18	87	0	16	16	0	32	6	0	0	0	0	193	0	25	26	0	51
108	12	0	1	1	0	2	1	0	0	0	0	0	0	0	0	0	0	13	0	1	1	0	2
109	89	0	9	12	0	21	127	0	30	29	0	59	3	0	0	0	0	213	0	39	41	0	80
110	147	0	3	4	0	7	30	33	27	19	0	78	54	0	0	0	0	123	33	30	23	0	85
111	201	0	7	9	0	16	6	0	0	0	0	0	1	0	0	0	0	206	0	7	8	0	15
112	157	0	11	14	0	26	69	0	9	7	0	17	15	0	0	0	0	211	0	21	22	0	43
113	115	0	10	12	0	22	60	0	14	13	0	26	8	0	0	0	0	167	0	23	25	0	48
114	82	0	6	7	0	13	59	0	9	8	0	18	8	0	0	0	0	132	0	15	16	0	31
115	129	0	5	6	0	11	23	10	2	1	0	12	5	0	0	0	0	147	10	7	7	0	24
116	66	0	12	15	0	27	110	0	26	25	0	51	10	0	0	0	0	166	0	38	40	0	78
117	125	0	5	6	0	11	27	0	5	4	0	8	8	0	0	0	0	144	0	9	10	0	19
118	100	0	9	12	0	21	137	0	33	32	0	65	8	0	0	0	0	229	0	42	44	0	86
119	45	0	7	9	0	16	36	0	17	16	0	33	5	0	0	0	0	77	0	24	25	0	49
120	258	0	14	18	0	33	173	0	32	31	0	63	5	0	0	0	0	426	0	47	49	0	96
121	20	200	179	89	0	469	33	79	41	96	0	217	11	38	12	0	50	42	241	208	185	0	635
122	62	0	8	11	0	19	294	0	41	38	0	79	14	0	0	0	0	343	0	49	49	0	98
123	1	0	6	8	0	14	0	0	0	0	0	0	0	0	0	0	0	1	0	6	7	0	13
124	84	0	6	8	0	14	85	0	20	19	0	39	6	0	0	0	0	163	0	26	27	0	53
125	205	0	7	9	0	16	18	0	1	0	0	1	0	0	0	0	0	224	0	8	8	0	16
126	130	0	4	5	0	9	5	0	3	2	0	4	1	0	0	0	0	134	0	7	7	0	14
127	5	30	70	5	0	105	39	108	50	26	0	184	4	6	7	0	13	41	132	114	31	0	276
128	70	0	8	10	0	17	120	0	29	28	0	57	5	0	0	0	0	185	0	36	38	0	74
129	22	0	3	4	0	6	49	20	9	9	0	38	7	0	0	0	0	64	20	12	13	0	45
130	72	0	3	4	0	8	9	0	1	1	0	2	3	0	0	0	0	78	0	5	5	0	10
131	0	0	0	0	68	68	0	0	0	0	39	39	0	0	0	0	0	0	0	0	0	107	107
132	0	16	28	12	0	57	10	55	27	10	0	92	0	25	0	0	25	10	46	55	22	0	124
133	2	91	68	34	0	193	0	41	52	5	0	98	2	21	0	0	21	0	112	120	39	0	271
134	0	0	9	71	0	80	0	9	165	156	0	329	0	0	13	25	38	0	9	162	201	0	372
135	0	0	20	75	0	94	0	40	865	727	0	1632	0	0	109	219	328	0	40	775	583	0	1398
136	142	0	8	10	0	19	30	0	6	5	0	11	0	0	0	0	0	172	0	15	15	0	30
137	16	0	3	0	0	3	25	40	19	10	0	69	7	0	0	0	0	34	40	22	10	0	73
138	0	10	1	4	0	14	0	1	12	12	0	24	0	0	0	0	0	0	11	12	16	0	38
139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	3	26	29	59	0	114	14	22	10	18	0	50	1	0	0	0	0	16	47	40	77	0	164
141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
142	18	10	80	1	0	92	6	9	3	11	0	23	1	0	0	0	0	22	19	83	12	0	114
143	0	0	1	11	0	12	0	0	6	5	0	11	0	0	2	4	6	0	0	6	12	0	18
144	0	0	0	0	36	36	0	0	0	0	21	21	0	0	0	0	0	0	0	0	0	57	57
145	32	85	50	46	0	181	88	345	164	88	0	597	10	8	4	1	13	110	422	209	133	0	764
146	9	0	37	0	0	37	5	15	6	4	0	25	3	0	0	0	0	11	15	43	4	0	61
147	0	0	0	0	90	90	0	0	0	0	50	50	0	0	0	0	0	0	0	0	0	140	140
148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	12	0	0	0	0	0	32	89	42	22	0	152	12	0	0	0	0	32	89	42	22	0	152
151	114	0	4	5	0	8	3	0	0	0	0	1	0	0	0	0	0	117	0	4	4	0	8
152	4	0	1	1	0	3	43	48	25	110	0	183	0	0	0	0	0	47	48	26	112	0	186
153	15	23	32	12	0	67	17	11	5	14	0	29	2	0	7	0	7	30	34	30	26	0	89
Total	2,773	550	864	961	195	2,570	1,970	1,376	3,946	3,854	110	9,286	253	128	233	429	790	4,490	1,798	4,578	4,386	304	11,065
EOA/Coord Pop Forecast	2,773	550	864	961	195	2,570												4,490	1,798	4,578	4,386	304	11,066

Key:

HH	Households
RET EMP	Retail Employment
SER EMP	Service Employment
OTH EMP	Other Employment
EDU	Educational Employment
EMP Total	Total Employment



Legend
XX TAZ number
Household Growth (2013-2035)
0 - 15 Households
16 - 50 Households
51 - 100 Households
101 - 200 Households
201 - 300 Households
N



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XX
TAZ number
Retail
Employment Growth (2013-2035)
0 - 15 Employees
16 - 50 Employees
51 - 85 Employees
86 - 140 Employees
141 - 360 Employees
N
DAHLGREN RD
KALBERER RD
SAM BLEHM RD
SCAPPOOSE VERNONIA HWY
GILMORE RD
WIKSTROM RD
PARADISE LN
MCKAY DR
N HONEYMAN RD
MOORE RD
AIRPORT RD
RING-A-RING RD
JEFFRIES RD
CALICO LN
SKY WAY DR
EAGLE DR
E J SMITH RD
APPLE VALLEY RD
BELLCREST RD
FLINT DR
COLUMBIA RIVER HWY
WEST LANE RD
WAGNER CT
NW OLEPHA DR
NW E J SMITH RD
NW 5TH ST
NW WILLOW LN
CROWN ZELLERBACH RD
J P WEST RD
DWIGHT DR
LUMA VISTA DR
NW EASTVIEW DR
NW MARIA LN
SW J P WEST RD
NE 1ST ST
NE 2ND ST
NE 3RD ST
NE ERIN DR
NE KALE ST
MOBILE LN
BIRD RD
BRYAN DR
SE 4TH ST
JAY DAVIS LN
E COLUMBIA AVE
NE 14TH ST
MILLER LN
SW ASHLEY CT
SW TAYLOR ST
SW KEYS RD
SW EGGLESTON LN
SW BONNIE LN
COAL CREEK RD
SE 2ND ST
SE ELM ST
SE 5TH ST
SE 8TH CT
SW FIR LN
SW 4TH ST
SW OLD PORTLAND RD
SE 6TH ST
SE 7TH ST
SE 9TH ST
SE 3RD ST
BAKERVIEW DR
DUTCH CANYON RD
RAYMOND CREEK RD
MEADOW LN
BRANCH RD
MOUNTAIN VIEW DR
GLEN VIEW LN
SW E M WATTS RD
SW JENNY LN
MEADOWBROOK DR
HAVLIK DR
SW HAVEN LN
SW HOLLAND DR
SW CALLAHAN RD
JAMES VIEW DR
CALLAHAN RD
HEMLOCK AVE
SATTLER DR
MAPLE AVE
FIRRIDGE AVE
BONNEVILLE DR
JOHNSONS LANDING
CHERRY WAY
KAMMEYER RD
MEDLIK DR
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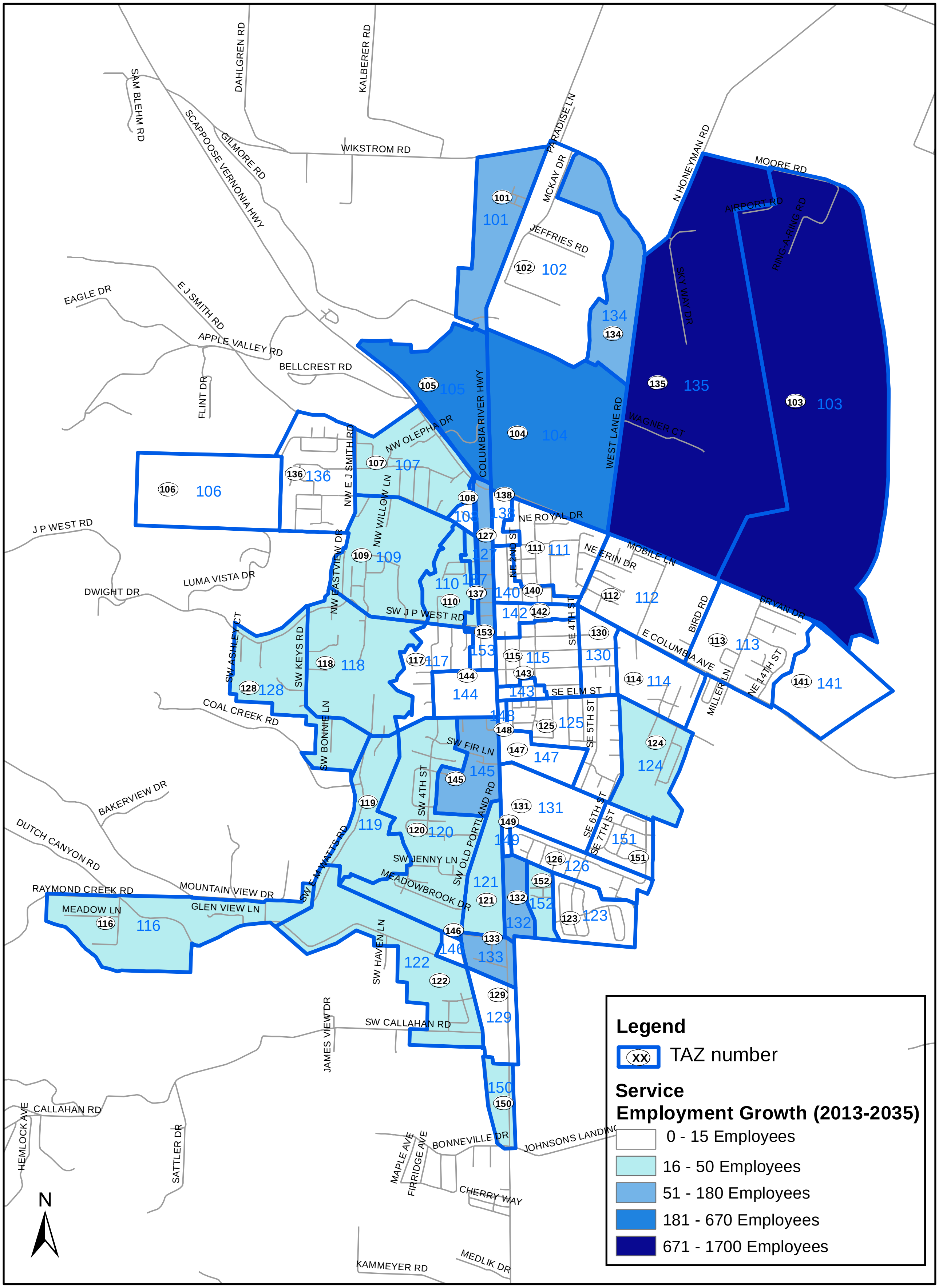
Legend
TAZ number
Service
Employment Growth (2013-2035)
0 - 15 Employees
16 - 50 Employees
51 - 180 Employees
181 - 670 Employees
671 - 1700 Employees
N
SAM BLEHM RD
DAHLGREN RD
KALBERER RD
WIKSTROM RD
GILMORE RD
SCAPPOOSE VERNONIA HWY
PARADISE LN
MCKAY DR
JEFFRIES RD
N HONEYMAN RD
MOORE RD
AIRPORT RD
RING-A-RING RD
SKY WAY DR
EAGLE DR
E J SMITH RD
APPLE VALLEY RD
BELLCREST RD
FLINT DR
NW OLEPHA DR
COLUMBIA RIVER HWY
WEST LANE RD
WAGNER CT
NW E J SMITH RD
NW WILLOW LN
J P WEST RD
NE ROYAL DR
NE ERIN DR
MOBILE LN
NE 2ND ST
LUMA VISTA DR
DWIGHT DR
NW EASTVIEW DR
SW J P WEST RD
SE 4TH ST
BIRD RD
BRYAN DR
E COLUMBIA AVE
SW ASHLEY CT
SW KEYS RD
SE ELM ST
MILLER LN
NE 14TH ST
COAL CREEK RD
SW BONNIE LN
SE 5TH ST
SW FIR LN
BAKERVIEW DR
SW 4TH ST
SW OLD PORTLAND RD
SE 6TH ST
SE 7TH ST
DUTCH CANYON RD
SW JENNY LN
MEADOWBROOK DR
RAYMOND CREEK RD
MOUNTAIN VIEW DR
MEADOW LN
GLEN VIEW LN
SW HAVEN LN
SW CALLAHAN RD
JAMES VIEW DR
CALLAHAN RD
HEMLOCK AVE
SATTLER DR
MAPLE AVE
FIRRIDGE AVE
BONNEVILLE DR
JOHNSONS LANDING
CHERRY WAY
KAMMEYER RD
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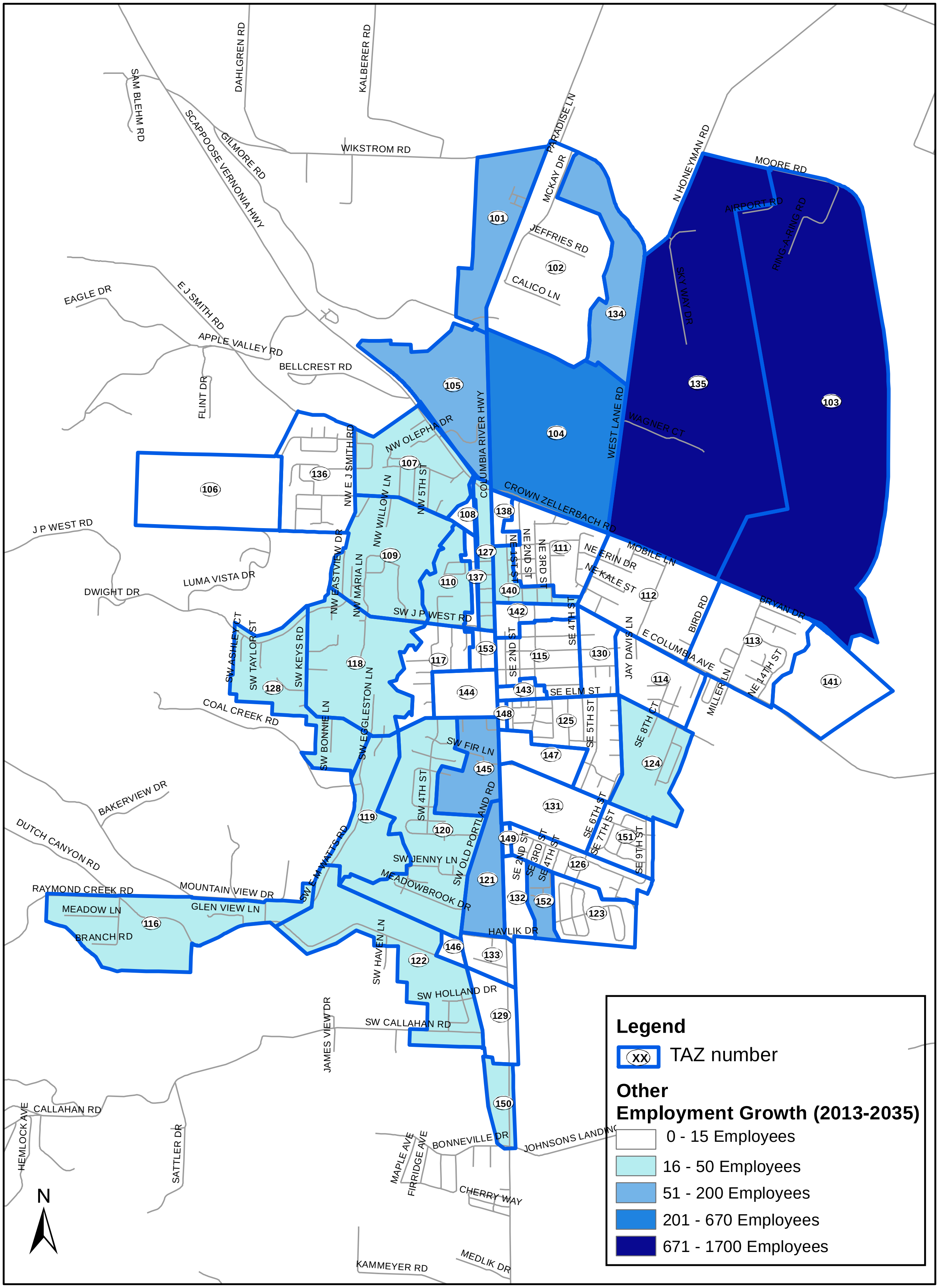
Legend
XX TAZ number
Other
Employment Growth (2013-2035)
0 - 15 Employees
16 - 50 Employees
51 - 200 Employees
201 - 670 Employees
671 - 1700 Employees
N
COLUMBIA RIVER HWY
CROWN ZELLERBACH RD
WEST LANE RD
SCAPPOOSE VERNONIA HWY
SW OLD PORTLAND RD
SW J P WEST RD
N HONEYMAN RD
MOORE RD
AIRPORT RD
WAGNER CT
E COLUMBIA AVE
SW HOLLAND DR
SW CALLAHAN RD
JOHNSONS LANDING
COAL CREEK RD
DUTCH CANYON RD
RAYMOND CREEK RD
MOUNTAIN VIEW DR
KAMMEYER RD
WIKSTROM RD
BELLCREST RD
APPLE VALLEY RD

Trip Table Summary (Trip Generation by TAZ)

30 HV Trip Generation by TAZ

Average PM Peak Hour Trip Generation by TAZ

Trip Generation by TAZ - 30 HV

TAZ	2013 Trips In	2013 Trips Out	2035 Trips In	2035 Trips Out	2013 - 2035 Trips In Growth	2013 - 2035 Trips Out Growth	2013 - 2035 Total Trip Growth
101	179	180	778	713	599	533	1132
102	28	33	43	40	15	7	22
103	13	19	945	1669	931	1650	2581
104	39	74	231	382	193	308	501
105	18	34	133	231	115	197	312
106	0	0	0	0	0	0	0
107	66	44	127	81	61	38	99
108	7	4	8	5	1	0	1
109	54	38	146	102	91	63	155
110	83	49	158	124	75	75	150
111	115	70	125	67	10	-3	7
112	93	61	135	82	42	21	63
113	68	46	111	72	42	26	68
114	48	32	86	54	37	22	59
115	74	45	112	68	38	22	60
116	43	34	118	87	74	53	127
117	72	44	90	51	18	7	25
118	60	41	157	109	97	68	164
119	29	22	58	47	29	25	54
120	150	95	275	170	125	75	200
121	481	541	641	649	160	108	267
122	39	29	226	148	187	119	306
123	4	8	4	7	0	-1	-1
124	50	33	110	74	60	41	100
125	117	71	136	73	19	2	20
126	74	45	82	45	8	1	9
127	89	114	351	340	262	225	487
128	43	30	128	91	85	60	146
129	14	10	87	68	74	58	132
130	42	26	48	27	7	1	8
131	65	61	103	87	39	26	64
132	46	58	129	134	83	76	159
133	221	243	288	299	68	57	124
134	19	35	114	197	95	163	258
135	23	44	440	785	417	742	1159
136	83	53	109	65	26	12	38
137	10	7	118	104	108	96	205
138	23	22	31	34	8	11	20
139	0	0	0	0	0	0	0
140	79	97	143	147	64	50	115
141	0	0	0	0	0	0	0
142	56	84	83	101	27	17	44
143	3	5	5	9	2	4	6
144	35	33	55	46	21	14	34
145	222	232	1031	950	809	719	1528
146	16	29	53	60	37	32	69
147	85	80	135	113	50	33	83
148	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0
150	7	4	231	209	224	206	430
151	65	39	71	38	6	-1	5
152	3	3	166	161	163	159	322
153	70	79	106	101	36	22	58
Total	3,320	3,080	9,058	9,315	5,738	6,235	11,974

Trip Generation by TAZ - Average PM Peak Hour							
	2013		2035		2013 - 2035		
TAZ	Trips In	Trips Out	Trips In	Trips Out	Trips In Growth	Trips Out Growth	Total Trips Growth
101	178	181	776	715	597	534	1131
102	28	33	43	40	15	7	22
103	13	19	942	1673	929	1654	2583
104	39	74	231	383	192	309	501
105	18	35	133	232	115	197	312
106	0	0	0	0	0	0	0
107	66	44	127	82	61	38	99
108	7	4	8	5	1	0	1
109	54	39	145	102	91	63	155
110	82	49	157	124	75	75	150
111	114	70	125	67	10	-3	7
112	92	62	134	82	42	21	63
113	68	47	110	73	42	26	68
114	48	32	86	54	37	22	59
115	74	46	111	68	38	22	60
116	43	35	117	87	74	53	127
117	72	44	89	51	18	7	25
118	60	42	156	110	96	68	164
119	29	22	58	47	29	25	54
120	149	96	274	171	125	75	200
121	478	545	639	650	161	105	267
122	39	29	226	148	187	119	306
123	4	8	4	7	0	-1	0
124	50	33	109	74	60	41	100
125	117	71	135	73	19	2	20
126	74	45	82	46	8	1	9
127	89	115	350	341	261	226	487
128	43	31	128	91	85	60	145
129	14	10	87	68	74	58	132
130	41	26	48	27	7	1	8
131	64	61	103	87	39	25	64
132	46	58	129	134	83	76	159
133	219	244	287	300	68	56	124
134	19	35	114	198	95	163	258
135	23	44	439	787	416	743	1159
136	83	53	109	65	26	12	38
137	10	7	117	104	108	97	205
138	23	23	31	34	8	11	20
139	0	0	0	0	0	0	0
140	78	98	143	148	64	50	114
141	0	0	0	0	0	0	0
142	55	84	82	101	27	17	44
143	3	5	5	9	2	4	6
144	34	33	55	46	21	14	34
145	220	233	1028	953	807	720	1528
146	16	29	53	61	37	31	68
147	84	80	135	114	50	33	83
148	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0
150	6	4	230	210	223	206	430
151	64	39	71	38	6	-1	5
152	3	3	166	162	163	159	322
153	70	79	106	101	37	22	58
Total	3,300	3,100	9,032	9,343	5,732	6,243	11,976

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Section H

Memo 7: Future Needs

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Scappoose Transportation System Plan Update

Technical Memorandum #7: Future Needs

Prepared by Reah Flisakowski, P.E. and Julie Sosnovske, P.E., DKS Associates

December 23, 2013

This document details the 2035 transportation conditions in Scappoose if no new investments are made in the existing transportation system beyond those that are already funded. Included is a summary of how future transportation needs are determined, a depiction of what travel conditions in 2035 could look like in Scappoose and a description of where transportation investments are needed.

How do we Determine Future Transportation System Needs?

The transportation planning process provides the information necessary to determine what improvements should be made to promote a multimodal system that is safe and efficient. Existing travel conditions are examined first, and then planning assumptions are used to forecast growth and future travel conditions. It is assumed that no new investments will be made into the transportation infrastructure beyond what is already funded for construction. The following sections explain where growth is expected, how the transportation system will perform, and where solutions will be needed. Solutions for addressing the transportation system needs will be explored in Technical Memorandum #9.

Estimating Future Travel

Travel demand models are tools used to help understand future commuter, school, and recreational travel patterns including information about the length and time of day a trip will be made. Forecasts are based on growth in housing and jobs. Model outputs are compared with observed vehicle counts and behaviors on the local system in order to refine model forecasts. This refinement step is completed before any evaluation of system performance is made. Once the traffic forecasting process is complete, the 2035 volumes are applied to determine the areas of the street network that are expected to be congested and that may need future investments to accommodate growth.

Snapshot of Scappoose in 2035

Table 1 summarizes household and employment growth planned in Scappoose. Today, Scappoose is home to almost 2,800 households and accounts for almost 2,600 jobs. Between now and 2035, employment growth is expected to increase substantially (about 6.8 percent per year compounded), significantly outpacing the rate of household growth over the same period (about 2.2 percent per year compounded). Scappoose is expected to supply about 4,500 households and almost 11,000 jobs by 2035, a 62 and 331 percent increase respectively from 2013.[1] With more people and more jobs in Scappoose, in addition to more through traffic on US 30, the transportation network will face increased demand through 2035.

Table 1: Growth in Households and Jobs (2013 – 2035)

Land Use	Existing 2013	2035	Total Growth	Total Growth Percentage
Population	**7,091**	**11,065**	**3,974**	**+56%**
Households	**2,773**	**4,490**	**1,717**	**+62%**
Total Employment	**2,570**	**11,066**	**8,496**	**+331%**
Retail Employment	550	1,798	1,248	+227%
Service Employment	864	4,578	3,714	+430%
Other Employment	1,156	4,690	3,534	+306%

More People, More Jobs

As shown in Figure 1 and Figure 2, much of the household growth is expected to be highest on the edge of Scappoose, especially on the west side of town. Relatively high household growth is also expected to occur on the north side of town and east of 6th Street and West Lane Road. Though some infill household growth is expected closer to US 30, many of the neighborhoods in that area are already developed.

A significant amount of employment growth is expected to occur in the northeast part of town, near the airport. Additional employment growth is expected to occur along US 30 in the downtown area as well as areas to the south (area between Havlik Drive and High School Way) and north (north of Scappoose-Vernonia Highway). A low level of employment growth is expected throughout Scappoose as more people work from home.

[1] Specific land use forecasting data provided in Scappoose Transportation System Plan Update Technical Memorandum #6.

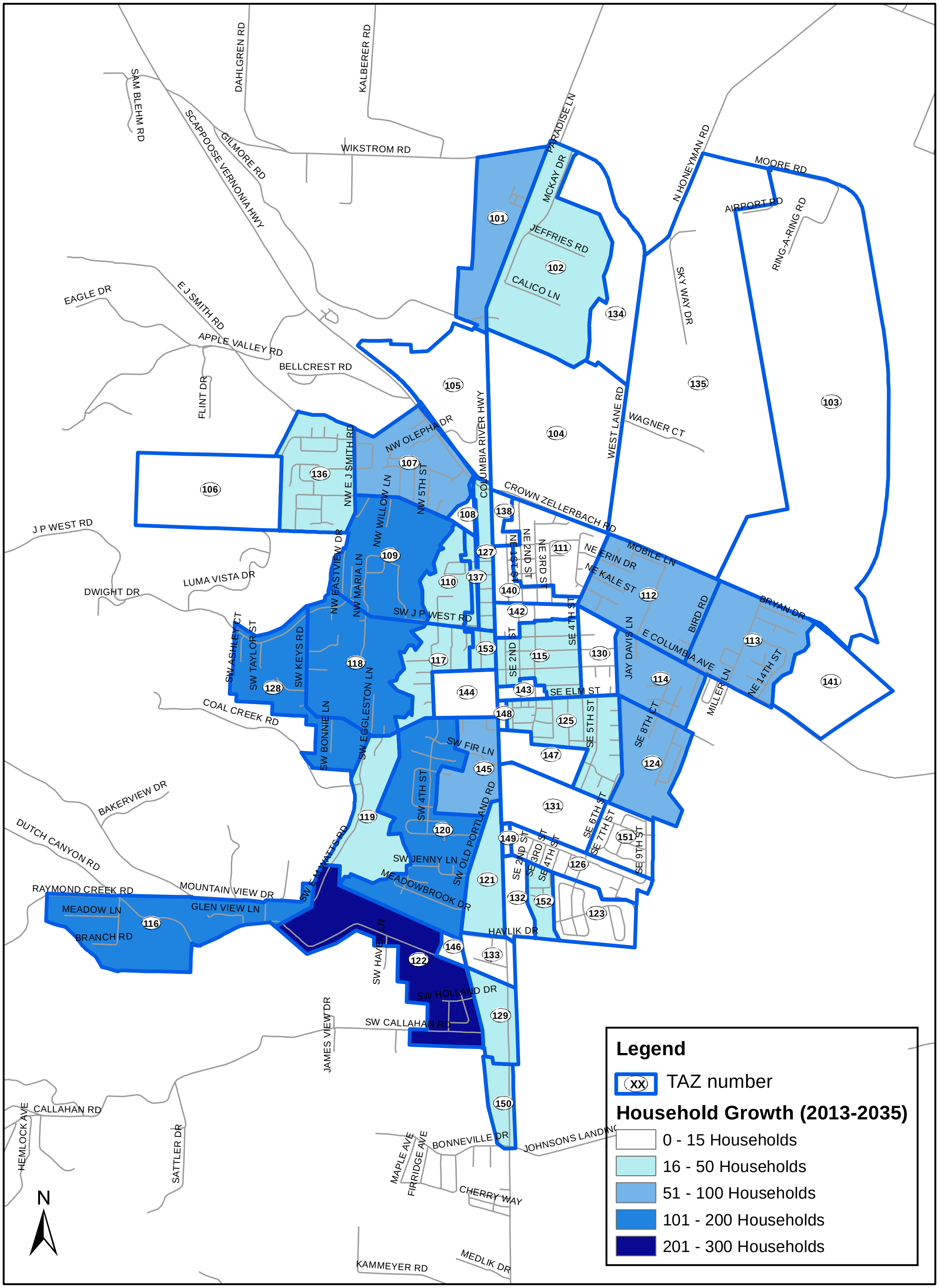


Figure 1: Scappoose Total Household Growth (2013 - 2035)

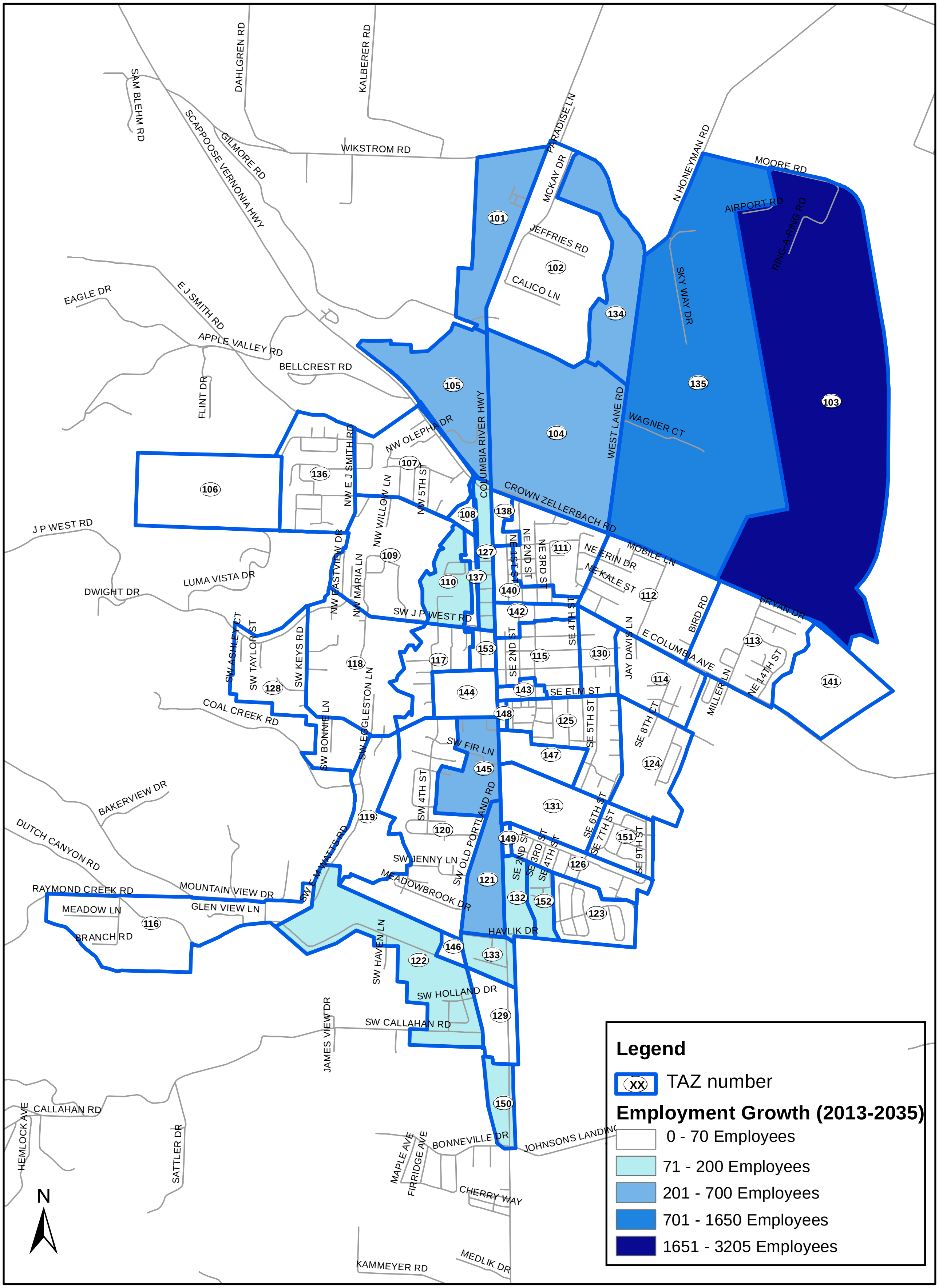


Figure 2: Scappoose Total Employment Growth (2013 - 2035)

Growth Brings More Travel

With more jobs and people in 2035, the street network in Scappoose must accommodate an additional 12,000 motor vehicle trip ends during the evening peak hour, in addition to increased through travel on US 30. Today, the street network in Scappoose handles an estimated 6,400 evening peak hour trip ends. However, the evening peak hour motor vehicle trips are expected to increase an average of about five percent a year (compounded), reaching about 18,400 evening peak hour trip ends by 2035. Through traffic on US 30 is expected to grow at a slower pace, about 1.3 percent growth each year (compounded).[2] Figure 3 illustrates how the population and employment growth through 2035 translates into motor vehicle travel by transportation analysis zone during the evening peak hour. As shown, much of the increased travel is expected to begin or end in zones located in major residential and/or employment growth areas, primarily in the north and southwest areas of Scappoose.

The 2035 motor vehicle volumes for the peak season and average weekday conditions were utilized to determine areas on the roadway network that will be congested and may require future investments to accommodate growth. Since there are no planned roadway improvements with secured funding, the 2035 Baseline street network matched that of the existing system in 2013.

The 2035 Baseline motor vehicle volumes for study intersections are shown in Figure 4 and Figure 5. Motor vehicle volumes in 2035 will be highest along the regional roadways, primarily US 30. US 30 serves vehicles entering and leaving the city, as well as providing local access in town. Other roadways that will see significant traffic increases include West Lane Road, Honeyman Road, Crown Zellerbach Road, 6th Street and Old Portland Road.

[2] Based on ODOT Future Traffic Volume Tables and coordination with ODOT TPAU staff, July 2013.

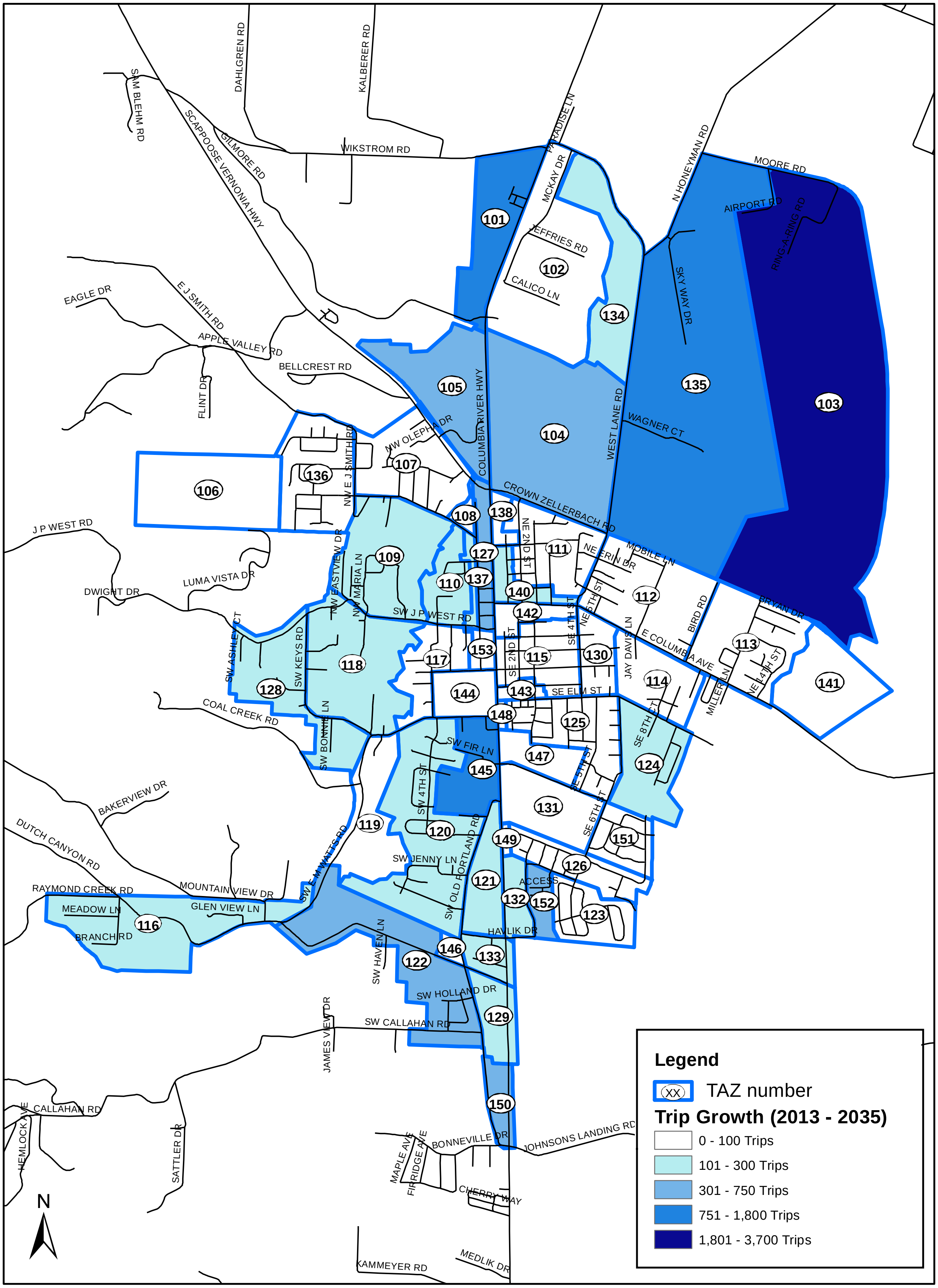
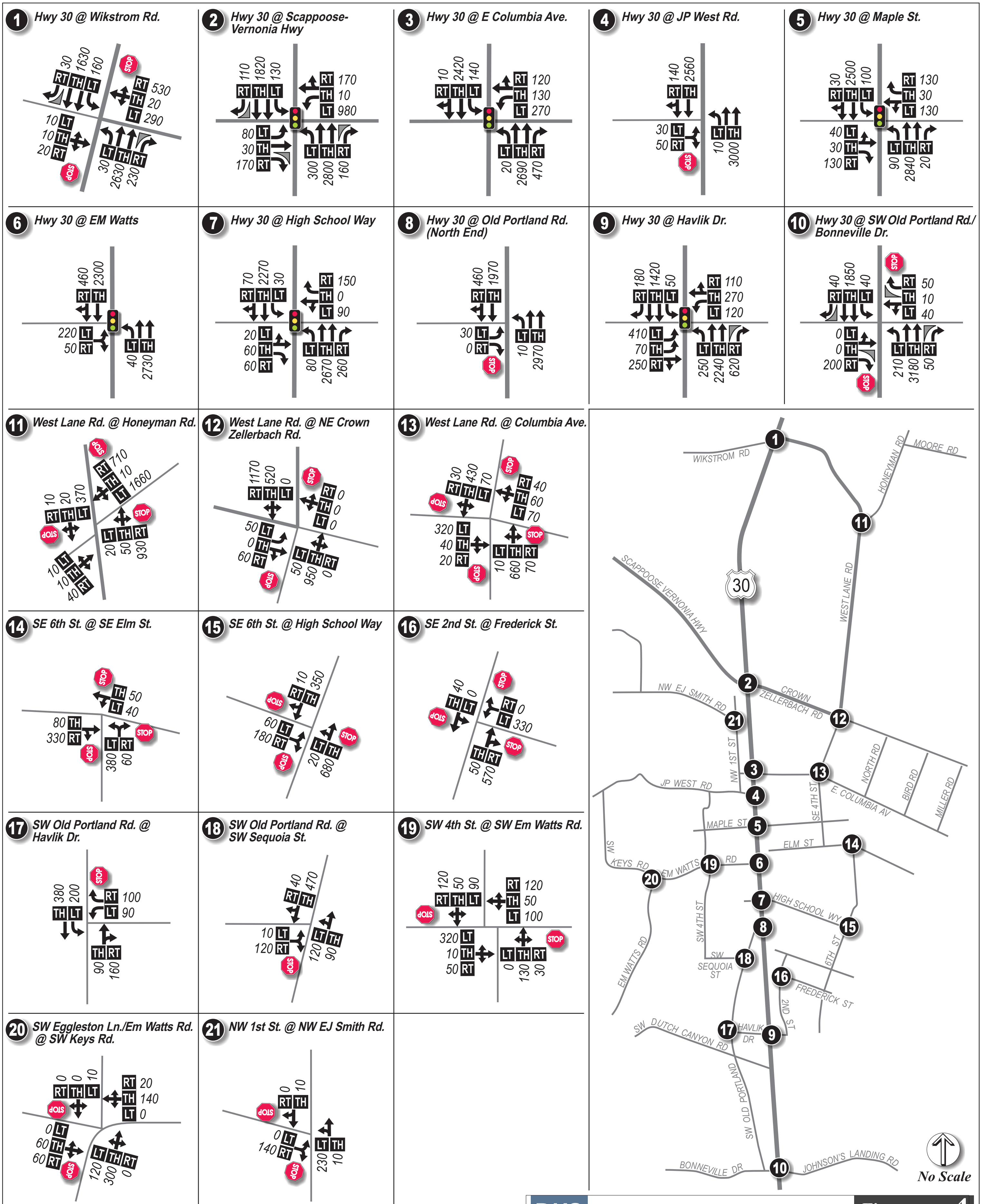


Figure 3: Scappoose Trip Growth by TAZ



LEGEND

- 0 - Study Intersection
- Traffic Signal - Traffic Signal
- STOP - Stop Sign
- ← - Lane Configuration
- 000 - PM Peak Hour Traffic Volumes
- LT TH RT (Left•Thru•Right) - Volume Turn Movement

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Figure 4

2035 FUTURE BASE (30 HV) PM PEAK HOUR TRAFFIC VOLUMES

*Represents the 30th Highest Hour Volume of the Year

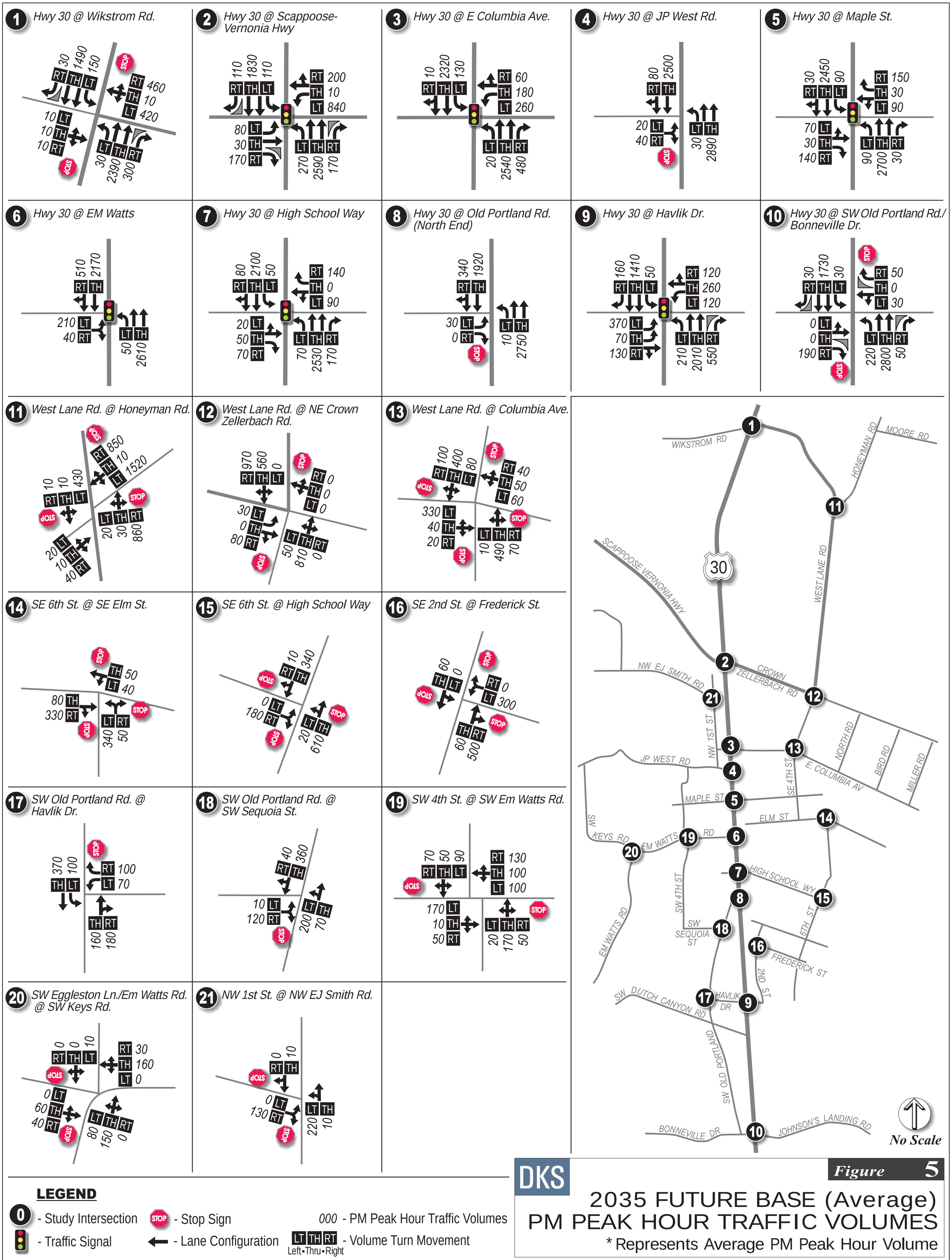

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Figure 5

2035 FUTURE BASE (Average)
PM PEAK HOUR TRAFFIC VOLUMES

* Represents Average PM Peak Hour Volume

More Congestion

An increase in motor vehicle travel during peak hours leads to an increase in congestion. Travel activity, measured by evening peak hour motor vehicle trips beginning or ending in Scappoose, is expected to increase by about 224 percent through 2035. Through travel, or trips that do not begin or end in Scappoose, is also expected to increase by about 33 percent through 2035 and is generally representative of growth in neighboring cities to the north and south of Scappoose. Figure 6 shows that most of the peak period congestion is expected to occur along US 30 northbound and in the northeastern part of Scappoose.

2035 Baseline Peak Season intersection operations can be seen in Table 2 and summarized in Figure 6. All of the state highway intersections and about half of the non-state intersections are expected to be substandard by 2035 during the evening peak period. Both signalized and unsignalized intersections experience congested conditions. The side street approaches to the unsignalized intersections along US 30 generally experience high delay due to steady volumes on the uncontrolled roadway. These approaches typically require more time for an acceptable gap in traffic to make a left turn onto the mainline, therefore, the delay of the side street is high and the intersection becomes substandard. This will likely cause high delays for the side streets, potentially encouraging drivers to be more aggressive when attempting to turn onto the mainline.

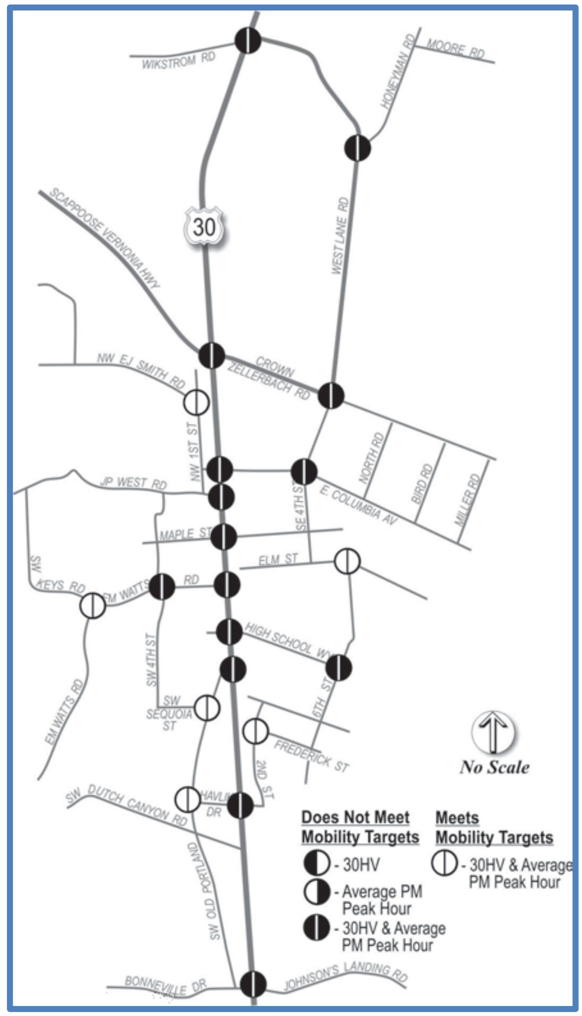


Figure 6: Study Intersections Not Meeting Mobility Targets in 2035

Under congested conditions, such as those expected in the future in Scappoose, the spreading of the peak operating conditions over time typically occurs. This means that some people will choose to travel during "shoulder" hours, the hours before and after the peak hour, to avoid the peak hour and reduce the delay they experience. It is expected that the "shoulder" hours will experience congested conditions, although less than the peak hours.

The City has both level of service (LOS) and volume-to-capacity ratio (v/c) standards, which are included in Table 2 under the heading "Mobility Target" (see Technical Memo # 5 for explanation). The West Lane Road/Honeyman Road, West Lane Road/Crown Zellerbach, SW 4th Street/E.M. Watts Road, E. Columbia Avenue/West Lane Road/SE 4th Street, and SE 6th Street/High School Way intersections all fail to meet both the LOS and v/c ratio standards.

Table 2: Intersection Operations (2035 p.m. peak hour)

Intersection	Mobility Target	Peak Seasonal Volumes		Average Weekday Volumes	
		v/c Ratio	LOS	v/c Ratio	LOS
State Route, Signalized Intersections	**V/C**				
US 30/Scappoose-Vernonia Highway	0.85	**>2.0**	**F**	**1.95**	**F**
US 30/East Columbia Ave	0.85	**1.27**	**F**	**1.20**	**F**
US 30/Maple St	0.85	**1.25**	**F**	**1.18**	**F**
US 30/E.M. Watts Rd	0.85	**1.32**	**F**	**1.28**	**F**
US 30/High School Wy	0.85	**1.12**	**E**	**1.08**	**D**
US 30/Havlik Dr	0.80	**1.61**	**F**	**1.46**	**F**
State Route, Unsignalized Intersections					
US 30/Wikstrom Rd/West Lane Rd	0.90	**>2.0**	**F**	**>2.0**	**F**
US 30/J.P. West Rd	0.95	**1.06**	**F**	**1.03**	**F**
US 30/Old Portland Rd (north end)	0.95	**>2.0**	**F**	**>2.0**	**F**
US 30/Bonneville Dr/Johnsons Landing Rd	0.95	**>2.0**	**F**	**>2.0**	**F**
Non-State Route, Unsignalized Intersections	**V/C LOS**				
West Lane Road/Honeyman	0.90 E	**>2.0**	**F**	**>2.0**	**F**
SW Old Portland Rd/Havlik Dr	0.90 E	0.46	E	0.27	C
SW Old Portland Rd/Sequoia St	0.90 E	0.33	C	0.26	B
SW Eggleston Ln/E.M. Watts/Keys Rd*	0.90 E	0.34	C	0.24	B
NW 1st St/E.J. Smith Rd	0.90 E	0.15	A	0.15	A
West Lane Road/Crown Zellerbach	0.90 E	**>2.0**	**F**	0.87	**F**
SW 4th St/E.M. Watts	0.90 E	**>2.0**	**F**	**>2.0**	**F**
Non-State Route, All-Way Stop Intersections					
E. Columbia Ave/West Lane Rd/SE 4th St	0.90 E	**1.89**	**F**	**1.46**	**F**
SE 6th St/Elm St	0.90 E	0.70	C	0.61	B
SE 6th St/High School Way	0.90 E	**1.15**	**F**	**0.97**	D
SE 2nd St/Frederick St	0.90 E	0.89	D	0.79	C

Notes: Signalized intersections: v/c ratio and LOS reported for the overall intersection
Unsignalized intersections: v/c ratio and LOS reported for the worst minor street approach
All-way stop controlled intersections: v/c ratio reported for worst approach, LOS reported for overall intersection
Bolded Red and Shaded indicates intersection exceeds mobility standard.
*Intersection configuration not allowed in Highway Capacity Manual (HCM) analysis, therefore intersection configuration was modified to allow for capacity analysis.

2035 Baseline Average Weekday intersection operations (shown in Table 2) are generally better than the peak seasonal operations at most intersections reviewed, with one intersection meeting the LOS target and one intersection meeting the v/c target that did not meet it under the peak seasonal condition. The West Lane Road/Crown Zellerbach intersection meets the v/c ratio standard and the SE 6th Street/High School Way intersection meets the City's LOS standard under the average weekday conditions.

Where are Transportation Improvements Needed?

After reviewing the expected growth throughout the City and considering existing gaps and deficiencies of the transportation system, locations needing improvements in 2035 were identified to meet the expected travel demand.

Driving Needs during the Peak Season

Intersection mobility (LOS) or capacity (v/c) deficiencies during the peak season (see Table 2 for more detail) are expected at all signalized and unsignalized intersections on US 30 by 2035:

- US 30/Scappoose-Vernonia Highway/Crown Zellerbach Road
- US 30/East Columbia Avenue
- US 30/Maple Street
- US 30/E.M. Watts Road
- US 30/High School Way
- US 30/Havlik Drive
- US 30/Wikstrom Road/West Lane Road
- US 30/J.P. West Road
- US 30/Old Portland Road (north end)
- US 30/Bonneville Drive/Johnson's Landing Road

In addition, the following non-state intersections are expected to operate below the City's mobility target, due to both LOS and v/c ratio standards:

- West Lane Road/Honeyman Road
- E. Columbia Avenue/West Lane Road/SE 4th Street
- West Lane Road/Crown Zellerbach Road
- SW 4th Street/E.M. Watts Road
- SE 6th Street/High School Way

Driving Needs during an Average Weekday

Intersection capacity deficiencies during an average weekday (see Table 2 for more detail) are expected at the same locations as during the peak season, however the West Lane Road/Crown Zellerbach intersection is expected to meet the v/c ratio standard and the SE 6th Street/High School Way intersection is expected to meet the LOS standard in 2035.

Through the alternatives evaluation process for this plan, the community may desire exploring significant changes to traffic circulation, roadway function, and/or roadway design to address goals such as promoting the downtown business core or improving the pedestrian/bicycle environment. Through that evaluation there may be a need to discuss acceptable levels of congestion and mobility targets and how they balance the other desires of the community.

Alternate Mobility Targets

All study intersections along US 30 are expected to be substandard by 2035 (as detailed in the previous sections). Improvements will be explored for each of these locations (e.g., traffic control, additional turn lanes or local street circulation changes) that could allow mobility targets (level of service and volume-to-capacity ratio standards) to be met, however, it is unlikely that all of the intersections can be mitigated to meet existing performance standards without significant investment.

Mobility targets are typically based on 30^{th} highest hour traffic volumes, in this case represented by the peak seasonal analysis shown in Table 2. ODOT also provides avenues for exploring alternative mobility targets, which are typically less difficult to meet. One approach to alternative targets is to analyze operations under traffic conditions that are less intense than the 30^{th} highest hour, such as the average weekday p.m. peak hour.

While future traffic analysis shows somewhat better operations under average weekday conditions, the difference is not significant enough to allow the intersections along US 30 to meet the mobility targets. Therefore, using average weekday operations to inform potential alternative mobility targets has limited benefit.

Connectivity Needs

The ability to travel between different parts of the city is an important part of system planning as well. The following issues have been identified for Scappoose under future conditions:

- The connection/route from US 30 to the northeast airport area will need to be determined in more detail as part of this TSP. It will be important to provide a relatively direct route that minimizes traffic impacts on residential local streets.
- Currently, the collector system in Scappoose is disjointed, with offset intersections not allowing for continuous through travel north and south parallel to US 30. Collectors should typically be continuous and spaced at approximately one-half mile intervals in both the north/south and east/west directions.

Safety Needs

The crash rates at three intersections (US 30/Havlik Drive, US 30/Old Portland Road (North), West Lane Road/Crown Zellerbach Road) were identified as high collision locations. While no specific locations were identified as a high collision roadway segment (top ten percent of State highways in Oregon), US 30 through Scappoose had a crash rate significantly higher than the statewide average (up to twice as high) for similar facilities in each of the three years of available data.

The following three intersections were identified as high collision locations:

- **US 30/Havlik Drive:** This intersection is signalized, with 22 reported crashes in the three-year period analyzed. There were nine rear-end crashes and eight turning crashes, the majority caused by following too close, driving too fast, and careless driving. At least nine of the crashes occurred prior to the intersection improvements that occurred in 2011. Twenty injuries occurred at this location, of which 16 were minor and four were moderate. This intersection should be monitored over time to determine whether the improvements have a positive impact on crash rates.
- **US 30/Old Portland Road (North):** Of the eight crashes at this intersection, all but one were rear-end crashes, the other a turning crash. Six injuries were reported at this location, of which four were minor, one was moderate and one was severe. The severe injury was due to following too close.
- **West Lane Road/Crown Zellerbach Road:** There were two reported crashes at this site, one caused by a driver driving too fast and the other by a broken tractor-trailer connection. With only two collisions, this intersection is considered a "high collision location" relative to its lower traffic volumes and in comparison to other lower volume intersections. No injuries were reported at this location.

Walking Needs

Sidewalks on arterial and collector streets are generally available near commercial areas and in newer neighborhoods, but generally are not available in older sections of town. There is a sidewalk available on at least one side of US 30 through Scappoose (within city limits) and the City street network is generally laid out in a grid, which facilitates pedestrian access between neighborhoods. However, there are large sections of town that do not have designated pedestrian facilities. Pedestrian improvements should focus on the following:

- **Lack of sidewalks:** Particularly near schools, on higher volume roadways (arterials and collectors), areas providing access to transit, and activity/shopping centers. Construction of standard sidewalks is ideal, however, alternatives can be considered, such as:
  - Add pedestrian-only paths adjacent to streets – ideally separated by two to six feet from the edge of the adjacent roadway, the path can be made of asphalt or pervious materials and should be at least five feet wide
  - Add a curb-tight shared-use path. Shared-use paths are typically wider than an average sidewalk (i.e. 10-14 feet)
- **Connectivity:** Provide pedestrian access in locations where vehicular access may not be available (between street stubs, between neighborhood and activity centers, etc.), including access to any recreational facilities or trails in the area (e.g. Crown Zellerbach Trail).

- **Crosswalks:** Improved crosswalk opportunities should be considered, especially along higher volume roadways and near activity centers such as Columbia Avenue in the downtown area and Old Portland Road near the Fred Meyer commercial area.
- **Highway Crossing:** There are several sections of US 30 with over one-quarter to one-half mile spacing between signalized crossing opportunities. Crossing opportunities should be considered at Bonneville Drive/Johnson's Landing Road, between Havlik Drive and High School Way and between Scappoose-Vernonia Highway/Crown Zellerbach Road and West Lane Road/Wikstrom Road. It should be noted that the railroad adjacent to US 30 precludes development of land use adjacent to the highway (between the highway and the railroad) and creates a barrier to neighborhoods/land uses east of the railroad.

Biking Needs

As both population and employment increase in Scappoose, more Scappoose residents are expected to live closer to work. This may spur an increase in the number of commuters biking and walking to work. This means that Scappoose has the potential to increase the number of people who travel by bike. It also highlights the importance of identifying and improving key bike connections into and out of the city:

- There are continuous bike lanes on US 30 through Scappoose, which are important on this high speed, high traffic volume facility.
- Scappoose's local street system (away from US 30) generally features relatively low volumes of motor vehicle traffic, and is suitable for shared use by cyclists, but is not marked or signed as such. Designated bike routes can provide continuity to other bicycle facilities such as roads with bike lanes and shared use paths. Including wayfinding signs will direct cyclists to key destinations such as shopping, employment centers, and schools. Wayfinding signs can also provide directions and distances to key connections to the bike network such as the Crown Zellerbach Trail.
- Parking is another important aspect of supporting increased biking. If safe and secure bike parking is not available, potential cyclists will be less likely to ride even if the trip is short and roadway facilities are comfortable. Bike parking should be considered at key destinations such as the commercial area on US 30 in downtown Scappoose, and in the northeast area, where employment levels are expected to increase. It is also important for businesses to provide long term bike parking for their employees.

Bicycle LTS (level of traffic stress), as described in technical memorandum #5, reflects comfort of a roadway or intersection for bicyclists. LTS was measured for all roadways and intersections in Scappoose. A majority of roadways are categorized as LTS 2 or better, ODOT's guideline for an effective bikeway system. Routes in Scappoose that are LTS 3 or LTS 4 typically include routes with more than two lanes (both directions) or higher speeds (typically above 35 m.p.h.). Examples include the following:

- US 30 both south and north of town
- West Lane Road
- Dutch Canyon Road

- E.M. Watts Road
- Coal Creek Road
- J.P. West Road
- E.J. Smith Road
- Old Portland Road

Study intersections with crossings which are difficult for bicyclists (LTS 3 or LTS 4) include intersections on higher speed/higher number of travel lane locations where a traffic signal is not provided:

- US 30/Bonneville Road/Johnson's Landing Road
- US 30/Old Portland Road
- US 30/JP West Road
- US 30/West Lane Road
- West Lane Road/Honeyman Road
- West Lane Road/Crown Zellerbach Road

Additional crossings should be considered along US 30 where existing crossings are more than one-half mile apart:

- Between Havlik Drive and High School Way (as mentioned in walking needs above, the railroad adjacent to US 30 creates a barrier and no new railroad crossings are expected).
- Between Scappoose-Vernonia Highway/Crown Zellerbach Road and West Lane Road/Wikstrom Road
- Bonneville Drive/Johnson's Landing Road

Transit Needs

Transit service is offered in Scappoose by the Columbia County Rider (CC Rider), a service of Columbia County Transit Division (CCTD). CC Rider provides fixed-route, flex-route, and dial-a-ride services within Columbia County and to adjacent counties.

The primary transit stop in Scappoose is located on NE Prairie Street between NE 1st Street and NE 2nd Street , near City Hall. All CC Rider buses that stop in Scappoose use this stop. There is also an informal park and ride lot at this location.

The flex route runs on an approximate schedule to allow for minor route deviations to assist elderly or disabled passengers as well as any member of general public who may have difficulty getting to a Flex Route bus stop. The south flex route has several stops in Scappoose. The following are future considerations as Scappoose grows:

- **Bus stop identification and amenities:** Bus stops should be clearly identifiable, with amenities such as shelters and information where appropriate. Given the rainy climate of the Pacific Northwest, sheltered bus stops and route schedules on signs would increase the comfort of existing riders and encourage others to take transit.

- **Primary stop stability:** While the primary bus stop in Scappoose is fairly centrally located near downtown businesses and activity centers, the parking area property is owned by ODOT and its continued use is not guaranteed. Finding a permanent location for this important stop should be a priority.
- **Transit service gaps and frequency:** The residential areas in the northwest and east side of town are outside of comfortable walking distance to transit stops. Also, with bus headways (the time between vehicle arrivals) on some routes of greater than an hour (one route is daily), transit use can be difficult.
- **Transit service in growth areas:** Areas of the City located in a major residential and/or employment growth area should incorporate transit amenities and ensure pedestrian and bicycle connectivity in preparation for transit service.

Underserved transit areas were identified to determine where potential investments in the network would enhance access to bus stops. Figure 7 shows the location of bus stops in Scappoose and includes a quarter mile buffer around each stop to indicate the areas of the City within comfortable walking distance to existing bus stops. As shown, many Scappoose residents live more than a quarter mile walking distance from a bus stop. While biking can increase access to transit for people living in neighborhoods distant from bus stops, gaps in the existing bicycle network and a lack of bicycle parking near stops limits the attractiveness of biking to transit. Currently, major growth areas are not served by transit.

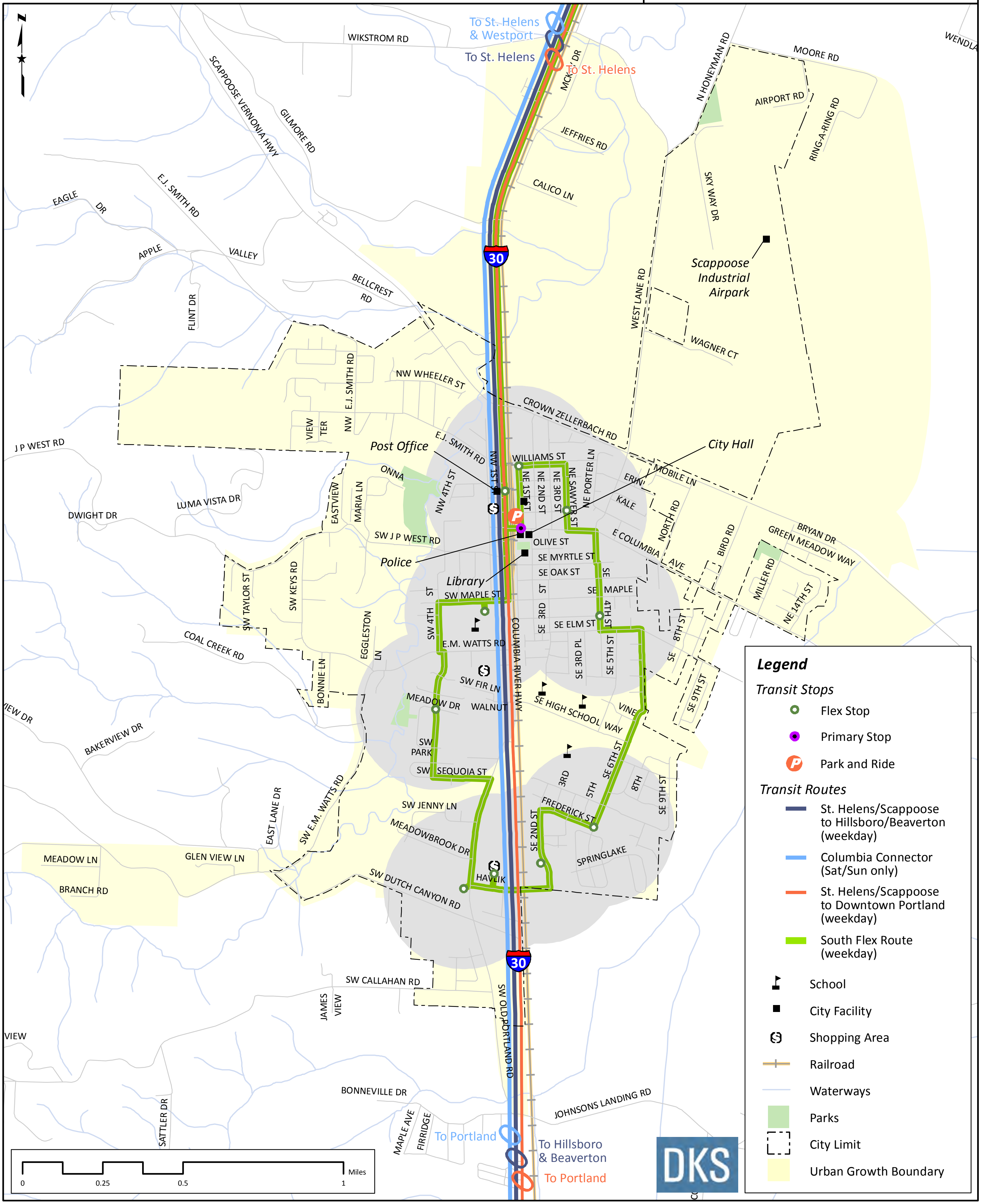
The availability of roadway crossing opportunities is another factor that could limit access to transit. The existing bus stops in Scappoose are not always located near a designated pedestrian crossing. Bus stops throughout the City could benefit from designated, ADA-compliant crossings (e.g. curb ramps, level paved ramp landings, paved access to an accessible route, etc.). These enhancements would also increase the general pedestrian friendliness of the streets.

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 7

1/4-mile Buffer to Transit Stops



Freight Needs

Portions of the US 30 State freight route/Federal truck route are expected to exceed capacity during the evening peak hour by 2035. In addition, improved truck access to the Scappoose Industrial Airpark is needed, including at the US 30/Crown-Zellerbach Road, US 30/Columbia Avenue, and US 30/West Lane Road intersections.

The Scappoose Industrial Airpark area, in northeast Scappoose, is expected to attract commercial and industrial development, so local truck traffic is likely to increase in Scappoose over the planning horizon. Development in the northeast area should be designed to accommodate significant freight traffic. Turning radii and pavement design will be important along any future freight routes.

Transportation System Management and Operations Needs

Performance of the existing transportation infrastructure could be improved through a combination of transportation system management (TSM) and transportation demand management (TDM) strategies and programs.

Transportation System Management (TSM): Scappoose has a significant regional roadway facility that serves the City and neighboring communities (US 30). This roadway could potentially benefit from improved TSM infrastructure. Opportunities include:

- Expanding the communications infrastructure along streets or at intersections concurrent with capacity or other improvements (such as fiber optic cable).
- Updating coordinated time of day traffic signal control plans at intersections along US 30.
- Improving access spacing along major roadways. An access inventory was conducted along US 30 within Scappoose city limits, comparing the number of existing approaches (driveways and public streets) to applicable ODOT standards. Each of the segments along the west side of US 30 has more driveways and public street approaches than allowed to comply with the access spacing standards. The stretch from J.P. West Road to Maple Street is particularly dense with driveways. As properties along US 30 redevelop, opportunities to remove or consolidate accesses should be identified to move toward the standard.

Transportation Demand Management: Opportunities to expand TDM measures in Scappoose include:

- Improved street connectivity
- Investing in pedestrian/bicycle facilities
- Improved amenities and access for transit stops

Air, Rail, Pipeline and Water Needs

The Scappoose Industrial Airpark, owned by the Port of St. Helens, is located in northeast Scappoose, with a paved and lighted runway that is 5,100 feet in length and 100 feet in width. The Port of St. Helens recently completed a Strategic Business Plan[3], in which it identified its Priority #1 project as the Scappoose Industrial Airpark. The Port following capital improvements, totaling $4.14 million, were identified in the Strategic Business Plan:

- Eastside and westside roadway infrastructure
- New hangars
- New tenant buildings (2)
- Obstruction removal

The Port is currently in the process of updating the Airport Master Plan for Scappoose Industrial Airpark.

The Portland & Western Railroad (PNWR) operates a rail line that runs parallel to US 30 through Scappoose. They report an average of three train movements per day during the week (Monday through Friday) and two train movements per day on the weekend (Saturday/Sunday). Trains originate and are destined for the Northwest Portland/Vancouver area and serve Scappoose and points west of Scappoose as far as Wauna. The Federal Railroad Administration designates six classes for rail tracks to set maximum train speeds based on the conditions of the tracks. The tracks within Scappoose are designated as Class 2, which limits train speeds to 25 miles per hour. There are seven public railroad crossings in Scappoose, all are at grade and adjacent to an intersection on US 30, which can create vehicle operation issues due to the short lane lengths and setback stop bars.

PNWR reports that traffic on the line has recently increased and that they are hopeful that will continue. It is likely that an additional two movements each day (per direction) will be added by 2014. There are a few areas west of Scappoose with possible industrial opportunities that PNWR hopes to benefit from. PNWR's long term plans are to continue to increase business on the entire line.[4]

PNWR has upgraded the rail system in Scappoose to allow for train speeds up to 25 miles per hour through town. They are working on upgrading the entire line, from Portland to Port Westward, to 25 miles per hour. At this point, they have no intention of upgrading the track to accommodate higher speeds in Scappoose, however, they do plan to maintain the track at a level that allows for continued 25 mile per hour speeds through town.

There were no system investment needs identified for Scappoose's water or pipeline system through 2035.

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[3] Port of St. Helens Strategic Business Plan, by Columbia Planning Northwest in Association with FCS Group, Lower Columbia Engineering and Acti-Dyne Survey Research, LLC, August 2012.

[4] Per communication with John Cyrus, PNWR, June 5, 2013 and October 3, 2013.

Appendix

Highway Capacity Analysis Results

2035 Seasonal Peak Hour (30 HV)

2035 Average PM Peak Hour

Highway Capacity Analysis Results

2035 Conditions – 30 HV

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	10	20	290	20	530	30	2630	230	160	1630	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	11	21	305	21	558	32	2768	242	168	1716	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	4068	4884	858	4053	4884	1384	1716			2768		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4068	4884	858	4053	4884	1384	1716			2768		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	93	0	0	0	91			0		
cM capacity (veh/h)	0	0	300	0	0	133	365			135		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	42	884	32	1384	1384	242	168	858	858	32
Volume Left	11	305	32	0	0	0	168	0	0	0
Volume Right	21	558	0	0	0	242	0	0	0	32
cSH	0	0	365	1700	1700	1700	135	1700	1700	1700
Volume to Capacity	Err	Err	0.09	0.81	0.81	0.14	1.24	0.50	0.50	0.02
Queue Length 95th (ft)	Err	Err	7	0	0	0	257	0	0	0
Control Delay (s)	Err	Err	15.8	0.0	0.0	0.0	220.2	0.0	0.0	0.0
Lane LOS	F	F	C				F			
Approach Delay (s)	Err	Err	0.2				19.4			
Approach LOS	F	F								

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	159.2%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	30	170	980	10	170	300	2800	160	130	1820	110
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.86		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1525	1750	1468	1661	1444		1646	3260	1295	1599	3228	1456
Flt Permitted	0.56	1.00	1.00	0.74	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	903	1750	1468	1287	1444		1646	3260	1295	1599	3228	1456
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	32	179	1032	11	179	316	2947	168	137	1916	116
RTOR Reduction (vph)	0	0	128	0	120	0	0	0	66	0	0	75
Lane Group Flow (vph)	84	32	51	1032	70	0	316	2947	102	137	1916	41
Confl. Peds. (#/hr)			1	1					2	2		
Confl. Bikes (#/hr)						1						1
Heavy Vehicles (%)	9%	0%	0%	0%	0%	3%	1%	2%	12%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8					6			2
Actuated Green, G (s)	23.0	23.0	23.0	23.0	23.0		15.0	37.0	37.0	6.0	28.0	28.0
Effective Green, g (s)	23.0	23.0	23.0	23.0	23.0		15.0	37.0	37.0	6.0	28.0	28.0
Actuated g/C Ratio	0.29	0.29	0.29	0.29	0.29		0.19	0.46	0.46	0.08	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	2.3	2.3		2.3	4.8	4.8	2.3	4.8	4.8
Lane Grp Cap (vph)	259	503	422	370	415		308	1507	598	119	1129	509
v/s Ratio Prot		0.02			0.05		c0.19	c0.90		0.09	0.59	
v/s Ratio Perm	0.09		0.04	c0.80					0.08			0.03
v/c Ratio	0.32	0.06	0.12	2.79	0.17		1.03	1.96	0.17	1.15	1.70	0.08
Uniform Delay, d1	22.4	20.7	21.0	28.5	21.3		32.5	21.5	12.5	37.0	26.0	17.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.1	0.1	812.6	0.1		58.1	432.4	0.3	128.9	317.5	0.1
Delay (s)	23.1	20.7	21.2	841.1	21.5		90.6	453.9	12.8	165.9	343.5	17.5
Level of Service	C	C	C	F	C		F	F	B	F	F	B
Approach Delay (s)		21.7			713.7			398.9			314.9	
Approach LOS		C			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	411.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	2.18		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	171.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	270	130	120	20	2690	470	140	2420	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes				1.00	0.98		1.00	1.00	0.93	1.00	1.00	
Flpb, ped/bikes				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt				1.00	0.93		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1646	1584		1662	3260	1363	1614	3258	
Flt Permitted				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1646	1584		1662	3260	1363	1614	3258	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	281	135	125	21	2802	490	146	2521	10
RTOR Reduction (vph)	0	0	0	0	28	0	0	0	47	0	0	0
Lane Group Flow (vph)	0	0	0	281	232	0	21	2802	443	146	2531	0
Confl. Peds. (#/hr)	17					17	2		16	16		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	0%	2%	0%	2%	2%	3%	2%	0%
Turn Type				Perm	NA		Prot	NA	Perm	Prot	NA	
Protected Phases					4		1	6		5	2	
Permitted Phases				4					6			
Actuated Green, G (s)				15.0	15.0		3.1	78.2	78.2	14.3	89.4	
Effective Green, g (s)				15.0	15.0		3.1	78.2	78.2	14.3	89.4	
Actuated g/C Ratio				0.12	0.12		0.03	0.65	0.65	0.12	0.75	
Clearance Time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)				3.0	3.0		2.3	4.1	4.1	2.3	4.1	
Lane Grp Cap (vph)				205	198		42	2124	888	192	2427	
v/s Ratio Prot					0.15		0.01	c0.86		c0.09	c0.78	
v/s Ratio Perm				c0.17					0.33			
v/c Ratio				1.37	1.17		0.50	1.32	0.50	0.76	1.04	
Uniform Delay, d1				52.5	52.5		57.7	20.9	10.8	51.2	15.3	
Progression Factor				1.00	1.00		1.26	1.14	0.85	1.00	1.00	
Incremental Delay, d2				194.7	117.9		0.5	144.0	0.2	15.2	30.6	
Delay (s)				247.2	170.4		73.0	167.7	9.3	66.4	45.9	
Level of Service				F	F		E	F	A	E	D	
Approach Delay (s)		0.0			210.3			143.7			47.0	
Approach LOS		A			F			F			D	

Intersection Summary			
HCM 2000 Control Delay	109.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	119.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	50	10	3000	2560	140
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	32	53	11	3158	2695	147
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				474	300	
pX, platoon unblocked	0.59	0.27	0.27			
vC, conflicting volume	4368	1421	2842			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	335	0	2406			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	89	82	80			
cM capacity (veh/h)	300	288	52			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	84	11	1579	1579	1796	1046
Volume Left	32	11	0	0	0	0
Volume Right	53	0	0	0	0	147
cSH	293	52	1700	1700	1700	1700
Volume to Capacity	0.29	0.20	0.93	0.93	1.06	0.62
Queue Length 95th (ft)	29	17	0	0	0	0
Control Delay (s)	22.2	91.1	0.0	0.0	0.0	0.0
Lane LOS	C	F				
Approach Delay (s)	22.2	0.3			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	30	130	130	30	130	90	2840	20	100	2500	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.97		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1592	1450		1665	1463	1583	3260	1420	1662	3252	
Flt Permitted		0.48	1.00		0.69	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		778	1450		1200	1463	1583	3260	1420	1662	3252	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	32	137	137	32	137	95	2989	21	105	2632	32
RTOR Reduction (vph)	0	0	120	0	0	97	0	0	7	0	1	0
Lane Group Flow (vph)	0	74	17	0	169	40	95	2989	14	105	2663	0
Confl. Peds. (#/hr)	4		12	12		4	1		2	2		1
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	8%	5%	0%	0%	0%	0%	5%	2%	2%	0%	2%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		15.0	15.0		15.0	15.0	11.6	80.3	80.3	12.2	80.9	
Effective Green, g (s)		15.0	15.0		15.0	15.0	11.6	80.3	80.3	12.2	80.9	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.10	0.67	0.67	0.10	0.67	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		3.0	3.0	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		97	181		150	182	153	2181	950	168	2192	
v/s Ratio Prot							0.06	c0.92		c0.06	0.82	
v/s Ratio Perm		0.10	0.01		c0.14	0.03			0.01			
v/c Ratio		0.76	0.09		1.13	0.22	0.62	1.37	0.01	0.62	1.22	
Uniform Delay, d1		50.8	46.5		52.5	47.2	52.1	19.9	6.6	51.7	19.5	
Progression Factor		1.00	1.00		1.00	1.00	1.15	0.65	1.00	0.89	1.05	
Incremental Delay, d2		28.2	0.2		111.5	0.6	0.6	167.0	0.0	0.5	97.2	
Delay (s)		78.9	46.7		164.0	47.8	60.5	179.9	6.6	46.8	117.7	
Level of Service		E	D		F	D	E	F	A	D	F	
Approach Delay (s)		58.0			112.0			175.0			115.0	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	142.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	118.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	220	50	40	2730	2300	460
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		5.0	4.5	4.5	
Lane Util. Factor	1.00		1.00	0.95	0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.97		1.00	1.00	0.98	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	1629		1614	3260	3166	
Flt Permitted	0.96		0.95	1.00	1.00	
Satd. Flow (perm)	1629		1614	3260	3166	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	232	53	42	2874	2421	484
RTOR Reduction (vph)	7	0	0	0	10	0
Lane Group Flow (vph)	278	0	42	2874	2895	0
Confl. Peds. (#/hr)		2	4			4
Confl. Bikes (#/hr)						1
Heavy Vehicles (%)	0%	2%	3%	2%	2%	1%
Turn Type	NA		Prot	NA	NA	
Protected Phases	8		1	6	2	
Permitted Phases						
Actuated Green, G (s)	17.0		6.9	94.5	82.6	
Effective Green, g (s)	17.0		6.9	94.5	82.6	
Actuated g/C Ratio	0.14		0.06	0.79	0.69	
Clearance Time (s)	4.0		5.0	4.5	4.5	
Vehicle Extension (s)	2.3		2.3	4.2	4.2	
Lane Grp Cap (vph)	230		92	2567	2179	
v/s Ratio Prot	c0.17		0.03	c0.88	c0.91	
v/s Ratio Perm						
v/c Ratio	1.21		0.46	1.12	1.33	
Uniform Delay, d1	51.5		54.7	12.8	18.7	
Progression Factor	1.00		1.25	0.72	0.49	
Incremental Delay, d2	127.6		0.2	54.4	148.2	
Delay (s)	179.1		68.6	63.6	157.4	
Level of Service	F		E	E	F	
Approach Delay (s)	179.1			63.6	157.4	
Approach LOS	F			E	F	

Intersection Summary			
HCM 2000 Control Delay	113.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	109.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	60	60	90	0	150	80	2670	260	30	2270	70
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1727	1458		1651	1422	1662	3292	1421	1630	3245	
Flt Permitted		0.91	1.00		0.65	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1590	1458		1125	1422	1662	3292	1421	1630	3245	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	62	62	93	0	155	82	2753	268	31	2340	72
RTOR Reduction (vph)	0	0	55	0	0	135	0	0	33	0	1	0
Lane Group Flow (vph)	0	83	7	0	93	20	82	2753	235	31	2411	0
Confl. Peds. (#/hr)	3		7	7		3			2	2		
Confl. Bikes (#/hr)									2			1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	1%	2%	2%	2%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		14.1	14.1		14.1	14.1	9.4	86.2	86.2	7.2	84.0	
Effective Green, g (s)		14.1	14.1		14.1	14.1	9.4	86.2	86.2	7.2	84.0	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.08	0.72	0.72	0.06	0.70	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		2.5	2.5	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		186	171		132	167	130	2364	1020	97	2271	
v/s Ratio Prot							0.05	c0.84		0.02	c0.74	
v/s Ratio Perm		0.05	0.00		c0.08	0.01			0.17			
v/c Ratio		0.45	0.04		0.70	0.12	0.63	1.16	0.23	0.32	1.06	
Uniform Delay, d1		49.3	47.0		50.9	47.4	53.6	16.9	5.7	54.1	18.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.74	0.33	
Incremental Delay, d2		1.2	0.1		14.6	0.2	7.9	79.1	0.5	0.1	28.9	
Delay (s)		50.6	47.0		65.6	47.6	61.5	96.0	6.2	40.0	34.8	
Level of Service		D	D		E	D	E	F	A	D	C	
Approach Delay (s)		49.1			54.4			87.3			34.9	
Approach LOS		D			D			F			C	

Intersection Summary			
HCM 2000 Control Delay	63.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	111.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	0	10	2970	1970	460
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	31	0	10	3031	2010	469
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					426	
pX, platoon unblocked	0.31	0.31	0.31			
vC, conflicting volume	3781	1240	2480			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5481	0	1346			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	100	94			
cM capacity (veh/h)	0	341	160			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	31	10	1515	1515	1340	1139
Volume Left	31	10	0	0	0	0
Volume Right	0	0	0	0	0	469
cSH	0	160	1700	1700	1700	1700
Volume to Capacity	636.54	0.06	0.89	0.89	0.79	0.67
Queue Length 95th (ft)	Err	5	0	0	0	0
Control Delay (s)	Err	29.1	0.0	0.0	0.0	0.0
Lane LOS	F	D				
Approach Delay (s)	Err	0.1			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	55.2		
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	410	70	250	120	270	110	250	2240	620	50	1420	180
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0			5.0	5.0
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	0.95			0.95	1.00
Frt	1.00	0.88		1.00	0.96		1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	3193	1509		1662	1674		1662	3167			3226	1488
Flt Permitted	0.95	1.00		0.24	1.00		0.95	1.00			0.57	1.00
Satd. Flow (perm)	3193	1509		412	1674		1662	3167			1857	1488
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	418	71	255	122	276	112	255	2286	633	51	1449	184
RTOR Reduction (vph)	0	152	0	0	10	0	0	30	0	0	0	64
Lane Group Flow (vph)	418	174	0	122	378	0	255	2889	0	0	1500	120
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	0%	2%	0%	0%	3%	0%
Turn Type	Prot	NA		Perm	NA		Prot	NA		Perm	NA	Perm
Protected Phases	8!	4			8!		1	6			2	
Permitted Phases				8						2		2
Actuated Green, G (s)	17.0	17.0		17.0	17.0		15.3	59.0			39.7	39.7
Effective Green, g (s)	17.0	17.0		17.0	17.0		15.3	59.0			39.7	39.7
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.18	0.69			0.47	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0			5.0	5.0
Vehicle Extension (s)	2.2	2.2		2.2	2.2		2.5	5.0			5.0	5.0
Lane Grp Cap (vph)	638	301		82	334		299	2198			867	694
v/s Ratio Prot	0.13	0.12			0.23		0.15	c0.91				
v/s Ratio Perm				c0.30							c0.81	0.08
v/c Ratio	0.66	0.58		1.49	1.13		0.85	1.31			1.73	0.17
Uniform Delay, d1	31.3	30.8		34.0	34.0		33.8	13.0			22.6	13.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	2.0	1.9		273.3	90.3		20.1	144.9			333.4	0.5
Delay (s)	33.3	32.6		307.3	124.3		53.8	157.9			356.0	13.7
Level of Service	C	C		F	F		D	F			F	B
Approach Delay (s)		33.0			168.0			149.5			318.6	
Approach LOS		C			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	183.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.61		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	183.3%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	200	40	10	50	210	3180	50	40	1850	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	211	42	11	53	221	3347	53	42	1947	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1			1						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	4153	5821	974	4847	5821	1674	1947			3347		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	4153	5821	974	4847	5821	1674	1947			3347		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	16	0	0	38	25			48		
cM capacity (veh/h)	0	0	251	0	0	84	297			82		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	211	105	221	1674	1674	53	42	974	974	42
Volume Left	0	42	221	0	0	0	42	0	0	0
Volume Right	211	53	0	0	0	53	0	0	0	42
cSH	189	0	297	1700	1700	1700	82	1700	1700	1700
Volume to Capacity	1.12	5962.85	0.75	0.98	0.98	0.03	0.52	0.57	0.57	0.02
Queue Length 95th (ft)	259	Err	138	0	0	0	55	0	0	0
Control Delay (s)	151.6	Err	45.5	0.0	0.0	0.0	88.8	0.0	0.0	0.0
Lane LOS	F	F	E				F			
Approach Delay (s)	151.6	Err	2.8				1.8			
Approach LOS	F	F								

Intersection Summary			
Average Delay	184.0		
Intersection Capacity Utilization	112.1%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	10	10	40	1660	10	710	20	50	930	370	20	10
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	11	42	1747	11	747	21	53	979	389	21	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	63	2505	1053	421
Volume Left (vph)	11	1747	21	389
Volume Right (vph)	42	747	979	11
Hadj (s)	-0.33	-0.02	-0.49	0.17
Departure Headway (s)	8.9	7.2	6.7	7.6
Degree Utilization, x	0.16	5.01	1.97	0.88
Capacity (veh/h)	385	506	543	463
Control Delay (s)	13.6	1825.5	458.8	45.2
Approach Delay (s)	13.6	1825.5	458.8	45.2
Approach LOS	B	F	F	E

Intersection Summary			
Delay	1255.9		
Level of Service	F		
Intersection Capacity Utilization	254.7%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	0	60	0	0	0	50	950	0	0	520	1170
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	53	0	63	0	0	0	53	1000	0	0	547	1232
Pedestrians		1			4			4			5	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2274	2273	1168	2340	2889	1009	1780			1004		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2274	2273	1168	2340	2889	1009	1780			1004		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	73	100	100	100	85			100		
cM capacity (veh/h)	25	34	237	17	14	292	346			695		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	116	0	1053	1779
Volume Left	53	0	53	0
Volume Right	63	0	0	1232
cSH	49	1700	346	695
Volume to Capacity	2.35	0.00	0.15	0.00
Queue Length 95th (ft)	299	0	13	0
Control Delay (s)	795.5	0.0	6.9	0.0
Lane LOS	F	A	A	
Approach Delay (s)	795.5	0.0	6.9	0.0
Approach LOS	F	A		

Intersection Summary			
Average Delay	33.7		
Intersection Capacity Utilization	123.8%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	320	40	20	70	60	40	10	660	70	70	430	30
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	356	44	22	78	67	44	11	733	78	78	478	33

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	422	189	822	589
Volume Left (vph)	356	78	11	78
Volume Right (vph)	22	44	78	33
Hadj (s)	0.14	-0.05	0.04	0.08
Departure Headway (s)	8.4	9.5	8.3	8.3
Degree Utilization, x	0.99	0.50	1.89	1.36
Capacity (veh/h)	422	367	440	442
Control Delay (s)	69.4	21.5	430.9	201.9
Approach Delay (s)	69.4	21.5	430.9	201.9
Approach LOS	F	C	F	F

Intersection Summary			
Delay	250.5		
Level of Service	F		
Intersection Capacity Utilization	110.5%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	80	330	40	50	380	60
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	84	347	42	53	400	63

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	432	95	463
Volume Left (vph)	0	42	400
Volume Right (vph)	347	0	63
Hadj (s)	-0.45	0.12	0.12
Departure Headway (s)	5.0	6.1	5.4
Degree Utilization, x	0.60	0.16	0.70
Capacity (veh/h)	689	536	641
Control Delay (s)	15.1	10.2	19.8
Approach Delay (s)	15.1	10.2	19.8
Approach LOS	C	B	C

Intersection Summary			
Delay	16.8		
Level of Service	C		
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	60	180	20	680	350	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	196	22	739	380	11

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	261	761	391
Volume Left (vph)	65	22	0
Volume Right (vph)	196	0	11
Hadj (s)	-0.37	0.04	0.02
Departure Headway (s)	6.2	5.5	5.7
Degree Utilization, x	0.45	1.15	0.62
Capacity (veh/h)	564	665	606
Control Delay (s)	14.1	106.4	17.8
Approach Delay (s)	14.1	106.4	17.8
Approach LOS	B	F	C

Intersection Summary			
Delay	64.8		
Level of Service	F		
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	330	0	50	570	0	40
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	367	0	56	633	0	44

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	367	689	44
Volume Left (vph)	367	0	0
Volume Right (vph)	0	633	0
Hadj (s)	0.23	-0.52	0.03
Departure Headway (s)	5.9	4.6	6.1
Degree Utilization, x	0.60	0.89	0.08
Capacity (veh/h)	583	766	555
Control Delay (s)	17.5	32.2	9.6
Approach Delay (s)	17.5	32.2	9.6
Approach LOS	C	D	A

Intersection Summary			
Delay	26.4		
Level of Service	D		
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	90	100	90	160	200	380
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	109	98	174	217	413
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1033	185			272	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1033	185			272	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	54	87			83	
cM capacity (veh/h)	214	857			1292	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	98	109	272	217	413
Volume Left	98	0	0	217	0
Volume Right	0	109	174	0	0
cSH	214	857	1700	1292	1700
Volume to Capacity	0.46	0.13	0.16	0.17	0.24
Queue Length 95th (ft)	55	11	0	15	0
Control Delay (s)	35.2	9.8	0.0	8.4	0.0
Lane LOS	E	A		A	
Approach Delay (s)	21.8		0.0	2.9	
Approach LOS	C				

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	120	120	90	470	40
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	11	133	133	100	522	44
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	911	544	567			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	911	544	567			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	75	87			
cM capacity (veh/h)	264	539	1005			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	144	233	567
Volume Left	11	133	0
Volume Right	133	0	44
cSH	499	1005	1700
Volume to Capacity	0.29	0.13	0.33
Queue Length 95th (ft)	30	11	0
Control Delay (s)	15.1	5.8	0.0
Lane LOS	C	A	
Approach Delay (s)	15.1	5.8	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	320	10	50	100	50	120	0	130	30	90	50	120
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	376	12	59	118	59	141	0	153	35	106	59	141
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					725							
pX, platoon unblocked												
vC, conflicting volume	200			71			1329	1229	41	1271	1188	129
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	200			71			1329	1229	41	1271	1188	129
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	73			92			100	0	97	0	53	85
cM capacity (veh/h)	1372			1530			54	119	1030	0	126	920

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	447	318	188	306
Volume Left	376	118	0	106
Volume Right	59	141	35	141
cSH	1372	1530	143	0
Volume to Capacity	0.27	0.08	1.32	Err
Queue Length 95th (ft)	28	6	293	Err
Control Delay (s)	7.6	3.2	243.9	Err
Lane LOS	A	A	F	F
Approach Delay (s)	7.6	3.2	243.9	Err
Approach LOS			F	F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	120	300	140	20	70	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	141	353	165	24	82	71
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	188				812	176
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	188				812	176
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				74	92
cM capacity (veh/h)	1386				313	867

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	494	188	153
Volume Left	141	0	82
Volume Right	0	24	71
cSH	1386	1700	444
Volume to Capacity	0.10	0.11	0.34
Queue Length 95th (ft)	8	0	38
Control Delay (s)	3.0	0.0	17.3
Lane LOS	A		C
Approach Delay (s)	3.0	0.0	17.3
Approach LOS			C

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (veh/h)	230	10	10	0	0	140
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	245	11	11	0	0	149
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	11				511	11
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	11				511	11
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	85				100	86
cM capacity (veh/h)	1609				443	1070

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	255	11	149
Volume Left	245	0	0
Volume Right	0	0	149
cSH	1609	1700	1070
Volume to Capacity	0.15	0.01	0.14
Queue Length 95th (ft)	13	0	12
Control Delay (s)	7.4	0.0	8.9
Lane LOS	A		A
Approach Delay (s)	7.4	0.0	8.9
Approach LOS			A

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

Highway Capacity Analysis Results

2035 Conditions – Average PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	10	10	420	10	460	30	2390	300	150	1490	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	11	11	442	11	484	32	2516	316	158	1568	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3695	4463	784	3695	4463	1258	1568			2516		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3695	4463	784	3695	4463	1258	1568			2516		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	97	0	0	0	92			8		
cM capacity (veh/h)	0	0	336	0	0	162	417			171		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	32	937	32	1258	1258	316	158	784	784	32
Volume Left	11	442	32	0	0	0	158	0	0	0
Volume Right	11	484	0	0	0	316	0	0	0	32
cSH	0	0	417	1700	1700	1700	171	1700	1700	1700
Volume to Capacity	Err	Err	0.08	0.74	0.74	0.19	0.92	0.46	0.46	0.02
Queue Length 95th (ft)	Err	Err	6	0	0	0	172	0	0	0
Control Delay (s)	Err	Err	14.3	0.0	0.0	0.0	103.3	0.0	0.0	0.0
Lane LOS	F	F	B				F			
Approach Delay (s)	Err	Err	0.2				9.3			
Approach LOS	F	F								

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	153.9%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	30	170	840	10	200	270	2590	170	110	1830	110
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99		1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.86		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1525	1750	1468	1661	1441		1646	3260	1295	1599	3228	1456
Flt Permitted	0.51	1.00	1.00	0.74	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	821	1750	1468	1287	1441		1646	3260	1295	1599	3228	1456
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	84	32	179	884	11	211	284	2726	179	116	1926	116
RTOR Reduction (vph)	0	0	128	0	120	0	0	0	76	0	0	75
Lane Group Flow (vph)	84	32	51	884	102	0	284	2726	103	116	1926	41
Confl. Peds. (#/hr)			1	1					2	2		
Confl. Bikes (#/hr)						1						1
Heavy Vehicles (%)	9%	0%	0%	0%	0%	3%	1%	2%	12%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8					6			2
Actuated Green, G (s)	23.0	23.0	23.0	23.0	23.0		14.9	37.0	37.0	6.0	28.1	28.1
Effective Green, g (s)	23.0	23.0	23.0	23.0	23.0		14.9	37.0	37.0	6.0	28.1	28.1
Actuated g/C Ratio	0.29	0.29	0.29	0.29	0.29		0.19	0.46	0.46	0.08	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	2.3	2.3		2.3	4.8	4.8	2.3	4.8	4.8
Lane Grp Cap (vph)	236	503	422	370	414		306	1507	598	119	1133	511
v/s Ratio Prot		0.02			0.07		c0.17	c0.84		0.07	0.60	
v/s Ratio Perm	0.10		0.04	c0.69					0.08			0.03
v/c Ratio	0.36	0.06	0.12	2.39	0.25		0.93	1.81	0.17	0.97	1.70	0.08
Uniform Delay, d1	22.6	20.7	21.0	28.5	21.9		32.0	21.5	12.6	36.9	25.9	17.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.1	0.1	633.4	0.2		32.7	366.7	0.3	73.9	318.8	0.1
Delay (s)	23.5	20.7	21.2	661.9	22.0		64.7	388.2	12.8	110.8	344.7	17.5
Level of Service	C	C	C	F	C		E	F	B	F	F	B
Approach Delay (s)		21.8			533.5			338.3			314.6	
Approach LOS		C			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	348.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.95		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	155.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	260	180	60	20	2540	480	130	2320	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor				1.00	1.00		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes				1.00	0.99		1.00	1.00	0.93	1.00	1.00	
Flpb, ped/bikes				1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt				1.00	0.96		1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1646	1663		1662	3260	1363	1614	3258	
Flt Permitted				0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)				1646	1663		1662	3260	1363	1614	3258	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	271	188	62	21	2646	500	135	2417	10
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	50	0	0	0
Lane Group Flow (vph)	0	0	0	271	240	0	21	2646	450	135	2427	0
Confl. Peds. (#/hr)	17					17	2		16	16		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	0%	2%	0%	2%	2%	3%	2%	0%
Turn Type				Perm	NA		Prot	NA	Perm	Prot	NA	
Protected Phases					4		1	6		5	2	
Permitted Phases				4					6			
Actuated Green, G (s)				15.0	15.0		3.1	78.6	78.6	13.9	89.4	
Effective Green, g (s)				15.0	15.0		3.1	78.6	78.6	13.9	89.4	
Actuated g/C Ratio				0.12	0.12		0.03	0.65	0.65	0.12	0.75	
Clearance Time (s)				4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)				3.0	3.0		2.3	4.1	4.1	2.3	4.1	
Lane Grp Cap (vph)				205	207		42	2135	892	186	2427	
v/s Ratio Prot					0.14		0.01	c0.81		c0.08	c0.74	
v/s Ratio Perm				c0.16					0.33			
v/c Ratio				1.32	1.16		0.50	1.24	0.50	0.73	1.00	
Uniform Delay, d1				52.5	52.5		57.7	20.7	10.7	51.2	15.3	
Progression Factor				1.00	1.00		1.23	1.13	0.87	1.00	1.00	
Incremental Delay, d2				174.8	112.8		0.5	108.1	0.2	11.9	18.2	
Delay (s)				227.3	165.3		71.5	131.6	9.4	63.2	33.5	
Level of Service				F	F		E	F	A	E	C	
Approach Delay (s)		0.0			197.5			111.9			35.1	
Approach LOS		A			F			F			D	

Intersection Summary			
HCM 2000 Control Delay	87.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	113.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	40	30	2890	2500	80
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	21	42	32	3042	2632	84
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				474	300	
pX, platoon unblocked	0.60	0.27	0.27			
vC, conflicting volume	4258	1358	2716			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	120	0	1931			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	85	61			
cM capacity (veh/h)	312	288	80			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	63	32	1521	1521	1754	961
Volume Left	21	32	0	0	0	0
Volume Right	42	0	0	0	0	84
cSH	296	80	1700	1700	1700	1700
Volume to Capacity	0.21	0.39	0.89	0.89	1.03	0.57
Queue Length 95th (ft)	20	39	0	0	0	0
Control Delay (s)	20.4	76.6	0.0	0.0	0.0	0.0
Lane LOS	C	F				
Approach Delay (s)	20.4	0.8			0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	30	140	90	30	150	90	2700	30	90	2450	30
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.97		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1575	1450		1673	1463	1583	3260	1420	1662	3251	
Flt Permitted		0.52	1.00		0.59	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		856	1450		1025	1463	1583	3260	1420	1662	3251	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	32	147	95	32	158	95	2842	32	95	2579	32
RTOR Reduction (vph)	0	0	129	0	0	138	0	0	10	0	1	0
Lane Group Flow (vph)	0	106	18	0	127	20	95	2842	22	95	2610	0
Confl. Peds. (#/hr)	4		12	12		4	1		2	2		1
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	8%	5%	0%	0%	0%	0%	5%	2%	2%	0%	2%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		15.0	15.0		15.0	15.0	11.6	81.0	81.0	11.5	80.9	
Effective Green, g (s)		15.0	15.0		15.0	15.0	11.6	81.0	81.0	11.5	80.9	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.10	0.68	0.68	0.10	0.67	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		3.0	3.0	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		107	181		128	182	153	2200	958	159	2191	
v/s Ratio Prot							c0.06	c0.87		0.06	0.80	
v/s Ratio Perm		0.12	0.01		c0.12	0.01			0.02			
v/c Ratio		0.99	0.10		0.99	0.11	0.62	1.29	0.02	0.60	1.19	
Uniform Delay, d1		52.4	46.5		52.4	46.6	52.1	19.5	6.4	52.0	19.5	
Progression Factor		1.00	1.00		1.00	1.00	1.15	0.66	1.00	0.90	1.02	
Incremental Delay, d2		83.8	0.2		76.9	0.3	0.6	131.6	0.0	1.3	87.5	
Delay (s)		136.3	46.7		129.3	46.8	60.6	144.5	6.4	48.1	107.4	
Level of Service		F	D		F	D	E	F	A	D	F	
Approach Delay (s)		84.2			83.6			140.3			105.4	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	120.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	116.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	210	40	50	2610	2170	510
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0		5.0	4.5	4.5	
Lane Util. Factor	1.00		1.00	0.95	0.95	
Frpb, ped/bikes	1.00		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.98		1.00	1.00	0.97	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	1634		1614	3260	3153	
Flt Permitted	0.96		0.95	1.00	1.00	
Satd. Flow (perm)	1634		1614	3260	3153	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	221	42	53	2747	2284	537
RTOR Reduction (vph)	6	0	0	0	13	0
Lane Group Flow (vph)	257	0	53	2747	2808	0
Confl. Peds. (#/hr)		2	4			4
Confl. Bikes (#/hr)						1
Heavy Vehicles (%)	0%	2%	3%	2%	2%	1%
Turn Type	NA		Prot	NA	NA	
Protected Phases	8		1	6	2	
Permitted Phases						
Actuated Green, G (s)	17.0		7.7	94.5	81.8	
Effective Green, g (s)	17.0		7.7	94.5	81.8	
Actuated g/C Ratio	0.14		0.06	0.79	0.68	
Clearance Time (s)	4.0		5.0	4.5	4.5	
Vehicle Extension (s)	2.3		2.3	4.2	4.2	
Lane Grp Cap (vph)	231		103	2567	2149	
v/s Ratio Prot	c0.16		0.03	c0.84	c0.89	
v/s Ratio Perm						
v/c Ratio	1.11		0.51	1.07	1.31	
Uniform Delay, d1	51.5		54.3	12.8	19.1	
Progression Factor	1.00		1.28	0.73	0.48	
Incremental Delay, d2	92.7		0.2	32.5	138.4	
Delay (s)	144.2		70.0	41.7	147.5	
Level of Service	F		E	D	F	
Approach Delay (s)	144.2			42.3	147.5	
Approach LOS	F			D	F	

Intersection Summary			
HCM 2000 Control Delay	97.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	105.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	50	70	90	0	140	70	2530	170	50	2100	80
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.98		1.00	0.98	1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		0.99	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.99	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1724	1458		1651	1422	1662	3292	1421	1630	3242	
Flt Permitted		0.90	1.00		0.68	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1570	1458		1190	1422	1662	3292	1421	1630	3242	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	52	72	93	0	144	72	2608	175	52	2165	82
RTOR Reduction (vph)	0	0	64	0	0	127	0	0	24	0	1	0
Lane Group Flow (vph)	0	73	8	0	93	17	72	2608	151	52	2246	0
Confl. Peds. (#/hr)	3		7	7		3			2	2		
Confl. Bikes (#/hr)									2			1
Heavy Vehicles (%)	0%	0%	0%	0%	0%	3%	0%	1%	2%	2%	2%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		13.9	13.9		13.9	13.9	8.8	84.0	84.0	9.6	84.8	
Effective Green, g (s)		13.9	13.9		13.9	13.9	8.8	84.0	84.0	9.6	84.8	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.07	0.70	0.70	0.08	0.71	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)		2.5	2.5		2.5	2.5	2.3	4.2	4.2	2.3	4.2	
Lane Grp Cap (vph)		181	168		137	164	121	2304	994	130	2291	
v/s Ratio Prot							0.04	c0.79		0.03	c0.69	
v/s Ratio Perm		0.05	0.01		c0.08	0.01			0.11			
v/c Ratio		0.40	0.05		0.68	0.10	0.60	1.13	0.15	0.40	0.98	
Uniform Delay, d1		49.2	47.2		50.9	47.5	53.9	18.0	6.0	52.5	16.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.73	0.32	
Incremental Delay, d2		1.1	0.1		11.5	0.2	5.9	65.5	0.3	0.1	2.6	
Delay (s)		50.3	47.3		62.4	47.7	59.8	83.5	6.4	38.2	8.0	
Level of Service		D	D		E	D	E	F	A	D	A	
Approach Delay (s)		48.8			53.4			78.1			8.7	
Approach LOS		D			D			E			A	

Intersection Summary			
HCM 2000 Control Delay	47.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	107.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	0	10	2750	1920	340
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	31	0	10	2806	1959	347
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					426	
pX, platoon unblocked	0.32	0.32	0.32			
vC, conflicting volume	3556	1153	2306			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4736	0	834			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	100	96			
cM capacity (veh/h)	0	347	255			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	31	10	1403	1403	1306	1000
Volume Left	31	10	0	0	0	0
Volume Right	0	0	0	0	0	347
cSH	0	255	1700	1700	1700	1700
Volume to Capacity	170.42	0.04	0.83	0.83	0.77	0.59
Queue Length 95th (ft)	Err	3	0	0	0	0
Control Delay (s)	Err	19.7	0.0	0.0	0.0	0.0
Lane LOS	F	C				
Approach Delay (s)	Err	0.1			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	59.4		
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	370	70	130	120	260	120	210	2010	550	50	1410	160
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	5.0			5.0	5.0
Lane Util. Factor	0.97	1.00		1.00	1.00		1.00	0.95			0.95	1.00
Frt	1.00	0.90		1.00	0.95		1.00	0.97			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	3193	1549		1662	1667		1662	3168			3226	1488
Flt Permitted	0.95	1.00		0.46	1.00		0.95	1.00			0.58	1.00
Satd. Flow (perm)	3193	1549		798	1667		1662	3168			1862	1488
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	378	71	133	122	265	122	214	2051	561	51	1439	163
RTOR Reduction (vph)	0	79	0	0	15	0	0	29	0	0	0	56
Lane Group Flow (vph)	378	125	0	122	372	0	214	2583	0	0	1490	107
Heavy Vehicles (%)	1%	0%	3%	0%	0%	0%	0%	2%	0%	0%	3%	0%
Turn Type	Prot	NA		Perm	NA		Prot	NA		Perm	NA	Perm
Protected Phases	8!	4			8!		1	6			2	
Permitted Phases				8						2		2
Actuated Green, G (s)	17.0	17.0		17.0	17.0		14.2	59.0			40.8	40.8
Effective Green, g (s)	17.0	17.0		17.0	17.0		14.2	59.0			40.8	40.8
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.17	0.69			0.48	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0			5.0	5.0
Vehicle Extension (s)	2.2	2.2		2.2	2.2		2.5	5.0			5.0	5.0
Lane Grp Cap (vph)	638	309		159	333		277	2198			893	714
v/s Ratio Prot	0.12	0.08			c0.22		0.13	c0.82				
v/s Ratio Perm				0.15							c0.80	0.07
v/c Ratio	0.59	0.40		0.77	1.12		0.77	1.18			1.67	0.15
Uniform Delay, d1	30.9	29.6		32.1	34.0		33.9	13.0			22.1	12.4
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	1.1	0.4		18.3	84.6		12.1	84.0			305.8	0.4
Delay (s)	31.9	30.0		50.4	118.6		45.9	97.0			327.9	12.8
Level of Service	C	C		D	F		D	F			F	B
Approach Delay (s)		31.3			102.2			93.1			296.8	
Approach LOS		C			F			F			F	

Intersection Summary			
HCM 2000 Control Delay	147.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.46		
Actuated Cycle Length (s)	85.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	172.5%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	190	30	0	50	220	2800	50	30	1730	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	200	32	0	53	232	2947	53	32	1821	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			1			1						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3821	5295	911	4384	5295	1474	1821			2947		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3821	5295	911	4384	5295	1474	1821			2947		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	28	0	100	55	30			73		
cM capacity (veh/h)	0	0	277	0	0	116	332			119		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	200	84	232	1474	1474	53	32	911	911	32
Volume Left	0	32	232	0	0	0	32	0	0	0
Volume Right	200	53	0	0	0	53	0	0	0	32
cSH	208	0	332	1700	1700	1700	119	1700	1700	1700
Volume to Capacity	0.96	693.09	0.70	0.87	0.87	0.03	0.27	0.54	0.54	0.02
Queue Length 95th (ft)	205	Err	124	0	0	0	25	0	0	0
Control Delay (s)	101.0	Err	37.3	0.0	0.0	0.0	46.0	0.0	0.0	0.0
Lane LOS	F	F	E				E			
Approach Delay (s)	101.0	Err	2.7				0.8			
Approach LOS	F	F								

Intersection Summary			
Average Delay	161.5		
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	20	10	40	1520	10	850	20	30	860	430	10	10
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	21	11	42	1600	11	895	21	32	905	453	11	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	74	2505	958	474
Volume Left (vph)	21	1600	21	453
Volume Right (vph)	42	895	905	11
Hadj (s)	-0.25	-0.06	-0.50	0.18
Departure Headway (s)	9.3	7.4	7.0	7.7
Degree Utilization, x	0.19	5.16	1.86	1.01
Capacity (veh/h)	382	492	523	474
Control Delay (s)	14.5	1890.6	410.3	71.2
Approach Delay (s)	14.5	1890.6	410.3	71.2
Approach LOS	B	F	F	F

Intersection Summary			
Delay	1287.7		
Level of Service	F		
Intersection Capacity Utilization	252.9%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	0	80	0	0	0	50	810	0	0	560	970
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	32	0	84	0	0	0	53	853	0	0	589	1021
Pedestrians		1			4			4			5	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2064	2063	1105	2150	2573	862	1612			857		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2064	2063	1105	2150	2573	862	1612			857		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	13	100	67	100	100	100	87			100		
cM capacity (veh/h)	36	48	258	21	23	355	402			790		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	32	84	0	905	1611
Volume Left	32	0	0	53	0
Volume Right	0	84	0	0	1021
cSH	36	258	1700	402	790
Volume to Capacity	0.87	0.33	0.00	0.13	0.00
Queue Length 95th (ft)	79	34	0	11	0
Control Delay (s)	273.9	25.6	0.0	4.7	0.0
Lane LOS	F	D	A	A	
Approach Delay (s)	93.3		0.0	4.7	0.0
Approach LOS	F		A		

Intersection Summary				
Average Delay	5.7			
Intersection Capacity Utilization	110.1%	ICU Level of Service		H
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	330	40	20	60	50	40	10	490	70	80	400	100
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	367	44	22	67	56	44	11	544	78	89	444	111

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	433	167	633	644
Volume Left (vph)	367	67	11	89
Volume Right (vph)	22	44	78	111
Hadj (s)	0.14	-0.07	0.02	0.00
Departure Headway (s)	8.3	9.5	8.1	8.1
Degree Utilization, x	0.99	0.44	1.43	1.46
Capacity (veh/h)	433	366	454	456
Control Delay (s)	70.7	19.7	230.2	239.4
Approach Delay (s)	70.7	19.7	230.2	239.4
Approach LOS	F	C	F	F

Intersection Summary			
Delay	177.9		
Level of Service	F		
Intersection Capacity Utilization	107.9%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	80	330	40	50	340	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	84	347	42	53	358	53

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	432	95	411
Volume Left (vph)	0	42	358
Volume Right (vph)	347	0	53
Hadj (s)	-0.45	0.12	0.13
Departure Headway (s)	4.8	5.9	5.4
Degree Utilization, x	0.58	0.15	0.61
Capacity (veh/h)	716	558	639
Control Delay (s)	14.2	9.9	16.5
Approach Delay (s)	14.2	9.9	16.5
Approach LOS	B	A	C

Intersection Summary			
Delay	14.8		
Level of Service	B		
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	0	180	20	610	340	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	196	22	663	370	11

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total (vph)	196	685	380
Volume Left (vph)	0	22	0
Volume Right (vph)	196	0	11
Hadj (s)	-0.57	0.04	0.02
Departure Headway (s)	5.9	5.1	5.5
Degree Utilization, x	0.32	0.97	0.58
Capacity (veh/h)	584	698	649
Control Delay (s)	11.7	50.2	15.8
Approach Delay (s)	11.7	50.2	15.8
Approach LOS	B	F	C

Intersection Summary			
Delay	33.8		
Level of Service	D		
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	300	0	60	500	0	60
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	333	0	67	556	0	67

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	333	622	67
Volume Left (vph)	333	0	0
Volume Right (vph)	0	556	0
Hadj (s)	0.23	-0.50	0.03
Departure Headway (s)	5.8	4.6	5.8
Degree Utilization, x	0.54	0.79	0.11
Capacity (veh/h)	584	772	561
Control Delay (s)	15.3	22.2	9.5
Approach Delay (s)	15.3	22.2	9.5
Approach LOS	C	C	A

Intersection Summary			
Delay	19.1		
Level of Service	C		
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	70	100	160	180	100	370
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	109	174	196	109	402
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	891	272			370	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	891	272			370	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	73	86			91	
cM capacity (veh/h)	284	767			1189	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	76	109	370	109	402
Volume Left	76	0	0	109	0
Volume Right	0	109	196	0	0
cSH	284	767	1700	1189	1700
Volume to Capacity	0.27	0.14	0.22	0.09	0.24
Queue Length 95th (ft)	26	12	0	8	0
Control Delay (s)	22.2	10.5	0.0	8.3	0.0
Lane LOS	C	B		A	
Approach Delay (s)	15.3		0.0	1.8	
Approach LOS	C				

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	120	200	70	360	40
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	11	133	222	78	400	44
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	944	422	444			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	944	422	444			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	79	80			
cM capacity (veh/h)	233	631	1116			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	144	300	444
Volume Left	11	222	0
Volume Right	133	0	44
cSH	558	1116	1700
Volume to Capacity	0.26	0.20	0.26
Queue Length 95th (ft)	26	19	0
Control Delay (s)	13.7	7.2	0.0
Lane LOS	B	A	
Approach Delay (s)	13.7	7.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	170	10	50	100	100	130	20	170	50	90	50	70
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	200	12	59	118	118	153	24	200	59	106	59	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					725							
pX, platoon unblocked												
vC, conflicting volume	271			71			982	947	41	1029	900	194
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	271			71			982	947	41	1029	900	194
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	85			92			83	2	94	0	73	90
cM capacity (veh/h)	1293			1530			137	204	1030	15	217	847

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	271	388	282	247
Volume Left	200	118	24	106
Volume Right	59	153	59	82
cSH	1293	1530	233	34
Volume to Capacity	0.15	0.08	1.21	7.28
Queue Length 95th (ft)	14	6	345	Err
Control Delay (s)	6.5	2.8	171.2	Err
Lane LOS	A	A	F	F
Approach Delay (s)	6.5	2.8	171.2	Err
Approach LOS			F	F

Intersection Summary			
Average Delay	2122.1		
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	80	150	160	30	70	40
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	94	176	188	35	82	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	224				571	206
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	224				571	206
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				82	94
cM capacity (veh/h)	1345				449	835

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	271	224	129
Volume Left	94	0	82
Volume Right	0	35	47
cSH	1345	1700	539
Volume to Capacity	0.07	0.13	0.24
Queue Length 95th (ft)	6	0	23
Control Delay (s)	3.1	0.0	13.8
Lane LOS	A		B
Approach Delay (s)	3.1	0.0	13.8
Approach LOS			B

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations						
Volume (veh/h)	220	10	10	0	0	130
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	234	11	11	0	0	138
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	11				489	11
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	11				489	11
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	85				100	87
cM capacity (veh/h)	1609				460	1070

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	245	11	138
Volume Left	234	0	0
Volume Right	0	0	138
cSH	1609	1700	1070
Volume to Capacity	0.15	0.01	0.13
Queue Length 95th (ft)	13	0	11
Control Delay (s)	7.3	0.0	8.9
Lane LOS	A		A
Approach Delay (s)	7.3	0.0	8.9
Approach LOS			A

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Section I

Memo 8: Goals, Objectives and Evaluation Criteria

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Scappoose Transportation System Plan Update

Technical Memorandum #8:
Goals, Objectives and Evaluation Criteria

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November 6, 2013

This memorandum begins the process of updating transportation related goals and objectives for Scappoose to be applied in the new Transportation System Plan (TSP). These elements provide a basis for discussion as the community proceeds through the TSP planning process. The goals and objectives presented here are a starting point and will be revised throughout the project. Transportation policy language will not be finalized until it is approved by the city council and adopted as part of Scappoose's Comprehensive Plan.

Setting Direction for Transportation Planning

Goals and objectives reflect Scappoose's values and guide how the TSP will be developed and implemented. Goals are somewhat general in nature and should be challenging, but not unreasonable, to achieve. Each goal must be supported by more finite objectives. In contrast to goals, objectives should be specific and measurable. Where feasible, a timeframe should be established to help prioritize and achieve the objective.

The solutions identified in the TSP must be consistent with the goals and objectives. To accomplish this, evaluation criteria based on the goals and objectives have also been developed to assess and screen transportation system alternatives and prioritize TSP actions.

The expectation is that goals and objectives described here will be refined throughout the TSP process as information on existing conditions and future needs is explored. Later in the TSP process, when solutions are identified, policy statements to guide decision-making along with specific code amendments to implement the new TSP will be developed. The final goals and policies will replace the transportation section of the Scappoose Comprehensive Plan.

Draft Goals and Objectives for the TSP Update

In developing the draft goals and objectives for this memo, the existing goals and objectives from the City's current TSP (1997) were first reviewed. They were brought forward if they are still relevant. Feedback from the Community Advisory Committee will inform changes and additions to the Draft Goals and Objectives.

Goal 1: Health and Safety

Develop a transportation system that maintains and improves individual health and safety by maximizing pedestrian and bicycle transportation options public safety and service access, and safe and smooth connections.

Goal 1 Objectives

A. Maximize active transportation options
B. Improve safety and provide safe connections for walking, biking and driving trips
C. Identify locations in the city where enhanced street crossings for walking and biking users are needed
D. Provide safe east-west access for pedestrian and bicyclists across US 30
E. Identify improvements to address high collision locations
F. Improve the visibility of transportation users in constrained areas, such as on hills and blind curves and in landscaped areas
G. Install amenities (e.g., chirpers, directional ramps) at signalized pedestrian crossings to improve safety of underserved and vulnerable populations
H. Identify programs that encourage walking and bicycling, and educate good traffic behavior and consideration for all users.
I. Increase the city's ability to manage emergencies
J. Improve safety at railroad crossings

Goal 1 Evaluation Criteria

- Increases active transportation options (e.g. walking, biking)
- Improves safety of the transportation system
- Improves emergency vehicle response times and evacuation efficiency

Goal 2: Transportation System Management

Emphasize effective and efficient management of the transportation system for all users.

Goal 2 Objectives

A. Develop an arterial and collector street system that provides additional north-south local access routes and an alternative route to US 30
B. Minimize the adverse impact of through travel on US 30
C. Seek to shift travel to off-peak periods
D. Identify opportunities to improve travel reliability and safety with system management operation strategies
E. Maintain existing facilities to preserve their intended function and useful life
F. Maximize mobility for all users, including those with special transportation needs
G. Adopt transportation impact study guidelines for development

Goal 2 Evaluation Criteria

- Improves daily traffic reliability
- Enhances travel for local trips off the state highway system

Goal 3: Travel Choices

Develop and maintain a well-connected transportation system that offers convenient and available pedestrian, bicycle and transit trips.

Goal 3 Objectives

A. Provide safe, comfortable and convenient transportation options
B. Incorporate amenities in the transportation system such as street lighting, bike parking, weather protection that better meet the needs of the walking, biking and transit user
C. Improve walking and biking connections to community destinations and continue to address deficiencies and gaps in the pedestrian and bicycle systems
D. Enhance way finding signage for those walking and biking, directing them to bus stops, trails, and key routes and destinations
E. Promote walking, bicycling, and sharing the road through public information and participation
F. Ensure connectivity between compatible land uses for pedestrian and bicycle trips
G. Establish and maintain transit stops in locations that are safe and convenient for users and that are consistent with the Columbia County Community-Wide Transit Plan
H. Coordinate with transit providers to improve the coverage, quality and frequency of services as needed in areas where existing and planned land uses support transit services
I. Promote and implement carpool/vanpool programs for reducing commuter vehicular travel demand along Highway 30 (to Portland).
J. Encourage increased opportunities for local and regional public transit routes and facilities

Goal 3 Evaluation Criteria

- Adds bikeway and walkways that fill in system gaps, improve system connectivity, and are accessible to all users
- Improves the basic provision of services to encourage higher levels of usage for walking, biking and transit trips
- Improves access to transit facilities and promotes transit as a viable alternative to the single occupant vehicle

Goal 4: Economic Vitality

Support the development and revitalization efforts of the City, Region, and State economies and ensure the efficient movement of people and goods.

Goal 4 Objectives

A. Improve the freight system efficiency, access, and travel reliability
B. Manage parking efficiently and ensure that it supports downtown business needs and promotes new development
C. Balance local access with the need to serve regional traffic on US 30
D. Provide transportation facilities that support existing and planned land uses
E. Enhance the vitality of the Scappoose downtown area by incorporating roadway design elements for all modes
F. Provide for convenient parking and access to community destinations such as businesses and scenic/recreation areas.
G. Ensure that all new development contributes a fair share toward on-site and off-site transportation system improvements
H. Ensure that transportation planning provides for future freight facility needs at the Scappoose Industrial Airpark

Goal 4 Evaluation Criteria

- Minimizes negative impacts to existing land uses
- Improves freight access and travel reliability

Goal 5: Livability

Provide transportation solutions that support active transportation, facilitates access to daily needs and services, and enhances the livability of the Scappoose neighborhoods and business community.

Goal 5 Objectives

A. Protect residential neighborhoods from excessive through traffic and travel speeds
B. Enhance transportation connections between community destinations
C. Balance the need to accommodate freight movement on US 30 with livability conditions in downtown Scappoose

D. Minimize transportation conflicts between neighborhoods and businesses
E. Incorporate streetscape amenities that reflect the city's unique character (e.g., street furnishings, landscaping)

Goal 5 Evaluation Criteria

- Reduces or discourages through vehicle trips in residential neighborhoods
- Increases connections or access to community amenities
- Enhances street aesthetics
- Reduces impacts from heavy volumes and trucks in downtown

Goal 6: Sustainable Transportation System

Provide a transportation system that meets the needs of present and future generations and is environmentally sustainable.

Goal 6 Objectives

A. Support travel options that allow individuals to reduce single-occupant vehicle trips
B. Identify areas where alternative land use types would significantly shorten trip lengths or reduce the need for motor vehicle travel within the city
C. Support alternative vehicle types by identifying potential electric vehicle plug-in stations and developing implementing code provisions
D. Minimize impacts to Scappoose Creek and other natural areas or environments
E. Support the reduction of greenhouse gas emissions from transportation sources
F. Support and encourage transportation system management (TSM) and transportation demand management (TDM) solutions to congestion
G. Develop and support alternative mobility standards on state and city facilities where necessary

Goal 6 Evaluation Criteria

- Protects environmentally sensitive areas
- Increases alternatives to single-occupant vehicle travel
- Emphasizes the movement of people over vehicles, which reduces the citywide vehicle-miles-travelled (VMT) per capita
- Supports a diverse set of land use types, including potential mixed use and/or increased density

Goal 7: Fiscal Responsibility

Sustain an economically viable transportation system for existing and future users that protects and improves existing transportation assets while cost-effectively enhancing the total system.

Goal 7 Objectives

A. Plan for an economically viable and cost-effective transportation system
B. Identify and develop diverse and stable funding sources to implement recommended projects in a timely fashion and ensure sustained funding for transportation projects and maintenance
C. Make maintenance of the transportation system a priority
D. Consider costs and benefits when identifying project solutions and prioritizing public investments
E. Prioritize funding of projects that are most effective at meeting the goals and policies of the Transportation System Plan

Goal 7 Evaluation Criteria

- Maximizes existing facilities/minimizes need for new facilities
- Reduces total transportation costs per capita

Goal 8: Equitable Transportation System

Provide a transportation system that is accessible to all users regardless of age, income, and health.

Goal 8 Objectives

A. Develop and maintain a transportation system that supports a variety of travel options
B. Ensure that the transportation system provides equitable access to underserved and vulnerable populations
C. Ensure that the transportation system supports users with a range of ages
D. Ensure the pedestrian facilities are clear of obstacles and obstructions (e.g., utility poles)
E. Provide connections for all modes that meet applicable Americans with Disabilities Act (ADA) standards

Goal 8 Evaluation Criteria

- Improves access and mobility to underserved or vulnerable populations

Goal 9: Coordinate Transportation Planning

Develop a transportation system that is consistent with the City's Comprehensive Plan and that is coordinated with County, State, and Regional plans.

Goal 9 Objectives

A. Coordinate and cooperate with adjacent jurisdictions and other transportation agencies to develop transportation projects that benefit the City, Region, and State as a whole
B. Work collaboratively with other jurisdictions and agencies to ensure the transportation system functions seamlessly
C. Review City transportation standards periodically to ensure consistency with Regional, State, and Federal standards
D. Coordinate with the County and State agencies to ensure that improvements to County and State highways within the City benefit all modes of transportation
E. Participate with ODOT and Columbia County in the revision of their transportation system plans, and coordinate land development outside of the Scappoose area to ensure provision of a transportation system that serves the needs of all users
F. Participate in updates of the ODOT State Transportation Improvement Program (STIP) and Columbia County Capital Improvement Program (CIP) to promote the inclusion of projects identified in the Scappoose TSP
G. Develop TSP policy and municipal code language to implement the TSP update
H. Coordinate public transit planning improvements within city limits with Columbia County to ensure that future transit routes and facilities are consistent with the findings and recommendations of the adopted Columbia County Community-wide Transit Plan
I. Continue to work with the Port of St. Helens to maintain the continuing viability of the Scappoose Industrial Airpark

Goal 9 Evaluation Criteria

- Compatible with other jurisdiction's plans and policies, (including adjacent cities, counties, or ODOT)
- Consistent with the standards of the City, County, and State as a whole

Section J

Memo 9: Solutions Evaluation

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Scappoose Transportation System Plan Update

Technical Memorandum #9: [FINAL]
Solutions Evaluation

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March 31, 2016

The purpose of this memorandum is to (1) identify improvements and other strategies to address existing deficiencies and future needs for each mode of travel and (2) to assess the identified solutions using the evaluation criteria developed in Technical Memo #8 Goals, Objectives, & Evaluation Criteria. The solutions were identified by examining the transportation needs documented in Technical Memo #7: Future Needs, and by considering input from city staff, the Community Advisory Committee, and the public open house. This draft is the first step toward identifying system solutions and will be further refined with input from the CAC and the public.

Evaluation Criteria

Transportation concepts and project alternatives were evaluated by applying criteria that are based on the TSP's goals and objectives. These project level criteria provided a point-based technical rating method that was used to evaluate how well proposed design alternatives meet the objectives of the TSP (Refer to Technical Memorandum #8).

Methodology

Project alternatives were compared by summing the ratings for each potential project. Ratings for each criterion were based on a five-point scale, from +2 to -2, with +2 generally representing a clear positive impact relative to the criterion, and -2 representing a clear negative impact relative to the criterion. A score of 0 typically represents no impact on the criterion, and +1 and -1 represent minor positive and negative impacts. For example, Table 1 shows an example of how the Safety criterion, which arises from the Health and Safety goal, was applied.

Table 1: Evaluation Criteria and Scoring Methodology Example

Evaluation Criteria	Evaluation Score	
Safety Increases safety of the transportation system (e.g., street lighting, emergency vehicle access, improved sight distance)	+2	Significantly improves safety for all road users
	+1	Improves safety for some road users
	0	No change
	-1	Improves safety for some road users, but reduces safety for other road users
	-2	Reduces safety for all road users

The criteria and related scoring parameters generate an aggregate score that reflects each project's effectiveness in addressing the TSP's goal areas:

1. Health and safety
2. Transportation system management
3. Travel choices
4. Economic vitality
5. Livability
6. Sustainable transportation system
7. Fiscal responsibility
8. Equitable transportation system
9. Coordinate transportation planning

Note that each of the nine goal areas have a different set of between one and four criteria, and scoring was averaged at the goal level so that each goal would be weighted the same. A complete list of the goals, evaluation criteria, and scoring parameters are included in the appendix to this memorandum. Potential solutions were developed for each transportation mode (transit, walking, biking, shared use paths and driving). Scores for projects within each modal category were grouped as high, medium or low. Within some modal categories, particularly walking and biking, scores were very similar due to the nature of the evaluation criteria. Therefore, different thresholds were used to categorize each mode based on scoring results.

Solutions Identification Process

In the past, a typical transportation planning response to congestion was to widen streets and expand the transportation system. This created significant barriers to walking and biking and detracted from the livability, health, safety, and fiscal wellbeing of the community. Scappoose's approach for this TSP update places more emphasis on connectivity and access, and takes a multi-modal network-wide approach to identifying transportation system solutions. This approach enables more cost-effective, non-capacity adding solutions to improve transportation system operations and helps to encourage multiple travel options, increase street connectivity, and promote a more sustainable transportation system. Capacity improvements were added to the system after other improvements or strategies were identified.

Non-Capacity Adding Solutions

Non-capacity adding solutions are defined as a set of transportation solutions and strategies that attempt to manage the performance of congested locations by developing transit, walking, biking, Transportation System Management ("TSM") and Transportation Demand Management ("TDM") alternatives first, rather than expanding the system. Emphasis is placed on reducing traffic conflicts, increasing safety, reducing demand, and encouraging more efficient usage of the existing transportation system.

Transportation System Management (TSM)

Transportation System Management (TSM) focuses on low cost strategies to enhance operational performance of the transportation system by seeking solutions to immediate transportation problems, finding ways to better manage transportation, maximizing urban mobility, and treating all modes of travel as a coordinated system. These types of measures include such things as signal improvements, traffic signal coordination, traffic calming, access management, local street connectivity and intelligent transportation systems (ITS). Typically, the most significant measures that can provide tangible benefits to the traveling public are traffic signal systems.

TSM measures focus primarily on region wide improvements, however there are a number of TSM measures that could be used in a smaller scale environment such as the Scappoose area. Standards that address TSM in Scappoose, including functional classification, access management, roadway cross-section standards, local street connectivity and neighborhood traffic management will be addressed in Technical Memorandum #10 (Transportation Standards).

Intelligent Transportation Systems (ITS)

ITS involves the application of advanced technologies and proven management techniques to relieve congestion, enhance safety, provide services to travelers and assist transportation system operators in implementing suitable traffic management strategies. ITS focuses on increasing the efficiency of existing transportation infrastructure, which enhances the overall system performance and reduces the need to add capacity (e.g., travel lanes). Efficiency is achieved by providing services and information to travelers so they make better travel decisions and to transportation system operators so they better manage the system and improve system reliability.

ITS projects to consider in the future may include:

- Transit signal priority
- Truck signal priority
- Signal coordination, phasing and optimization

- Traffic monitoring and surveillance
- Information availability
- Incident management

US 30 is a regional roadway facility under ODOT jurisdiction and while several of the signals in Scappoose are already coordinated, the system could benefit from additional transportation system management (TSM) infrastructure as volumes and congestion increase. Before future investments are made along this roadway, designs should be reviewed with City and ODOT staff to determine if communications or other ITS infrastructure should be addressed as part of the street design/construction.

Transportation Demand Management (TDM)

Transportation Demand Management (TDM) is the general term used to describe actions that remove single occupant vehicle trips from the roadway network during peak travel demand periods. As growth in the Scappoose area occurs, the number of vehicle trips and travel demand in the area will also increase. The ability to change a user's travel behavior and provide alternative mode choices will help accommodate this growth.

Generally, TDM focuses on reducing vehicle miles traveled and promoting alternative modes of travel for large employers. Research has shown that a comprehensive set of complementary policies implemented over a large geographic area can have an effect on the number of vehicle miles traveled to/from that area.[1] However, the same research indicates that in order for TDM measures to be effective, they should go beyond the low-cost, uncontroversial measures commonly used such as carpooling, transportation coordinators/associations, priority parking spaces, etc.

The more effective TDM measures include parking strategies (limiting or increasing supply in strategic locations), improved services for alternative modes of travel, and other market-based measures. However, TDM includes a wide variety of actions that are specifically tailored to the individual needs of an area. Table 2 provides a list of several strategies that could be applicable to the Scappoose area. Potential trip reductions listed in the table represent data from a variety of communities. Results in Scappoose will vary based on specific local characteristics (e.g. level of transit provided, availability of bicycle and pedestrian facilities, parking availability, etc.).

[1] *The Potential for Land Use Demand Management Policies to Reduce Automobile Trips*, ODOT, by ECO Northwest, June 1992.

Table 2: Transportation Demand Management Strategies

Strategy	Description	Potential Trip Reduction
Telecommuting	Employees work at home or at a work center closer to home, rather than commuting from home to work. This can be full time or on selected workdays. This can require computer equipment to be most effective.	82-91% (Full Time) 14-36% (1-2 day/wk)
Compressed Work Week	Schedule in which employees work their regular scheduled number of hours in fewer days per week.	7-9% (9 day/80 hr) 16-18% (4 day/40 hr) 32-36% (3 day/36 hr)
Transit Pass Subsidy	For employees who take transit to work on a regular basis, the employer pays for all or part of the cost of a monthly transit pass.	19-32% (full subsidy, high transit service) 2-3% (half subsidy, medium transit service)
Alternative Mode Subsidy	For employees that commute to work by modes other than driving alone, the employer provides a monetary bonus to the employee.	21-34% (full subsidy of cost, high alternative modes) 2-4% (half subsidy of cost, medium alternative modes)
Bicycle Program	Provides support services to those employees that bicycle to work. Examples include: safe/secure bicycle storage, shower facilities and subsidy of commute bicycle purchase.	0-10%
On-site Rideshare Matching for high occupancy vehicles (HOVs)	Employees who are interested in carpooling or vanpooling provide information to a transportation coordinator regarding their work hours, availability of a vehicle and place of residence. The transportation coordinator then matches employees who can reasonably rideshare together.	1-2%
Provide Vanpools	Employees that live near each other are organized into a vanpool for their trip to work. The employer may subsidize the cost of operating and maintaining the van.	15-25% (company provided van with fee) 30-40% (subsidized van)
Gift/Awards for Alternative Mode Use	Employees are offered the opportunity to receive a gift or an award for using modes other than driving alone.	0-3%
Company Cars for Business Travel	Employees are allowed to use company cars for business-related travel during the day.	0-1%
Guaranteed Ride Home Program	A company owned or leased vehicle or taxi fare is provided in the case of an emergency for employees that use alternative modes.	1-3%
Time off with Pay for Alternative Mode Use	Employees are offered time off with pay as an incentive to use alternative modes.	1-2%

Source: *Guidance for Estimating Trip Reductions from Commute Options*, Oregon Department of Environmental Quality, August 1996.

Opportunities to expand transportation demand management and other measures in Scappoose include:

- Develop requirements for long-term bicycle parking for all places of employment, transit stops, park and ride facilities and multi-family residential uses. The bicycle parking requirements for these uses should be required to be long-term. All other land uses should continue to be required to provide short-term bike parking, but should be encouraged to implement the long-term options. Long-term parking options include:

  - Lockers, individual lockers for one or two bicycles
  - Racks in an enclosed, lockable room
  - Racks in an area that is monitored by security cameras or guards (within 100 feet)
  - Racks or lockers in an area always visible to employees
- Implement a transportation management association program with employers in the area around Scappoose Industrial Airpark.
- Support alternative vehicle types by identifying potential electric vehicle plug-in stations and developing implementing code provisions.
- Encourage/support rideshare/vanpool to major employers in Washington County and Portland (e.g., Intel, Nike, etc.) for employees living in Scappoose.
- Improve street connectivity.
- Invest in pedestrian/bicycle facilities.
- Establish site development standards that require pedestrian and bicycle access through sites and connections to adjacent sties and transportation facilities.
- Improve amenities and access for transit stops. Actions could include instituting site design requirements allowing redevelopment of parking areas for transit amenities; requiring safe and direct pedestrian connections to transit and; permitting transit-supportive uses outright in commercial and institutional zones.

Potential Projects

While TSM and TDM solutions are largely policy-based, rather than specific projects undertaken by the city, specific projects were identified for transit, walking and bicycling. These projects are summarized and identified below.

The following section evaluates a set of potential transportation improvement projects identified through the CAC, community meetings, and gap and deficiency analysis. Individual projects were broken down by mode and evaluated using the evaluation criteria discussed previously. Project scores are included in the appendix. The funding source column indicates which projects are likely to be constructed as part of new development, or whether they are city or ODOT facilities. This is an educated guess about the likely source of funding, but will be refined through the project development process.

These projects will be further refined based on identified community priorities and available funding. It is also likely that some projects will be developed independently, while others will be developed in concert. For example, a new roadway that terminates at an existing roadway will likely include both roadway segment and intersection components.

Transit Projects

Transit use in Scappoose is generally either locally oriented (within Columbia County, including Scappoose, St. Helens or nearby areas) or commuter oriented (to/from employment in Portland, Washington County, etc.). There is an opportunity for increased transit ridership between Scappoose and focused employment centers in Portland and Washington County due to the distance between Scappoose and TDM measures in place at those employment centers.

Potential transit projects are listed in Table 3 below. All of the transit projects would involve coordination with ODOT, Columbia County Rider, and other agencies. Transit project scores were generally high, with the park-and-ride lot scoring medium due to its requirement for right of way/land. A breakdown of scoring for each project is available in the appendix. Transit project costs are primarily the responsibility of CC Rider and not the city.

A summary of potential transit stop amenities is provided in the appendix.

Table 3: Transit Projects

Project	Project Location	Project Description	Score	Funding Source	Cost ($1,000's)*
T1	US 30	Park and ride lot(s) near US 30 to support express and local bus service	Medium	ODOT STIP	$1,558
T2	City Wide	Use local bus routing to feed the inter-city express bus system	High	CC Rider	-
T3	Scappoose Industrial Airpark	Extend existing transit service to Airpark area to accommodate future demand	High	CC Rider	-
T4	City Wide	Provide flex route transit stops within ¼ mile of all residences throughout city	High	CC Rider	-
T5	Citywide	Transit amenity improvements (e.g., shelters, furniture, route schedules)	High	Development/ CC Rider	-
T6	US 30	Add northbound US 30 bus stop at Havlik	High	ODOT/CC Rider	$65

* Improvements are primarily the responsibility of CC Rider and not the city.

Sidewalk Projects

Sidewalk projects are listed below in Table 4 and illustrated in Figure 1. These projects all scored relatively high, with sidewalks providing access to transit or with an expected safety improvement generally scoring higher than sidewalks without those features. For this reason, the sidewalk projects were categorized as either medium or high-priority. Where sidewalks are part of an overall roadway improvement, the project that includes the sidewalk cost is referenced. It should be noted that providing a sidewalk on at least one side of the street is preferable to providing sidewalks on both sides of a shorter segment. A breakdown of the scores for each project is available in the appendix. Planning level cost estimates are provided for comparison purposes.

Table 4: Sidewalk Projects

Project	Project Name	Project Description	Primary Need	Score	Funding Source	Cost ($1,000's)
W1	Old Portland Rd.	Bonneville Dr. to existing sidewalks north of Dutch Canyon Rd.	Fills Gap	Medium	Development	$2,345
W2	Old Portland Rd.	Complete sidewalk system between Jenny Ln. and US 30	Fills Gap	High	City/ Development	B1
W3	New Collector St.	Old Portland Rd. to Walnut Street	New Street	High	Development	D12
W4	Dutch Canyon Rd.	Old Portland Rd. to US 30	Fills Gap	Medium	City	D11
W5	E.M. Watts Rd.	Complete sidewalk system between US 30 and SW 4th St.	Fills Gap	High	City	$255
W6	E.M. Watts Rd.	Complete west side sidewalk between SW 4th St. to Keys Rd.	Fills Gap	High	City	B10
W7	Keys Rd.	Complete sidewalk system between E.M. Watts Rd. and J.P. West Rd.	Fills Gap	Medium	City/ Development	$1,095
W8	J.P. West Rd.	Complete sidewalk system between Keys Rd. and SW 4th St.	Fills Gap	High	City/ Development	$1,115
W9	J.P. West Rd.	Complete sidewalk system between SW 4th St. and US 30	Fills Gap	High	City	$280
W10	SW 4th St.	E.M. Watts Rd. to J.P. West Rd.	Fills Gap	High	City	$840
W11	SW Maple St.	Complete sidewalk system between US 30 and SW 4th St.	Fills Gap	High	City	$375
W12	SW 1st St.	SW Maple St. to J.P. West Rd.	Fills Gap	High	City	$360
W13	High School Way	Complete sidewalk on north side between existing sidewalk and SE 6th St.	Fills Gap	High	City	$295

Project	Project Name	Project Description	Primary Need	Score	Funding Source	Cost ($1,000's)
W14	SE Vine St.	Grant Watts Elementary School to SE 6th St.	School	High	City	$310
W15	SE 3rd Pl.	Grant Watts Elementary School to SE Elm St.	School	High	City	$505
W16	SE Elm St.	Complete sidewalk system from SE 3rd St. to east UGB	Fills Gap	High	City	$760
W17	SE 6th St.	Complete sidewalk system between Vine St. and Elm St.	Fills Gap	High	City/ Development	B19
W18	SE Maple St.	Complete sidewalk system between US 30 and SE 4th St.	Fills Gap	High	City	$610
W19	SE 4th St.	Elm St. to E. Columbia Ave.	Fills Gap	High	City	B17
W20	E. Columbia Ave.	Complete sidewalk system between US 30 and SE 4th St./West Lane Rd.	Fills Gap	High	City	$440
W21	West Lane Rd.	Existing sidewalk terminus north of Erin Dr. to Crown Zellerbach Rd.	Fills Gap	Medium	City	$125
W22	Miller Rd.	Complete sidewalk system between E. Columbia Ave. and Crown Zellerbach Rd.	Fills Gap	Medium	City	B8
W23	E.J. Smith Rd.	NW 1st St. to Bella Vista Dr.	Fills Gap	High	City/ Development	$1,865
W24	Crown Zellerbach Rd.	Complete sidewalk system between US 30 and Miller Rd. (south side only east of West Lane Rd.)	Fills Gap	Medium	City	D1
W25	Scappoose-Vernonia Hwy.	US 30 to west UGB (south side only)	Fills Gap	High	City	$575
W26	US 30	Scappoose-Vernonia Hwy./Crown Zellerbach to West Lane Rd./Wikstrom Rd. (west side only)	Fills Gap	Medium	ODOT	$2,045
W27	Wikstrom Rd.	US 30 to west UGB	Fills Gap	Medium	Development	B14
W28	Gilmore Rd.	US 30 to west UGB	Reconstructed Street	Medium	Development	D5
W29	West Lane Rd.	US 30 to Crown Zellerbach Rd.	Fills Gap	Medium	Development	B5

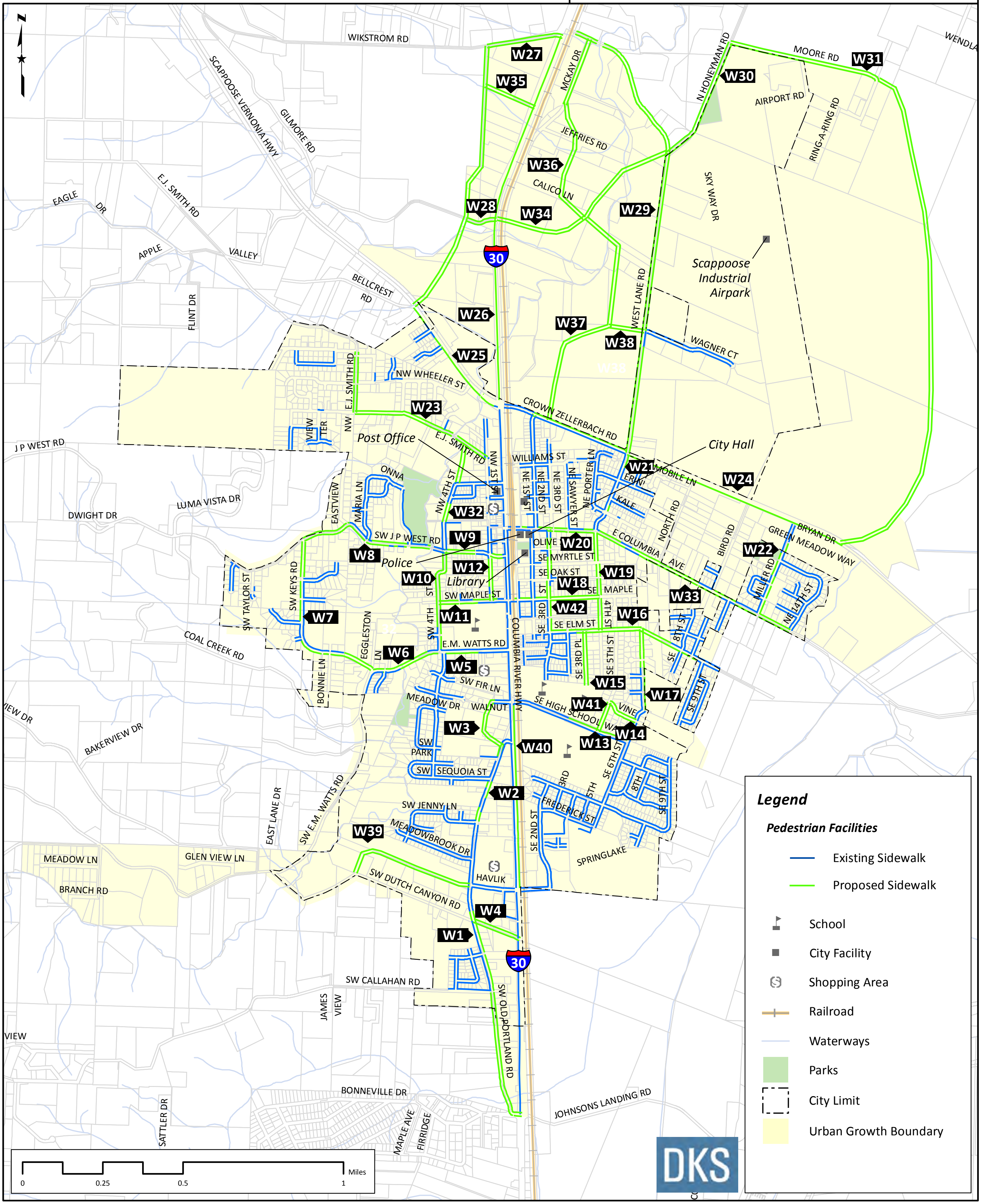
Project	Project Name	Project Description	Primary Need	Score	**Funding Source**	**Cost ($1,000's)**
W30	Honeyman Rd.	West Lane Rd. to Moore Rd.	Fills Gap	Medium	Development	B6
W31	Moore Rd.	Honeyman Rd. to Crown Zellerbach Rd.	New Street	Medium	Development	D2, D16
W32	NW 4th Street	New section between J.P. West Rd. and Laurel St.	New Street	Medium	Development	D6
W33	E. Columbia Ave.	Complete sidewalk between SE 4th St./West Lane Rd. and east UGB	Fills Gap	Medium	City/ Development	B12
W34	Gilmore Rd.	US 30 to West Lane Rd.	New/Reconstructed Street	Medium	Development	D3
W35	New neighborhood street	US 30 to west UGB	New Street	Medium	Development	D17
W36	New neighborhood street	West Lane Rd. to Gilmore Rd.	New Street	Medium	Development	D18
W37	New neighborhood street	Gilmore Rd. to Crown Zellerbach Rd.	New Street	Medium	Development	D8
W38	New neighborhood street	West Lane Rd. to new neighborhood street	New Street	Medium	Development	D9
W39	New neighborhood street	Old Portland Rd. to E.M. Watts Rd.	New Street	Medium	Development	D10
W40	US 30	Havlik Drive to High School Way	Fills Gap	High	ODOT	$1,615
W41	5th Street	High School Way to Vine Street	Fills Gap	High	City	$385
W42	3rd Street	Elm Street to Columbia Avenue	Fills Gap	High	City	$930

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 1

Proposed Pedestrian Facilities



Bicycle Projects

Bicycle projects are listed below in Table 5 and illustrated in Figure 2. Bicycle projects were identified on all collector roadways in Scappoose. All of the bicycle projects scored relatively high and the scores were within a tight range. Scoring differences are due primarily to expected improvement in safety or whether or not existing right-of-way is available. Although not reported in Table 5 due to the very minor differences between projects, a breakdown of scoring for each project is available in the appendix. While potential treatments were identified below, a number of bicycle treatments are possible (see Bicycle Toolbox in Technical Memo #10) and specific bike treatments will be determined as the projects are refined. Planning level cost estimates are provided for comparison purposes. Where bicycle projects are part of an overall roadway improvement, the project that includes the bicycle project is referenced.

Table 5: Bicycling Projects

Project	Project Location	Project Description	Potential Treatment	Project Type	Funding Source	Cost ($1,000's)
B1	Old Portland Rd.	Holland Dr. (terminus of existing bike lanes) to new street	Bike lanes	Widen	City/Develop	$5,250
B2	New street	Old Portland Rd. to Walnut St.	Bike lanes	New Road	Development	D12
B3	Walnut St.	New street to US 30	Bike lanes	Retrofit	Development	$3
B4	West Lane Rd.	E. Columbia Ave. to Crown Zellerbach Rd.	Bike lanes	Retrofit	City	$15
B5	West Lane Rd.	Crown Zellerbach Rd. to US 30	Bike lanes	Widen	Development	$8,635
B6	Honeyman Rd.	West Lane Rd. to Moore Rd.	Shared Lane	Widen	City	D21
B7	Moore Rd.	Honeyman Rd. to Crown Zellerbach Rd.	Bike lanes	New Road	Development	D2, D16
B8	Miller Rd.	Crown Zellerbach Rd. to E. Columbia Ave.	Bike lanes	Widen	City	$1,660
B9	SW Havlik Dr.	US 30 to Old Portland Rd.	Bike lanes	Widen	City	$1,215
B10	E.M. Watts Rd.	US 30 to Eggleston Ln./Keys Rd.	Shared Lane	Retrofit/Widen	City	$1,445
B11	E. Columbia Ave.	US 30 to West Lane/SE 4th St.	Shared Lane	Retrofit	City	$15
B12	E. Columbia Ave.	West Lane/SE 4th St. to Miller Rd.	Shared Lane	Widen	City/Develop	$3,320
B13	Gilmore Rd.	US 30 to West Lane Rd.	Bike lanes	New Road	Development	D3
B14	Wikstrom Rd.	US 30 to west UGB	Bike lanes	Widen	Development	$1,525
B15	New street	Wikstrom Rd. to Scappoose-Vernonia Hwy.	Bike lanes	New Road	Development	D4
B16	Gilmore Rd.	West UGB to US 30	Bike lanes	New Road	Development	D5
B17	SE 4th St.	Elm St. to E. Columbia Ave.	Shared Lane	Widen	City	$1,785
B18	SE Elm St.	SE 6th St. to SE 4th St.	Shared Lane	Widen	City	$965
B19	SE 6th Street	Frederick St. to SE Elm St.	Shared Lane	Retrofit/Widen	City	$1,895
B20	E.M. Watts Rd.	Keys Rd. to Dutch Canyon Road	Bike lanes	Widen	City	$6,975
B21	Dutch Canyon Rd.	Old Portland Rd. to E.M. Watts Rd.	Bike lanes	Widen	City	$3,975
B22	West side of Scappoose	Sign bike route on west side of US 30 between Columbia Ave. and E.M. Watts (cross US 30 as pedestrian at Columbia Ave.)	Signage	Retrofit	City	$30

Shared-Use Path Projects

Shared-use path projects are listed below in Table 6 and illustrated in Figure 2. Most of the shared-use path projects scored lower than other walking and biking projects, mostly due to the right of way required and the potential environmental impact. The scores were very close. A breakdown of scoring for each project is available in the appendix. Planning level cost estimates are provided for comparison purposes. The relocation of the Crown Zellerbach Trail between West Lane Road and the UGB is included in driving project D1.

Table 6: Shared-Use Path Projects

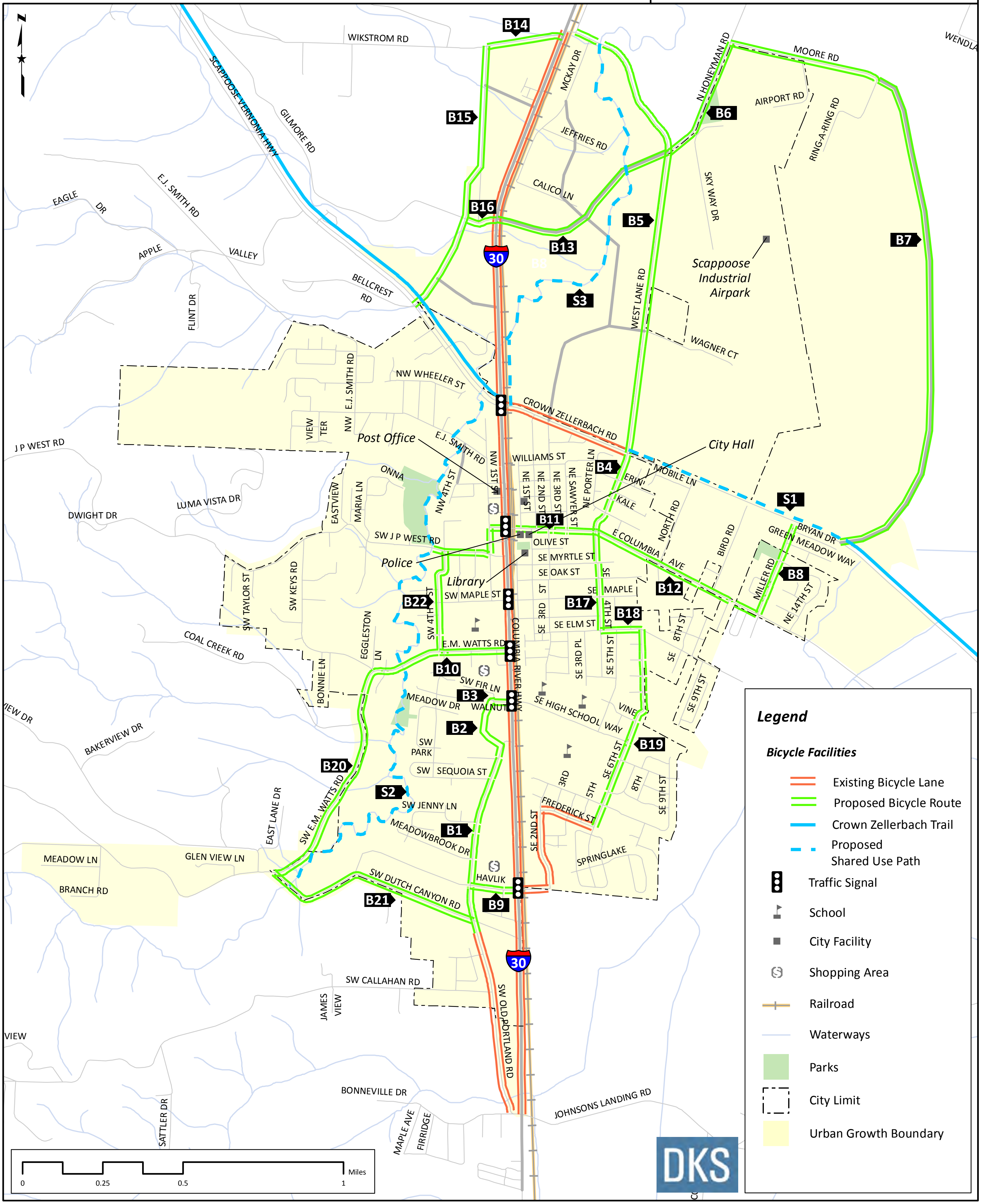
Project	Project Location	Project Description	Score	Funding Source	Cost ($1,000's)
S1	Crown Zellerbach Trail	Relocate existing Crown Zellerbach trail north of planned Crown Zellerbach Rd. construction	Medium	City	D1
S2	Scappoose Creek Trail	Trail along Scappoose Creek from south city limits to Crown Zellerbach Road	Medium	City	$5,870
S3	Scappoose Creek Trail	Trail along Scappoose Creek from north of Crown Zellerbach Road to north city limits	Medium	City	$2,985

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 2

Proposed Bicycle and Shared Use Facilities



Motor Vehicle Projects

Intersection Projects

Intersection projects are listed below in Table 7 and illustrated in Figure 3. These projects encompass a variety of intersection improvements, ranging from traffic control changes, installation of turn lanes to realignments. All future improvements on ODOT facilities will require further detailed evaluation to gain approval and determine design features prior to construction.

Where traffic signals are recommended, preliminary peak hour warrants are met. Meeting a signal warrant does not imply approval for a signal at a given location. ODOT approval of a traffic signal would require a documented intersection traffic control study, as described in the ODOT Traffic Manual.[2] The intersection control study would need to demonstrate the satisfaction of an MUTCD signal warrant, as well as show safety and operational conditions with a signal installed. Medians at certain locations on US 30 were considered due to the higher than average crash rate, however, since none of the locations were identified as SPIS (Safety Priority Index System) top 5 percent or to 10 percent locations and since there were concerns from the CAC, medians on US 30 will not be pursued at this time. A breakdown of the scoring for each project is available in the appendix. Planning level cost estimates are provided for comparison purposes.

[2] ODOT Traffic Manual, revised January, 2016, Section 6.36.

Table 7: Intersection Projects

Project	Intersection	Project Description	Primary Need	Score	Funding Source	Cost $1,000's
I1	US 30/West Lane Rd.	Install roundabout or traffic signal Two westbound right-turn lanes Two southbound left-turn lanes	Capacity	Medium	ODOT	$1,000
I2	US 30/Gilmore Rd.	Install roundabout or traffic signal	Capacity	Medium	ODOT	$1,000
I3	West Lane Rd./Crown Zellerbach Rd.	Install traffic signal Southbound right-turn lane Northbound right-turn lane Westbound left-turn lane	Capacity	Medium	City	$950
I4	West Lane Rd./SE 4th St./E. Columbia Rd.	Install traffic signal Southbound right-turn lane OR install single-lane roundabout	Capacity	Medium	City	$500
I5	West Lane Rd./Honeyman Rd.	Install traffic signal Southbound left-turn lane Westbound right-turn lane Eastbound left-turn lane Westbound left-turn lane OR multi-lane roundabout	Capacity	Medium	City	$1,000
I6	US 30/Scappoose-Vernonia Hwy./Crown Zellerbach Rd.	2nd westbound left-turn lane	Capacity	Medium	ODOT	$645
I7	US 30/Old Portland Rd.	Convert to right-in/right-out only	Safety	Low	ODOT	$135

Project	Intersection	Project Description	Primary Need	Score	Funding Source	Cost $1,000's
I8	SE 6th St./High School Way	Convert to two-way stop control (SE 6th St. uncontrolled)	Capacity	Low	City	$4
I9	SW 4th St./E.M. Watts Rd.	Realign SW 4th Street to eliminate or improve offset. Convert to all-way stop control.	Safety	Medium	City	$335
I10	SE 3rd St./Elm St.	Convert to all-way stop control	Safety	High	City	$4
I11	SW 1st St./J.P. West Rd.	Extend southeast curb to better align east and west intersection approaches and provide shorter pedestrian crossing.	Safety	High	City	$20
I12	SE 6th St./Elm St.	Realign 6th Street to reduce skew angle. Realign 6th to reduce offset. Close private driveway on north side of intersection.	Safety	Medium	City	$500
I13	SW Keys Rd./E.M. Watts Rd./Eggleston Ln.	Tighten Keys Rd./E.M. Watts Rd. intersection. Realign Eggleston Ln. approximately 100 feet west of new intersection. Remove/realign existing 33060 SW Keys Rd. driveway to west of existing location. Realign 33076 SW Keys Rd. driveway to alternate access.	Safety	Medium	City	$700
I14	SW Keys Rd./J.P. West Rd.	Clear vegetation, install street lighting, investigate possibility of speed zone reduction on J.P. West Rd. (advance warning? Advisory speed signs?)	Safety	Medium	City	$60

Note: Projects listed in this table are representative of the types of improvements that are likely to be necessary at each of the study intersections. All future improvements on ODOT facilities will require further detailed evaluation to gain approval and determine design features prior to construction.

Driving Projects

An initial set of driving projects are listed below in Table 8 and illustrated in Figure 3. Projects are scored as high, medium, or low-priority. Only a few project stood out as high-priority projects (there are more medium-priority and low-priority projects because several projects had similar scores). A breakdown of the scoring for each project is available in the appendix. Planning level cost estimates are provided for comparison purposes.

Many of the new street projects are dependent on development and/or redevelopment of existing properties, especially in the north part of town where the urban growth boundary (UGB) has recently been expanded to provide more employment opportunities in Scappoose. A conceptual master plan will be required for large sites in the Airport Employment Overlay zones, which will specifically address street layout in that part of town. North Honeyman Road and Moore Road are within the airport's Runway Projection Zone (RPZ). Any modification to these roadways will require a "modification to standards" agreement from the FAA.

The descriptions for most driving projects are self-explanatory, although every project will require further detailed evaluation to gain approval and determine design features prior to construction. However, a more detailed explanation of projects D20 and D21 may be warranted. Each of these projects are related to traffic signals along the US 30 corridor in Scappoose. Project D20 provides for traffic signal timing and optimization, which will allow for the efficient flow of traffic (signal progression) through town. An element of this project that is being considered is an "advanced dilemma zone detection" system, which would extend the green time on US 30 when heavy vehicles (trucks) are detected approaching the intersection. This system would allow additional time to get through the intersection for vehicles that may not be able to stop in time (typically trucks), with a typical yellow time. This project is already funded through the ODOT ARTS (All Roads Transportation Safety) program and the City is working with ODOT on the design.

Project D21 would upgrade the traffic signals along the corridor to allow protected/permitted left-turn phasing, to make more efficient use of green time on US 30 when opposing volumes are light and left-turns could be made safely without a "protected" signal phase.

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 3

Proposed Motor Vehicle Projects

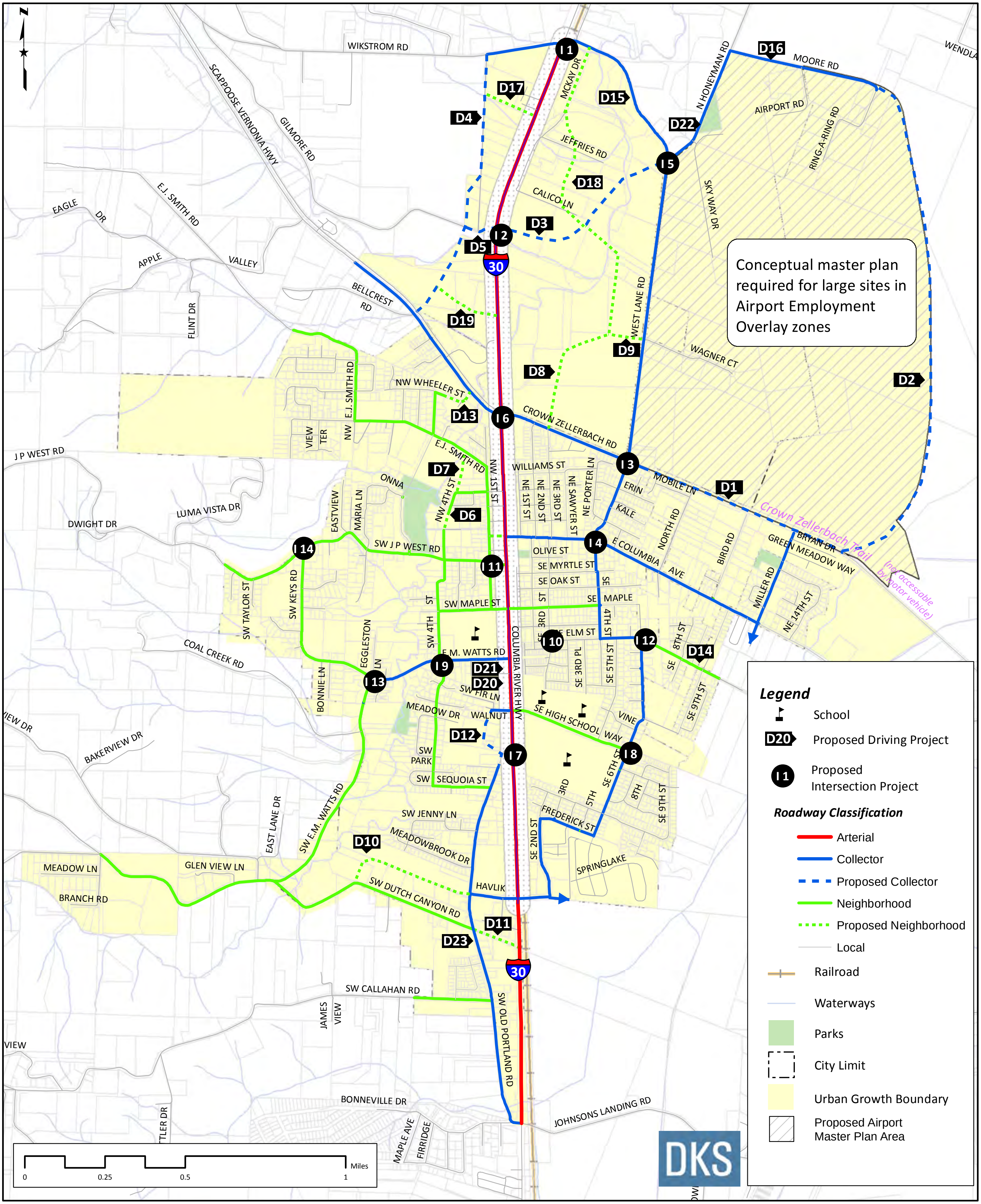


Table 8: Driving Projects

Project	Project Name	Project Description	Primary Need	Score	Funding Source	Cost ($1,000's)
D1	Crown Zellerbach Rd.	New street from West Lane Rd. to UGB	Connectivity	Medium	Development	$5,850
D2	Moore Rd. Extension	Extension from existing terminus along UGB to Crown Zellerbach Rd. extension	Connectivity	Medium	Development	$23,940
D3	Gilmore Rd.	New street from US 30 to West Lane Rd.	Connectivity/ Capacity	Medium	Development	$11,355
D4	New street	New street from Wikstrom Rd. to Scappoose-Vernonia Hwy	Connectivity	Medium	Development	$14,230
D5	Gilmore Rd. Improvement	Improvement of Gilmore Rd. to collector standards (west UGB to US 30)	Connectivity/ Capacity	Medium	Development	$655
D6	SW 4th St.	New street from Seely Ln. to just south of Meersburg St.	Connectivity	Low	City	$620
D7	NW 4th St.	New street from Laurel St. to E.J. Smith Rd.	Connectivity	Low	City	$1,220
D8	New Street	New neighborhood street from Gilmore Rd. to Crown Zellerbach Rd.	Connectivity	Low	Development	$8,950
D9	New Street	New neighborhood street from West Lane Rd. (opposite Wagner Ct.) to new neighborhood street (D8)	Connectivity	Low	Development	$1,120
D10	New Street	New street from Havlik Dr./Old Portland Rd. to Dutch Canyon Rd.	Connectivity	Low	Development	$4,150
D11	Dutch Canyon Rd.	Improve to neighborhood standards from Old Portland Rd. to US 30	Connectivity	Medium	City	$1,045

Project	Project Name	Project Description	Primary Need	Score	Funding Source	Cost ($1,000's)
D12	New Street	New street from Old Portland Rd. to Walnut St.	Connectivity/ Functional Classification	Low	Development	$3,255
D13	Wheeler St. Improvement	Improve Wheeler St. to neighborhood standards from NW 5th Street to Scappoose-Vernonia Hwy. along Blair Ln. alignment	Connectivity	Medium	City	$445
D14	SE Elm St. Improvement	Improve SE Elm St. to neighborhood standards from SE 6th St. to UGB	Safety/ Capacity	Medium	City	$1,160
D15	West Lane Rd. Improvement	Improve West Lane Rd. to collector standards from US 30 to Honeyman Rd.	Safety/ Capacity	High	Development	$5,930
D16	Moore Rd. Improvement	Improve Moore Rd. to collector standards from Honeyman Rd. to end	Safety/ Capacity	High	Development	$5,060
D17	New Street	New neighborhood street from new street to US 30	Connectivity	Low	Development	$1,680
D18	New Street	New neighborhood street from West Lane Rd. to Gilmore Rd.	Connectivity	Low	Development	$7,045
D19	New Street	New neighborhood street from US 30 to new collector (D4)	Connectivity	Low	Development	$2,105
D20	US 30 Corridor	Signal Timing and Phasing Optimization and Truck Signal Priority (partially funded by ODOT ARTS)	Capacity	High	ODOT/ ODOT ARTS	$600
D21	US 30 Corridor	Upgrade existing traffic signals to provide protective/permissive phasing	Safety/ Capacity	High	ODOT	$225
D22	Honeyman Rd.	Improve Honeyman Rd. to collector standards from West Lane Rd. to Moore Rd.	Safety/ Capacity	High	Development	$4,230

Preferred System Improvements

Priorities for implementing the preferred system improvements were determined based on the evaluation of alternative solutions (earlier in this technical memorandum), funding forecasts from Technical Memorandum #5 (and revised to include anticipated System Development Charge funds) and input provided from the public and agency staff. Updated funding information and initial project prioritization are summarized below.

Funding Availability

Historic and potential funding was reviewed in Technical Memorandum #4, with a future funding forecast based on average revenues and expenditures over the past five years. That analysis indicates that Scappoose would have about $166,000 available annually for capital improvements over the 20 year horizon, or about $3.7 million in total. This forecast assumes that $117,000 is collected annually for SDC's, or about $20.5 million in total. However, since detailed trip estimates have been forecasted over the planning horizon, SDC funds were estimated based on the existing SDC fees and the forecasted trips (e.g., housing, retail, service commercial and office uses) over the 20 year planning horizon. Estimated SDC funds are shown in Table 1 below. Between the $3.7 million from historic revenue sources and $20.5 million from SDCs, the city is expected to have about $24.2 million available for capital improvements over the 20-year planning horizon.

Table 9: Estimated System Development Charge Funding (2015 – 2035)

Category	Units	2013	2035	Growth	Average Rate/Unit (HH or Emp)	Total (2015 – 2035)
Housing	Households	2,773	4,490	1,717	$2,088	$3.3 million
Retail	Employees	550	1,798	1,248	$2,387	$2.7 million
Service Commercial	Employees	864	4,578	3,714	$3,913	$13.2 million
Office	Employees	1,156	4,690	3,534	$420	$1.3 million
Total						$20.5 million

ODOT has provided a preliminary funding estimate of $4 to 6 million over the 20 year planning horizon for projects on ODOT facilities (US 30) in Scappoose. In addition, ODOT has jurisdictionally blind grants for safety projects (ARTS funding)[3] that may be on or off of the state highway system. Scappoose could apply for additional grants to potentially increase the amount of funding available from ODOT.

[3] All Roads Transportation Safety program is a safety program to address safety needs on all public roads in Oregon.

Financially Constrained Projects

Projects for each mode were scored as high/medium/low as described previously in this memorandum. In addition, input from staff, the public and city officials was considered and changed the prioritization of some projects. The planning level cost estimates of projects with a "high" ranking were compared to anticipated funding availability over the 20-year period. Additional projects were added or removed to balance the cost estimates with the available funding. Changes to the initial project rankings are summarized by mode below, followed by tables summarizing the financially constrained project lists by mode.

Changes to Project Prioritization

A number of project rankings were changed based on input provided by various parties involved with the project and several new projects were added. Changes to motor vehicle prioritization were made based on concerns raised at the CAC regarding access to US 30 with future development in Scappoose and numerous comments on the project website regarding the safety at the SE 6th Street/Elm Street intersection. It was determined that project I5 could be developer funded, rather than City funded, likely through a master plan development agreement. The Wheeler Street improvement was elevated to high priority based on CAC input indicating the need for an outlet for the neighborhood off of E.J. Smith Road.

Bicycle projects were not previously ranked high/medium/low since the evaluation criteria used resulted in very similar rankings for all bicycle projects. The projects listed below were determined to be high priority based on concerns at the CAC for providing alternate routes to US 30 and by focusing on less expensive retrofit projects that are likely to produce the best "bang for the buck." In addition, walking projects that were assumed to be constructed in conjunction with a bike facility were packaged with the corresponding bicycle project, elevating the bicycle project's ranking to "High" priority (e.g. B1, B10 and B17). Project B22 was expanded from its original limits, including sections north of Columbia and south of E.M. Watts.

Walking project W3 was moved from high to medium since a sidewalk would not be feasible without available right-of-way for a new street. This project would be constructed by development and will be built when the area develops.

Changes to prioritization are summarized below [previous ranking to current ranking]:

- Motor Vehicle Projects

  Intersection Projects
  - I1 – US 30 / West Lane Rd. – Install roundabout or traffic signal and add turn lane capacity [Medium to High]
  - I5 – West Lane Rd./Honeyman Road – Install traffic signal and add turn lane capacity [Medium to High]
  - I6 – US 30/Scappoose-Vernonia Highway/Crown Zellerbach Road – Add 2nd westbound left-turn lane. [Medium to High]
  - I12 – SE 6th Street/Elm Street – Realign 6th Street to intersect with Elm in "T" configuration, realign Elm Street as necessary [Medium to High]

  Driving Projects
  - D13 – Wheeler Street Improvement - Improve to neighborhood standards from NW 5th Street to Scappoose-Vernonia Hwy. along Blair Ln. alignment [Medium to High]
  - D23 – Old Portland Road – Upgrade to Collector standard from US 30 (south end) to D12. [New Project – High]
  - D24 – JP West Improvement - upgrade to collector standards from 2nd Street to 4th Street [New Project – High]
  - D25 – W. Columbia Ave. – Conduct feasibility study for converting to two-way traffic and modification of the US 30/Columbia Ave. signal to include a pedestrian/bicycle crossing on the south leg of the intersection. [New Project - High]

- Bicycle Projects
  - B1 – Old Portland Road from terminus of existing bike lanes (near Holland Dr.) to new street – Widen [not ranked to High]
  - B3 – Walnut Street from new street to US 30 – Retrofit [not ranked to High]
  - B4 – West Lane Road – E. Columbia Avenue to Crown Zellerbach Road – Retrofit [not ranked to High]
  - B10 – E.M. Watts Road from US 30 to Eggleston Ln./Keys Road – Retrofit/widen [not ranked to High]
  - B11 – E. Columbia Avenue – US 30 to West Lane/SE 4th Street – Retrofit [not ranked to High]
  - B17 – SE 4th Street from Elm Street to E. Columbia Avenue – Widen [not ranked to High]
  - B18 – SE Elm Street from SE 6th Street to SE 4th Street – Widen [not ranked to High]
  - B19 – SE 6th Street from Frederick Street to SE Elm Street – Retrofit/widen [not ranked to High]
  - B22 – West Scappoose Bike Route – Sign bike route on west side of US 30 between Scappoose-Vernonia and Columbia Avenue (via NW 1st St. – requires a development-

funded pedestrian/bike connection) and between Columbia Avenue and E.M. Watts Road and from E.M. Watts Road to Old Portland Road via SW 4th Street and SW Sequoia Street – signing/striping only [not ranked to High]
    - B23 – High School Way – Retrofit – signing/striping only [New Project - High]
    - B24 – Maple Street – Retrofit – signing/striping only [New Project - High]
- Walking Projects
    - W3 – New Collector Street – Old Portland Road to Walnut Street – Construct new street [High to Medium]

Recommended Financially Constrained Projects

Table 10: Financially Constrained Sidewalk Projects

Project	Project Name	Project Description	Primary Need	Funding Source	Cost ($1,000's)
W2	Old Portland Rd.	Complete sidewalk system between Jenny Ln. and US 30	Fills Gap	City (70%)/ Development (30%)	D23
W5	E.M. Watts Rd.	Complete sidewalk system between US 30 and SW 4th St.	Fills Gap	City	$255
W6	E.M. Watts Rd.	Complete west side sidewalk between SW 4th St. to Keys Rd.	Fills Gap	City	B10
W8	J.P. West Rd.	Complete sidewalk system between Keys Rd. and SW 4th St.	Fills Gap	City (70%)/ Development (30%)	$1,115
W9	J.P. West Rd.	Complete sidewalk system between SW 4th St. and US 30	Fills Gap	City	$110
W10	SW 4th St.	E.M. Watts Rd. to J.P. West Rd.	Fills Gap	City	$840
W11	SW Maple St.	Complete sidewalk system between US 30 and SW 4th St.	Fills Gap	City	$375
W12	SW 1st St.	SW Maple St. to J.P. West Rd.	Fills Gap	City	$360
W13	High School Way	Complete sidewalk on north side between existing sidewalk and SE 6th St.	Fills Gap	City	$295
W14	SE Vine St.	Grant Watts Elementary School to SE 6th St.	School	City	$310
W15	SE 3rd Pl.	Grant Watts Elementary School to SE Elm St.	School	City	$505
W16	SE Elm St.	Complete sidewalk system from SE 3rd St. to east UGB	Fills Gap	City	$760
W17	SE 6th St.	Complete sidewalk system between Vine St. and Elm St.	Fills Gap	City (60%)/ Development (40%)	B19

Project	Project Name	Project Description	Primary Need	Funding Source	Cost ($1,000's)
W18	SE Maple St.	Complete sidewalk system between US 30 and SE 4th St.	Fills Gap	City	$610
W19	SE 4th St.	Elm St. to E. Columbia Ave.	Fills Gap	City	B17
W20	E. Columbia Ave.	Complete sidewalk system between US 30 and SE 4th St./West Lane Rd.	Fills Gap	City	$440
W23	E.J. Smith Rd.	NW 1st St. to Bella Vista Dr.	Fills Gap	City (40%)/ Development (60%)	$1,865
W25	Scappoose-Vernonia Hwy.	US 30 to west UGB (south side only)	Fills Gap	City	$575
W40	US 30	Havlik Drive to High School Way	Fills Gap	ODOT	$1,615
W41	5th Street	High School Way to Vine Street	Fills Gap	City	$385
W42	3rd Street	Elm Street to Columbia Avenue	Fills Gap	City	$930
City Cost Total					*$8.3 million*
Development Cost Total					*$1.5 million*
ODOT Cost Total					*$1.6 million*
Financially Constrained Walking Projects Cost Total					**$11.4 million**

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 4

Financially Constrained Pedestrian Facilities

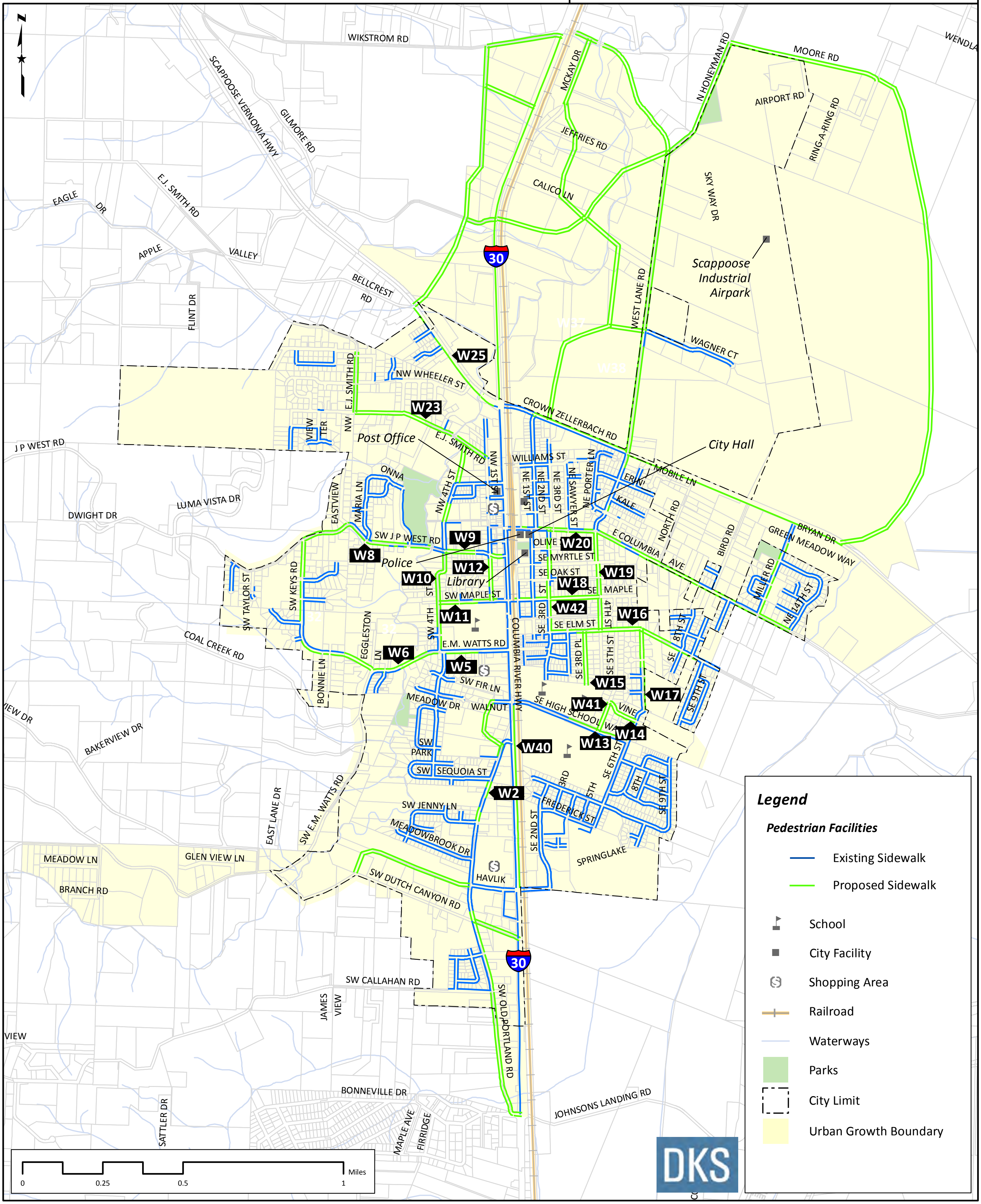


Table 11: Financially Constrained Bicycling Projects

Project	Project Location	Project Description	Potential Treatment	Project Type	Funding Source	Cost ($1,000's)
B1	Old Portland Rd.	Holland Dr. (terminus of existing bike lanes) to new street (includes W2)	Bike lanes	Widen	City (70%)/ Development (30%)	D23
B3	Walnut St.	New street to US 30	Bike lanes	Retrofit	Development	$3
B4	West Lane Rd.	E. Columbia Ave. to Crown Zellerbach Rd.	Bike lanes	Retrofit	City	$15
B10	E.M. Watts Rd.	US 30 to Eggleston Ln./Keys Rd. (includes W6)	Shared Lane	Retrofit/ Widen	City	$1,445
B11	E. Columbia Ave.	US 30 to West Lane/SE 4th St.	Shared Lane	Retrofit	City	$15
B17	SE 4th St.	Elm St. to E. Columbia Ave. (includes W19)	Shared Lane	Widen	City	$1,785
B18	SE Elm St.	SE 6th St. to SE 4th St.	Shared Lane	Widen	City	$965
B19	SE 6th Street	Frederick St. to SE Elm St.	Shared Lane	Retrofit/ Widen	City	$1,895
B22	West side of Scappoose	Sign bike route on west side of US 30 between Scappoose-Vernonia Hwy. and Columbia Ave. (via NW 1st St. – requires a development ped/bike connection), Columbia Ave. and E.M. Watts (cross US 30 as pedestrian at Columbia Ave.) and between E.M. Watts and Old Portland Rd. via SW 4th St.	Signage	Retrofit	City (50%)/ Development (50%)	$180

Project	Project Location	Project Description	Potential Treatment	Project Type	Funding Source	Cost ($1,000's)
		and SW Sequoia St.				
B23	High School Way	US 30 to SE 6th Ave.	Shared Lane	Retrofit	City	$20
B24	Maple Street	SW 4th St. to SE 4th St.	Shared Lane	Retrofit	City	$25
City Cost Total						*$6.3 million*
Development Cost Total						*$0.1 million*
Financially Constrained Bicycle Project Cost Total						**$6.4 million**

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 5

Financially Constrained Bicycle Facilities

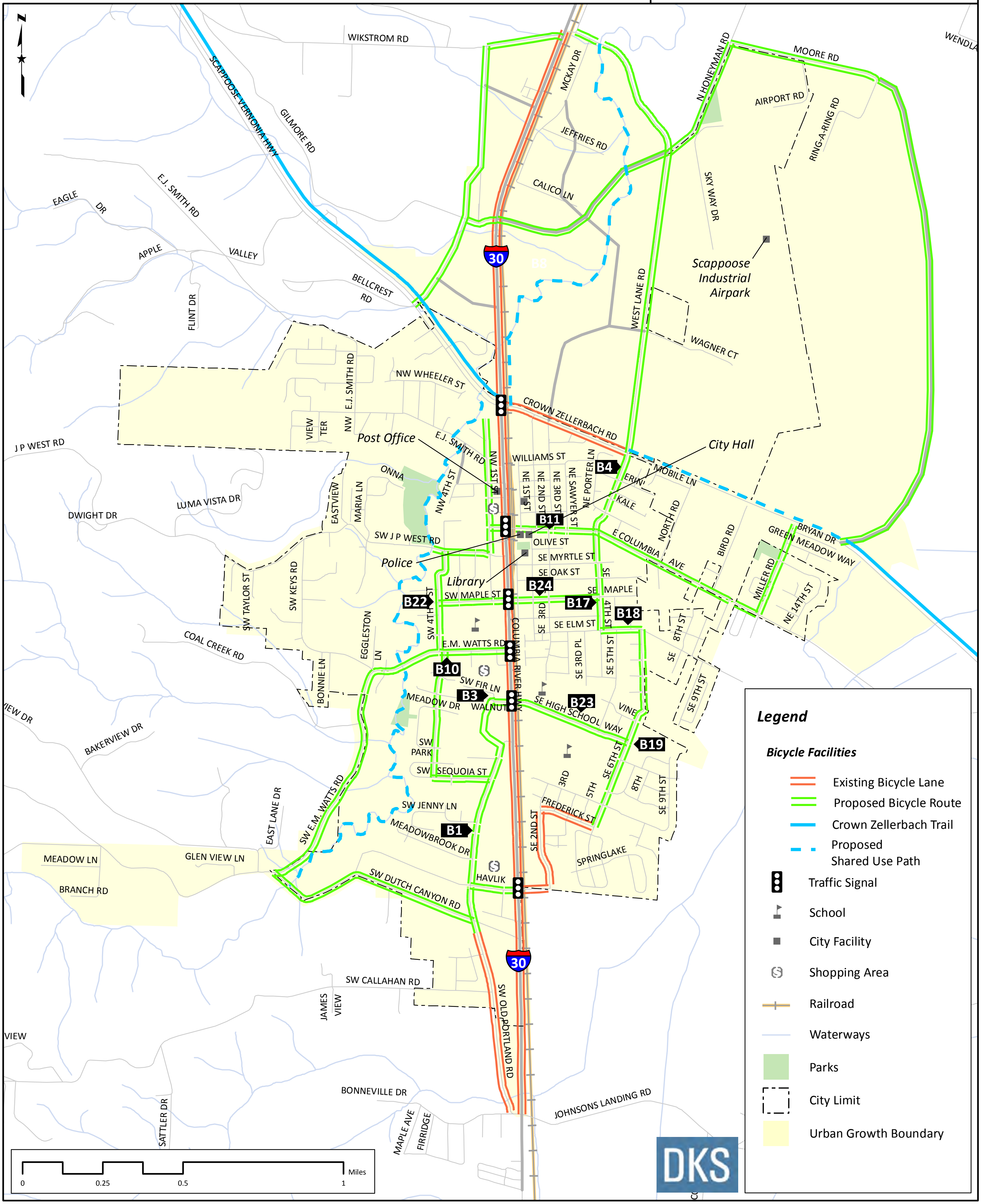


Table 12: Financially Constrained Motor Vehicle Projects

Project	Intersection	Project Description	Primary Need	Funding Source	Cost ($1,000's)
Intersection Projects					
I1	US 30/West Lane Rd.	Install roundabout or traffic signal (with two westbound right-turn lanes and two southbound left-turn lanes)	Capacity	ODOT	$1,000
I5	West Lane Rd./ Honeyman Rd.	Install roundabout or traffic signal (with southbound left-turn lane, westbound right-turn lane, eastbound left-turn lane, westbound left-turn lane)	Capacity	Development	$1,000
I6	US 30/Scappoose-Vernonia Hwy./ Crown Zellerbach Rd.	2nd westbound left-turn lane	Capacity	ODOT	$645
I10	SE 3rd St./Elm St.	Convert to all-way stop control	Safety	City	$4
I11	SW 1st St./ J.P. West Rd.	Extend southeast curb to better align east and west intersection approaches and provide shorter pedestrian crossing.	Safety	City	$20
I12	SE 6th St./Elm St.	Realign 6th Street to reduce skew angle. Realign 6th to reduce offset. Close private driveway on north side of intersection.	Safety	City	$975
Driving Projects					
D13	New Street	Improve Wheeler Street to neighborhood standards from NW 5th St. to Scappoose-Vernonia Hwy.	Connectivity/ Functional	Development	$445
D15	West Lane Rd. Improvement	Improve West Lane Rd. to collector standards from US 30 to Honeyman Rd., includes bridge reconstruction and realignment at US 30	Safety/ Capacity	Development	$5,930
D16	Moore Rd. Improvement	Improve Moore Rd. to collector standards from Honeyman Rd. to end	Safety/ Capacity	Development	$5,060

Project	Intersection	Project Description	Primary Need	Funding Source	Cost ($1,000's)
D20	US 30 Corridor	Signal Timing and Phasing Optimization and Truck Signal Priority	Capacity	ODOT	$600
D21	US 30 Corridor	Upgrade existing traffic signals to provide protective/permissive phasing	Safety/ Capacity	ODOT	$225
D22	Honeyman Rd.	Improve Honeyman Rd. to collector standards from West Lane Rd. to Moore Rd.	Safety/ Capacity	Development	$4,230
D23	Old Portland Rd.	Upgrade to collector standards from US 30 (south end) to D12	Safety/ Capacity	City (60%)/ Development (40%)	$10,770
D24	JP West Rd.	Upgrade to collector standards between SW 2nd St. and SW 4th St.	Safety/ Capacity	City (55%)/ County (45%)	$1,610
D25	W. Columbia Ave.	Study to determine feasibility of converting W. Columbia Ave. to two-way traffic, including signal modification at US 30/Columbia Ave.	Connectivity	City	$50
City Cost Total					*$8.4 million*
Development/Other Cost Total					*$21.7 million*
ODOT Cost Total					*$2.5 million*
Financially Constrained Motor Vehicle Projects Cost Total					**$32.6 million**

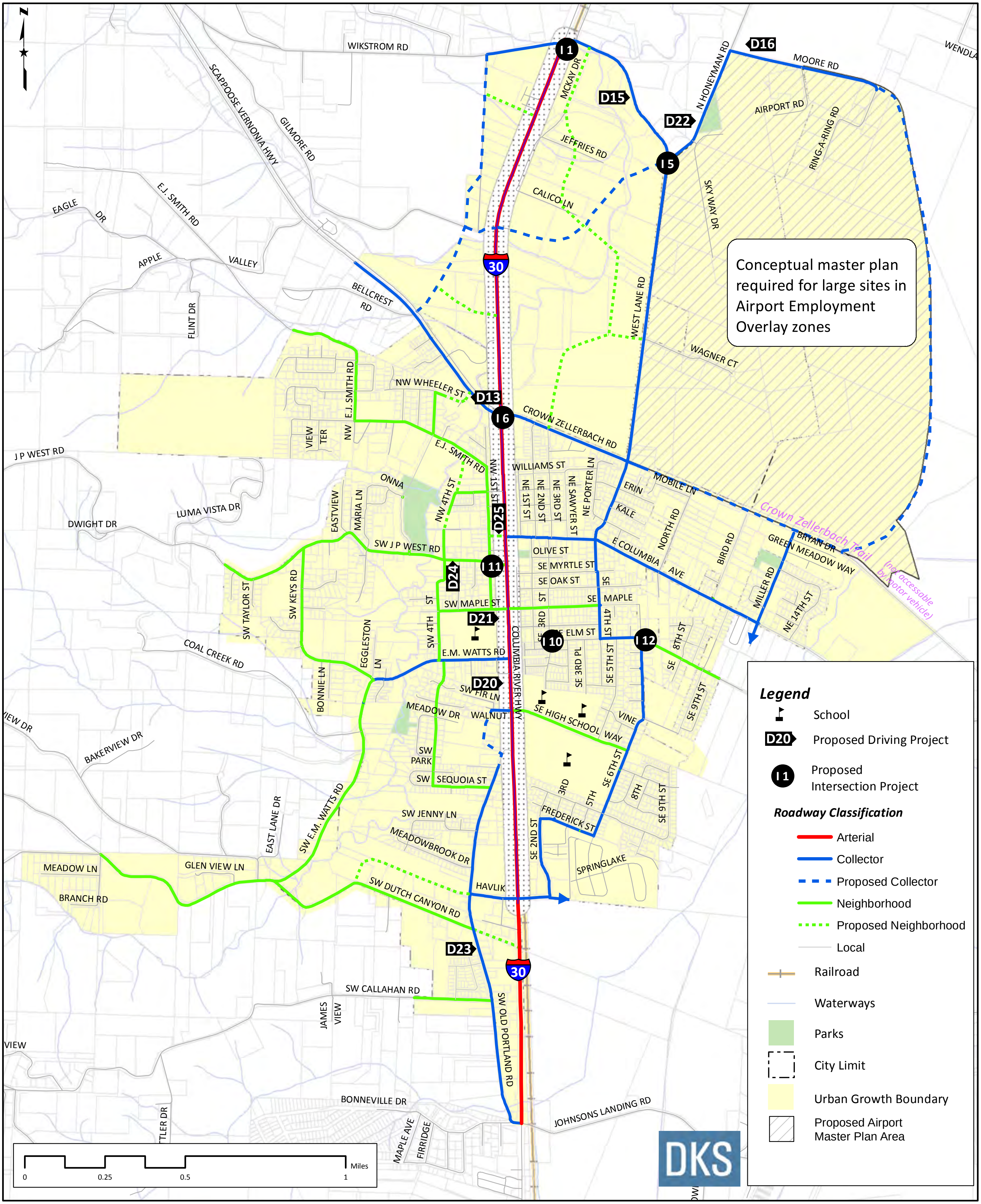
Note: Projects listed in this table are representative of the types of improvements that are likely to be necessary at each of the study intersections. All future improvements on ODOT facilities will require further detailed evaluation to gain approval and determine design features prior to construction.

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 6

Financially Constrained Motor Vehicle Projects



Financially Constrained Project Cost Summary

Cost estimates for the financially constrained project list are summarized in Table 13 below, including about a $4.1 million ODOT share, a $23 million expected City share, and about $23.3 million of the "high priority" projects are expected to be developer/other funded (e.g. frontage improvements, county funded). These costs match anticipated funding levels over the 20-year planning horizon fairly closely and represent the "financially constrained" project list.

Table 13: Cost Estimates by Jurisdiction and Mode

Mode	ODOT Cost	City Cost	Development/ Other Cost	Total Cost
Walking	$1.6 million	$8.3 million	$1.5 million	$11.4 million
Biking	$0	$6.3 million	$0.1 million	$6.4 million
Motor Vehicle	$2.5 million	$8.4 million	$21.7 million	$32.6 million
Total	**$4.1 million**	**$23.0 million**	**$23.3 million**	**$50.4 million**
Estimated Available Funds*	**$4-6 million**	**$24.2 million**		

* Estimated available funds summarized previously in "Funding Availability" section (page 25)

These "high priority" projects represent only about a quarter of the needs identified for Scappoose over the planning horizon. Approximately $184 million worth of improvements have been identified. Additional projects could be funded if the city chooses to pursue increased SDC rates or other funding opportunities (e.g. gas tax, street utility fee, local improvement districts, etc.).

Even assuming the financially constrained projects are built over the planning horizon, a number of intersections will still fail to meet ODOT's mobility standards. The project team and community decided that US 30 would not be expanded beyond the existing five-lane cross-section, and grade separation would not be considered, due to funding constraints and the desire to minimize impacts on the community. Since the reasonable improvements have been identified would not fully mitigate the intersections to meet the standards, alternate mobility standards are being recommended. The alternate mobility standard process is described below.

Alternative Mobility Standards

Alternative mobility standards are being requested for a number of intersections on US 30. All feasible mitigations (assumes the financially constrained project list identified previously) were tested, and it was determined that these intersections could not meet current mobility standards without significant improvements that are either (1) not likely to be funded over the plan horizon, or (2) have impacts that may not be desirable for the community. Many of these intersections are expected to have traffic volume that exceeds capacity for more than one hour during the day.

There are several steps in the process to identify the appropriate alternative mobility standard, which are briefly summarized as follows:

- 30th Highest Hour volumes (30 HV) with planned improvements
    - financially constrained project list, compared with existing mobility targets
- 30 HV volumes with planned improvements, compared with v/c < 1.0
    - assumes the maximum intersection capacity
- Average weekday p.m. peak hour volumes, compared with v/c < 1.0
- Peak congestion spreading
    - assumes that any vehicles that exceed the intersection capacity will shift their commute either before or after the p.m. peak hour. If the second peak hour (1/2 hour before and after the p.m. peak hour) still exceeds capacity, vehicles are shifted to the third peak hour, etc.

As part of the alternative mobility standard request, the level of alternative mobility standard required or the duration of the peak congestion spreading was estimated. Table 14 summarizes the intersections for which an alternative mobility standard is being requested, as well as the expected duration that the demand will exceed the capacity. More details on the methodology used to assess congestion are included in the *Alternative Mobility Targets* memorandum in the appendix.

Table 14: Alternative Mobility Standard Requests and Expected Peak Spreading with Planned Improvements in Place

Intersection	Meets 30 HV V/C Target?	Meets 30 HV V/C < 1.0?	Meets Average PM Peak Hour V/C < 1.0?	Estimated Duration of Peak Congestion Spreading
Signalized Intersections				
US 30/Wikstrom Rd/West Lane Rd	No	No	Yes	
US 30/Scappoose-Vernonia Hwy	No	No	No	5 hours
US 30/E. Columbia Ave	No	No	No	6 hours
US 30/Maple St	No	No	No	5 hours
US 30/E.M. Watts Rd	No	No	No	4 hours
US 30/High School Wy	No	No	Yes	
US 30/Havlik Dr	No	No	No	5 hours

Appendix

Evaluation Criteria and Scoring

Scappoose TSP Evaluation Criteria and Scoring

Evaluation Criteria	Evaluation Score	
Goal 1: Health and Safety		
Active Transportation Increases active transportation options (e.g., walking, biking)	+2	Improves both walking and biking
	+1	Improves walking or biking, but not both
	0	No change
	-1	Negative impact on walking and biking
	-2	Significant negative impact on walking and biking
Safety Increases safety of the transportation system (e.g., street lighting, emergency vehicle access, improve sight distance)	+2	Significantly improves safety for all road users
	+1	Improves safety for some road users
	0	No change
	-1	Improves safety for some road users, but reduces safety for other road users
	-2	Reduces safety for all road users
Response Times Improves emergency vehicle response times	+2	Improves response times and efficiency system wide
	+1	Improves response times and efficiency in localized areas
	0	No change
	-1	Reduces response times and efficiency in localized areas
	-2	Reduces response times and efficiency system wide
Goal 2: Transportation System Management		
Improves Travel Reliability Improves daily travel reliability/consistency.	+2	Significantly improves travel reliability/consistency
	+1	Somewhat improves travel reliability/consistency
	0	No change
	-1	Reduces travel reliability/consistency
	-2	Significantly reduces travel reliability/consistency
Enhances Travel for Local Trips off US 30 Provides improvements that encourage local trips to occur off of US 30	+2	Significantly improves roadway system off of US 30 for local trips
	+1	Improves roadway system off of US 30 for local trips
	0	No change
	-1	Discourages local trips from using roadway system off of US 30
	-2	Significantly discourages local trips from using roadway system off of US 30
Goal 3: Travel Choices		
Pedestrian/Bicycle Access Adds bikeways and walkways that fill in system gaps, improve connectivity, and are accessible to all users.	+2	Significantly improves pedestrian/bicycle access and connectivity
	+1	Improves pedestrian/bicycle access and connectivity
	0	No change
	-1	Negatively impacts pedestrian/bicycle access and connectivity

Evaluation Criteria	Evaluation Score	
	-2	Significant negative impacts on pedestrian/bicycle access and connectivity
<u>Encourages Pedestrian/Bicycle/Transit Use</u> Improves the basic provision of services to encourage higher levels of usage for walking, biking and transit trips	+2	Significantly improves pedestrian/bicycle/transit access and connectivity
	+1	Improves pedestrian/bicycle/transit access and connectivity
	0	No change
	-1	Negatively impacts pedestrian/bicycle/transit access and connectivity
	-2	Significant negative impacts on pedestrian/bicycle/transit access and connectivity
<u>Promotes Transit</u> Improves user experience and comfort to encourage higher levels of transit ridership (e.g., provide benches, shelters, lighting, schedules)	+2	Significantly improves amenities, facilities or coverage for transit
	+1	Improves amenities, facilities or coverage for transit
	0	No change
	-1	Negative impact on amenities, facilities or coverage for transit
	-2	Significantly negative impacts on amenities, facilities or coverage for transit
Goal 4: Economic Vitality		
<u>Protects Existing Land Uses</u> Minimizes negative impacts to existing land uses.	+2	Significantly minimizes negative impact on existing land uses
	+1	Minimizes negative impact on existing land uses
	0	Does not impact existing land uses
	-1	Increases negative impact on existing land uses
	-2	Significantly increases negative impact on existing land uses
<u>Freight Access/Reliability</u> Improves freight access and travel reliability.	+2	Significantly improves freight facilities and travel reliability
	+1	Improves freight facilities an travel reliability
	0	No change
	-1	Negatively impacts freight facilities and travel reliability
	-2	Significantly negatively impacts freight facilities and travel reliability
Goal 5: Livability		
<u>Reduces Cut-Through Traffic</u> Reduces or discourages through vehicle trips in residential neighborhoods	+2	Significantly discourages cut-through traffic
	+1	Discourages cut-through traffic
	0	No change

Evaluation Criteria	Evaluation Score	
	-1	Increases cut-through traffic
	-2	Significantly increases cut-through traffic
Access to Community Amenities Increases connections or access to community amenities.	+2	Significantly improves access to commercial and destination uses
	+1	Improves access to commercial and destination uses
	0	No change
	-1	Reduces access to commercial and destinations uses
	-2	Significantly reduces access to commercial and destination uses
Street Aesthetics Enhances street aesthetics (e.g., landscaping, decorative lighting)	+2	Significantly improves street aesthetics
	+1	Improves street aesthetics
	0	No change
	-1	Detracts from street aesthetics
	-2	Significantly detracts from street aesthetics
Trucks Outside Industrial Areas Reduces impacts from heavy vehicles and trucks outside of industrial areas.	+2	Improvements encourage trucks to stay within industrial areas
	+1	Allows trucks to stay within industrial areas
	0	No change
	-1	Trucks somewhat encouraged to travel outside of industrial areas
	-2	Trucks unable to stay within industrial areas
Goal 6: Sustainable Transportation System		
Environment Protects environmentally sensitive areas.	+2	Significantly enhances the natural environment
	+1	Enhances the natural environment
	0	No change
	-1	Negatively impacts the natural environment
	-2	Negatively impacts the natural environment in significant ways
Alternatives to SOV (Single Occupant Vehicle) Increases alternatives to single-occupant vehicle travel.	+2	Serves more than two travel modes
	+1	Serves more than one travel mode
	0	Serves single travel mode
	-1	Serves single travel mode, but has a negative impact on another
	-2	Serves single travel mode, but has negative impact on more than one travel mode

Evaluation Criteria	Evaluation Score	
Reduce VMT per Capita Emphasizes the movement of people over vehicles, which reduces the citywide vehicle-miles-travelled (VMT) per capita.	+2	Significantly reduces vehicle miles traveled
	+1	Reduces vehicle miles traveled
	0	No change
	-1	Increases vehicle miles traveled
	-2	Significantly increases vehicle miles traveled
Diverse Land Use Supports a diverse set of land use types, including potential mixed use and/or increased density.	+2	Significantly improves pedestrian/bicycle/transit access/connectivity
	+1	Improves pedestrian/bicycle/transit access/connectivity
	0	No change
	-1	Reduces pedestrian/bicycle/transit access/connectivity
	-2	Significantly reduces pedestrian/bicycle/transit access/connectivity
Goal 7: Fiscal Responsibility		
Maximize Existing Facilities Maximizes existing facilities/minimizes need for new facilities.	+2	Significantly improves efficiency of existing facilities
	+1	Improves efficiency of existing facilities
	0	No change
	-1	Decreases efficiency of existing facilities
	-2	Significantly decreases efficiency of existing facilities
Transportation Costs Has a high likelihood of funding availability.	+2	Likely to have funding available (e.g., growth areas, adjacent development, grants, etc.)
	+1	Somewhat likely to have funding available
	0	No change
	-1	Possible funding available
	-2	Unlikely to have funding available (e.g., retrofit in existing developed area)
Goal 8: Equitable Transportation System		
Serves Underserved or Vulnerable Populations Improves access and mobility to underserved or vulnerable populations (e.g., children, elderly, low income).	+2	Significantly improves access and mobility to underserved or vulnerable populations
	+1	Improves access and mobility to underserved or vulnerable populations
	0	No change
	-1	Reduces access and mobility to underserved or vulnerable populations
	-2	Significantly reduces access and mobility to underserved or vulnerable populations

Evaluation Criteria		Evaluation Score
Goal 9: Coordinate Transportation Planning		
Plan and Policy Compatibility Compatible with plans and policies of other jurisdictions, including ODOT, Columbia County and adjacent cities	+2	Compatible with all plans and policies of other jurisdictions
	+1	Compatible with most plans and policies of other jurisdictions
	0	No change
	-1	Requires change from plans and policies of other jurisdictions
	-2	Requires significant change from plans and policies of other jurisdictions
Standard Consistency Consistent with the standards of the City, County and State	+2	Consistent with all standards of the City, County and ODOT
	+1	Consistent with most standards of the City, County and ODOT
	0	No change
	-1	Requires some deviations from City, County and/or ODOT standards
	-2	Inconsistent with standards of the City, County and/or ODOT and not likely to be approved

Section K

Memo 10: Transportation Standards

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Scappoose Transportation System Plan Update

Technical Memorandum #10: Transportation Standards

Prepared by Reah Flisakowski, P.E. and Julie Sosnovske, P.E., DKS Associates

January 6, 2016

This document provides an overview of the street system standards in Scappoose. Standards and regulations were developed to ensure future development or redevelopment of property is consistent with the vision of the transportation system in Scappoose.

Functional Classification System

Functional classification of roadways is a common practice in the United States. Traditionally, a roadway is classified based on the type of vehicular travel it is intended to serve (local versus through traffic). In Scappoose, the functional classification of a roadway determines the level of mobility for all travel modes, defining its level of access and usage within the city and region. The proposed functional classification of roadways was developed following a detailed review of the existing Scappoose and Columbia County functional classification systems.[1] To the extent possible, arterials were designated at one-mile intervals and collectors at half-mile intervals. Since the one state highway in Scappoose (US 30) serves regional travel through the city, it was designated as an Arterial Street. Streets providing primary access to neighborhoods and activity generators in Scappoose were designated as collectors or neighborhood routes, while all other streets were classified as local streets. Also, a proposed framework roadway system was developed within the TSP study area. Substantial changes were relative to the City's previous functional classification system. The proposed functional classification for existing and future roadways is shown in Figure 1.

[1] *Scappoose Transportation System Plan*, David Evans and Associates, October 1997. *Columbia County Rural Transportation System Plan*, June, 1998.

The street functional classification system recognizes that individual streets do not act independently of one another but instead form a network that works together to serve travel needs on a local and regional level. From highest to lowest intended usage, the classifications are arterials, collectors, neighborhood routes and local streets. Roadways with a higher intended usage generally provide more efficient motor vehicle traffic movement (or mobility) through the city, while roadways with lower intended usage provide greater access for shorter trips to local destinations.

- **Arterial Streets** in Scappoose are limited to the state highway (US 30) which is intended to move traffic through the city and is oriented north and south through the center of Scappoose. It experiences higher traffic volumes and connects to locations outside of the city, such as St. Helens to the north and Portland to the south. Similarly, this is the primary route that visitors use to reach Scappoose. Posted speed limits on US 30 range from 35 to 55 miles per hour, with the higher speeds posted in less developed areas and lower speeds in areas with more activity such as the downtown core. All design standards on US 30 are set by ODOT as the road authority.
- **Collector Streets** often connect the neighborhoods and major activity generators in Scappoose to arterial roadways. These roadways provide greater accessibility to neighborhoods and provide efficient through movement for local traffic. Arterials and major collector facilities are required by state law to provide bicycle facilities.[2] Posted speeds on collector roadways are typically 25 to 35 miles per hour. Due to physical constraints west of US 30, collector streets are limited.
- **Neighborhood Routes** are similar to collector streets in that they provide greater accessibility to neighborhoods and provide efficient through movement for local traffic. While some may interpret the term "neighborhood" to imply residential land use, this classification refers to a level of connectivity for any land use type, including commercial and/or industrial land uses. Neighborhood routes are not required to provide bicycle facilities. Therefore, routes with relatively low traffic volumes, where bikes could travel comfortably in a shared lane environment, would be designated neighborhood routes. Posted speeds on neighborhood routes are typically 25 to 30 miles per hour.
- **Local Streets** provide more direct access to residences and businesses in Scappoose. These roadways are often lined with driveways and are designed to serve lower traffic volumes and posted speeds of 25 miles per hour.

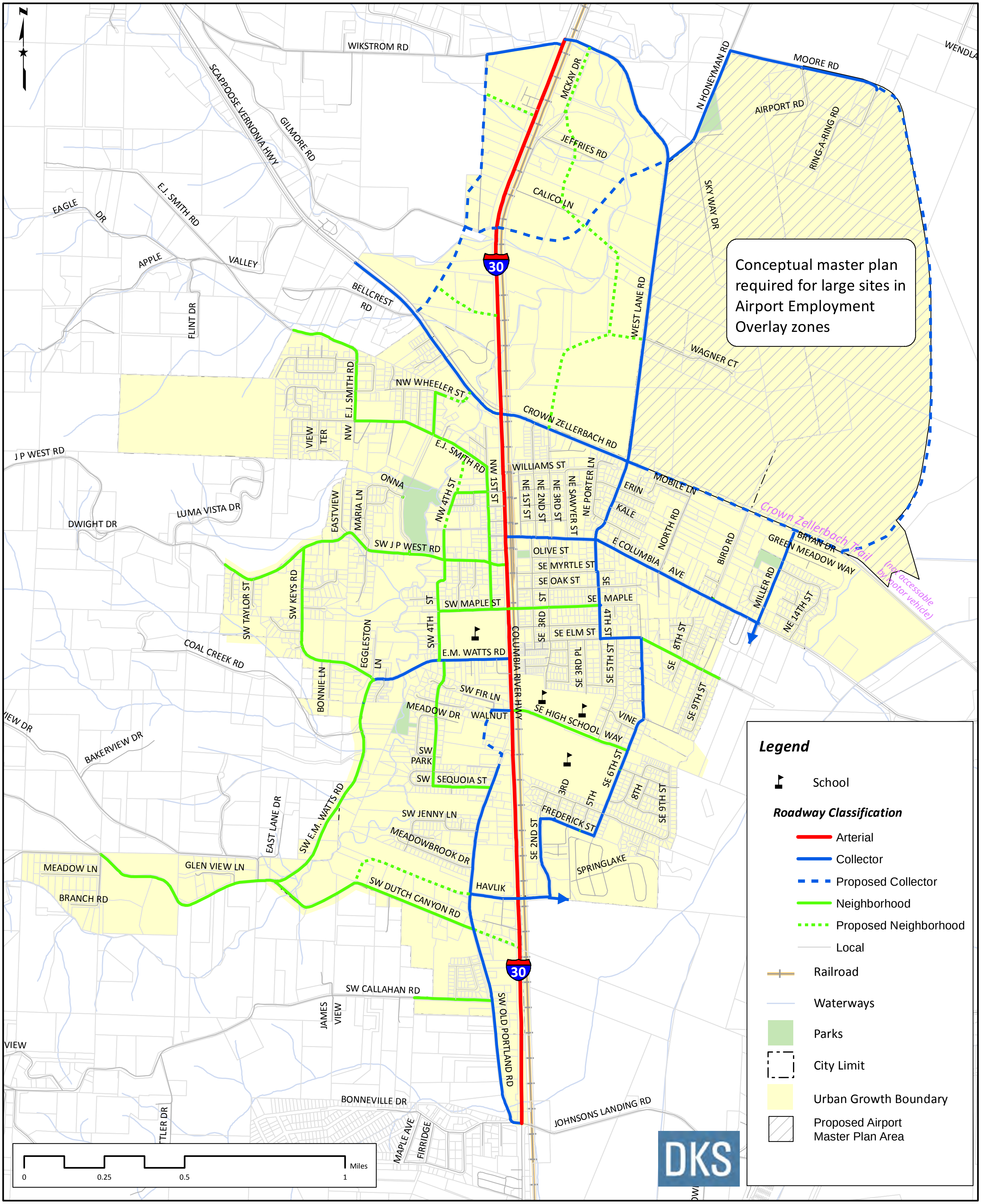
[2] Transportation Planning Rule, OAR 660-012-0045 (3)(b)(B).

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 1

Proposed Roadway Functional Classification



Roadway and Access Spacing Standards

Access spacing along Scappoose streets is managed through access spacing standards. Access management is a broad set of techniques that balance the need to provide efficient, safe, and timely travel with the ability to allow access to individual destinations. Proper implementation of access management techniques will reduce congestion and accident rates, and may lessen the need for additional highway capacity.

Table 1 identifies the minimum and maximum public street intersection and minimum private access spacing standards for streets in Scappoose. Within developed areas of the city, streets not complying with these standards could be improved with strategies that include shared access points, access restrictions (through the use of a median or channelization islands) or closed access points as feasible. New streets or redeveloping properties must comply with these standards, to the extent practical (as determined by the City). Note that driveway spacing requirements are different for streets with residential frontage than for streets with commercial and/or industrial frontage. Residential access to collector streets should be provided only if alternate access is not feasible. Table 2 lists the access spacing standards for US 30.

Table 1: Scappoose Access Spacing Standards

	Functional Classification			
	Arterial	**Collector**	**Neighborhood**	**Local**
Maximum Block Size (Public Street to Public Street)*	See Table 2	530 ft.	530 ft.	530 ft.
Minimum Block Size (Public Street to Public Street)		300 ft.	150 ft.	100 ft.
Minimum Driveway Spacing (Public Street to Driveway and Driveway to Driveway) – Commercial or Industrial		100 ft.	100 ft.	45 ft.
Minimum Driveway Spacing (Public Street to Driveway and Driveway to Driveway) – Residential		45 ft.**	45 ft.	N/A.

* If the maximum block size is exceeded, mid-block pedestrian and bicycle accessways should be provided at spacing no more than 330 feet, unless the connection is impractical due to existing development, topography, or environmental constraints.
** Only if alternate access is not feasible.

Table 2: Highway Access Spacing Standards

ODOT Facility	Speed Zone	Minimum Driveway Spacing *
US 30		
South City Limits to north of Havlik Drive	45 mph	800 feet
North of Havlik Drive to North of Crown Zellerbach/Scappoose-Vernonia Highway	35 mph	500 feet
North of Crown Zellerbach/Scappoose-Vernonia Highway to North UGB	55 mph	1,320 feet

Source: 1999 Oregon Highway Plan, Appendix C (2011), Table 14.
* Measurement of the approach road spacing is from center to center on the same side of the roadway.

Local Street Connectivity

Much of the local street network in Scappoose is built but is not well connected. Multiple access opportunities for entering or exiting neighborhoods are limited. There are a number of locations where neighborhood traffic is funneled onto one single street. This type of street network results in out-of-direction travel for motorists and an imbalance of traffic volumes that can impact residents. The outcome can result in the need for wider roads, traffic signals and turn lanes (which can negatively impact traffic flow). By providing connectivity between neighborhoods, out-of-direction travel and vehicle miles traveled (VMT) can be reduced, accessibility between various travel modes can be enhanced and traffic levels can be balanced among various streets. Additionally, public safety response time is reduced.

Some of these local connections can contribute, with other street improvements, to improve roadway capacity by better dispersing traffic. Several roadway connections will be needed within neighborhood areas to reduce out-of-direction travel for vehicles, pedestrians and bicyclists. This is most important in the areas where a significant amount of new development is possible.

Figure 2 shows the conceptual Local Street Connectivity Plan for Scappoose. In most cases, the connector alignments are not specific and are aimed at reducing potential neighborhood traffic impacts by better balancing traffic flows on neighborhood routes. The arrows shown in the figures represent conceptual connections and the general direction for the placement of the connection. In each case, the specific alignments and design will be better determined upon development review.

To protect existing neighborhoods from potential traffic impacts of extending stub end streets, connector roadways should incorporate neighborhood traffic management into their design and construction. All stub streets should have signs indicating the potential for future connectivity. Additionally, new development that constructs new streets, or street extensions, must provide a proposed street system that:

- Provides full street connections with spacing of no more than 530 feet between connections except where prevented by barriers such as topography, other environmental conditions, existing development, or existing legal arrangements.
- Provides bike and pedestrian access ways in lieu of streets with spacing of no more than 330 feet except where prevented by barriers.
- Limits use of cul-de-sacs and other closed-end street systems to situations where barriers prevent full street connections
- Includes no permanent dead-end street longer than 400 feet or having no more than 16 dwelling units
- Includes pedestrian connections from the end of any stub end street that results in a cul-de-sac

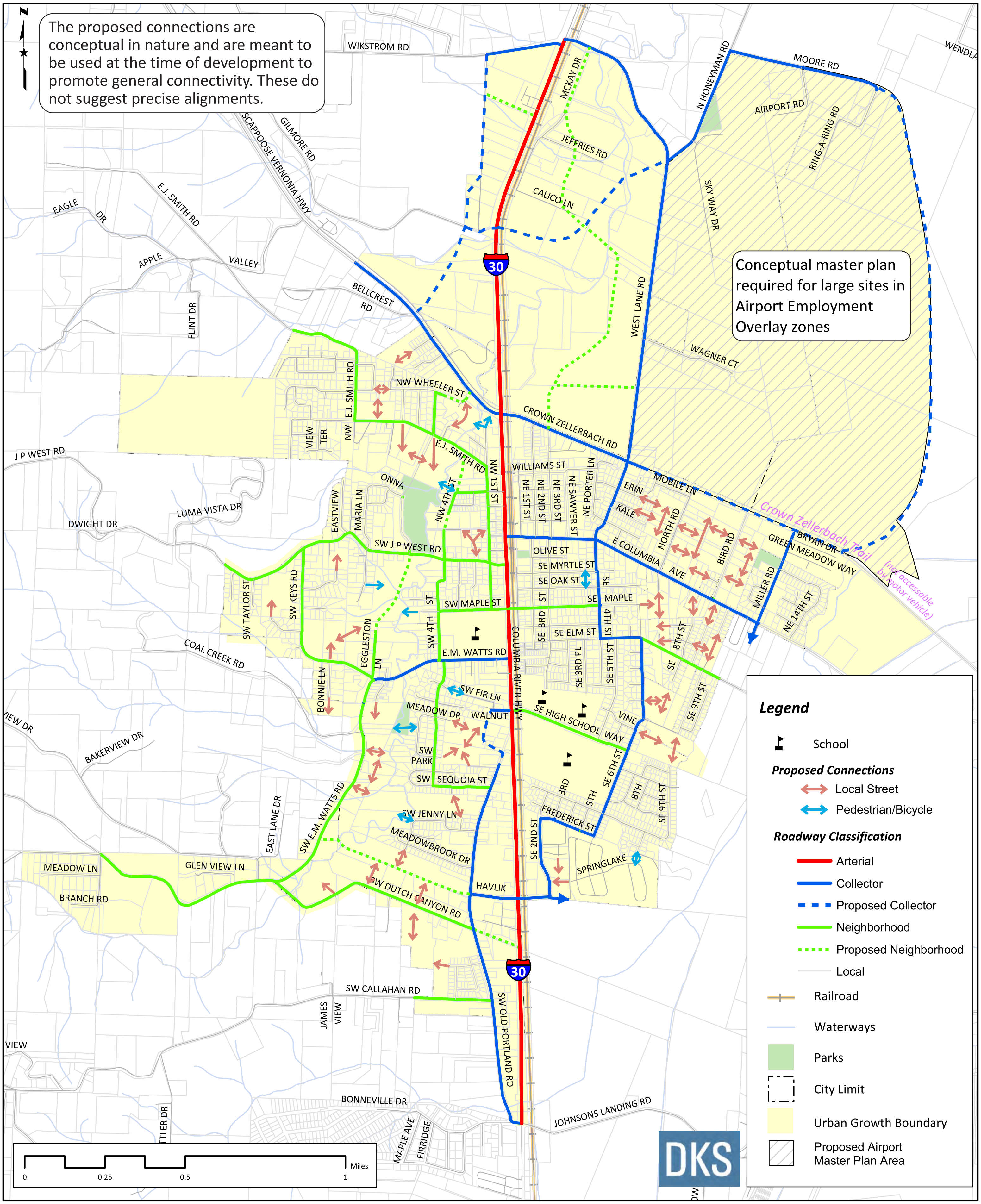
Topography and environmental conditions limit the level of potential connectivity in several areas of Scappoose. The objective is to improve city connectivity for all modes of transportation.

City of Scappoose

TRANSPORTATION SYSTEM PLAN UPDATE

FIGURE 2

Conceptual Local Street Connections



Intersection Operations

Intersection mobility standards are included in the City of Scappoose Public Works Design Standards. [3]Intersection operations must meet the following standards:

- **Signalized intersections:** Minimum level of service of "D", with a maximum volume-to-capacity (v/c) ratio of 0.90.
- **All-Way Stop controlled intersections:** Minimum level of service of "D", with a maximum volume-to-capacity (v/c) ratio of 0.90, for the overall intersection.
- **Unsignalized intersections:** Minimum level of service of "E" or a maximum volume-to-capacity (v/c) ratio of 0.90, for worst movement on the minor street approach.
- **Roundabout intersections:** Minimum level of service of "D", with a maximum volume-to-capacity (v/c) ratio of 0.90, for the critical approach.

In addition, for intersections controlled by other jurisdictions (e.g., Columbia County or ODOT)[4], the mobility standards for that jurisdiction must be met in addition to the city's mobility standard.

Roadway Cross Sections

Design of the streets in Scappoose requires attention to many elements of the public right-of-way and considers how the street interacts with the adjoining properties. Street design varies based on the functional classification and, for some specific land uses, street type.

The ideal street designs for most streets in Scappoose are shown in Figures 3a and 3b. In addition, there are special design types for Commercial/Industrial Local Streets and some select downtown mixed-use streets (e.g., NW First Street, E. Columbia Avenue), which are described in more detail below. The only Arterial street in Scappoose is US 30, which is a State Highway and therefore is subject to the design criteria in the Oregon Highway Plan and ODOT Highway Design Manual.

These standards should be applied whenever possible. However, any street located in steep, environmentally sensitive, rural, historic, or development limited areas of the city may be considered a constrained street. These streets may require different design elements that may not be to scale with the adjacent land use. Constrained elements may include narrower or limited travel lanes and pedestrian and bicycle facilities, or accommodations that generally match those provided by the surrounding developed land uses. Table 3 shows both desired and minimum characteristics for the various street elements to guide design. When partial-street improvements are needed as part of a development, more than 50 percent of the ultimate paved section may be required, at the City's request, in order to accommodate two-way traffic for public safety.

[3] *City of Scappoose Public Works Design Standards*, Chapter 5, May 29, 2002.

[4] See *Tech Memo #5: Existing Conditions*, Figure 12: Roadway Jurisdiction & Posted Speed Limits.

Table 3: Proposed Street Characteristics

Street Element	Characteristic	Desired Width/Options	Minimum Width/Options
Vehicle Lane Widths:	Truck Route	12 feet	12 feet
	Bus Route	12 feet	11 feet
	Arterial	12 feet	12 feet
	Collector	12 feet	12 feet
	Neighborhood	12 feet	10 feet
	Local	12 feet	10 feet
	Turn Lane	14 feet	12 feet
On-Street Parking:	Abutting bike lane	8 feet	8 feet
	Not abutting bike line	8 feet	7 feet
Bicycle Lanes:		6 feet	5 feet
Sidewalks:	Neighborhood/Local	6 feet	5 feet
	Collector	6 feet	5 feet
	Arterial (ODOT standard)	6 feet	6 feet
Planter Strips:	Required on all streets	5 feet	4 feet
Neighborhood Traffic Management:	Local	Consider if appropriate	
	Neighborhood	Consider if appropriate	
	Collectors	Under special conditions	
	Arterials	Prohibited	

Special Street Types

Scappoose further classifies some of the roadways within the city based on the surrounding land use and the intended function for pedestrians, bicyclists and transit riders in that specific area. The street type of a roadway defines its cross-section characteristics and determines how users of a roadway interact with the surrounding land use.

The street types attempt to strike a balance between street functional classification, adjacent land use, zoning designation and the competing travel needs by prioritizing various design elements. Two special street types are described below for Scappoose:

- **Local Commercial/Industrial Streets** are typically adjacent to large employment complexes, and often serve industrial areas. These uses serve customers throughout the city and region and may not have a direct relationship with nearby residential neighborhoods. Buildings are typically set back behind parking lots. These streets are somewhat more auto-oriented, but should still accommodate pedestrians and bicyclists safely and comfortably. Roadway widths are typically wider to accommodate a high volume of large vehicles such as trucks, trailers and other delivery vehicles. The Local Commercial/Industrial Street cross-section would likely be applied to local streets in the Airport Employment Overlay zone and any other areas where a higher number of trucks are expected. This cross-section is shown in Figure 3b.

- **Mixed-Use Streets** typically have a higher amount of pedestrian activity and are often on a transit route or near a transit stop. These streets should emphasize a variety of travel choices such as pedestrian, bicycle and transit use to complement the development along the street. Since Mixed-Use streets typically serve pedestrian oriented land uses, walking should receive the highest priority of all the travel modes. They should be designed with features such as wider sidewalks, pedestrian amenities, transit amenities, attractive landscaping, on-street parking, pedestrian crossing enhancements and bicycle facilities. Specific street cross-sections incorporating these elements have been identified for two streets in Scappoose (see Figure 4):
    - NW & SW First Street – Neighborhood Street
    - E. Columbia Avenue between US 30 & West Lane Rd./SE 4th Street – Collector Street

Arterial

ODOT's design standards would apply to US 30. See the ODOT Highway Design Manual, 2012.

Collector

New roadways should be built to three-lane standards with parking (as shown above). Reduced cross-sections (as shown below) could be considered in constrained environments or with infill at the discretion of the City, according to the *City of Scappoose Public Works Design Standards.*

Note: The curb is included in the zone (planter strip or sidewalk) adjacent to the travel lane. When partial-street improvements are needed, more than 50 percent of the ultimate paved section may be required.

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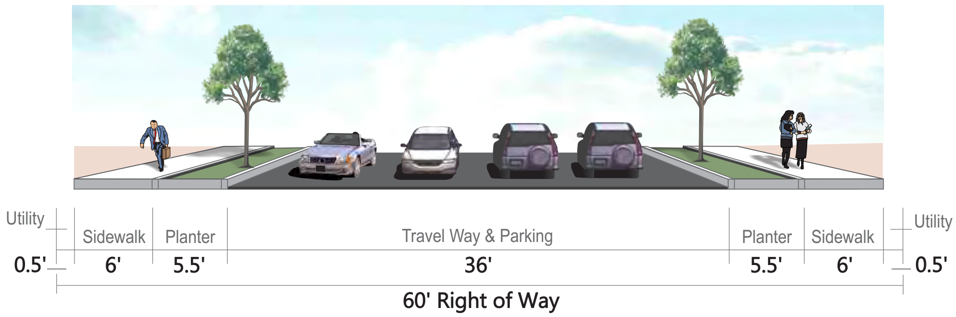
Figure 3a

STREET DESIGN STANDARDS

Neighborhood Route

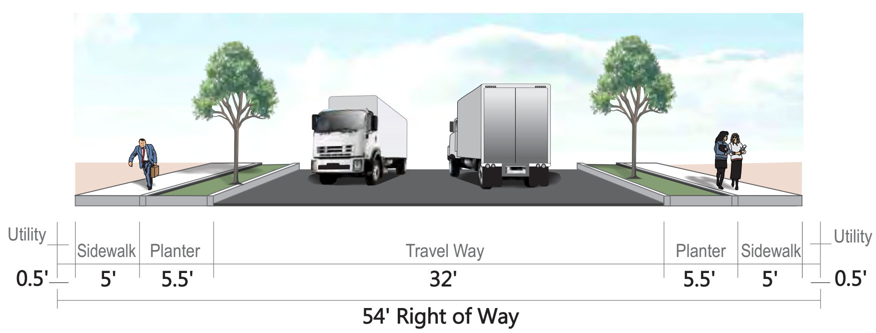


Reduced cross-sections for neighborhood routes may be considered on a case by case basis by the City, according to the *City of Scappoose Public Works Design Standards*. On-street parking may be removed in areas adjacent to industrial land uses.

Local Street

Reduced cross-sections for local street may be considered on a case by case basis by the City, according to the *City of Scappoose Public Works Design Standards*.

Local Commercial/Industrial Street



The Local Commercial/Industrial design standard would apply in commercial or industrial areas where more trucks are expected. The Local Commercial/Industrial design standard provides a wider pavement width to accommodate trucks. Plantings should be kept at a low height to eliminate truck damage to trees.

Note: The curb is included in the zone (planter strip or sidewalk) adjacent to the travel lane. When partial-street improvements are needed, more than 50 percent of the ultimate paved section may be required.

DKS

Figure **3b**

STREET DESIGN STANDARDS

Mixed-Use Collector

E. Columbia Avenue (between US 30 and West Lane Rd./SE 4th St.)

Mixed-Use Neighborhood Route

NW/SW 1st Street

Notes:

- Streetscape amenities such as pedestrian bulb-outs, decorative lighting and street trees should be incorporated.
- The curb is included in the zone (planter strip or sidewalk) adjacent to the travel lane.
- When partial-street improvements are needed, more than 50 percent of the ultimate paved section may be required.

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Figure 4

SPECIAL CROSS-SECTIONS

Walking and Biking Treatment Guidelines

The following sections detail various walking and biking standards and treatment guidelines. Note that all design standards on US 30 are set by ODOT as the road authority.

Walking and Biking Facilities

A network of walking and biking facilities is envisioned to connect major destinations and neighborhoods in Scappoose. While sidewalks and dedicated bike lanes are the most common pedestrian and bicycle facilities, a number of options are available to enhance the pedestrian and bicycle experience. Table 4 summarizes potential pedestrian and bicycle treatments and a more comprehensive tool box of improvements is included in the appendix.

Table 4: Pedestrian and Bicycle Facilities and Enhancements

Bicycle Facilities	Comfort Level*	Design Guidance**
Shared Lane Markings/Sharrows	◊	• Streets with motor vehicle volumes < 3,000 ADT • Streets with posted speeds ≤ 30 mph
Shoulder Bikeways	◊◊	• 6 foot shoulder recommended • Minimum 4 foot shoulder allowed when curb, guardrail or roadside barrier is not present • Otherwise, 5 foot minimum shoulder acceptable • Edge line designated by 4 inch stripe
Standard Bike Lane	◊◊	• Streets with motor vehicle volumes ≥ 3,000 ADT • Streets with posted speeds ≥ 25 mph • 6 foot width is recommended • Minimum 4 foot on open shoulders • Minimum 5 foot from face of curb, guardrail or parked car • Use 8 inch stripe to designate bike lane • Bike lanes should not be wider than 7 feet so drivers do not mistake the lane for parking
Bike Boulevard	◊◊	• Streets with motor vehicle volumes < 3,000 ADT • Streets with posted speeds ≤ 30 mph
Buffered Bike Lane	◊◊◊	• Same as standard bike lane (5' to 6') with an additional 2' to 4' striped buffer • Streets with posted speeds ≥ 25 mph • Locations where standard bike lanes are being considered and additional space for buffering is desired to increase cyclist comfort

Bicycle Facilities	Comfort Level*	Design Guidance**
Shared Use Path	◊◊◊◊	• Commonly 10 feet wide for two-way traffic in rural areas, but should be 12 feet or wider • Minimum width is 8 feet to be used at pinch points or for low volume sections • Proper sight distance should be maintained
Bicycle Routes (Wayfinding)		Signage communicates cyclists preferred routes based on: • Lower automobile volume • Shorter routes • Flatter routes • Presence of bike facilities • A bicycle specific destination • Alternate to busy bicycle unfriendly route
Bicycle Parking		

* Comfort level: ◊ - least comfortable for bicyclists to ◊◊◊◊ - most comfortable for bicyclists.

**All design standards on US 30 are set by ODOT as the road authority.

Pedestrian Facilities	General Use	Design Guidance*
Marked Crosswalks at Uncontrolled Location	• Should be located at all school crossings • Raised speed table can double as crosswalks • Pedestrian islands and median refuges allow pedestrians to find gaps in traffic in one direction at a time	• General: o Crossing opportunities consolidated at a single point o Curb ramps should be within the extent/width of the crosswalk o Should be 300+ feet from nearest crossing • Signing and striping: see toolbox • Medians and geometry o Cut-throughs (at least 5 feet wide) preferred over ramps o Curb extensions increase visibility, yielding, traffic calming and opportunity for street furniture o Crosswalks should be at least 10 feet wide or width of

Pedestrian Facilities	General Use	Design Guidance*
		approaching sidewalk if greater than 10 feet • Low traffic volumes and moderate-to-high pedestrian volumes

Active When Present Crossing	• Used in combination with an "active when present" device
	• More effective than a simple crosswalk
	• Reminds automobile drivers of pedestrian right-of-way at uncontrolled locations
	• Provides added safety and convenience for pedestrians
		• Medians and geometry
		  o Cut-throughs (at least 5 feet wide) preferred over ramps
		  o Curb extensions increase visibility, yielding, traffic calming and opportunity for street furniture
		  o Crosswalks should be at least 10 feet wide or width of approaching sidewalk if greater than 10 feet
		• Signing and striping: see toolbox
		• Moderate traffic volumes and moderate-to-high pedestrian volumes

Signalized Pedestrian Crossing	• More effective than a simple crosswalk
	• Provides added safety and convenience for pedestrians
	• Adds motor vehicle delay
		• Medians and geometry
		  o Cut-throughs (at least 5 feet wide) preferred over ramps
		  o Curb extensions increase visibility, yielding, traffic calming and opportunity for street furniture
		  o Crosswalks should be at least 10 feet wide or width of approaching sidewalk if greater than 10 feet
		• Signing and striping: see toolbox
		• Moderate-to-high traffic volumes, traffic speeds and pedestrian volumes
		• Must meet pedestrian signal warrants

Widened Shoulder – Path or Trail		• Provide path or trail for short distances to fill gaps for continuous connectivity until sidewalks can be provided • Minimize disturbance to natural

Pedestrian Facilities	General Use	Design Guidance*
		vegetation • Signage to restrict parking on path or trail
Shared Use Path	• Paths include continuous separation from motor vehicle traffic, frequent connection to land uses including schools and shopping, often have scenic qualities and should have well-designed street crossings	• Commonly 10 feet wide for two-way traffic in rural areas, but should be 12 feet or wider • Minimum width is 8 feet to be used at pinch points or for low volume sections • Proper sight distance should be maintained

**All design standards on US 30 are set by ODOT as the road authority.

Transportation System Management (TSM)/ ITS Coordination Guidelines

Transportation System Management (TSM)

US 30 is a regional roadway facility that could benefit from transportation system management (TSM) infrastructure. Before future investments are made along this roadway, designs should be reviewed with City and ODOT staff to determine if communications or other ITS infrastructure should be addressed as part of the street design/construction.

Traffic Impact Study (TIS) Guidelines

Traffic Impact Study (TIS)

The City or other road authority with jurisdiction may require a Traffic Impact Study (TIS) as part of an application for development, a change in use, or a change in access. TIS requirements are established in the City Public Works Design Standards (Section 5.0013). A reference to these requirements will be added to the code as part of this TSP update. A draft of the revised TIS guidelines is included in the appendix.

Neighborhood Traffic Management Tools

Neighborhood Traffic Management (NTM)/Traffic Calming

Neighborhood Traffic Management (NTM), or traffic calming, refers to street design techniques used to promote safe, slow streets (primarily in residential and mixed-use areas) without significantly changing vehicle capacity and to mitigate the impacts of traffic on neighborhoods and business districts where a greater balance between safety and mobility is needed. Physical traffic calming techniques include:

- Narrowing the street by providing curb extensions or bulb-outs, or mid-block pedestrian refuge islands
- Deflecting the vehicle path vertically by installing speed humps, speed tables, or raised intersections
- Deflecting the vehicle path horizontally with roundabouts or mini-roundabouts

Traffic calming measures must balance the need to manage vehicle speeds and volumes with the need to maintain mobility, circulation, and function for service providers (e.g., emergency response). Table 5 lists common traffic calming applications and suggests which devices may be appropriate along various streets in the city. Any traffic calming project should include coordination with emergency agency staff to ensure public safety is not compromised. A Neighborhood Traffic Management toolbox providing additional detail regarding a variety of traffic calming measures can be found in the appendix.

Table 5: Traffic Calming Measures by Street Functional Classification

Traffic Calming Measure	Is Measure Appropriate? (per Roadway Classification)**		
	Collector*	Neighborhood*	Local Street*
Narrowing travel lanes	Yes	Yes	Calming measures are generally supported on local streets that have connectivity (more than two accesses)
Placing buildings, street trees, on-street parking, and landscaping next to the street	Yes	Yes	
Curb Extensions or Bulbouts	Yes	Yes	
Roundabouts	Yes	Yes	
Mini-Roundabouts	Yes	Yes	
Medians and Pedestrian Islands	Yes	Yes	
Pavement Texture	Yes	Yes	
Speed Hump or Speed Table	No	Yes	
Raised Intersection or Crosswalk	No	Yes	
Speed Cushion (provides emergency pass-through with no vertical deflection)	Yes	Yes	
Choker	No	No	
Traffic Circle	No	No	
Diverter (with emergency vehicle pass through)	Yes	Yes	

* Any traffic calming project should include coordination with emergency agency staff to ensure public safety is not compromised.

** Traffic calming is not appropriate for US 30.

Freight Routes and Restrictions

US 30 is classified by ODOT as a Statewide Highway, Freight Route and Truck Route. It is also on the National Highway System (NHS). These classifications indicate that truck/freight traffic is a priority on this route. ODOT's roadway design standards apply to this route.

The City of Scappoose prohibits vehicles longer than 30 feet from using NE 2nd Street between NE Williams Street and NE Crown Zellerbach Road. This route provides a convenient link between heavy industrial uses in the north part of Scappoose to restaurants and services downtown, particularly at lunch time. The restriction was put in place because the local residential street was not intended to serve a moderate volume of large trucks.

Unless otherwise posted, trucks are allowed on all streets unless prohibited. Trucks over 30 feet long should only be prohibited on streets where the following conditions are met:

- Functional classification is "Local"
- A 24-hour vehicle classification count reveals at least 5% trucks on a typical day

Based on the limited traffic volume data available for the TSP (most traffic count data is for neighborhood, collector and arterial streets), no additional local streets would qualify for a truck restriction.

Transit Standards

The Columbia County Community-Wide Transit Plan and US 30 Transit Access Plan[5] provides transit stop and amenity guidelines and standards, including a Transit Design Toolbox.[6] This toolbox should be used as a reference by both the City and the Columbia County Rider when locating and designing bus stops.

The Transit Design Toolbox was developed using available research. The toolbox highlights five major design considerations that must be considered when planning and designing bus stops to improve transit access:

1. Transit operations
2. Customer information and wayfinding
3. Stop accessibility
4. Safety
5. Comfort and convenience

These five areas are addressed in detail in the Transit Design Toolbox. Some of the characteristics of each of these five design elements are summarized in Table 6.

[5] Columbia County Community-Wide Transit Plan and US 30 Transit Access Plan, June 2009.

[6] Ibid., Section 3, Transit Design Toolbox.

Table 6: Transit Design Considerations

Design Element	Key Characteristics
Transit Operations	• Stop spacing • Stop type • Safe transit vehicle movements • Out-of-direction travel • Park-and-Ride facilities o Site selection o Site design
Customer Information and Wayfinding	• Wayfinding and on-site signage • Service information
Stop Accessibility	• ADA compliance • Bicycle facilities • Street crossings • Rail crossings
Safety	• Lighting • Visibility
Comfort and Convenience	• Shelters • Benches • Trash receptacles

Each existing bus stop within the city requires some level of improvement to provide basic amenities such as a shelter, bench, lighting, and rider information, supporting the comfort and convenience design element. Bus stop amenity guidelines for Scappoose are shown in the Appendix.

Appendix

Proposed Functional Classification Changes

Proposed TIS Guidelines

Pedestrian/Bicycle Treatment Toolbox

Traffic Calming/NTM Toolbox

Bus Stop Amenity Guidelines

Proposed Functional Classification Changes from previous TSP

A new functional classification system was developed as part of this TSP. In general, roadways previously classified as arterial remained arterials, roadways previously classified as major collector became collectors and roadways previously classified as minor collector became neighborhood routes. Changes to roadways previously classified as arterial, major collector or minor collector that do not follow this pattern are listed in the table below.

Roadway	Limits	Previous Functional Classification	Proposed Functional Classification
E.M. Watts Rd.	Dutch Canyon Rd. to Keys Rd.	Major Collector	Neighborhood
E.M. Watts Rd.	SW 4th St. to Keys Rd.	Minor Collector	Collector
5th Street	JP West Rd. to E.J. Smith Rd.	Major Collector	No roadway proposed
5th Street	E.J. Smith Rd. to Wheeler St.	Major Collector	Neighborhood
SE Havlik St.	US 30 to SE 2nd St.	Minor Collector	Collector
SE 2nd St.	SE Havlik St. to Frederick St.	Minor Collector	Collector
Frederick St.	SE 2nd St. to SE 6th St.	Minor Collector	Collector
SE 6th St.	Frederick St. to SE Elm St.	Minor Collector	Collector
SE Elm St.	SE 4th St. to SE 6th St.	Local	Collector
SE 4th St.	SE Elm St. to Columbia Ave.	Minor Collector	Collector
Sawyer St.	Columbia Ave. to Williams St.	Minor Collector	Local
Williams St.	US 30 to Sawyer St.	Minor Collector	Local
SE Maple St.	SE 4th St. to east	Minor Collector	Local
SE Elm St.	SE 6th St. to east	Local	Neighborhood
Miller Rd.	Crown Zellerbach Rd. to Columbia Ave.	Local	Collector
SE 9th St?	SE 6th St. to Columbia Ave.	Minor Collector	No roadway proposed

SCAPPOOSE
TRANSPORTATION IMPACT STUDY GUIDELINES

The following guidelines are intended to provide assistance to transportation planners/traffic engineers who will prepare transportation impact reports for developments located within the City of Scappoose's planning jurisdiction. Transportation impact reports will be required for land use actions as outlined in Table 1, below.[1]

The preparation of the transportation impact report is the responsibility of the land owner or applicant. The applicant can choose any qualified traffic engineer. All transportation impact reports shall be reviewed by the City Engineer and City Planner (referred to as "City" in this document). The transportation impact report shall be prepared under the supervision of an Oregon Professional Traffic Engineer or an Oregon Professional Engineer with a traffic engineering background. Studies that do not address the guidelines adequately shall be returned to the applicant for modification. The applicant should coordinate with Columbia County and/or ODOT[2] for any potential impacts or access to county roads or state highways.

Study Scope

The engineer preparing the transportation impact study should contact the City at the project's outset. The City will then establish the project study area, intersections for analysis, scenarios to be evaluated and any other pertinent information concerning the study. In general, studies will fall into one of two categories based on their estimated trip generation, as described in Table 1.

For any level of project, the City may require additional analysis when a development's location, proposed site plan or traffic characteristics could affect traffic safety, access management, street capacity, or known traffic problems or deficiencies in a development's study area.

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[1] Proposals to amend the comprehensive plan or zoning map shall be reviewed to determine whether they significantly affect a transportation facility pursuant to Oregon Administrative Rule (OAR) 660-012-0060 (Transportation Planning Rule - TPR). TPR analysis requirements is outside the scope of this document.
[2] Analysis of ODOT facilities should follow the current version of ODOT's Analysis Procedures Manual (APM).

Table 1: Study Scope Trip Generation Thresholds

Scope Level	Peak Hour Project Trip Generation Total (In/Out)		Daily Project Trip Generation Total (In/Out)
Letter	10 or fewer	Or	100 or fewer
Report	> 10	Or	> 100

Report requirements for each project category are described below:

Letter Outline (10 or fewer peak hour trips or 100 or fewer daily trips)

Trip generation should be estimated for the proposed project using the latest version of the ITE Trip Generation Manual and/or trip generation surveys conducted at similar facilities[3]. If the estimated trip generation for the proposed project is 10 or fewer PM peak hour trips or 100 or fewer daily trips, a brief report would be required, including a discussion of the following items:

- Weekday AM/PM peak hour and daily trip generation estimate
- Sight distance at project access point(s) (verified by a registered Oregon Traffic or Civil Engineer)
- Safety evaluation within ¼ mile of project frontage (i.e. horizontal/vertical curves, sight distance, high collision locations, access spacing, street lighting/visibility, etc.)
- Discussion/evaluation of on site circulation and street connectivity to adjacent parcels
- Explanation of locations where local street and/or pedestrian/bicycle access way minimum spacing cannot be met
- Pedestrian/bicycle facility discussion/evaluation with a list of nearest bicycle/pedestrian routes and potential connections to adjacent parcels
- Describe safe walking route to school for residential developments within ½ mile of a school

It is at the City's discretion whether additional analysis would be required once this initial information is collected. In general, addressing the items listed above would be sufficient analysis and could typically be achieved in two to three pages.

[3] Use of trip generation surveys collected independently from ITE should be verified with the City prior to use.

Report Outline (more than 10 peak hour trips or 100 daily trips)

If the estimated trip generation for the proposed project is more than 10 PM peak hour trips or more than 100 daily trips, a full transportation impact report will be required. The report shall include the following components:

Introduction and Summary

Provide a brief description of the project, site location, study area, key assumptions and summary of project impacts and any other conclusions. Any recommended mitigation measures and/or operational issues shall be discussed.

Existing Conditions

This section shall include the following elements:

- Description of roadways in the study area, including roadway classification (City of Scappoose, ODOT, and Columbia County), number of lanes, average daily traffic volume, roadway width, presence or absence of sidewalks and/or bicycle facilities, nearest transit route, posted speed, presence or absence of on-street parking, etc.
- Existing geometric deficiencies at study intersections
- Existing traffic volumes at the study intersections measured within the previous twelve months
- Crash data at study intersections for the most recent five-year period available
- Other pertinent features.

Study area intersections shall be determined at the City's discretion, which will typically be based on:

- Intersections of regional significance (arterials, collectors and neighborhood streets) where the traffic generated by the proposed project exceeds ten percent of existing AM or PM peak hour total intersection traffic volumes within the Scappoose City limits
- All project access points onto the public roadway system

Intersection analysis shall be determined for study area intersections for the weekday AM and PM peak periods using the most recent version of the Highway Capacity Manual. The analysis shall include level of service, average delay and volume to capacity ratio (v/c for traffic signal and all-way stop controlled intersections only). Figures showing the study area roadway network, traffic control, and AM and PM peak hour intersection turn movement volumes shall be provided. A speed survey shall be conducted at predetermined locations (as required by the City).

Impacts

A detailed description of the proposed project shall be provided including the intended land use and intensity of use. Trip generation shall be estimated using the most recent version of the *ITE Trip Generation Manual* and/or trip generation surveys conducted at similar facilities,[4] and shown in a table.

The following figures shall be provided (combining them is allowable as long as data are clearly shown):

- Existing peak hour traffic volumes (AM and PM), including lane geometry and traffic control at study intersections
- Project trip distribution (percentages)
- Added project peak hour traffic volumes (AM and PM)
- Pass-by trips, if applicable (AM and PM)
- Existing plus approved project (trips from projects that have been approved but not yet constructed/occupied) peak hour traffic volumes (PM)
- Total peak hour traffic volumes (existing plus project plus approved—PM)
- If applicable, planning horizon future peak hour traffic volumes (PM)

Intersection analysis shall be conducted for the following scenarios:

- Existing plus project (AM and PM)
- Existing plus approved (PM)
- Existing plus project plus approved (PM)

For developments with trip generation or study intersections that do not peak during the PM peak hour (e.g. schools, churches, etc.), city staff may request alternate peak hour analyses (e.g. weekday AM peak hour, Sunday morning, etc.) for existing conditions and/or scenarios which include background growth (Existing plus approved, Existing plus project plus approved).

[4] Use of trip generation surveys collected independently from ITE should be verified with the City prior to use.

For developments that have an anticipated year of opening greater than one year from the TIS date, additional background growth should be added (using a background growth rate provided by city staff).

Information regarding approved project traffic may be requested from the City. Information to be provided in the appendix includes the following:

- Map showing location of approved projects in the City
- Trips associated with each approved project (i.e. remaining trips associated with unoccupied portion of project)
- Figures from individual projects' transportation impact reports showing trip generation, distribution and assignment, if available.

The intersection analysis for each scenario shall be summarized in a table with the calculation sheets provided in an appendix to the report.

A list of planned and reasonably funded improvements (City of Scappoose, ODOT and Columbia County Capital Improvement Plans) assumed in the intersection analysis shall be provided.

Signal warrant analysis based on the *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)* shall be conducted at unsignalized study area intersections that are at or below minimum level of service thresholds (LOS E for minor street approach for the City of Scappoose). The peak hour warrant (Warrant 3) should be checked and, if met, Warrants 1 and 2 (8-hour and 4-hour warrants) should be checked.

Left turn lane needs shall be evaluated using *Highway Research Record Number 211, Aspects of Traffic Control Devices, Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections.*

Right turn lane needs shall be evaluated using *NCHRP 279, Intersection Channelization Design Guide, Figure 4-23*.

Sight distance at project access points shall be evaluated using *A Policy on Geometric Design of Highways and Streets 2011 (AASHTO).*[5]

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[5] *A Policy on Geometric Design of Highways and Streets 2011*, by American Association of State Highway and Transportation Officials, AASHTO.

A brief review of the site plan, including a site plan layout shall be provided. On-site circulation/connectivity issues shall be discussed, for example:

- Evaluation of site access locations (access drive depth, driveway lanes, queuing storage)
- Safety and efficiency of proposed vehicular circulation
- Parking layout

An explanation of locations where 530 foot (local street) and/or 330 foot (pedestrian/bicycle) minimum spacing cannot be met should be provided.

For sites with arterial or collector frontage, access management plans or techniques shall be evaluated. Techniques could include reducing accesses or increasing spacing between them, channelizing turn movements (turn lanes), turn restrictions, striping, medians, shared accesses, etc.

Bicycle and pedestrian issues shall be discussed and planned facilities shall be compared with the Scappoose Transportation System Plan (TSP) to make sure any facilities proposed in the TSP on the proposed project site are included as part of the proposed project. For those projects within ½ mile of a school, a safe (walking) route to school shall be described. Potential path connections to adjacent parcels shall be determined and discussed. The availability of public transportation to serve the site should be discussed.

The project site plan shall be evaluated for conformance to the City's Public Works Design Standards[6] and specific traffic calming measures (traffic circles, speed humps, chokers) shall be utilized where necessary.

Mitigation

Both project specific and area-wide mitigation measures shall be recommended where study intersections do not meet minimum performance standards. At a minimum, the study shall consider improvements identified in the Scappoose TSP, ODOT STIP, and Columbia County TSP. Recommendations should be made not only for motor vehicle needs, but for improvements to bicycle, pedestrian and transit facilities as well. The study shall clearly state the mitigation measures recommended by the analysis to mitigate project impacts.

[6] City of Scappoose, Public Works Design Standards.

Appendix

The following items shall be in the appendix:

- Existing traffic counts
- Approved project information
- Level of service calculations
- Current site plan

Pedestrian Facility Design Guide

The pedestrian facility design guide[1] was developed to characterize the types of pedestrian facilities being recommended as part of the Scappoose TSP update. Design elements for marked crosswalks (uncontrolled locations, active when present crossings and signals), widened shoulder paths and shared use paths are shown in the following design guide. These types of pedestrian facilities should be considered to support the recommended pedestrian improvements in the Transportation System Plan. Identifying appropriate treatments require an evaluation of facility characteristics and the public needs.

Pedestrian Facility Types

Pedestrian Facility Alternatives *Design Guidance*

Marked Crosswalk at Uncontrolled Location

Crosswalk signs (W11-2 and W16-7p)

Stop for pedestrians (R1-5c)

School advanced crossing assembly (S1-1 and W16-9p)

▶ A marked crosswalk at an uncontrolled location can be an effective treatment where pedestrians are expected and drivers may need extra communication to yield to pedestrians. Safe street crossings provide added comfort to pedestrians and encourages pedestrian transportation. Should be located at all school crossings and intersections on school routes when there is substantial conflict or lack of clear direction on crossing location.

Design Guidance

- General considerations:
  - Appropriate for low traffic volumes and moderate to high pedestrian volumes
  - Curb ramps should be within the extent/width of the crosswalk
  - Provide 300+ foot spacing from next nearest crossing
- Signs:
  - Signs W11-2 and W16-7pL should be located at the crosswalk
  - Stop for pedestrian (R1-5 series) or school advance crossing assembly (S1-1) and (W16-9p) should be place leading up to the crosswalk
- Refuge islands and geometry:
  - Crosswalks should be 10 feet wide, or the width of the approaching sidewalk if greater than 10 feet
  - Refuge island cut-throughs (min. 5 feet wide) are preferred over ramps, a cut through to the right (to force pedestrians and oncoming traffic to face one another) is a preferred treatment
  - Curb extensions -- benefits visibility, increased vehicle yielding, and traffic calming

[1] Reference Documents: ODOT Bicycle and Pedestrian Design Guide 2011

Active When Present Crossing

Rectangular Rapid Flashing Beacon

▶ This type of crossing is also called an enhanced or high visibility crossing and is used in combination with an "active when present" device. The treatment highlights pedestrian right-of-way at uncontrolled locations, which reminds drivers and provides added safety and convenience for pedestrians.

Design Guidance

- General considerations:
  - Appropriate for moderate traffic volumes and moderate to high pedestrian volumes
  - Curb ramps should be within the extent/width of the crosswalk
  - Provide 300+ foot spacing from next nearest crossing
- Signs:
  - High visibility crossing sign (R1-6 series) in roadway, State law language is optional
  - Yield to pedestrian (R1-5 series) or school advance crossing assembly (S1-1) and (W16-9p) should be place leading up to the crosswalk
- Refuge islands and geometry:
  - Crosswalks should be 10 feet wide, or the width of the approaching sidewalk if greater than 10 feet
  - Refuge island cut-throughs (min. 5 feet wide) are preferred over ramps, a cut through to the right (to force pedestrians and oncoming traffic to face one another) is a preferred treatment
  - Raised medians and islands should be the first consideration for multi-lane, two-way roads; ideally they should be large and visible, with yellow curbs and landscaping

Signalized Pedestrian Crossing

HAWK Pedestrian Signal

▶ A pedestrian-activated signal facilities crossings when there is a significant crossing demand and/or if it is difficult for pedestrians to find an adequate gap. This type of control requires driver attention and communicates a clear message to stop, which provides added safety for pedestrians.

An example is a HAWK signal which creates gaps in motor vehicle traffic to let pedestrians cross without unduly adding delay. This is accomplished by using a beacon with yellow and red indicators, rather than a full green-yellow-red traffic signal.

Design Guidance

- General considerations:
    - Engineering study required to determine if treatment meets MUTCD pedestrian signal warrants and provides best option for location
    - Appropriate for high traffic and pedestrian volumes and moderate to high vehicle speeds
    - Sight-distance must be adequate to ensure that motorists will see the signal in time to stop
- Signs and Pavement Markings:
    - High visibility crossing sign (R1-6 series) in roadway
    - Advance warning signs should be installed on the approaching roadway
    - Stop bar on roadway approaches
- Refuge islands and geometry:
    - Crosswalks should be 10 feet wide, or the width of the approaching sidewalk if greater than 10 feet
    - Curb extensions and raised medians increase the effectiveness of pedestrian signals, reduce crossing times and decrease motor vehicle delay

Widen Shoulder - Path or Trail

Roadway Shoulder Pedestrian Path

▶ Provide path or trail associated with existing street for short distances to fill gaps for continuous pedestrian connectivity. Treatment serves as a short-term improvement until sidewalks can be provided.

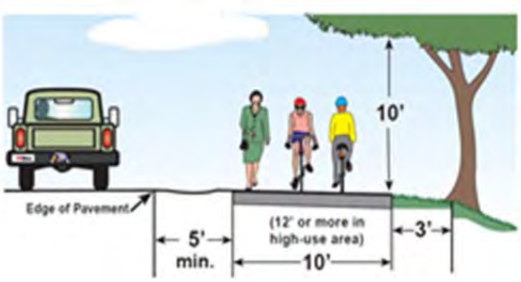
Design Guidance

- General considerations:
  - Appropriate for low volume and low speed roadways with available shoulder width
  - Asphalt is the preferred surface material
  - Provide a minimum width of five feet, six to eight feet wide is preferred
  - Should be placed on roadways without many driveways or accesses
- Pavement Markings and Barriers:
  - At a minimum, pavement markings should be provided between the travel lane and path
  - A barrier may be provided necessary to separate path users from the roadway
- Signs:

  Roadway signs should be used to identify the pedestrian path area and discourage bicycle use

Shared Use Path

Comfort Level ●●●●



▶ Shared use paths are used by pedestrians, bicyclists, skaters, and many other community members. Paths include continuous separation from motor vehicle traffic, frequent connection to land uses including schools and shopping, provide some security to users through illumination and proximity to housing or businesses, have scenic qualities, and well-designed street crossings.

Design Guidance

- Shared use paths are commonly 10′ wide for two-way traffic in rural areas, but should be 12′ wide or wider in urban and suburban areas.
- Minimum width for a shared use path is 8′ wide to be used at pinch points or where low volumes are expected.
- Proper sight distance should be maintained.
- Path should be illuminated for night time users.

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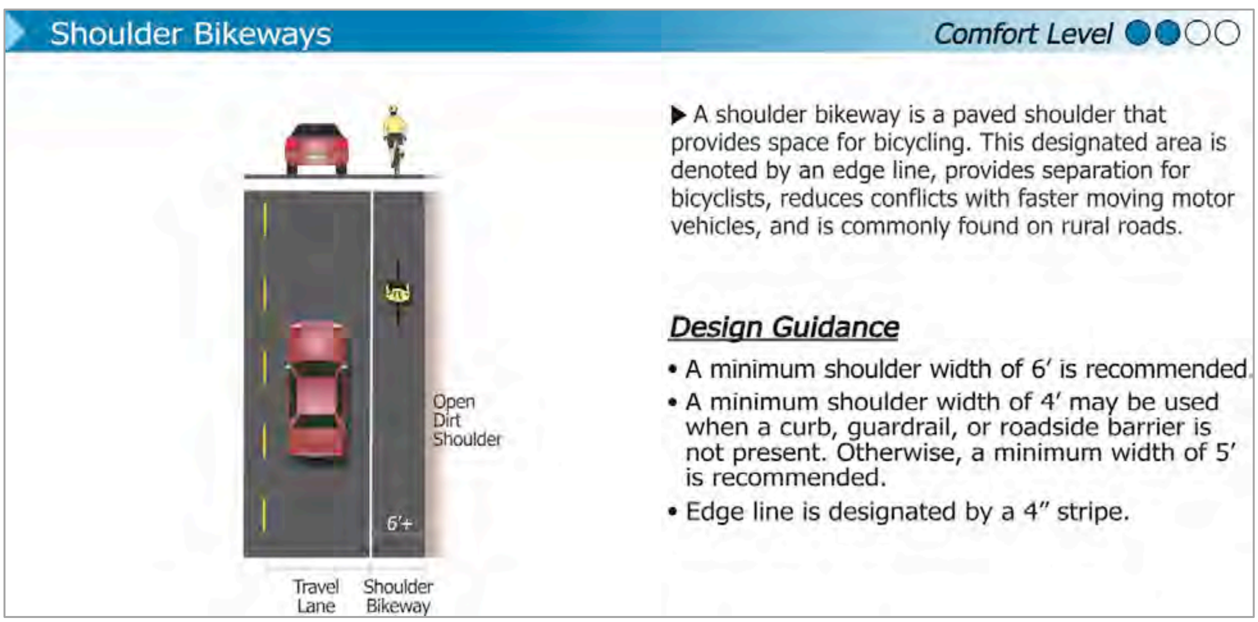
Bicycle Facility Design Guide

The bicycle facility design guide was developed to characterize the types of bicycle facilities recommended for the Scappoose TSP update. The types of bicycle facilities increase from the lowest comfort level to the highest comfort level. The highest comfort level is a multi-use path, which provides complete separation from motor vehicle traffic and gives cyclists a dedicated space in the transportation network. Design elements for shared lane markings/sharrows, shouldered bikeways, bike lanes, bike boulevard, buffered bike lane, multi-use path, bicycle route signage, and bicycle parking are shown in the following design guide.

Several of the recommended improvements are part of the designated continuous bicycle route throughout Scappoose. The treatment for the bicycle routes has not yet been decided. The Shared Lane Markings/Sharrows, Shouldered Bikeways, Standard Bike Lanes, Bike Boulevard, Buffered Bike Lane could all satisfy the requirements for the bicycle routes and the appropriate treatment will be dependent upon the facility and the public needs.

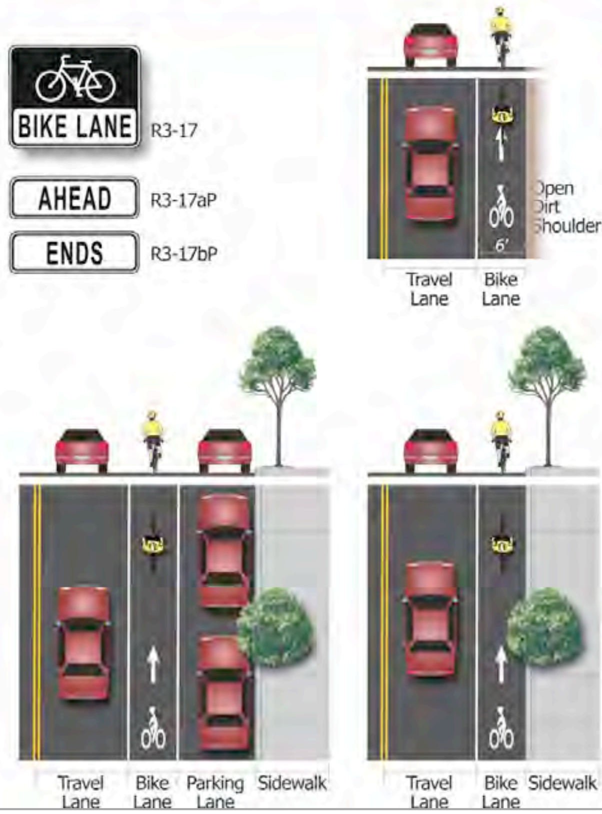
Bicycle Facility Design Guide[1]



[1] Reference Documents: MUTCD 2009, NACTO Urban Bikeway Design Guide, AASHTO Guide for Development of Bicycle Facilities, ODOT Bicycle and Pedestrian Design Guide 2011

Standard Bike Lane

Comfort Level ●●○○



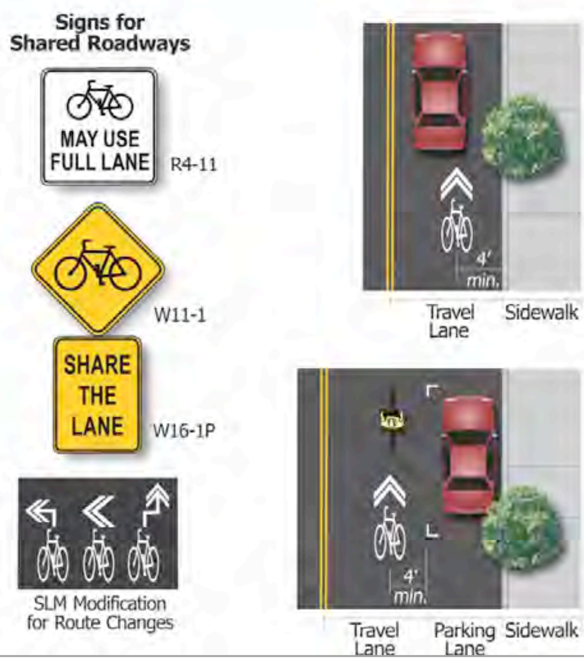
▶ Bike lanes are used to designate space for exclusive use by bicyclists. Bike lanes are denoted by a solid white line, bike lane symbols, and can be accompanied by signing. Most often bike lanes are intended for one-way travel in the same direction as adjacent traffic lanes, although contraflow and left side bike lanes have been used. Application of bike lanes is appropriate on arterial and collector streets with higher motor vehicle volumes and speeds.

Design Guidance

- Streets with motor vehicle volume of 3,000 vehicles per day or more.
- Streets with posted motor vehicle speed of 25 mph or higher.
- Use 8" stripe to designate a bike lane.
- Recommended width is 6', with a minimum of 4' on open shoulders or 5' from face to curb, guardrail, or parked car.
- Bike lanes should not be wider than 7' so drivers do not mistake the lane for parking.

Shared Lane Markings/Sharrows

Comfort Level ●○○○



▶ Shared lane markings (SLMs), also known as "sharrows", are high-visibility pavement marking symbols that indicate the appropriate position for a bicycle when sharing a lane with motor vehicles. Sharrows can be used on low-volume, low-speed roadways, where bike lanes are desirable but not possible or cost effective due to physical constraints. The marking encourages bicyclists to ride away from the door zone if adjacent on-street parking is available, and indicates to drivers where to expect cyclists. Signing can also accompany the SLMs to alert motorist that cyclists may be encountered.

Design Guidance

- Streets with motor vehicle volumes of less than 3,000 vehicles per day.
- Streets with motor vehicle posted speeds of 30 mph or lower.
- Spacing can vary from 50'-100' along busier streets, or up to 250' along low traffic routes.

Bike Boulevard

Comfort Level ●●○○

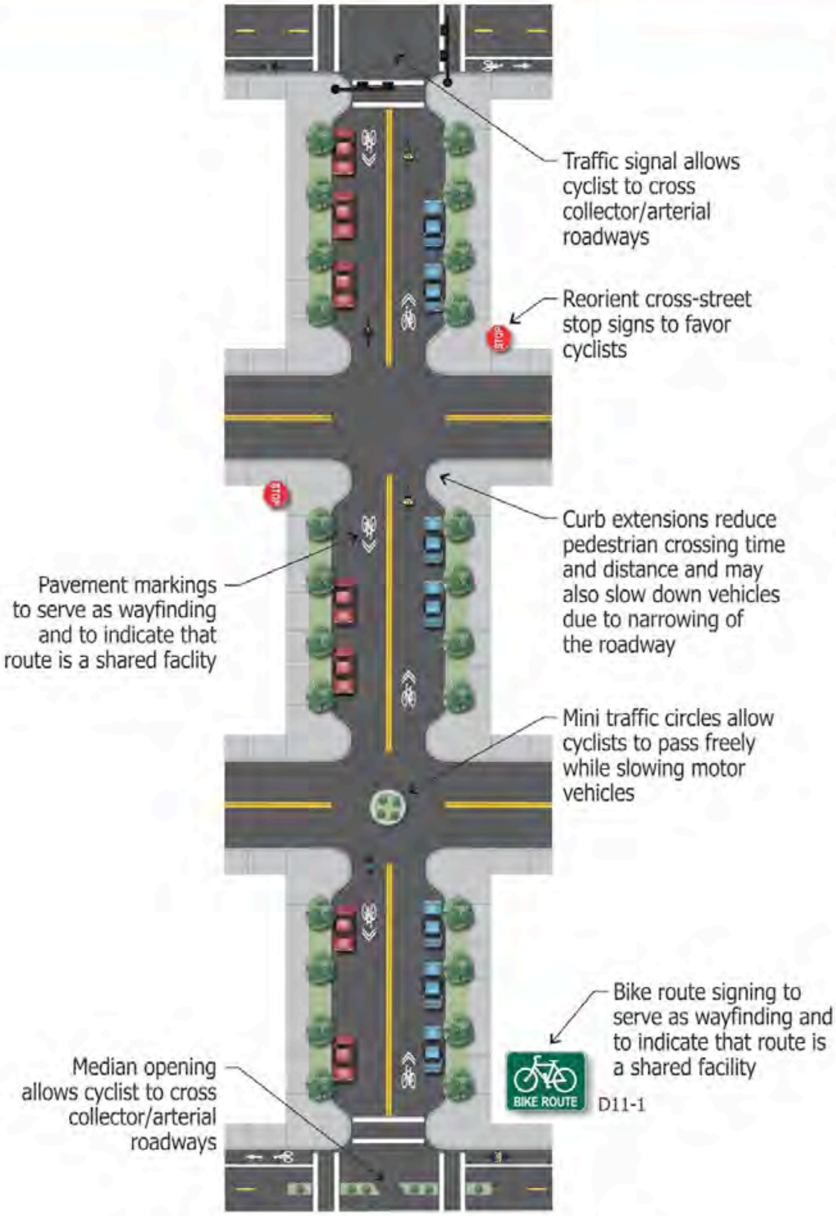


Illustration is one example of a bike boulevard. Treatments applied may vary.

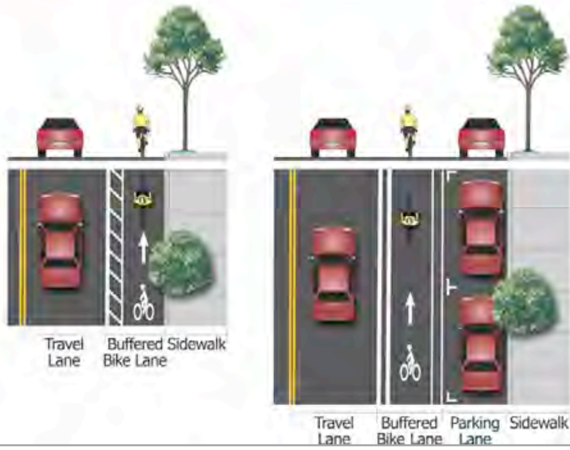
▶ A bike boulevard is a roadway with low motor vehicle speeds and volumes that has been modified to prioritize the movement of bicycles. These facilities use a variety of design treatments to discourage through trips by motor vehicles and to create a safe and comfortable environment for cyclists. Treatments include signing and pavement markings, along with traffic calming measures.

Design Guidance

- Streets with less than 3,000 motor vehicles per day.
- Streets with posted speeds of 25 mph or lower.

Buffered Bike Lane

Comfort Level ●●●○



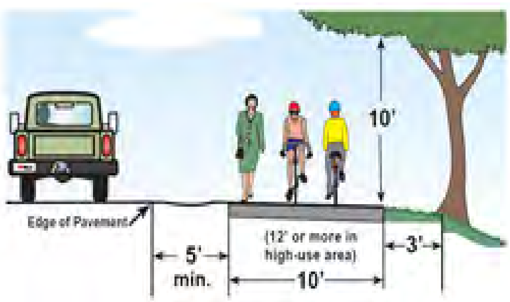
▶ A buffered bike lane is a standard bike lane paired with a delineated buffer space, which further separates the bike lane from the adjacent motor vehicle travel lane and/or parking lane, to increase bicyclist comfort. This treatment can be used on streets with excess width to provide more separation for bicyclist, or when there are high motor vehicle volumes, speed, and/or high amounts of truck traffic.

Design Guidance

- Standard bicycle bike lane (5' to 6') with an additional 2' to 4' striped buffer.
- Streets with posted speeds of 25 mph or higher.
- Locations where standard bike lanes are being considered and additional space for buffering is desired to increase cyclist comfort.

Shared Use Path

Comfort Level ●●●●



▶ Shared use paths are used by pedestrians, bicyclists, skaters, and many other community members. Paths should be designed to include:

- continuous separation from motor vehicle traffic
- provide connections to land uses including schools and shopping
- provide some security to users through illumination be in close proximity to housing or businesses
- have scenic qualities
- provide well-designed street crossings

Design Guidance

- **Shared use paths are commonly 10' wide for two-way traffic in rural areas, but should be 12' wide or wider in urban and suburban areas.**
- **Minimum width for a shared use path is 8' wide to be used at pinch points or where low volumes are expected.**
- **Proper sight distance should be maintained.**
- **Path should be illuminated for night time users.**

Bicycle Parking

D4-3

▶ Bicycle parking provides a designated parking area for cyclists. This amenity is an effective way to encourage bicycle trips. Bicycle parking can range from providing storage for a few bicycles to many bicycles and can be for short term or for long term use. A bicycle parking sign designates where bicycle parking is available and desirable.

Design Guidance

- General bicycle parking considerations from ODOT:
  - Should be located in a highly visable area to discourage theft and encourage cycling.
  - Should be located so pedestrians are not obstructed.
  - Long term parking should be covered to protect bicycles from inclement weather.
  - Physical barriers between vehicle and bicycle parking protect bicycles from potential damage by cars.

Bike Routes

D11-1

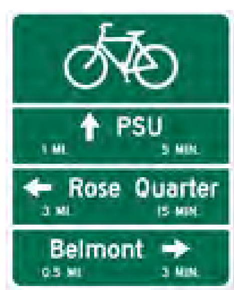
D1-1

D1-2b

▶ Bicycle routes are used to communicate to cyclists preferred routes, which may be chosen based on lower automobile volume, shorter routes, flatter routes, the presence of a bicycle boulevard, a bicycle specific destination, or an alternate to a unfriendly bicycle route. Basic bicycle routes provide signage without pavement markings.

Design Guidance

- Bike route signs can be repeated at regular intervals using D11-1.
- To communicate a specific destination, D1-1 and D1-2 series signs can be used, though ODOT prefers Oregon supplement OBD1 signs.



NEIGHBORHOOD TRAFFIC MANAGEMENT (NTM) TOOLBOX

As the result of continued growth in the community, there is potential for neighborhoods to be impacted by increased traffic volumes and speeding. Many neighborhoods in Scappoose already experience these problems and their detrimental effects on safety and livability. In many cities, no one issue generates more citizen comment than traffic on residential streets.

A Neighborhood Traffic Management (NTM) toolbox is a set of measures that can be used to address the negative impacts of unchecked speed and volume on neighborhood streets. Successful application of these tools can help to fix existing traffic issues, and also avoid simply shifting the problem to another area. NTM should be applied along with strategies that ensure adequate arterial and collector capacity and connectivity are in place to serve future travel needs.

The TSP addresses the need for future capacity and/or lack of connectivity that can result in traffic infiltration through neighborhoods. With a well-planned functional classification system in place, streets should be designed and built to operate at their designated speed and volume. NTM projects should use appropriate tools that match the designated street category (for example, no speed humps on arterials). Measures should enhance safety and not impede the multi-modal use of the streets (measures should not limit the use of the street by public transit, emergency response, school buses, delivery vehicles, pedestrians or bicycles).

The functional classification of the street can help guide the use of the most appropriate traffic calming measure. The types of NTM measures that would be appropriate for each of the functional classifications in Scappoose are described below:

National Highway/Arterial (US 30)

There is one arterial in Scappoose, US 30, which provides regional connections between and through Scappoose to adjacent cities/areas. This would be an appropriate route for access control to preserve capacity. These routes should carry through traffic. Since US 30 is on the National Highway System, NTM measures are not appropriate on this route.

Collector/Neighborhood

These routes provide both access and circulation within residential and commercial/industrial areas providing more of a citywide circulation function. Access control requirements are less restrictive than the National Highway/Arterial group (but still should have some access management). These routes penetrate residential neighborhoods, distributing trips from the local street system. Some NTM measures that may be appropriate for these routes include:

- Pavement Texture
- On-Street Parking
- One Way Streets
- Curb Extensions/Medians
- Traffic Circles
- Landscaping/Street Trees

Local

These routes provide access to fronting properties. Some NTM measures that may be appropriate for these routes include:

- Traffic Circles
- Diverters
- Speed Humps
- Speed Cushions
- Pavement Textures
- On-Street Parking
- One Way Streets
- Curb Extensions/Medians
- Landscaping/Street Trees

For **new construction** (not retrofit), also consider:

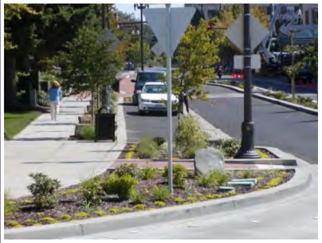
- Curvilinear Street Design
- Narrow Streets (28' to 32')
- Street Grids
- Shared Space

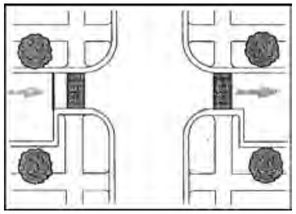
The needs and priorities for applying NTM to roadways are based on a number of criteria. These factors need to be evaluated to determine if NTM is justified and appropriate for a roadway. This includes collecting data for existing conditions, assessing the street system and nearby land uses and estimating future conditions with NTM solutions in place. A transportation analysis should be conducted to assess these criteria to help define the issues and potential solutions.

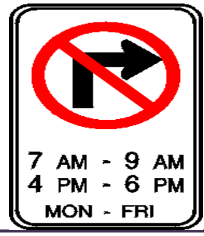
- Traffic speed (average and 85^{th} percentile)
- Traffic volume (existing or estimated future)
- Proximity to schools and parks (designated School Zone)
- Pedestrian activity
- Bicycle activity and classification (neighborhood greenway)
- Cut through traffic (existing or estimated)
- Safety/accident history

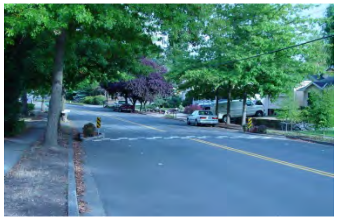
The NTM toolbox provides the city and community with resources to manage traffic and improve neighborhood livability by reducing vehicle speeds, reducing traffic volumes, and addressing other traffic-related issues. As neighborhood traffic issues arise, the city should work with the community to understand its needs and consult the toolbox for guidance on appropriate solutions. It is important that traffic calming projects are supported by initial community education and follow up enforcement.

Neighborhood Traffic Management (NTM) Toolbox

Measure	Sample	What is it?	What does it do?	How much does it cost?
Curb Extensions/ Medians		A roadway narrowing. This could be a curb extension at an intersection (also called bulb outs) to reduce the roadway width at a selected location. This could be a median placed in the middle of the roadway. Medians can be used for pedestrian refuge and/or access control to restrict turning movements.	▪ Speed reduction (3 MPH) ▪ Moderate volume reduction and diversion	$5,000 to $15,000
Diverters		Channelization or islands that restrict movements at an intersection. Typically, allows right turns, not through traffic. There are full and partial diverters depending upon the number of movements restricted or diverted at an intersection.	▪ Speed reduction (1 MPH) ▪ High volume reduction, high diversion impact	$3,000 to $15,000
Enhanced Corridor Performance		Providing adequate capacity, spacing, and connectivity for arterials and collectors allows longer trips to stay on these facilities and not on neighborhood routes. Coordinated traffic signals can be effective in keeping through traffic on arterials.	▪ Speed reduction can be moderate - mostly due to removing faster traveling vehicles by moving traffic from neighborhood routes ▪ Can significantly reduce volume where congestion exists	Street improvements are expensive Typically not considered NTM projects

Measure	Sample	What is it?	What does it do?	How much does it cost?
Landscaping/ Street Trees		Provides a visual narrowing of the street and separates the sidewalk from the vehicle travel lane.	■ Speed reduction varies ■ Limited volume reduction	$10,000 to $20,000/block
One Way Streets		Takes the entry to a neighborhood area and makes the access road one way (typically out). Similar in some respects to a diverter. Can be used in connection with entry treatments.	■ Speed reduction (no data) ■ Significant volume reduction and diversion	$5,000 to $30,000
Pavement Texture/Markings		Instead of smooth pavement surface, create roughness by using raised markers, pavers, or colored concrete with patterns. Can be used to emphasize pedestrian crossing location or create channelization or narrowing. May not be compatible with snow routes.	■ Limited speed reduction ■ Limited volume change ■ Increases driver awareness of changed conditions (entering a neighborhood or pedestrian zone)	$1,000 to $15,000
Parking On-street		Many streets less than 32' do not allow parking on one or both sides. By allowing parking, the traveled way is narrowed. Speeds must be slow for safe sight distance.	■ Moderate speed reduction ■ Limited volume reduction	$0 - $10,000/block

Measure	Sample	What is it?	What does it do?	How much does it cost?
Part Time Restrictions		Uses signs to limit vehicle movements during key times (typically school times or peak hours). Can be turn restrictions, truck restrictions, through traffic restrictions, etc. Difficult and expensive to enforce and can have high violation rates.	■ Moderate speed reduction (if through traffic removed) ■ Moderate volume reduction (if restrictions enforced)	$500 - $5,000
Road Closure		Uses islands or barricades to close the end of a street. Creates a cul-de-sac for vehicles; can remain open for pedestrians and bicycles. Contrary to emphasis on vehicular connectivity.	■ Speed reduction limited to site of closure ■ Significant volume reduction and diversion	$2,000 - $15,000
Shared Space "Woonerf"		A concept where there are no curbs in the roadway right-of-way. The road area is shared among various users, using bollards, chokers, and landscape elements to help define user areas.	■ Speed reduction ■ Significant volume reduction and diversion	$10,000 - $50,000
Speed Cushions		A device similar to a speed hump, but designed to allow buses or emergency vehicles with larger wheel bases to pass over without impact.	■ Speed reduction (7 MPH) ■ Low volume reduction or diversion	$1,500 - $3,000

Measure	Sample	What is it?	What does it do?	How much does it cost?
Speed Humps		Raising of pavement surface about 3" over about 10 to 20 feet. Similar to this measure are speed tables, raised pedestrian crossings, and raised intersections.	■ Speed reduction (7 MPH) ■ Low volume reduction or diversion	$3,000 to $5,000
Speed Trailer		A trailer unit with a reader board that indicates the approaching vehicle speeds. Portable and can be moved from site to site. Can be reinforced with actual police enforcement on a selective basis.	■ Speed reduction (4 MPH) however, reduction occurs only when trailer is present ■ No volume reduction	$10,000 - $25,000 purchase + labor
Speed Zone Changes		Typically, for collector and arterial streets, the 85^{th} percentile speed is used as a guide. Past studies have proven that unrealistically low speed zones are ignored by drivers.	■ Little speed or volume change (without enforcement)	$20,000 (for signs and studies)

Measure	Sample	What is it?	What does it do?	How much does it cost?
Stop Signs		Warrants determined by MUTCD. Significant research on unwarranted stop signs and their negative impact. MUTCD specifically indicates stop signs are not to be used for speed control.	■ Mixed findings on speed reduction (some up some down) ■ Low volume reduction and diversion ■ A device for traffic control and safety, generally not NTM	$250 - $2,500 (including studies, staff time and installation)
Traffic Circles		A round island in the middle of an intersection. Operates similar to a roundabout.	■ Speed reduction (5 MPH), Low volume reduction and diversion	$10,000 to $15,000

Sources:

Traffic Calming, American Planning Association, Planning Advisory Service, Report Number 456, July 1995.

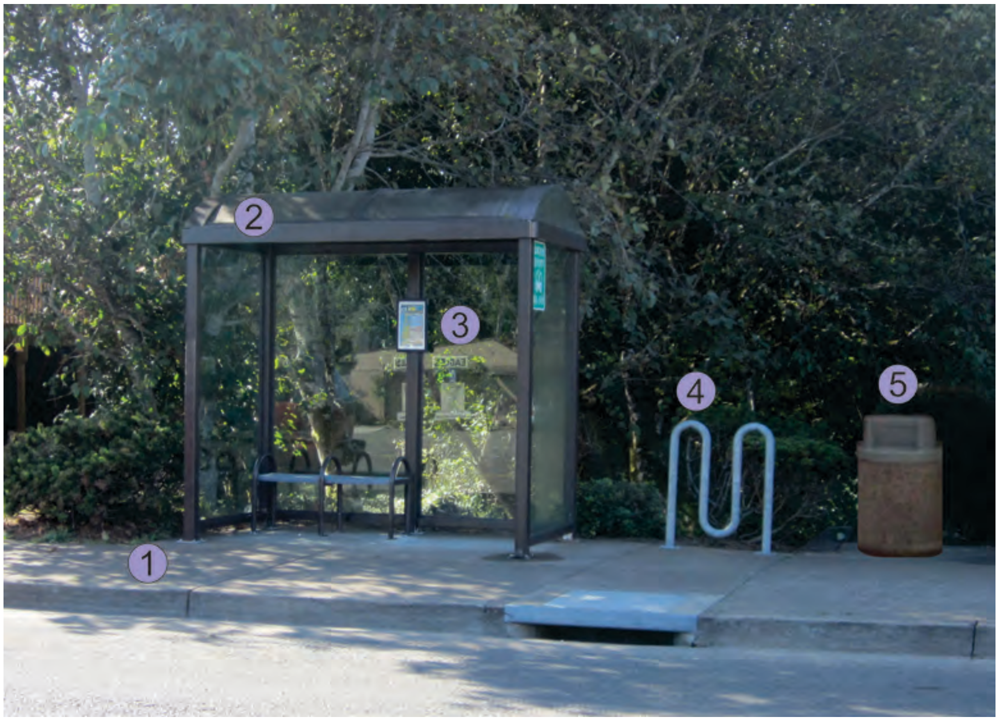
Handbook for Walkable Communities, Burden & Wallwork.

Civilised Streets: A Guide to Traffic Calming, Environmental & Transport Planning, Brighton, Great Britain, 1992.

Note: Cost Estimates are in 2010 dollars. Average construction cost inflation per year based on 10-year data is 2-3% per year.

Bus Stop Design Guidelines

These are guidelines for designing bus stops in Scappoose. In all cases critical items must be accounted for, recommended items should be implemented in most cases, and the need for optional items may vary by location.



Critical Items

1 - Bus stops are required to meet ADA standards. This includes providing at least four feet of sidewalk clearance, and landing pads and curb heights that allow for passengers in wheelchairs to board and depart the bus. Ideally, bus stops are located at the back of sidewalk to provide maximum sidewalk clearance.

Recommended Items

2 - Bus shelters with benches are recommended at bus stops in Scappoose due to the wet climate of the Pacific Northwest and longer wait times resulting from long headways between buses.

3 - Information should be provided to transit users at bus stops, which includes route maps, schedules, phone numbers and agency logos.

Optional Items

4 - Residents located larger distances from bus stops are more likely to use transit if bicycling is a reasonable option, and bike parking supports the bike component.

5 - Trash receptacles help to mitigate littering before boarding.

Section L

Memo 11: Implementation Ordinances

Scappoose Transportation System Plan Update

Technical Memorandum #11a: Implementation Ordinances

Prepared by Darci Rudzinski, Angelo Planning Group

April 14, 2016 *(revised May 24, 2016)*

The purpose of this memorandum is to provide recommended modifications to Title 17 of the Scappoose Municipal Code, the Scappoose Land Use and Development Code ("code"). Updated regulatory requirements are recommended to be consistent with and implement the updated TSP and to comply with the Oregon Transportation Planning Rule (OAR 660-012, the "TPR").

Proposed code amendments are based on the recommendations in Technical Memorandum #3, Regulatory Review (Table 1 in the June 19, 2013 memorandum and the October 23, 2015 addendum addressing TPR Section -0045(4)). The recommended changes to the Land Use and Development Code are summarized in the following table, which includes comments regarding the origin of the changes, such as references to the updated draft TSP, recommendations from the update process, and corresponding TPR requirements. Proposed transportation goals and policies for the Comprehensive Plan are provided in separate draft memorandum (Technical Memorandum #11b).

Following the table, the draft proposed code amendments are shown in an adoption-ready format, with new proposed text underlined, and deleted text ~~struck out~~. The amendments are presented sequentially as they would appear in Title 17.

Note that the entire code will need to be searched for additional references to requirements in the TSP and, where necessary, amended to be consistent with the updated TSP.

Summary of Proposed Land Use and Development Code Amendments

Recommendation	Proposed Amendments	Comments
	Chapter 17.26 Definitions	
1.	New definitions are proposed to better identify pedestrian and bicycle facilities. Also, an expanded definition of public support facilities is proposed to include transportation facilities.	The proposed new definitions reflect suggested code language addressing safe and convenient pedestrian and bicycle circulation, consistent with TPR -0045(3)(b). "Public support facilities" are permitted outright in the city's land use zones. The proposed language expands the definition to include transportation facilities and improvements that do not need to be subject to land use regulations, consistent with TPR -0045(1)(a).
	Chapter 17.106 Off-street Parking and Loading Requirements	
2.	Minor modifications to the location of required off-street parking; new section for carpool/vanpool spaces.	Proposed modifications require larger employers to provide carpool/vanpool spaces, consistent with TPR -0045(3)(b) ("designated employee parking areas in new developments shall provide preferential parking for carpools and vanpools").
3.	New requirements and standards for bicycle parking.	Proposed requirements are modified from Transportation Growth Management's Model Development Code for Small Cities (3rd Edition) ("Model Code"). Proposed language differentiates between land uses, expanding on the city's current requirement which complies with TPR -0045(3)(a).
4.	New section enabling a reduction in off-street parking requirements.	The proposed section would provide some flexibility in providing off-street parking and would allow a reduction in required parking for developments that provide transit-related improvements. Allowing existing development to redevelop a portion of existing parking areas for transit-oriented uses brings the city in compliance with TPR -0045(4)(e).
5.	New requirements for pedestrian walkways in parking areas under parking dimension standards.	Proposed text requires differentiating walkways within parking areas with contrasting paving materials to enhance pedestrian safety and comfort. Proposed requirements meet the TPR's "safe and convenient pedestrian access" objectives

Recommendation	Proposed Amendments	Comments
		(TPR -0045(3)).
	Chapter 17.120 Site Development Review	
6.	New approval requirements for pedestrian access and circulation.	Proposed standards ensure that proposals provide for safe and convenient pedestrian access through the proposed development. Proposed language implements TPR requirements that jurisdictions adopt regulations for on-site facilities to provide and accommodate safe and convenient pedestrian and bicycle access from within new subdivisions, multi-family developments, planned developments, shopping centers, and commercial districts to adjacent residential areas, transit stops, and neighborhood activity centers (TPR 660-012-0045(3)(b)).
	Chapter 17.154 Street and Utility Improvement Standards	
7.	Modify street improvement requirements to narrow the circumstances under which the City will consider a non-remonstrance agreement in lieu of street improvements. Modify requirements related to (vehicular) access to be consistent with proposed "access way" definition and to include the adopted TSP as a compliance document under "general provisions." Include Traffic Impact Study requirements based on city's existing procedures in codified improvement standards.	Proposed requirements are consistent with the City's Traffic Impact Study Guidelines. Codifying the thresholds for which a traffic impact letter or study will be required give city staff and developers clear direction and certainty regarding process and requirements. Recommended language complies with TPR requirements that jurisdictions codify standards to protect the future operations of roads, transitways and major transit corridors (TPR -0045(2)(b)).
8.	Amend block standards to be consistent with the updated TSP. Codify cul-de-sac standards.	The proposed amendments are consistent with access management standards in the draft TSP Table 2. Currently, "dead-end access ways" are addressed in the Public Works Design Standards (5.0102 — Private Residential Access ways). The Development Code should address cul-de-sacs, clarifying under what circumstances they will be permitted and including standards that minimize excessive out-of-direction travel.

Recommendation	Proposed Amendments	Comments
	Chapter 17.160 Procedures for Decision Making – Legislative	
9.	Make explicit in the approval criteria that consistency with the TPR is required.	This proposed modification is to ensure that TPR Section -660 and a "significant effect" assessment (allowed land uses are consistent with the identified function, capacity, and performance standards of the impacted existing or planned transportation facility) is part of decision making, when applicable.
	Chapter 17.162 Procedures for Decision Making – Quasi-judicial	
10.	Make explicit in the application procedures that staff from other city departments and public agencies will be invited to provide technical expertise applicable to the proposal. Notice requirements have been prefaced to identify City Staff's role in determining the extent of notice to interested public agencies based on perceived interest or impact. Make explicit in the approval criteria that consistency with the TPR is required for proposals that "significantly effect" the transportation system (see comments under Recommendation #9).	Minor modifications to the City's procedures help ensure that other transportation providers, including CC Rider, will have an opportunity to provide information to City decision-makers. These modifications are consistent with TPR requirements that jurisdictions support transit in urban areas where the area is already served by a public transit system (TPR -0045(4)) and were suggested as part of the Columbia County Community-wide Transit Plan (2009).

Proposed Title 17 Land Use and Development Code Amendments

Recommendation #1

Chapter 17.26

DEFINITIONS

<u>"Access way" means a pedestrian and/or bicycle connection between two rights-of-way, or to achieve other connectivity needs as determined by the planning commission. An access way conforms to city standards and is in either an off-street public right-of-way or a public access easement on private property.</u>

<u>"Pathway" means a walkway, bikeway or access way conforming to City standards and separated from the street right-of-way, that may or may not be within a public right-of-way</u>

<u>"Sidewalk" means a paved walkway within a public street right-of-way that is generally located</u>

adjacent to and separated from the roadway by a curb, drainage facility (e.g., ditch or swale), or planter strip.

"Walkway" means a sidewalk or path, including any access way, improved to City standards, or to other roadway authority standards, as applicable. See also, Access Way, Pathway, Sidewalk.

"Public support facilities" means services which are necessary to support uses allowed outright in the underlying zone and involves ~~only minor~~ structures necessary to support the primary use that are not listed as permitted outright or conditionally in the underlying zones, such as power lines and poles, ~~phone booths,~~ fire hydrants, ~~as well as~~ bus stops, benches and mailboxes ~~which are necessary to support principal development~~. Public support facilities include the following transportation uses:

1. Operation, maintenance, and repair of existing transportation facilities identified in the city Transportation System Plan;
2. Dedication of right-of-way, authorization of construction, and the construction of facilities and improvements, where the improvements are consistent with clear and objective dimensional standards; and
3. Changes in the frequency of transit, rail, and airport services.

Recommendation #2

Chapter 17.106

OFF-STREET PARKING AND LOADING REQUIREMENTS

17.106.020 General provisions.

H. Location of Required Parking. Vehicle parking is allowed only on improved parking shoulders that meet City standards for public streets, within garages, carports and other structures, or on driveways or parking lots that have been developed in conformance with this code.

   1. Off-street parking spaces for single-family, duplex dwellings and single-family attached dwellings shall be located on the same lot with the dwelling.
   2. Off-street parking spaces for uses other than single- family or duplex residential shall be located not further than four hundred feet from the building or use they are required to serve, measured in a straight line.
   3. Parking lots for commercial and institutional uses shall be located to the side or rear of buildings where feasible; for commercial uses in the Downtown Overlay off-street parking shall be located to the side or rear of buildings, as required by 17.80.050.

4. For office, industrial, and institutional uses where there are more than 20 parking spaces on the site, the following standards must be met:

   a. Five spaces or five percent of the parking spaces on site, whichever is less, must be reserved for carpool use before 9:00 AM on weekdays. More spaces may be reserved, but they are not required.

   b. The spaces will be those closest to the building entrance or elevator, but not closer than the spaces for disabled parking and those signed for exclusive customer use.

Recommendation #3

P. ~~At least one secured bicycle rack space shall be provided for each ten parking spaces in any development. Bicycle parking areas shall not be located within parking aisles, landscape areas, or pedestrian ways.~~ Bicycle parking.

1. Standards. At a minimum, bicycle parking shall be provided based on the standards in Subsection 5 below. Where an application is subject to Conditional Use Permit approval or the applicant has requested a reduction to an automobile-parking standard, pursuant with Subsection 17.80.050.E or Subsection 17.106.020.Z, the planning commission may require bicycle parking spaces in addition to those in Subsection 5.

2. Design. Bicycle parking shall consist of staple-design steel racks or other City-approved racks, lockers, or storage lids providing a safe and secure means of storing a bicycle.

3. Exemptions. This Section does not apply to single-family and duplex housing, home occupations, and agricultural uses. The planning commission may exempt other uses upon finding that, due to the nature of the use or its location, it is unlikely to have any patrons or employees arriving by bicycle.

4. Prohibitions. Bicycle parking shall not impede or create a hazard to pedestrians or vehicles, and shall be located so as to not conflict with the visual clearance areas as provided in Chapter 12.10. Bicycle parking areas shall not be located within parking aisles, landscape areas, or pedestrian ways.

5. Number of spaces. The bicycle parking standards below shall apply to the uses listed. Bicycle parking spaces shall be installed in conjunction with the installation of required new or additional vehicle parking. When two standards are provided, the standard that results in the greater number of bicycle parking spaces shall govern.

   Multi-family residential (four or more units): 2 spaces per 4 units

   Commercial: 2 spaces per primary use or 1 per 5 vehicles spaces

Industrial: 2 spaces per primary use or 1 per 10 vehicle spaces

Parks: 4 spaces

Schools: 2 spaces per classroom

Institutional Uses and Places of Worship: 2 spaces per primary use or 1 per 10 vehicle spaces

Transit centers and park-and-ride lots: 8 spaces

Other uses: 2 spaces per primary use or 1 per 10 vehicle spaces

Recommendation #4

Z. Exceptions and Reductions to Off-Street Parking. The applicant may propose a parking standard that is different than the standard under Section 17.106.030, for review and action by the planning commission processed according to the procedures in Chapter 17.162. The applicant's proposal shall consist of a written request, and a parking analysis prepared by a qualified planning or transportation professional.

1. The parking analysis, at a minimum, shall assess the average parking demand and available supply for existing and proposed uses on the subject site; opportunities for shared parking with other uses in the vicinity; existing public parking in the vicinity; transportation options existing or planned near the site, such as frequent bus service, carpools, or private shuttles; and other relevant factors.

2. The planning commission may reduce the off-street parking standards of Section 17.106.030 for sites with one or more of the following features, pursuant with this Subsection:

   a. Site has a bus stop with frequent transit service located adjacent to it, and the site's frontage is improved with a bus stop waiting shelter, consistent with the standards of the applicable transit service provider: Allow up to a 10 percent reduction to the standard number of automobile parking spaces.

   b. Site has dedicated parking spaces for carpool/vanpool vehicles: Allow up to a 5 percent reduction to the standard number of automobile parking spaces.

   c. Site has dedicated parking spaces for motorcycle and/or scooter or electric carts: Motorcycle parking may substitute for up to 5 spaces or 5 percent of required automobile parking, whichever is less. For every 4 motorcycle parking spaces provided, the automobile parking requirement is reduced by one space. Each motorcycle space must be at least 4 feet wide and 8 feet deep. Existing parking may be converted to take advantage of this provision.

Recommendation #5

17.106.050 Parking dimension standards.

L. Pedestrian walkway. Where a walkway crosses a parking area or driveway, it shall be clearly marked with contrasting paving materials (e.g., pavers, light-color concrete inlay between asphalt, or similar contrast). The crossing may be part of a speed table to improve driver-visibility of pedestrians. If crossings involve grade changes, the crossing shall include ADA accessible ramps. Painted striping, thermo-plastic striping, and similar types of non-permanent applications are discouraged, but may be approved for lower-volume crossings of 24 feet or less.

Recommendation #6

Chapter 17.120

SITE DEVELOPMENT REVIEW

17.120.180 Approval standards.

J. Access and circulation:

1. The number of allowed access points for a development shall be as provided in the public works design standards .

2. All circulation patterns within a development shall be designed to accommodate emergency vehicles.

3. Provisions shall be made for pedestrian ways and bicycle ways ~~if such facilities are shown on an adopted plan~~ consistent with 17.120.180(Q);

[…]

Q. Pedestrian Access and Circulation Standards. Developments shall conform to all of the following standards for pedestrian access and circulation:

1. Continuous Walkway System. A pedestrian walkway system shall extend throughout the development site and connect to adjacent sidewalks, if any, and to all future phases of the development, as applicable.

2. Safe, Direct, and Convenient. Walkways within developments shall provide safe, reasonably direct, and convenient connections between primary building entrances and all adjacent parking areas, transit stops, recreational areas/playgrounds, and public rights-of-way based on all of the following criteria:

   a. The walkway is reasonably direct. A walkway is reasonably direct when it follows a route that does not deviate unnecessarily from a straight line or it does not involve a significant amount of out-of-direction travel;

   b. The walkway is designed primarily for pedestrian safety and convenience, meaning it is reasonably free from hazards and provides a reasonably smooth and consistent surface and direct route of travel between destinations. The city planning commission may require landscape buffering between walkways and adjacent parking lots or driveways to mitigate safety concerns.

   c. The walkway network connects to all primary building entrances and, where required, Americans With Disabilities Act requirements.

3. Vehicle/Walkway Separation. Except as required for crosswalks, pursuant to Subsection 4, below, where a walkway abuts a driveway or street it shall be raised 6 inches and curbed along the edge of the driveway/street. Alternatively, the city planning commission may approve a walkway abutting a driveway at the same grade as the driveway if the walkway is physically separated from all vehicle-maneuvering areas. An example of such separation is a row of bollards (designed for use in parking areas) with adequate minimum spacing between them to prevent vehicles from entering the walkway.

4. Crosswalks. Where a walkway crosses a parking area or driveway (“crosswalk”), it shall be clearly marked with contrasting paving materials (e.g., pavers, light-color concrete inlay between asphalt, or similar contrast). The crosswalk may be part of a speed table to improve driver-visibility of pedestrians.

   Painted or thermo-plastic striping and similar types of non-permanent applications are discouraged, but may be approved for lesser used crosswalks not exceeding 20 feet in length.

5. Walkway Width and Surface. Walkways, including access ways required for subdivisions pursuant with Chapter 17.150, shall be constructed of concrete, asphalt, brick/masonry pavers, or other durable surface, as approved by the city engineer, and not less than 5 feet wide. Multi-use paths (i.e., designed for shared use by bicyclists and pedestrians) shall be concrete or asphalt and shall conform to the public works design standards.

6. Walkway Construction. Walkway surfaces may be concrete, asphalt, brick/masonry pavers, or other city-approved durable surface meeting Americans with Disabilities Act

requirements. Walkways shall be not less than 5 feet in width, except that concrete walkways a minimum of 6 feet in width are required in commercial developments and where access ways are required for subdivisions under Chapter 17.150 the planning commission may also require 6foot wide, or wider, concrete sidewalks in other developments where pedestrian traffic warrants walkways wider than 5 feet.

7. Multi-Use Pathways. Multi-use pathways, where approved, shall be 12 feet wide and constructed of asphalt or concrete, consistent with the applicable public works design standards.

Chapter 17.150

LAND DIVISION - SUBDIVISION

17.150.020 General provisions.

H. All subdivision proposals shall include neighborhood circulation plans that conceptualize future street plans and lot patterns to parcels within five hundred feet of the subject site. Circulation plans address future vehicular/bicycle/pedestrian transportation systems including bike lanes, sidewalks, bicycle/pedestrian paths, and destination points and must meet the criteria in 17.120(Q). A circulation plan is conceptual in that its adoption does not establish a precise alignment. ~~An applicant for a subdivision is required to submit a circulation plan unless the applicant demonstrates to the planning services manager one of the following:~~

~~1. An existing street or proposed new street need not continue beyond the land to be divided in order to complete or extend an appropriate street system or to provide access to adjacent parcels within five hundred feet of the proposed development; or~~

~~2. The proposed street layout is consistent with a street pattern adopted as part of the city's transportation system plan, or a previously adopted circulation plan.~~

Recommendation #7

CHAPTER 17.154

STREET AND UTILITY IMPROVEMENT STANDARDS

17.154.020 General provisions.

A. The standard specifications for construction, reconstruction or repair of streets, sidewalks, curbs and other public improvements within the city shall occur in accordance with the standards of this title, the public works design standards, the transportation system plan, and in accordance with county or state standards where appropriate.

17.154.030 Streets.

A. No development shall occur unless the development has frontage or approved access to a public street:

[…]

3. Subject to approval of the ~~public works director~~ city engineer and the planner, the planner may accept and record a non-remonstrance agreement in lieu of street improvements if ~~one~~ two or more of the following conditions exist:

a. A partial improvement is not feasible due to the inability to achieve a cohesive design for the overall street~~;~~.

b. A partial improvement may create a potential safety hazard to motorists or pedestrians~~;~~.

c. Due to the nature of existing development on adjacent properties it is unlikely that street improvements would be extended in the foreseeable future and the improvement associated with the project under review does not, by itself, provide a significant improvement to street safety or capacity~~;~~.

d. The improvement would be in conflict with an adopted capital improvement plan;.

~~e. The improvement is associated with an approved land partition on property zoned residential and the proposed land partition does not create any new streets; or~~

~~f.~~ e. Additional planning work is required to define the appropriate design standards for the street and the application is for a project which would contribute only a minor portion of the anticipated future traffic on the street.

C. The planning commission may approve an access easement established by deed without full compliance with this title provided such an easement is the only reasonable method by which a lot large enough to develop can develop:

1. Vehicular ~~A~~access easements which exceed one hundred fifty feet shall be improved in accordance with the Uniform Fire Code.

2. Vehicular ~~A~~access shall be improved in accordance with the public works design standards.

3. ~~All access ways shall be improved in accordance with the public works design standards, and shall be a minimum of twenty feet in width with a paved width of eighteen feet.~~

D. The location, width and grade […]

[…]

S. A Transportation Impact Study (TIS) must be submitted with a land use application if the conditions in (1) or (2) apply in order to determine whether conditions are needed to protect and minimize impacts to transportation facilities, consistent with Section 660-012-0045(2)(b) and (e) of the State Transportation Planning Rule.

1. Applicability – TIS letter. A TIS letter shall be required to be submitted with a land use application to document the expected vehicle trip generation of the proposal. The expected number of trips shall be documented in both total peak hour trips and total daily trips. Trip generation shall be estimated for the proposed project using the latest edition of the Institute of Engineers Trip Generation Manual or, when verified with the City prior to use, trip generation surveys conducted at similar facilities.

2. Applicability – TIS report. A TIS report shall be required to be submitted with a land use application if the proposal is expected to involve one or more of the following:

    a. The proposed development would generate more than 10 peak hour trips or more than 100 daily trips.

    b. The proposal is immediately adjacent to an intersection that is functioning at a poor level of service, as determined by the city engineer.

    c. A new direct approach to US 30 is proposed.

    d. A proposed development or land use action that the road authority states may contribute to operational or safety concerns on its facility(ies).

    e. An amendment to the Scappoose Comprehensive Plan or Zoning Map is proposed.

3. Consistent with the city's Traffic Impact Study (TIS) Guidelines, the city engineer will determine the project study area, intersections for analysis, scenarios to be evaluated and any other pertinent information concerning the study what must be addressed in either a TIS letter or a TIS report.

4. Approval Criteria. When a TIS Letter or Report is required, a proposal is subject to the following criteria:

a. The TIS is addresses the applicable elements identified by the city engineer, consistent with the Traffic Impact Study Guidelines;

b. The TIS demonstrates that adequate transportation facilities exist to serve the proposed development or, in the case of a TIS report, identifies mitigation measures that resolve identified traffic safety problems in a manner that is satisfactory to the city engineer and, when state highway facilities are affected, to ODOT;

c. For affected non-highway facilities, the TIS report establishes that mobility standards adopted by the city have been met; and

d. Proposed public improvements are designed and will be constructed consistent with Public Works Design Standards and access standards in the Transportation System Plan.

5. Conditions of Approval.

a. The city may deny, approve, or approve a proposal with conditions necessary to meet operational and safety standards; provide the necessary right-of-way for improvements; and to require construction of improvements to ensure consistency with the future planned transportation system.

b. Construction of off-site improvements may be required to mitigate impacts resulting from development that relate to capacity deficiencies and public safety; and/or to upgrade or construct public facilities to city standards.

c. Improvements required as a condition of development approval, when not voluntarily provided by the applicant, shall be roughly proportional to the impact of the development on transportation facilities. Findings in the development approval shall indicate how the required improvements directly relate to and are roughly proportional to the impact of development.

Recommendation #8

17.154.040 Blocks.

A. The length width, and shape of blocks shall be designed with regard to providing adequate building sites for the use contemplated, consideration of needs for safe and convenient pedestrian and vehicular access and circulation and recognition of limitations and opportunities of topography.

B. Except for arterial streets, no block face shall be more than ~~six hundred~~ five hundred and thirty (530) feet in length between street corner lines and no block perimeter formed by the intersection of pedestrian ~~accessways~~ access ways and local, collector and arterial streets shall be more than one thousand ~~six hundred~~ five hundred feet in length. If the maximum block size is exceeded, mid-block pedestrian and bicycle access ways should be provided at spacing no more than 330 feet, unless one or all of the conditions in Subsection C can be met. ~~The recommended minimum length of blocks along an~~ Minimum access spacing along an arterial street must meet the standards in the city's adopted Transportation System Plan ~~is one thousand eight hundred feet~~. A block shall have sufficient width to provide for two tiers of building sites. Reverse frontage on arterial streets may be required by the planning commission.

C. Exemptions from requirement of ~~s~~Subsection B of this section may be allowed, upon approval by the planner and the ~~public works director~~ city engineer, where one or all of ~~for~~ the following ~~two~~ conditions apply:

1. Where topography and/or other natural conditions, such as wetlands or stream corridors, preclude a local street connection consistent with the stated block length standards. When such conditions exist, a pedestrian ~~accessway~~ access way shall be required in lieu of a public street connection if the ~~accessway~~ access way is necessary to provide safe, direct and convenient circulation and access to nearby destinations such as schools, parks, stores, etc.

2. Where access management standards along an arterial street preclude a full local street connection. ~~The recommended minimum block along an arterial is one thousand eight hundred feet which conflicts with the street connectivity requirements.~~ Where such conditions exist, and in order to provide for adequate connectivity and respect the needs for access management, the approval authority shall require either a right-in/right-out public street connection or public ~~accessway~~ roadway connection to the arterial in lieu of a full public street connection. Where a right-in/right-out street connection is provided, turning movements shall be defined and limited by raised medians to preclude inappropriate turning movements.

3. A cul-de-sac street shall only be used where the city engineer and planner determine that environmental or topographical constraints, existing development patterns, or compliance with other applicable City requirements preclude a street extension. Where the City determines that a cul-de-sac is allowed, all of the following standards shall be met:

   a. The cul-de-sac shall not exceed a length of 500 feet, except where the city engineer and planner determine that topographic or other physical constraints of the site require a longer cul-de-sac. The length of the cul-de-sac shall be measured along the centerline of the roadway from the near side of the intersecting street to the farthest point of the cul-de-sac.

b. The cul-de-sac shall terminate with a circular or hammer-head turnaround meeting the Uniform Fire Code and the standards of Public Works Design Standards.

c. The cul-de-sac shall provide, or not preclude the opportunity to later install, a pedestrian and bicycle access way between it and adjacent developable lands. Such access ways shall conform to the standards in Section 17.120.180(Q), as applicable.

Recommendation #9

Chapter 17.160

PROCEDURES FOR DECISION MAKING—LEGISLATIVE

17.160.120 The standards for the decision.

A. The recommendation by the planning commission and the decision by the council shall be based on consideration of the following factors:

1. Any applicable statewide planning goals and guidelines adopted under Oregon Revised Statutes Chapter 197;
2. Any federal or state statutes or rules found applicable, including compliance with Subsection C and OAR 660-012-660;
3. The applicable comprehensive plan policies and map; and
4. The applicable provisions of the implementing ordinances.

B. Consideration may also be given to: Proof of a substantial change in circumstances, a mistake, or inconsistency in the comprehensive plan or implementing ordinance which is the subject of the application.

C. Proposed amendments to the comprehensive plan, Title 17, or the zoning map shall be reviewed to determine whether it significantly affects a transportation facility pursuant to Section -0060 of Oregon Administrative Rule (OAR) 660-012, the Transportation Planning Rule (TPR). When the City, in consultation with the applicable roadway authority, finds that a proposed amendment would have a significant effect on a transportation facility, the City shall work with the roadway authority and applicant to modify the request or mitigate the impacts in accordance with the TPR and applicable law.

Recommendation #10

Chapter 17.162

PROCEDURES FOR DECISION MAKING--QUASI-JUDICIAL

17.162.020 Application process.

A. The applicant shall be required to meet with the planner for a pre-application conference. Such a requirement may be waived in writing by the applicant.

B. The planner will invite city staff from other departments to provide technical expertise applicable to the proposal, as necessary, as well as other public agency staff.

~~B.~~ C. At such conference, the planner shall:

1. Cite the applicable comprehensive plan policies and map designation;

2. Cite the applicable substantive and procedural ordinance provisions;

[Note: All subsequent subsections will need to be re-numbered.]

[…]

P. Referrals will be sent to interested agencies such as city departments, police department, fire district, school district, utility companies, and applicable city, county, and state agencies. Affected jurisdiction and agencies could include the Department of Environmental Quality, the Oregon Department of Transportation, and Columbia County Rider.

[…]

17.162.025 Noticing requirements.

A. Notice of a pending quasi-judicial public hearing shall be given by the planner in the following manner:

1. At least twenty days prior to the scheduled hearing date, or if two or more hearings are scheduled, ten days prior to the first hearing, notice shall be sent by mail to:

   a. The applicant and all owners or contract purchasers of record of the property which is the subject of the application;

   b. All property owners of record or the most recent property tax assessment roll within three hundred feet of the property which is the subject of the notice plus any properties abutting proposed off-site improvements.

c. Any governmental agency or utility whose property, services or facilities may be affected by the decision ~~which may include any of the following:~~. The reviewing City Staff shall determine the extent of notice to public agencies or utilities based on perceived interest or impact; noticed agencies may include:

[…]

17.162.090 Approval authority responsibilities.

C. The planning commission shall conduct a public hearing in the manner prescribed by this chapter and shall have the authority to approve, approve with conditions, approve with modifications or deny the following development applications:

1. Recommendations for applicable comprehensive plan and zoning district designations to city council for lands annexed to the city;

2. A quasi-judicial comprehensive plan map amendment except the planning commission's function shall be limited to a recommendation to the council. The commission may transmit its recommendation in any form and a final order need not be formally adopted;

3. A quasi-judicial zoning map amendment shall be decided in the same manner as a quasi-judicial plan amendment and is subject to 17.160.120(C);

[…]

Scappoose Transportation System Plan Update

Technical Memorandum #11b: Implementation Ordinances

Prepared by Darci Rudzinski and CJ Doxsee, Angelo Planning Group

April 14, 2016

The 2016 Transportation System Plan (TSP) will be adopted as the transportation element of the Scappoose Comprehensive Plan.[1] The purpose of this memorandum is to provide recommended modifications to transportation policies in the Comprehensive Plan. Updated policies are recommended to be consistent with and implement the updated TSP and to be consistent with the requirements of the Oregon Transportation Planning Rule (OAR 660-012, the "TPR").

Recommended policy amendments reflect issues identified through the TSP update and the need for consistency between the TSP and Comprehensive Plan. The City's existing transportation policies were adopted in the 1997 TSP, with the exception of more recent policies regarding street trees and the Scappoose Industrial Airpark. The current TSP update planning process provides an opportunity to ensure that the transportation-related policy language in the Comprehensive Plan is consistent with the objectives and recommendations of the updated TSP and to clarify the role each document serves in providing guidance for transportation planning in the City.

New language is principally based on the draft TSP.[2] Proposed policies also support related modifications to Title 17 of the Scappoose Municipal Code; proposed modifications to the Scappoose Land Use and Development Code are provided in separate draft memorandum (Technical Memorandum #11a).

The following table presents draft policy language in the first column; the comment column indicates the origin of the policy (e.g., the numbered objectives from the draft Transportation System Plan or

[1] Attachment A to this memorandum includes a draft summary of the TSP update process that is proposed as a replacement to the Transportation Section of the Comprehensive Plan.
[2] Note that not all objectives from the draft TSP are reflected in the table; those that directed the update project and do not provide policy guidance beyond the date the TSP is adopted are not included.

existing Comprehensive Plan policy). The policy recommendations are proposed to replace the transportation section of the Comprehensive Plan and serve as the City's primary policy direction.[3]

The proposed formatting follows each goal with numbered policies specific to that goal. This is not consistent with the current Comprehensive Plan formatting, which lists all goals first and numbers all policies sequentially. However, the proposed format provides a clear organization for easy reference and is recommended for a new Comprehensive Plan Transportation section.

Summary of Proposed Land Use and Development Code Amendments

Proposed Policy	Comment
Goal 1: Health and Safety. It is the goal of the City of Scappoose to develop and support a transportation system that maintains and improves individual health and safety by maximizing pedestrian and bicycle transportation options, increasing public safety and service access, and enhancing safe and smooth connections between land uses and transportation modes.	TSP Goal 1 (revised), Objective I
It is the policy of the City of Scappoose to:	
1.1) Prioritize improvements at locations in the City where enhanced street crossings for walking and biking users are needed.	TSP Goal 1, Objective C (revised: changed "identify" to "prioritize")
1.2) Work with ODOT to provide safe east-west access for pedestrian and bicyclists across US 30.	TSP Goal 1, Objective D (revised: added language to "work with ODOT")
1.3) Work to implement improvements to address high collision locations, improve safety at railroad crossings, and improve safety for walking, biking, and driving in the City.	Combined TSP Goal 1, Objectives A, B, E, and J Replaced "identify" with "implement"
1.4) Plan for and implement, through the adopted Transportation System Plan and development approval, improvements that improve the visibility of transportation users in constrained areas, such as on hills and blind curves and in landscaped areas.	TSP Goal 1, Objective F (revised)
1.5) To evaluate and install features to improve safety at signalized pedestrian crossings, such as chirpers and directional ramps, in locations that benefit underserved and vulnerable populations.	TSP Goal 1, Objective G

[3] When the goals and policies are prepared for adoption, they will be presented entirely in underlined format to signify that they are all new policies. The transportation policies currently in the Comprehensive Plan will be presented as struck-through to signify that they will be replaced by these new policies.

Proposed Policy	Comment
1.6) Identify and promote programs that encourage walking and bicycling, and that educate all users of the transportation system about good traffic behavior and consideration for other modes.	TSP Goal 1, Objective H (revised)
1.7) Work with private rail companies and the Oregon Department of Transportation Rail Division to improve the safety at railroad crossings.	Existing Comprehensive Plan Policy 5 (Ord 735, 2003) TSP Goal 1, Objective B
Goal 2: Transportation System Management. It is the goal of the City of Scappoose to emphasize effective and efficient management of the transportation system for all users.	
It is the policy of the City of Scappoose to:	
2.1) Work to develop and implement an arterial and collector street system that provides additional north-south local access routes and an alternative route to US 30.	TSP Goal 2, Objective A Incorporates TSP Goal 4, Objective C Added "work to develop and implement"
2.2) Work with ODOT to minimize the adverse impact of through travel on US 30.	TSP Goal 2, Objective B Added language to "work with ODOT"
2.3) To shift vehicular travel to off-peak periods by encouraging Transportation Demand Management Strategies, as identified in the adopted Transportation System Plan.	TSP Goal 2, Objective C (revised); TM #9 Table 2
2.4) To improve travel reliability and safety with Transportation System Management strategies identified in the Transportation System Plan, including employing advanced technologies and management techniques to increase the efficiency of existing transportation infrastructure.	TSP Goal 2, Objective D (revised) TSP Goal 6, Objective F ("Support and encourage transportation system management (TSM) and transportation demand management (TDM) solutions to congestion.")
2.5) Develop and maintain existing facilities to preserve their intended function and useful life in a way that supports mobility for all users, including those with special transportation needs.	Combined TSP Goal 2, Objectives E and F
2.6) Use transportation impact study guidelines to determine an appropriate level of required analysis to ensure that land use and development proposal are consistent with the identified function, capacity, and performance standards of impacted transportation facilities.	TSP Goal 2, Objective G (revised "Adopt transportation impact study guidelines for development")

Proposed Policy	Comment
2.7) Ensure that land use approvals on properties including or adjacent to rights-of-way and street improvements which are less than that specified in the transportation plan and maps require: dedication of adequate land for public right-of-way to meet that specified in the plan; construction of the required interior street system; and construction of, or execution of a non-remonstrance deed restriction for the specified street improvements immediately adjacent to the properties.	Existing Comprehensive Plan Goals 8 and 9 (revised/expanded)
Goal 3: Travel Choices. It is the goal of the City of Scappoose to develop and maintain a well-connected transportation system that offers convenient and available pedestrian, bicycle and transit trips.	
It is the policy of the City of Scappoose to:	
3.1) Provide safe, comfortable and convenient transportation options by providing for all transportation modes.	TSP Goal 3, Objective A
3.2) Incorporate streetscape features in the transportation system such as street lighting, bike parking, and weather protection (e.g., bus shelters, covered bicycle parking) that better meet the needs and enhance the experience of the walking, biking and transit user.	TSP Goal 3, Objective B (revised)
3.3) Connect bikeways and pedestrian accessways to local and regional travel routes and community destinations.	Combined TSP Goal 3, Objectives C and F
3.4) Require bicycle parking facilities at all new residential multifamily developments of four units or more, commercial, industrial, recreational, and institutional facilities.	New policy supports proposed amendments to Off-street Parking and Loading Requirements in the Land Use and Development Code.
3.5) Require sidewalks on all new streets within the Urban Growth Boundary and that these facilities be designed to the standards in the City's adopted Transportation System Plan.	TSP Street Design Standards

Proposed Policy	Comment
3.6) Require special features for designated Mixed-Use Streets, such as wider sidewalks, pedestrian amenities, transit amenities, attractive landscaping, on-street parking, pedestrian crossing enhancements and bicycle facilities.	TSP Street Design Standards, Figure 14 Special Cross-Sections
3.7) Ensure that new development and redevelopment provide pedestrian connections within the site and to adjacent sidewalks, existing and planned developments, and transit streets and facilities.	New policy supports proposed amendments to Site Development Review/Pedestrian Access and Circulation Standards in the Land Use and Development Code.
3.8) Enhance way finding signage for those walking and biking, directing them to bus stops, trails, and key routes and destinations.	TSP Goal 3, Objective D
3.9) Promote walking, bicycling, and sharing the road through public information and participation.	TSP Goal 3, Objective E
3.10) Transit stops shall be established and maintained in locations that are safe and convenient for users and that are consistent with the Columbia County Community-Wide Transit Plan.	TSP Goal 3, Objective G
3.11) Encourage carpool/vanpool programs for reducing commuter vehicular travel demand along Highway 30 (to Portland).	TSP Goal 3, Objective I; reflects existing Comprehensive Plan Policy 9
3.12) Encourage increased opportunities for local and regional public transit routes and facilities.	Recommended Implementation Plan policy from the 2009 Columbia County Community-Wide Transit Plan and US 30 Transit Access Plan.
Goal 4: Economic Vitality. It is the goal of the City of Scappoose to support the development and revitalization efforts of the City, Region, and State economies and ensure the efficient movement of people and goods.	
It is the policy of the City of Scappoose to:	
4.1) Provide transportation facilities that support existing and planned land uses.	TSP Goal 4, Objective D

Proposed Policy	Comment
4.2) Plan for and accommodate freight system efficiency, access, and travel reliability.	TSP Goal 4, Objective A (revised: replaced "improve" with "plan for and accommodate")
4.3) Encourage employment opportunities at the Scappoose Industrial Airpark. The City shall plan for future freight facility needs at the Airpark and implement compatibility and safety standards to promote air navigational safety at the Airpark and to reduce potential safety hazards for persons living, working or recreating near the Airpark.	TSP Goal 4, Objective H, and text related to the Airport Employment Overlay Zones and the AO Public Use Airport Safety and Compatibility Overlay Zone.
4.4) Manage parking efficiently and ensure that it supports downtown business needs and promotes new development.	TSP Goal 4, Objective B
4.5) Enhance the vitality of the Scappoose downtown area by incorporating roadway design elements for all modes.	TSP Goal 4, Objective E
4.6) Provide for convenient parking and access to community destinations such as businesses and scenic/recreation areas.	TSP Goal 4, Objective F
4.7) Require that proposed land developments mitigate adverse traffic impacts and ensure that all new development contributes a fair and proportionate share toward on-site and off-site transportation system improvements.	TSP Goal 4, Objective G (revised). As proposed policy is specific to developers' role and is related to the Traffic Impact Study Guidelines and associated proposed modifications to Street and Utilities Development Standards in the Land Use and Development Code.
Goal 5: Livability. It is the goal of the City of Scappoose to provide transportation solutions that support active transportation, facilitate access to daily needs and services, and enhance the livability of the City's neighborhoods and business community.	
It is the policy of the City of Scappoose to:	
5.1) Protect residential neighborhoods from excessive through traffic and travel speeds. When required, the application of traffic calming measures will be proportional to the identified need and appropriate for the facility on which it is located, based on street functional classification.	TSP Goal 5, Objective A and TSP Table 3, Traffic Calming Measures by Street Functional Classification

Proposed Policy	Comment
5.2) Prioritize facility improvements with transportation connections between community destinations.	TSP Goal 5, Objective B Replaced "enhance" with "prioritize"
5.3) Work with ODOT to balance freight movement on US 30 with livability conditions in the downtown area.	TSP Goal 5, Objective C Added language to "work with ODOT"
5.4) Minimize transportation-related conflicts between neighborhoods and businesses by requiring developers to design commercial sites in context with existing and planned land uses by, among other things, providing sufficient parking for cars and bikes, adequate directional signage, and good neighbor agreements where needed.	TSP Goal 5, Objective D
5.5) Incorporate streetscape amenities that reflect the City's unique character (e.g., street furnishings, landscaping).	TSP Goal 5, Objective E
5.6) Allow trucks on all streets, unless posted otherwise. The City will consider prohibiting trucks over 30 feet long on streets classified as "Local" and a 24-hour vehicle classification count reveals that traffic is comprised of at least 5% trucks on a typical day.	New policy reflects direction in TM #10, Freight Routes and Restrictions.
5.7) Enhance the aesthetics of all streets and roadways through planting and maintenance of street trees.	Existing Comprehensive Plan Policy 12.
Goal 6: Sustainable Transportation System. It is the goal of the City of Scappoose to provide a transportation system that meets the needs of present and future generations and is environmentally sustainable.	Removed TSP Goal 6, Objective C
It is the policy of the City of Scappoose to:	
6.1) Plan and develop a network of streets, accessways, and other improvements, including bikeways, sidewalks, and safe street crossings to promote safe and convenient bicycle and pedestrian circulation within the community.	TSP Goal 6, Objective A (Revised: "Support travel options that allow individuals to reduce single-occupant vehicle trips")
6.2) Identify areas where alternative land use types would significantly shorten trip lengths or reduce the need for motor vehicle travel within the City.	TSP Goal 6, Objective B

Proposed Policy	Comment
6.3) Minimize the impacts of transportation improvements to Scappoose Creek and other natural areas or environments.	TSP Goal 6, Objective D (revised)
6.4) Support the reduction of greenhouse gas emissions from transportation sources, including promoting travel options that allow individuals to reduce single-occupant vehicle trips.	TSP Goal 6, Objective E and Objective A Inclusive of Objective C ("Support alternative vehicle types by identifying potential electric vehicle plug-in stations and developing implementing code provisions.")
6.5) Support alternative mobility standards on state facilities where needed improvements to meet adopted standards are not likely to be funded over the planning horizon or have impacts that are not desirable for the community.	TSP Goal 6, Objective G (revised. Original objective included "city facilities.")
Goal 7: Fiscal Responsibility. It is the goal of the City of Scappoose to sustain an economically viable transportation system for existing and future users that protects and improves existing transportation assets while cost-effectively enhancing the total system.	
It is the policy of the City of Scappoose to:	
7.1) Plan for an economically viable and cost-effective transportation system.	TSP Goal 7, Objective A
7.2) Identify and develop diverse and stable funding sources to implement recommended projects in a timely fashion and ensure sustained funding for transportation projects and maintenance.	TSP Goal 7, Objective B
7.3) Make maintenance of the transportation system a priority.	TSP Goal 7, Objective C
7.4) Consider costs and benefits when evaluating potential transportation options, identifying project solutions, and prioritizing public investments. The City will consider the distribution of benefits and impacts to its citizens and will work towards fair access to transportation facilities for all users, all ages, and all abilities.	TSP Goal 7, Objective D (revised)

Proposed Policy	Comment
7.5) Prioritize funding of projects that are most effective at meeting the goals and policies of the Transportation System Plan.	TSP Goal 7, Objective E
Goal 8: Equitable Transportation System. It is the goal of the City of Scappoose to provide a transportation system that is accessible to all users regardless of age, income, and health.	
It is the policy of the City of Scappoose to:	
8.1) Develop and maintain a transportation system that supports a variety of travel options.	TSP Goal 8, Objective A
8.2) Ensure that the transportation system provides equitable access to underserved and vulnerable populations as well as users with a range of ages.	Combined TSP Goal 8, Objectives B and C
8.3) Ensure that the pedestrian access ways (including sidewalks and pathways) are clear of obstacles and obstructions (e.g., utility poles).	TSP Goal 8, Objective D
8.4) Ensure that the transportation system provides connections for all modes that meet applicable Americans with Disabilities Act (ADA) standards.	TSP Goal 8, Objective E
Goal 9: Coordinate Transportation Planning. It is the goal of the City of Scappoose to develop a transportation system that is consistent with the City's Comprehensive Plan and that is coordinated with County, State, and Regional plans.	Removed TSP Goal 9, Objective G
It is the policy of the City of Scappoose to:	
9.1) Coordinate and cooperate with adjacent jurisdictions and other transportation agencies to develop transportation projects that benefit the City, Region, and State as a whole and to ensure the transportation system functions seamlessly.	Combined TSP Goal 9, Objectives A and B
9.2) Review transportation standards periodically to ensure consistency with Regional, State, and Federal standards.	TSP Goal 9, Objective C
9.3) Coordinate with the County and State agencies to ensure that improvements to County and State highways within the City benefit all modes of transportation.	TSP Goal 9, Objective D

Proposed Policy	Comment
9.4) Participate with ODOT and Columbia County in the revision of their transportation system plans, and coordinate land development outside of the Scappoose area to ensure provision of a transportation system that serves the needs of all users.	TSP Goal 9, Objective E
9.5) Participate in updates of the ODOT State Transportation Improvement Program (STIP) and Columbia County Capital Improvement Program (CIP) to promote the inclusion of projects identified in the Scappoose TSP.	TSP Goal 9, Objective F
9.6) Coordinate public transit planning improvements within City limits with Columbia County to ensure that future transit routes and facilities are consistent with the findings and recommendations of the adopted Columbia County Community-wide Transit Plan.	TSP Goal 9, Objective H
9.7) Coordinate with the Port of St. Helens to maintain the continuing viability of the Scappoose Industrial Airpark.	TSP Goal 9, Objective I; existing Comprehensive Policy 13
9.8) Coordinate with transit providers to improve the coverage, quality and frequency of services as needed in areas where existing and planned land uses support transit services.	Combined TSP Goal 3, Objectives H and J

The following draft summary of the TSP update process is intended to replace the Transportation Section of the Comprehensive Plan.

In 2012 the City of Scappoose began a planning project to replace the City's 1997 Transportation System Plan and to prepare associated land use ordinances. The primary objective of the project was to describe and document a new baseline condition for the City's multi-model transportation system and to identify transportation improvements based on a 2035 planning horizon. This long-overdue project was informed by several studies and plans that had been conducted and completed since the 1997 TSP was adopted, including the Columbia County Transit Study (2002), Rail Corridor Study (2002), Airport Master Plan (2004), and Economic Opportunities Analysis (2011). The TSP update was needed to ensure consistency and further the outcomes of these earlier plans, as well as to plan for the future needs of expected growth in the City. Specifically, high residential household growth is expected in south Scappoose, in the vicinity of Dutch Canyon Road, and on the west side of town, west of Scappoose Creek; employment growth will be highest in the north part of town, particularly near the airport and along US 30 through town. Identified growth areas informed the travel demand forecasting efforts and future transportation system needs. In addition to roadway needs, the project also focused on a full evaluation of the bicycle and pedestrian systems, with special attention on identifying new and enhanced local routes and connections to the regional trail system.

The resulting 2016 Transportation System Plan is a multi-modal plan that embodies the community's vision for an equitable and efficient transportation system. It is a planning tool that will help the City balance its investments to ensure that it can develop and maintain the transportation system adequately to serve everyone who travels in and through Scappoose. The TSP outlines strategies and projects that are important for protecting and enhancing the quality of life in Scappoose through the next 20 years and includes standards to guide future development.

The 2016 Transportation System Plan serves as the Transportation element of the City's Comprehensive Plan; additional information, including forecasted future transportation needs, roadway functional classifications, and transportation facility standards can be found in the TSP document.

Section M

Memo: Alternative Mobility Standards

DKS

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TECHNICAL MEMORANDUM

DATE: March 31, 2016

TO: Scappoose TSP Project Management Team

FROM: Julie Sosnovske, PE
Reah Flisakowski, PE

SUBJECT: **Scappoose Transportation System Plan Alternative Mobility Targets** P11086-012

It is important for a Transportation System Plan (TSP) to identify a full range of transportation system projects and services that would address the deficiencies that would exist at the end of a 20-year planning horizon. As a base case, it is assumed that the community grows in accordance with its existing adopted land use plan and no additional improvements are made during that period of time.

However, it is also important for a TSP to realistically identify which transportation projects and services are reasonably likely to be implemented over the 20-year planning horizon, based on financial or other constraints. This exercise enables the community and, as appropriate, the state to establish realistic expectations for how that transportation system will likely operate at the end of the 20-year planning horizon.

Because of the financial and other constraints that have been faced by state and local governments over the last 20 years and which are expected to continue into the foreseeable future, it is often the case that the local and/or state roadways will not be improved to the extent that they will be able meet local level-of-service (LOS) standards or, in the case of ODOT, roadway volume-to-capacity (v/c) ratio based mobility targets, at the end of the 20-year planning horizon if the community grows in accordance with its existing, adopted land use plan. In some cases, a community may also choose to not add capacity to major roadways due to other urban design or livability priorities. This is particularly common in larger communities or in those with roadways that experience higher travel demands. In these cases, it is appropriate to adjust roadway performance expectations, as expressed through local LOS standards or state mobility targets, to match the performance that is actually forecasted to exist at the end of the 20-year planning horizon, through the adoption of alternative standards or mobility targets.

In other words, in these situations, adopting alternative standards or mobility targets is simply an exercise in adjusting roadway performance expectations to match realistic expectations for how the roadways are actually forecasted to operate, taking into account financial and other constraints and assuming implementation of the existing, adopted local land use plan. In addition to establishing realistic expectations for future system performance, this process will help reduce the potential for state and local investment needs by not continuing to require compliance with standards or targets that both parties acknowledge cannot likely be achieved, assuming that the community continues to grow in accordance with its existing, adopted land use plan.

In Scappoose, the transportation system analysis has revealed that portions of US 30 are not expected to be able to meet ODOT's existing adopted mobility targets at the end of the 20-year planning horizon, based on the transportation impact associated with the population and employment growth expected through implementation of the City's existing, adopted land use plan and the transportation system performance that would result, assuming implementation of only those projects and services that have been identified as reasonably likely to be funded during the 20-year planning horizon. This memorandum documents the need for developing alternative mobility targets for US 30 through Scappoose and describes the proposed new targets. Included is a summary of the methodology and results, and the recommended alternative mobility targets for the highway.

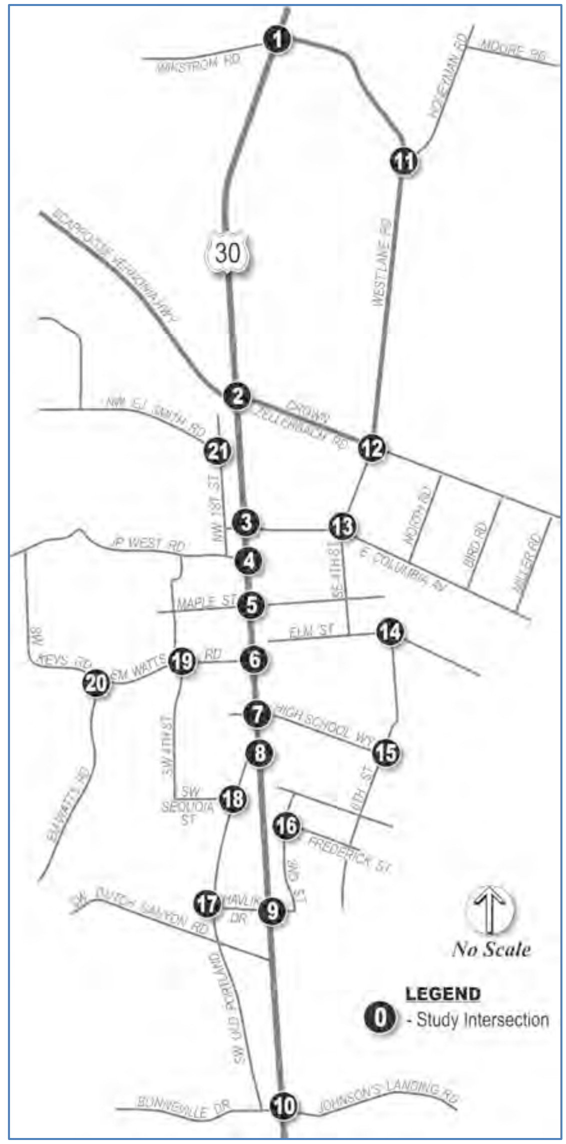

Figure 1: Scappoose TSP Study Area

Background

The segment of US 30 under consideration, shown in Figure 1, is represented by study intersections numbered 1 through 10. The segment of US 30 is bounded by the urban growth boundary (near West Lane Road/Wikstrom Roads to the north and near Bonneville Drive/Johnson Landing Road to the south). US 30 is the major transportation route through Scappoose, running north and south, bisecting the city. The Columbia River to the east, hilly topography to the west, existing development and the UGB limit continuous north to south routes parallel to US 30.

Within Scappoose, US 30 is classified as a Statewide Highway. 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 intraurban and intra-regional trips. The management objective is to provide safe and efficient, high-speed, continuous-flow operation. In addition, US 30 through Scappoose is part of the National Highway System (NHS), and is a designated Freight Route and Truck Route.

The Need for Alternative Mobility Targets

Prior to exploring alternatives to the current mobility targets, evaluation of the disparity between the current targets and forecasted traffic operations confirmed the need for assessing the potential to mitigate conditions through other means. The findings of that evaluation are described below.

Current Mobility Targets

All intersections along US 30 in Scappoose must comply with the volume to capacity (v/c) ratio targets in the Oregon Highway Plan (OHP). ODOT v/c ratio targets are based on highway classification, area type, and posted speeds. Table 1 lists the existing OHP Mobility Targets for US 30.

Table 1: Mobility Targets for ODOT Intersections along US 30

Roadway (Intersection)	Speed Limit Major/Minor (mph)	OHP Mobility Standard (volume-to-capacity ratio)	
		OHP Signalized or all-way stop intersections, or free movements at unsignalized intersections	OHP Stop or yield-controlled movements at unsignalized intersections
US 30/Wikstrom Rd	55/45	0.80	0.90
US 30/Scappoose-Vernonia Highway	35/35	0.85	
US 30/East Columbia Ave	35/25	0.85	
US 30/J.P. West Rd	35/25	0.85	0.95
US 30/Maple St	35/25	0.85	
US 30/E.M. Watts Rd	35/25	0.85	
US 30/High School Wy	35/25	0.85	
US 30/Old Portland Rd (north end)	35/35	0.85	
US 30/Havlik Dr	45/25	0.80	0.95
US 30/Bonneville Dr	45/25	0.80	0.95

***v/c ratios are the maximum allowed**

Source: Oregon Highway Plan (OHP), Policy 1F, Table 6, as amended December 21, 2011Targets

All intersections along US 30 in Scappoose should comply with the volume to capacity (v/c) ratio targets in the Oregon Highway Plan (OHP). ODOT v/c ratio targets are based on highway classification, area type, and posted speeds.

ODOT standard analysis procedure also requires intersection operating conditions to be compared to existing OHP Mobility Targets during the 30th highest annual hour of traffic (30 HV). In Scappoose, the 30th highest annual hour typically occurs during the summer months, when traffic volumes increase due to vacationers and visitors traveling through to and from the coast. During an average weekday, volumes are generally 15 percent lower than those along the highway during the summer, as described in Technical Memorandum #5.

Existing and Future Highway Operations

A comparison of existing (year 2012) and future (year 2035) traffic operations along US 30 to adopted mobility targets during summer traffic conditions (30 HV) shows that most intersections operate well today, but traffic demand in the summer p.m. peak period at many intersections will exceed capacity by 2035. Table 2 summarizes the results of this analysis, along with existing OHP Mobility Targets. As shown, most of the intersections would fail to comply with the targets by 2035. Note that a more restrictive Highway Design Manual (HDM) mobility standard is applied to the evaluation of planned improvements or highway construction improvements on state highways.[1] If the HDM standards are not met at the time of project development, a design exception may be required.

The Transportation System Plan (TSP) development process considered a range of improvement options for US 30. This included making spot improvements at intersections, enhancing the transit system, expanding the cycling and walking networks, strategies to help manage peak travel demands, and improvements to maximize the efficiency of the existing street network. Widening the highway beyond the existing five lanes through the city would add a significant amount of capacity and would allow nearly all intersections to comply with current mobility targets. However, the impact to existing development would be significant considering the surrounding environment and constrained right-of-way (both built environment and physical constraints). Additionally, the cost of such widening is well beyond any reasonably likely expectation for funding during the 20-year based on current ODOT funding capabilities. Therefore, the highway-widening improvements were not recommended for implementation within the 20-year planning horizon.

ODOT and the City will manage US 30 with the expectation that no highway widening projects will be developed during the 20-year planning horizon. Without highway widening, the management approach for US 30 is to maximize the safety and efficiency of the overall transportation system and increase accessibility and availability of transit, walking and biking facilities, recognizing that it is not currently financially feasible or practical from either a community impact or physical constraint perspective (or both) to construct additional highway capacity on US 30 to reduce congestion.

Table 2 shows how US 30 intersections, which did not meet mobility targets for the 2035 "No Build" condition, are expected to operate in 2035 during the summer peak with the recommended improvements from the Scappoose TSP in place (Financially Constrained projects shown in Tech Memo #9). Congestion on the highway is not expected to significantly improve over the "No Build" condition, with peak hour demand exceeding capacity at all signalized and unsignalized intersections. Given that highway widening would be required to meet existing OHP Mobility Targets, it is clear that it will not be possible to meet them along US 30 in Scappoose by the end of the 20-year planning horizon.

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[1] 2012 ODOT Highway Design Manual (HDM), Table 10-2: 20 Year Design Mobility Standards.

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Table 2: Intersection Operations along US 30 within Scappoose, 30 HV Conditions (V/C Ratios)

Intersection	Existing OHP Mobility Target	2012 Existing Conditions	2035 Baseline Conditions (No Build)	2035 with Recommended System Improvements
Signalized Intersections				
US 30/Scappoose-Vernonia Highway	0.85	0.81	**>2.0**	**1.32**
US 30/East Columbia Avenue	0.85	0.83	**1.28**	**1.24**
US 30/Maple Street	0.85	**0.91**	**1.28**	**1.21**
US 30/E.M. Watts Road	0.85	**0.92**	**1.33**	**1.24**
US 30/High School Way	0.85	0.84	**1.11**	**1.05**
US 30/Havlik Drive	0.80	**0.91**	**1.48**	**1.26**
US 30/Wikstrom Road/West Lane Road	0.80			**1.13**

* Worst mainline volume-to-capacity ratio/worst side street volume-to-capacity ratio

Factors Limiting the Ability to Meet Existing Mobility Targets

Several factors combine to make compliance with the current mobility targets along US 30 difficult. They include:

- **Competition from Multiple Users**
  The importance of US 30 to statewide, regional, and local traffic creates significant demands for both short and long trips along the corridor. These competing users include:
  - Motorists making local trips to homes, work, and shopping
  - Motorists making regional trips through Scappoose between other cities
  - Freight traveling to and through Scappoose (US 30 is a Federal Truck Route)
  - Transit, including movement and access – most of the local transit routes are along US 30
  - Bicyclists- US 30 is a touring bike route as well as a means of transportation for locals
  - Pedestrians using the most direct route, in some places the only route, connecting their residences with community facilities, employment, and shopping
- **Financial Factors**
  As is true for most agencies, funding for City and ODOT transportation improvements is limited. Even if all forecasted state and local transportation revenue for projects in Scappoose over the next 20 years were spent on highway capacity improvements, it would still fall well short of enabling current mobility targets to be met.
- **Existing Development Patterns**
  In many areas along US 30, adjacent development constrains the ability to widen the highway right-of-way or provide parallel alternate routes. Obtaining needed right-of-way for highway widening would

require acquisition and removal of such development, which would be very expensive and undesirable to the community.

- **Environmental Factors**
  The railroad tracks immediately east of US 30, the Columbia River to the east, hilly topography and Scappoose Creek to the west and the UGB limit options to provide an effective, connected transportation system, especially along or parallel US 30, which is the primary transportation corridor through the city. These factors provide a challenging environment for transportation and make the construction or expansion of transportation facilities or the construction of parallel routes potentially cost prohibitive.

Other Strategies Being Applied to Enhance Mobility

Recognizing that mobility along US 30 will be constrained, the City's Transportation System Plan includes several actions to help relieve congestion:

- Improvements to local streets to allow the city street network to operate at a Level of Service "D" or better for signalized intersections and Level of Service "E" or better for unsignalized intersections (both with v/c ratios less than 0.90) through the year 2035. Maintaining good performance of the local streets will help to provide attractive travel alternatives to US 30 for local trips, where practical.
- Expand the city's local street network, especially in the northeast parts of the city, to improve connectivity and create alternate routes to US 30 for local trips, removing them from the highway.
- Use an array of Transportation System Management (TSM) strategies, including protective/permissive signal timing on US 30 (currently being implemented), improved connectivity of local streets, as well as access management regulations already in place.
- Work with ODOT to ensure that traffic signal timing remains up-to-date, including coordination between signals, as traffic volume conditions change over time.
- Fill facility gaps in the pedestrian and bicycle network and improve crossing opportunities along US 30, improving safety and providing access to major activity generators.

However, even with these actions in place, traffic operations along US 30 will not meet existing OHP Mobility Targets at the end of the 20-year planning horizon. The implementation of these actions, along with the OTC adoption of alternative mobility targets for US 30 into the OHP that reflect ODOT and the City's mutual, realistic highway performance expectations, constitutes ODOT's US 30 management strategy in Scappoose through the 20-year planning horizon.

Proposed Alternative Mobility Targets

This section describes the proposed alternative mobility targets in detail, including the process used to develop them and the associated analysis methodology.

Alternative Mobility Target Process

Figure 3 shows the ODOT Region 2 methodology for determining alternative mobility targets. Table 3 summarizes the assessment of each study intersection along US 30 using the methodology. Refer to Technical Memorandum #8 (Future Transportation Conditions) for summer and average weekday 2035 p.m. peak hour motor vehicle volumes used for this methodology.

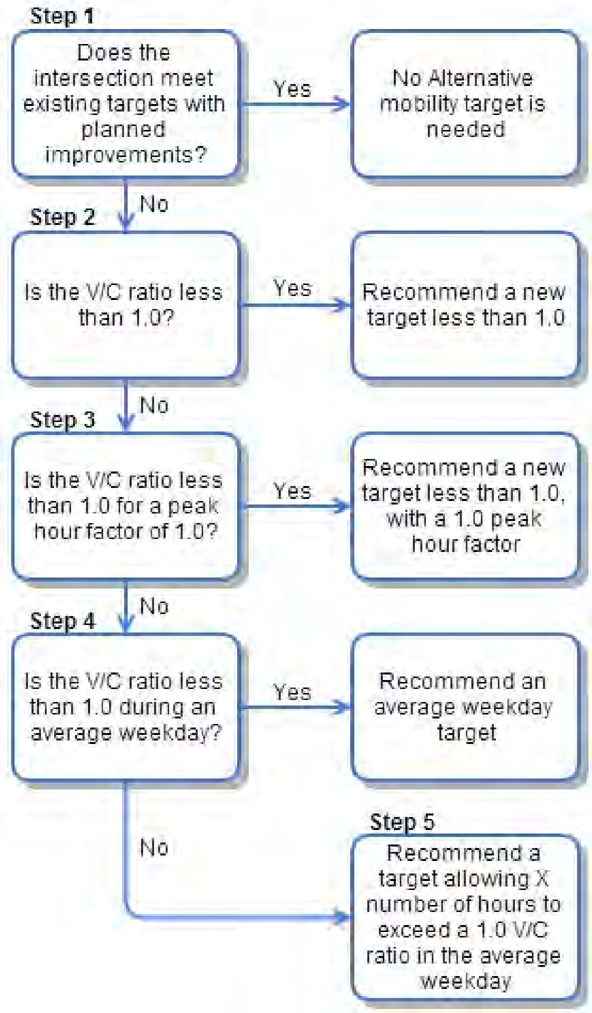

Figure 3: Alternative Mobility Target

Step 1: None of the seven signalized study intersections along US 30 would be expected to meet existing OHP mobility targets during the summer of 2035, after recommended improvements described earlier. To be compliant, Scappoose would need alternative mobility targets for all of the seven signalized study intersections along US 30.

Step 2: Of the seven study intersections that would not meet current mobility targets during the summer of 2035, none would be expected to operate with a v/c ratio less than 1.0.

Step 3: Of the seven study intersections expected to operate with a v/c ratio over 1.0 during the summer of 2035, none would be expected to operate with v/c ratios less than 1.0 after assuming a peak hour factor of 1.0.[2]

Step 4: Of the seven study intersections expected to operate with a v/c ratio over 1.0 during the summer of 2035 after assuming a 1.0 peak hour factor, five (the signalized intersections of US 30 with Scappoose-Vernonia Highway, East Columbia Avenue, Maple Street, E.M. Watts Road and Havlik Drive) would be expected to also operate with a v/c ratio over 1.0 during an average weekday peak hour in 2035.

Step 5: "Hours of congestion" analysis was conducted, which assumes that traffic volumes that exceed capacity in the analysis hour are shifted to the "shoulder" hours, iteratively, until all traffic can be accommodated. The

[2] Peak hour factors (PHF) are used to account for the non-uniformity of traffic flow within the peak hour by converting hourly volumes to peak flow rates associated with a selected interval of time within the peak hour. The most common interval of time selected for traffic analysis is the peak 15 minutes. A PHF of 1.0 assumes uniform traffic flow within the four 15-minutes periods of the peak hour.

analysis applied to the five signalized intersections identified in Step 4, shows the intersections will exceed capacity for up to six consecutive hours during an average weekday in 2035, as follows:

- US 30/Scappoose-Vernonia Highway – 5 hours
- US 30/East Columbia Avenue – 6 hours
- US 30/Maple Street – 5 hours
- US 30/E.M. Watts Road – 4 hours
- US 30/Havlik Drive – 5 hours

Recommended Alternative Mobility Targets

Five signalized intersections are forecasted to exceed the existing OHP Mobility Target values once the analysis methodology is adjusted to assess the average annual condition, as follows:

- US 30/Scappoose-Vernonia Highway (signalized)
- US 30/East Columbia Avenue (signalized)
- US 30/Maple Street (signalized)
- US 30/E.M. Watts Road (signalized)
- US 30/Havlik Drive (signalized)

Therefore, the existing adopted OHP target values require an alternative mobility standard for those intersections. The following alternative OHP Mobility Targets are recommended for adoption by the Oregon Transportation Commission (OTC).

- US 30/Scappoose-Vernonia Highway (signalized) – v/c ratio of 1.0 - "full capacity" for 5 hours
- US 30/East Columbia Avenue (signalized) – v/c ratio of 1.0 - "full capacity" for 6 hours
- US 30/Maple Street (signalized) – v/c ratio of 1.0 - "full capacity" for 5 hours
- US 30/E.M. Watts Road (signalized) – v/c ratio of 1.0 - "full capacity" for 4 hours
- US 30/Havlik Drive (signalized) – v/c ratio of 1.0 - "full capacity" for 5 hours

OTC adoption of the alternative analysis methodology that assesses the average annual weekday traffic condition, with an assumed peak hour factor of 1.0, is also recommended for all of US 30 in Scappoose.

Table 3: Alternative Mobility Target Results (v/c Ratio)

Intersection	Existing OHP Mobility Target	2035 Summer (30 HV) Intersection Operations	Assuming 0.99 v/c Mobility Target	2035 Summer (30 HV) Intersection Operations		2035 Average Weekday Intersection Operations	
		Step 1: With Recommended Improvements*		Step 2: With Recommended Improvements*	Step 3: 1.0 Peak Hour Factor	Step 4: With Recommended Improvements	Step 5: Total Hours v/c > 1.0
Signalized Intersections							
US 30/Scappoose-Vernonia Highway	0.85	**1.32**	0.99	**1.32**	**1.24**	**1.18**	5 hours
US 30/East Columbia Avenue	0.85	**1.24**	0.99	**1.24**	**1.19**	**1.17**	6 hours
US 30/Maple Street	0.85	**1.21**	0.99	**1.21**	**1.15**	**1.08**	5 hours
US 30/E.M. Watts Road	0.85	**1.24**	0.99	**1.24**	**1.18**	**1.10**	4 hours
US 30/High School Way	0.85	**1.05**	0.99	**1.05**	**1.01**	0.93	-
US 30/Havlik Drive	0.80	**1.26**	0.99	**1.26**	**1.24**	**1.11**	5 hours
US 30/Wikstrom Road/West Lane Road	0.80	**1.13**	0.99	**1.13**	**1.07**	0.94	-

* Planned Improvements include the Financially Constrained Motor Vehicle Projects included in Technical Memorandum #9.

Bold, Red and Shaded indicates intersection fails to meet target

Peak Volume Profile

Date	Sum of all vehicles in timespan
5/5/2010 7:00 AM	548
5/5/2010 7:15 AM	555
5/5/2010 7:30 AM	557
5/5/2010 7:45 AM	521
5/5/2010 8:00 AM	526
5/5/2010 8:15 AM	559
5/5/2010 8:30 AM	443
5/5/2010 8:45 AM	447
5/5/2010 9:00 AM	394
5/5/2010 9:15 AM	400
5/5/2010 9:30 AM	392
5/5/2010 9:45 AM	399
5/5/2010 10:00 AM	403
5/5/2010 10:15 AM	446
5/5/2010 10:30 AM	416
5/5/2010 10:45 AM	419
5/5/2010 11:00 AM	416
5/5/2010 11:15 AM	454
5/5/2010 11:30 AM	448
5/5/2010 11:45 AM	479
5/5/2010 12:00 PM	460
5/5/2010 12:15 PM	483
5/5/2010 12:30 PM	498
5/5/2010 12:45 PM	495
5/5/2010 1:00 PM	522
5/5/2010 1:15 PM	494
5/5/2010 1:30 PM	505
5/5/2010 1:45 PM	508
5/5/2010 2:00 PM	543
5/5/2010 2:15 PM	516
5/5/2010 2:30 PM	549
5/5/2010 2:45 PM	565
5/5/2010 3:00 PM	584
5/5/2010 3:15 PM	633
5/5/2010 3:30 PM	633
5/5/2010 3:45 PM	628
5/5/2010 4:00 PM	695
5/5/2010 4:15 PM	646
5/5/2010 4:30 PM	706
5/5/2010 4:45 PM	733
5/5/2010 5:00 PM	748
5/5/2010 5:15 PM	711
5/5/2010 5:30 PM	616
5/5/2010 5:45 PM	672
5/5/2010 6:00 PM	592
5/5/2010 6:15 PM	568
5/5/2010 6:30 PM	531
5/5/2010 6:45 PM	485
5/5/2010 7:00 PM	382
5/5/2010 7:15 PM	335
5/5/2010 7:30 PM	304
5/5/2010 7:45 PM	318
5/5/2010 8:00 PM	316
5/5/2010 8:15 PM	262
5/5/2010 8:30 PM	286
5/5/2010 8:45 PM	253
5/5/2010 9:00 PM	211
5/5/2010 9:15 PM	216
5/5/2010 9:30 PM	180
5/5/2010 9:45 PM	165
5/5/2010 10:00 PM	163
5/5/2010 10:15 PM	120
5/5/2010 10:30 PM	101
5/5/2010 10:45 PM	90
5/5/2010 11:00 PM	76
5/5/2010 11:15 PM	84
5/5/2010 11:30 PM	69
5/5/2010 11:45 PM	65

Totals

Peak	2808	
Hour 1	2616	0.93
Hour 2	2422	0.86
Hour 3	2133	0.76
Hour 4	1788	0.64
Hour 5	1699	0.61
Hour 6	1599	0.57

Hours of Congestion Analysis

Hour 1 Factor	0.93
Hour 2 Factor	0.86
Hour 3 Factor	0.76
Hour 4 Factor	0.64
Hour 5 Factor	0.61

Peak Hour Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	310	2200	440	100	1640	50	40	170	300	580	350	70
US 30/East Columbia Ave	20	2710	130	110	2170	10	0	0	0	280	220	50
US 30/Maple St	90	2660	40	70	2370	60	70	50	110	70	30	130
US 30/E.M. Watts Rd	30	2560	0	0	2210	330	230	0	40	0	0	0
US 30/Havlik Dr	230	2000	560	60	1350	150	400	120	120	90	250	110
US 30/Bonneville Dr/Johnsons Landing Rd	240	2770	50	30	1760	30	0	0	150	30	0	50

Peak Hour Excess Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	47	288		26	113					87		
US 30/East Columbia Ave		548		5								
US 30/Maple St		409			238	6						
US 30/E.M. Watts Rd		61			233	35						
US 30/Havlik Dr	9	218		16							37	17
US 30/Bonneville Dr/Johnsons Landing Rd										-28		30

Peak Hour Adjusted Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	**263**	**1912**	440	**74**	**1527**	50	40	170	300	**493**	350	70
US 30/East Columbia Ave	20	**2162**	130	**105**	2170	10	0	0	0	280	220	50
US 30/Maple St	90	**2251**	40	70	**2132**	**54**	70	50	110	70	30	130
US 30/E.M. Watts Rd	30	**2499**	0	0	**1977**	**295**	230	0	40	0	0	0
US 30/Havlik Dr	**221**	**1782**	560	**44**	1350	150	400	120	120	90	**213**	**93**
US 30/Bonneville Dr/Johnsons Landing Rd	240	2770	50	30	1760	30	0	0	150	**58**	0	**20**

Hour 1 Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	336	2338	410	119	1641	47	37	158	279	627	326	65
US 30/East Columbia Ave	19	3073	121	107	2022	9	0	0	0	261	205	47
US 30/Maple St	84	2887	37	65	2446	62	65	47	102	65	28	121
US 30/E.M. Watts Rd	28	2446	0	0	2292	342	214	0	37	0	0	0
US 30/Havlik Dr	223	2081	522	72	1258	140	373	112	112	84	270	119
US 30/Bonneville Dr/Johnsons Landing Rd	224	2581	47	28	1640	28	0	0	140	0	0	77

Hour 1 Excess Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	73	469		24	114					116		
US 30/East Columbia Ave		889		2								
US 30/Maple St		599			277	7						
US 30/E.M. Watts Rd					250	40						
US 30/Havlik Dr		328		20							39	17
US 30/Bonneville Dr/Johnsons Landing Rd										0		-26

Hour 1 Adjusted Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	**263**	**1869**	410	**95**	**1527**	47	37	158	279	**511**	326	65
US 30/East Columbia Ave	19	**2184**	121	**105**	2022	9	0	0	0	261	205	47
US 30/Maple St	84	**2288**	37	65	**2169**	**55**	65	47	102	65	28	121
US 30/E.M. Watts Rd	28	2446	0	0	**2042**	**302**	214	0	37	0	0	0
US 30/Havlik Dr	223	**1753**	522	**52**	1258	140	373	112	112	84	**231**	**102**
US 30/Bonneville Dr/Johnsons Landing Rd	224	2581	47	28	1640	28	0	0	140	0	0	**75**

Hour 2 Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	340	2367	380	110	1529	43	35	147	259	616	302	60
US 30/East Columbia Ave	17	3226	112	97	1872	9	0	0	0	242	190	43
US 30/Maple St	78	2893	35	60	2321	59	60	43	95	60	26	112
US 30/E.M. Watts Rd	26	2208	0	0	2156	325	198	0	35	0	0	0
US 30/Havlik Dr	198	2053	483	72	1164	129	345	104	104	78	255	112
US 30/Bonneville Dr/Johnsons Landing Rd	207	2389	43	26	1518	26	0	0	129	26	0	17

Hour 2 Excess Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	33	433		25	47					120		
US 30/East Columbia Ave		1042										
US 30/Maple St		566			138	7						
US 30/E.M. Watts Rd					136	20						
US 30/Havlik Dr		271		28							34	15
US 30/Bonneville Dr/Johnsons Landing Rd										26		-26

Hour 2 Adjusted Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	**307**	**1934**	380	**85**	**1482**	43	35	147	259	**496**	302	60
US 30/East Columbia Ave	17	**2184**	112	97	1872	9	0	0	0	242	190	43
US 30/Maple St	78	**2327**	35	60	**2183**	**52**	60	43	95	60	26	112
US 30/E.M. Watts Rd	26	2208	0	0	**2020**	**305**	198	0	35	0	0	0
US 30/Havlik Dr	198	**1782**	483	**44**	1164	129	345	104	104	78	**221**	**97**
US 30/Bonneville Dr/Johnsons Landing Rd	207	2389	43	26	1518	26	0	0	129	**0**	0	**43**

Hour 3 Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	268	2104	334	101	1293	38	30	129	228	561	266	53
US 30/East Columbia Ave	15	3101	99	84	1648	8	0	0	0	213	167	38
US 30/Maple St	68	2587	30	53	1938	53	53	38	84	53	23	99
US 30/E.M. Watts Rd	23	1945	0	0	1815	271	175	0	30	0	0	0
US 30/Havlik Dr	175	1790	425	74	1025	114	304	91	91	68	224	99
US 30/Bonneville Dr/Johnsons Landing Rd	182	2104	38	23	1337	23	0	0	114	23	0	12

Hour 2 Excess Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway		173		6						54		
US 30/East Columbia Ave		896										
US 30/Maple St		203										
US 30/E.M. Watts Rd												
US 30/Havlik Dr		91										
US 30/Bonneville Dr/Johnsons Landing Rd										21		-21

Hour 3 Adjusted Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	268	**1931**	334	**95**	1293	38	30	129	228	**507**	266	53
US 30/East Columbia Ave	15	**2205**	99	84	1648	8	0	0	0	213	167	38
US 30/Maple St	68	**2384**	30	53	1938	53	53	38	84	53	23	99
US 30/E.M. Watts Rd	23	1945	0	0	1815	271	175	0	30	0	0	0
US 30/Havlik Dr	175	**1699**	425	74	1025	114	304	91	91	68	224	99
US 30/Bonneville Dr/Johnsons Landing Rd	182	2104	38	23	1337	23	0	0	114	**2**	0	**33**

Hour 4 Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	197	1574	280	70	1044	32	25	108	191	423	223	45
US 30/East Columbia Ave	13	2622	83	70	1382	6	0	0	0	178	140	32
US 30/Maple St	57	1897	25	45	1509	38	45	32	70	45	19	83
US 30/E.M. Watts Rd	19	1630	0	0	1407	210	146	0	25	0	0	0
US 30/Havlik Dr	146	1365	357	38	860	96	255	76	76	57	159	70
US 30/Bonneville Dr/Johnsons Landing Rd	153	1764	32	19	1121	19	0	0	96	19	0	11

Hour 2 Excess Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway												
US 30/East Columbia Ave		371										
US 30/Maple St												
US 30/E.M. Watts Rd												
US 30/Havlik Dr												
US 30/Bonneville Dr/Johnsons Landing Rd										13		-13

Hour 4 Adjusted Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	197	1574	280	70	1044	32	25	108	191	423	223	45
US 30/East Columbia Ave	13	**2251**	83	70	1382	6	0	0	0	178	140	32
US 30/Maple St	57	1897	25	45	1509	38	45	32	70	45	19	83
US 30/E.M. Watts Rd	19	1630	0	0	1407	210	146	0	25	0	0	0
US 30/Havlik Dr	146	1365	357	38	860	96	255	76	76	57	159	70
US 30/Bonneville Dr/Johnsons Landing Rd	153	1764	32	19	1121	19	0	0	96	**6**	0	**24**

Hour 5 Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	188	1331	266	61	992	30	24	103	182	351	212	42
US 30/East Columbia Ave	12	2011	79	67	1313	6	0	0	0	169	133	30
US 30/Maple St	54	1609	24	42	1434	36	42	30	67	42	18	79
US 30/E.M. Watts Rd	18	1549	0	0	1337	200	139	0	24	0	0	0
US 30/Havlik Dr	139	1210	339	36	817	91	242	73	73	54	151	67
US 30/Bonneville Dr/Johnsons Landing Rd	145	1676	30	18	1065	18	0	0	91	18	0	17

Hour 2 Excess Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway												
US 30/East Columbia Ave												
US 30/Maple St												
US 30/E.M. Watts Rd												
US 30/Havlik Dr												
US 30/Bonneville Dr/Johnsons Landing Rd												

Hour 5 Adjusted Total Volume	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
US 30/Scappoose-Vernonia Highway	188	1331	266	61	992	30	24	103	182	351	212	42
US 30/East Columbia Ave	12	2011	79	67	1313	6	0	0	0	169	133	30
US 30/Maple St	54	1609	24	42	1434	36	42	30	67	42	18	79
US 30/E.M. Watts Rd	18	1549	0	0	1337	200	139	0	24	0	0	0
US 30/Havlik Dr	139	1210	339	36	817	91	242	73	73	54	151	67
US 30/Bonneville Dr/Johnsons Landing Rd	145	1676	30	18	1065	18	0	0	91	18	0	17

Section N

Memo: Public Involvement Summary

Scappoose Transportation System Plan Update

Public Involvement Summary

Prepared by Reah Flisakowski, P.E. and Julie Sosnovske, P.E., DKS Associates

May 23, 2016

The purpose of this memorandum is to summarize the public involvement activities/events that were used to involve the public in developing the Scappoose Transportation System Plan (TSP) update.

Community Advisory Committee (CAC)

This group assisted the PMT and local decision makers in identifying and addressing community issues throughout the planning effort. At major milestones, they were asked to review the technical work and seek consensus-based recommendations that balance the various community interests and accomplish the objectives of the update process. CAC members acted as liaisons to the community to help inform stakeholders and the public about the process and encourage their participation in community outreach events and meetings. City staff representatives provided oversight and assistance with interagency coordination to ensure consistency between overlapping plans.

The CAC for this project was appointed by the City Council. The CAC consists of city staff responsible for transportation-related systems within the planning area, and staff or citizens representing the following groups:

- Citizens
- City of Scappoose City Council
- City of Scappoose Planning Commission
- Columbia County
- Scappoose School District
- Port of St. Helens
- ODOT
- CC Rider

The CAC met eight times over the course of the project, as follows:

CAC Meeting #0 (December 12, 2012)	▪ Overview of Advisory Committee role and responsibilities ▪ Election of committee Chairperson and Vice-Chairperson ▪ Background information on the Transportation System Plan
CAC Meeting #1 (February 20, 2013)	▪ "TSP 101" – Consultant presents TSP update process, including decision points and Advisory Committee's input ▪ Relationship between TSP policies and project priorities and funding ▪ Balancing the City's transportation needs and available funding in the TSP update process
CAC Meeting #2 (June 5, 2013)	▪ Project kick-off ▪ Consultant presents TSP process and role of CAC ▪ Review and discuss Technical Memoranda #1 - #3
CAC Meeting #3 (November 20, 2013)	▪ Review existing and future baseline transportation conditions ▪ Consultant presents overview of Technical Memoranda #5 - #8 ▪ Discuss developing solutions to meet the transportation system deficiencies
CAC Meeting #4 (April 16, 2014)	▪ Review preliminary alternatives for meeting transportation system deficiencies ▪ Choose alternatives for full analysis ▪ Consultant to present sketch level analysis (e.g. preliminary travel forecast assignments and comparison to project evaluation criteria) to guide the discussion on selecting alternatives for further evaluation.
Bonus CAC Meeting (May 20, 2015)	▪ BONUS CAC – following project hiatus due to city staff turnover ▪ Brief overview of Technical Memoranda #1 - #6 ▪ Presentation and discussion of Tech Memo #7 (Future Needs) ▪ Presentation of Goals, Objectives and Evaluation Criteria ▪ Presentation and discussion of Tech Memo #9 (Solutions Evaluation)
CAC Meeting #5 (October 14, 2015)	▪ Consultant to present a summary of the alternatives evaluation and the results of the community outreach ▪ Review the alternatives evaluation ▪ Consider public and agency feedback to recommend a preferred system alternative
CAC Meeting #6 (May 23, 2016)	▪ Review Draft TSP ▪ Consider public and agency feedback ▪ Consultant to present a summary of Planning Commission and City Council comments ▪ Finalize committee recommendations on the Draft TSP considering Planning Commission and City Council comments.

Community Meetings

The following public involvement events were held to involve a larger and more diverse group of participants in the TSP update planning process.

Community Events

Three community events were conducted for this project. An open house format was used for each, and City and Consultant staff cooperatively planned and facilitated the events as outlined below.

Community Event #1 (December 4, 2013)	▪ Present an overview of the project purpose/process
	▪ Present findings from Technical Memoranda #1 through #8
	    ▪ Public Involvement Plan
	    ▪ Background Documents
	    ▪ Regulatory Review
	    ▪ Potential Transportation Funding
	    ▪ Existing Conditions
	    ▪ Future Forecasting (including land use assumptions)
	    ▪ Future Conditions
	    ▪ Goals, Objectives & Evaluation Criteria
	▪ Seek input on the goals and objectives of the plan
	▪ Seek suggestions for transportation system alternatives to be considered in subsequent technical memoranda and the TSP

Community Event #2 (May 27, 2015)	▪ Present an overview of the alternatives evaluation and potential recommendations for system improvements ▪ Seek input on alternatives evaluation, potential recommended alternatives and prioritization
Community Event #3 (May 3, 2016)	▪ Present an overview of the Draft TSP ▪ Seek input on the Draft TSP recommendations

Public Information

Website

The consultant team developed and maintained a project website dedicated to the TSP update. It included key project information, including a brief overview of the project, meeting dates and summaries, other public involvement opportunities, and project materials. The website also provided an opportunity for public comments and questions, where over 70 comments were logged. The website was updated regularly to include new project materials.

Compliance with Title VI Outreach Requirements

Implementation of this Public Involvement Plan met requirements and guidance found in ODOT's Title VI (1964 Civil Rights Act) Plan. Specifically, Title VI identifies measures to reach and solicit comments from disadvantaged populations within a community. Although Scappoose has relatively limited concentrations of minority and low-income residents, these populations are present throughout the city.

Based on 2010 census data, the racial makeup of the city was about 91% Caucasian and 5% Hispanic (4% from other groups). This is a higher percentage of Caucasian and lower percentages of nearly all other ethnic groups compared to Oregon as a whole.[1]

Approximately eleven percent of individuals in the City were below the poverty line in 2011, compared to 14.8 percent for the state as a whole.[2]

Outreach to low-income and minority populations was accomplished using the following methods:

- Use a variety of communication techniques as described in the sections above, as well as advertising events in the local newspaper (the Spotlight), most of which are accessible to minority and low-income residents.
- City supported efforts by distributing notifications to additional locations (i.e. post office, City Hall, etc.), if determined to be beneficial.
- Held meetings in places that are accessible by transit, walking, or bicycling.
- Offered ADA assistance (e.g. accessibility, hearing assistance) as needed, given prior notice.

[1] Source: 2010 Demographic Profile, US Census Bureau via American FactFinder.

[2] Source: 2007-2011 American Community Survey 5-Year Estimates for Oregon and Scappoose, Oregon.