Oregon
Theodore R. Kulongoski, Governor

Department of Land Conservation and Development
635 Capitol Street, Suite 150
Salem, OR 97301-2540
(503) 373-0050
Fax (503) 378-5518
www.lcd.state.or.us

NOTICE OF ADOPTED AMENDMENT

09/20/2011

TO: Subscribers to Notice of Adopted Plan or Land Use Regulation Amendments

FROM: Plan Amendment Program Specialist

SUBJECT: City of St. Helens Plan Amendment
DLCD File Number 001-11

The Department of Land Conservation and Development (DLCD) received the attached notice of adoption. Due to the size of amended material submitted, a complete copy has not been attached. A Copy of the adopted plan amendment is available for review at the DLCD office in Salem and the local government office.

Appeal Procedures*

DLCD ACKNOWLEDGMENT or DEADLINE TO APPEAL: Tuesday, October 04, 2011

This amendment was submitted to DLCD for review prior to adoption pursuant to ORS 197.830(2)(b) only persons who participated in the local government proceedings leading to adoption of the amendment are eligible to appeal this decision to the Land Use Board of Appeals (LUBA).

If you wish to appeal, you must file a notice of intent to appeal with the Land Use Board of Appeals (LUBA) no later than 21 days from the date the decision was mailed to you by the local government. If you have questions, check with the local government to determine the appeal deadline. Copies of the notice of intent to appeal must be served upon the local government and others who received written notice of the final decision from the local government. The notice of intent to appeal must be served and filed in the form and manner prescribed by LUBA, (OAR Chapter 661, Division 10). Please call LUBA at 503-373-1265, if you have questions about appeal procedures.

*NOTE: The Acknowledgment or Appeal Deadline is based upon the date the decision was mailed by local government. A decision may have been mailed to you on a different date than it was mailed to DLCD. As a result, your appeal deadline may be earlier than the above date specified. NO LUBA Notification to the jurisdiction of an appeal by the deadline, this Plan Amendment is acknowledged.

Cc: Jacob Graichen, City of St. Helens
Angela Lazarean, DLCD Urban Planning Specialist
Anne Debbaut, DLCD Regional Representative

<paa> YA

FORM 2 DLCD

Notice of Adoption

This Form 2 must be mailed to DLCD within **5-Working Days after the Final Ordinance is signed** by the public Official Designated by the jurisdiction and all other requirements of ORS 197.615 and OAR 660-018-000

DATE STAMP

☐ In person ☐ electronic ☐ mailed

DEPT OF

SEP 14 2011

LAND CONSERVATION AND DEVELOPMENT

For Office Use Only

Jurisdiction: **City of St. Helens**

Local file number: **CPZA.1.11**

Date of Adoption: **September 7, 2011**

Date Mailed: **9/12/2011**

Was a Notice of Proposed Amendment (Form 1) mailed to DLCD? ☒ Yes ☐ No Date: 5/26/11

☒ Comprehensive Plan Text Amendment

☐ Comprehensive Plan Map Amendment

☒ Land Use Regulation Amendment

☐ Zoning Map Amendment

☒ New Land Use Regulation

☒ Other: **Comp. Plan Addendum**

Summarize the adopted amendment. Do not use technical terms. Do not write "See Attached".

In mid-2010, the City of St. Helens was awarded a Transportation and Growth Management (TGM) grant to update its Transportation Systems Plan (TSP) adopted in 1997. Through this process a new TSP was developed along with related Development Code and Comprehensive Plan text amendments. This adoption concludes the process. Note: Some Development Code text amendments unrelated to the TSP are included too.

Does the Adoption differ from proposal? No, no explaination is necessary

Slight text edits, though nothing major.

Plan Map Changed from: to:

Zone Map Changed from: to:

Location: **UGB-wide**

Acres Involved:

Specify Density: Previous: New:

Applicable statewide planning goals:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
☒	☒	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐

Was an Exception Adopted? ☐ YES ☒ NO

Did DLCD receive a Notice of Proposed Amendment...

45-days prior to first evidentiary hearing? ☒ **Yes** ☐ **No**

If no, do the statewide planning goals apply? ☐ **Yes** ☐ **No**

If no, did Emergency Circumstances require immediate adoption? ☐ **Yes** ☐ **No**

DLCD File No. 001-11 (18847) [16760]

DLCD file No. ______________________

Please list all affected State or Federal Agencies, Local Governments or Special Districts:

ODOT, ODOT Rail, Columbia County, Columbia County Rider

Local Contact: **Jacob Graichen** Phone: **(503) 366-8204** Extension:

Address: **265 Strand Street / PO Box 278** Fax Number: **503-397-4016**

City: **St. Helens** Zip: **97051-** E-mail Address: **jacobg@ci.st-helens.or.us**

ADOPTION SUBMITTAL REQUIREMENTS

This Form 2 must be received by DLCD no later than 5 working days after the ordinance has been signed by the public official designated by the jurisdiction to sign the approved ordinance(s)

per ORS 197.615 and OAR Chapter 660, Division 18

1. This Form 2 must be submitted by local jurisdictions only (not by applicant).
2. When submitting the adopted amendment, please print a completed copy of Form 2 on light **green paper if available**.
3. Send this Form 2 and **one complete paper copy** (documents and maps) of the adopted amendment to the address below.
4. Submittal of this Notice of Adoption must include the final signed ordinance(s), all supporting finding(s), exhibit(s) and any other supplementary information (ORS 197.615).
5. Deadline to appeals to LUBA is calculated **twenty-one (21) days** from the receipt (postmark date) by DLCD of the adoption (ORS 197.830 to 197.845).
6. In addition to sending the Form 2 - Notice of Adoption to DLCD, please also remember to notify persons who participated in the local hearing and requested notice of the final decision. (ORS 197.615).
7. Submit **one complete paper copy** via United States Postal Service, Common Carrier or Hand Carried to the DLCD Salem Office and stamped with the incoming date stamp.
8. Please mail the adopted amendment packet to:

ATTENTION: PLAN AMENDMENT SPECIALIST
DEPARTMENT OF LAND CONSERVATION AND DEVELOPMENT
635 CAPITOL STREET NE, SUITE 150
SALEM, OREGON 97301-2540

9. **Need More Copies?** Please print forms on **8½ -1/2x11 green paper only if available**. If you have any questions or would like assistance, please contact your DLCD regional representative or contact the DLCD Salem Office at (503) 373-0050 x238 or e-mail **plan.amendments@state.or.us**.

City of St. Helens
265 Strand / PO Box 278
St. Helens, Oregon
97051

NOTICE OF DECISION

September 12, 2011

RE: CPZA.1.11

Dear applicant/interested party,

The **City of St Helens City Council approved** the application to incorporate the City's revised Transportation Systems Plan as an addendum to the Comprehensive Plan and adopt related text amendments to the Development Code (SHMC Title 17) and Comprehensive Plan (SHMC Title 19).

All required notices pursuant to SHMC 17.24.130 have been met. The adopted findings of fact, decision, and statement of conditions, as applicable, are on file at City Hall and are available for review during normal business hours. Copies are available for a nominal charge.

This decision of the City Council may be appealed to the Oregon Land Use Board of Appeals (LUBA) pursuant to the applicable State laws (e.g. see ORS 197.830). Generally, a person may petition LUBA for review of a land use decision or a limited land use decision if they filed a notice of intent to appeal with LUBA and presented testimony or evidence into the record. You normally have 21 calendar days from the date of final decision to file a notice of intent to appeal. If you desire to appeal this decision, you should contact LUBA to obtain further instructions and to confirm your rights to appeal.

The Oregon Land Use Board of Appeal's contact information is as follows:

Address: 550 Capitol Street NE, Suite 235
Salem, Oregon 97301-2552

Phone: Phone: 503-373-1265

Internet: http://www.oregon.gov/LUBA/index.shtml

If you have any questions, please contact this office. Some information such as the St. Helens Municipal Code (SHMC) can also be obtained at the City's website: www.ci.st-helens.or.us.

Respectfully yours,

JAG

Jacob A. Graichen, AICP, City Planner

St. Helens Transportation System Plan Update

ORDINANCE 3150

City of St. Helens, Oregon

August 2011

City of St. Helens

ORDINANCE NO. 3150

AN ORDINANCE ADOPTING AN UPDATED TRANSPORTATION SYSTEMS PLAN AS AN ADDENDUM TO THE CITY OF ST. HELENS COMPREHENSIVE PLAN AND AMENDING THE ST. HELENS MUNICIPAL CODE CHAPTERS 17.08, 17.20, 17.24, 17.72, 17.84, 17.96, 17.108, 17.136, 17.140, 17.152, 19.08, AND 19.16, AND ADDING CHAPTER 17.156

WHEREAS, pursuant to SHMC 17.20.020(1)(c) the Planning Director initiated a legislative change to the St. Helens Comprehensive Plan (St. Helens Municipal Code Title 19) to adopt an updated Transportation Systems Plan as an addendum to the Comprehensive Plan and related text amendments to the Community Development Code (St. Helens Municipal Code Title 17) and Comprehensive Plan (St. Helens Municipal Code Title 19); and

WHEREAS, the State of Oregon Transportation Planning Rule (TPR), OAR 660 Division 12, requires the City to prepare and adopt a Transportation Systems Plan and to adopt land use regulations consistent with state and federal requirements to protect transportation facilities, corridors, and sites for their identified function and to implement the TPR; and

WHEREAS, the City's original Transportation Systems Plan was adopted by Resolution No. 1247 in 1997 and such time has passed that an update is needed; and

WHEREAS, consultants have prepared the Transportation Systems Plan and related amendments after extensive review of existing plans and policies; inventorying; analysis; consultation with an ad hoc Technical Advisory Committee, an ad hoc Citizen Advisory Committee, the City Council, Planning Commission, City staff and other agencies; and public involvement; and

WHEREAS, pursuant to the SHMC and Oregon Revised Statutes, the City has provided notice to: the Oregon Department of Land Conservation and Development on May 26, 2011, and the local newspaper of record on June 22, 2011; and

WHEREAS, the St. Helens Planning Commission did hold a duly noticed public hearing on July 12, 2011 and, following deliberation, made a recommendation of approval to the City Council; and

WHEREAS, the St. Helens City Council conducted a public hearing on July 20, 2011 and having the responsibility to approve, approve with modifications, or deny an application for a legislative change, has deliberated and found that based on the information in the record and the applicable criteria in the SHMC that the proposed addendum be approved.

NOW, THEREFORE, THE CITY OF ST. HELENS ORDAINS AS FOLLOWS:

Section 1. The above recitations are true and correct and are incorporated herein by reference.

Section 2. The City hereby adopts the updated Transportation Systems Plan, attached hereto as **Attachment "A"** and made part of this reference, as an addendum to the St. Helens Comprehensive Plan (St. Helens Municipal Code Title 19).

Section 3. The City of St. Helens Development Code and Comprehensive Plan are hereby amended, attached hereto as **Attachment "B"** and made part of this reference.

Section 4. In support of the plan addendum described herein, the Council hereby adopts the Findings of Fact and Conclusions of Law, attached hereto as **Attachment "C"** and made part of this reference.

Section 5. If any section, provision, clause, sentence, or paragraph of this Ordinance or the application thereof to any person or circumstances shall be held invalid, such invalidity shall not affect the other sections, provisions, clauses or paragraphs of this Ordinance which can be given effect without the invalid provision or application, and to this end the provisions of this Ordinance are declared to be servable.

Section 6. Provisions of this Ordinance shall be incorporated in the St. Helens Municipal Code and the word "ordinance" may be changed to "code," "article," "section," or another word, and the sections of this Ordinance may be renumbered, or re-lettered, provided however that Whereas clauses and boilerplate provisions need not be codified.

Section 7. The effective date of this Ordinance shall be 30 days after approval, in accordance with the City Charter and other applicable laws.

Read the first time:	August 17, 2011
Read the second time:	September 7, 2011

APPROVED AND ADOPTED this 7th day of September, 2011, by the following vote:

Ayes:

Nays:

Randy Pet

Randy Peterson, Mayor

ATTEST:

Kathy Payne

Kathy Payne, City Recorder

Attachment "A"

St. Helens Transportation System Plan Update

Ordinance No. 3150

Attachment "B"

Amendments to the Development Code and Zone District Maps

Ordinance No. 3150

Added text is *underlined and italicized*.
Deleted text is ~~stricken~~.

Chapter 17.08
AMENDMENTS TO THE CODE AND ZONE DISTRICT MAPS

Sections:

17.08.010 Purpose.
17.08.020 Legislative amendments.
17.08.030 Quasi-judicial amendments and procedures.
17.08.040 Quasi-judicial amendments and standards.
17.08.050 Conditions of approval.
17.08.060 Transportation Planning Rule Compliance.

17.08.060 Transportation Planning Rule Compliance.

(1) Review of Applications for Affect on Transportation Facilities. A proposed comprehensive plan amendment, zone change or land use regulation change, whether initiated by the city or by a private interest, shall be reviewed to determine whether it significantly affects a transportation facility, in accordance with Oregon Administrative Rule (OAR) 660-012-0060 (the Transportation Planning Rule – "TPR"). "Significant" means the proposal would:

(a) Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors in an adopted plan);

(b) Change standards implementing a functional classification system; or

(c) As measured at the end of the planning period identified in the adopted transportation system plan:

(i) Allow land uses or levels of development that would result in types or levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility;

(ii) Reduce the performance of an existing or planned transportation facility below the minimum acceptable performance standard identified in the TSP; or

(iii) Worsen the performance of an existing or planned transportation facility that is otherwise projected to perform below the minimum acceptable performance standard identified in the TSP or comprehensive plan.

(2) Amendments That Affect Transportation Facilities. Comprehensive plan amendments, zone changes or land use regulations that significantly affect a transportation facility shall ensure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the TSP. This shall be accomplished by one or a combination of the following:

(a) Adopting measures that demonstrate allowed land uses are consistent with the planned function, capacity, and performance standards of the transportation facility.

(b) Amending the TSP or comprehensive plan to provide transportation facilities, improvements or services adequate to support the proposed land uses consistent with the requirements of Section -0060 of the TPR.

(c) Altering land use designations, densities, or design requirements to reduce demand for vehicle travel and meet travel needs through other modes of transportation.

(d) Amending the TSP to modify the planned function, capacity or performance standards of the transportation facility.

(3) Traffic Impact Analysis. A Traffic Impact Analysis shall be submitted with a plan amendment or zone change application, as applicable, pursuant to Chapter 17.156 SHMC.

Chapter 17.20
PROCEDURES FOR DECISION-MAKING – LEGISLATIVE

17.20.080 Public hearing – Notice requirements

(3) Notice of the public hearings on the proposed change and alternatives, if any, shall be given by the director in the following manner:

(a) At least 10 days prior to the scheduled hearing date, notice shall be sent to:

(i) The applicant;

(ii) Any affected governmental agency*. Notice shall be sent to ODOT when land subject to the proposed action is located adjacent to a state roadway or the proposed action may have an impact on a state roadway*;

(iii) Any person who requests notice in writing and pays a fee established by council resolution; and

17.20.120 The standard of the decision.

(1) The recommendation by the commission and the decision by the council shall be based on consideration of the following factors:

(a) The statewide planning goals and guidelines adopted under ORS Chapter 197, including compliance with the Transportation Planning Rule, as described in SHMC 17.08.060;

Chapter 17.24
PROCEDURES FOR DECISION-MAKING – QUASI-JUDICIAL

17.24.040 Preapplication conference.

(2) Preapplication Conference Issues. At the preapplication conference, the director, the applicant, and the representatives from other city departments and county and state agencies, as applicable, shall discuss issues that relate to the proposed development and application. Those issues shall include but not be limited to the following, as applicable to the proposed development:

(g) Status of public facilities that would serve the proposed development, including specifically water, sewer, solid waste, drainage, roads, parks and mass transit. *When the proposed action is located adjacent to a state roadway or the proposed action may have an impact on a state roadway, ODOT shall be invited to participate in the preapplication conference and review of the application.*

17.24.120 Notice of decision by the director.

(1) Notice of the director's decision on an application pursuant to SHMC 17.24.090 shall be given by the director in the following manner:

(a) Within 10 working days of signing the proposed decision, notice shall be sent by mail to:

(iii) Any governmental agency which is entitled to notice under an intergovernmental agreement entered into with the city which includes provision for such notice*. For subject sites located adjacent to a state roadway or where proposals may have an impact on a state facility, notice of the decision shall be sent to ODOT*; and

(iv) Any person who requests, in writing, and pays the required fee established by the council.

17.24.130 Notice of planning commission, historic landmark commission and city council proceedings.

(1) Notice of an impending action pursuant to SHMC 17.24.090 shall be given by the director in the following manner:

(a) At least 20 days prior to the scheduled hearing date, or if two or more hearings are scheduled, 10 days prior to the first hearing and 20 days prior to the second hearing, notice shall be sent by mail to:

(iii) Any affected governmental agency which has entered into an intergovernmental agreement with the city which includes provision for such notice or public agency that provides service within the city*. When the application site is located adjacent to a state roadway or was determined by a Traffic Impact Analysis to have an effect on a state roadway, notice of the decisions shall be sent to ODOT*;

17.24.250 The decision process of the approval authority.

(1) The decision shall be based on:

(a) Proof by the applicant that the application fully complies with:

(i) Applicable portions of the city of St. Helens comprehensive plan; and

(ii) The relevant approval standards found in the applicable chapter(s) of this code or other applicable implementing ordinances; *and*

(iii) The Oregon Transportation Planning Rule as applicable, pursuant to SHMC 17.08.060.

Chapter 17.72
LANDSCAPING AND SCREENING

17.72.060 Exemptions.

(1) ~~Exemptions from the~~ *Modifications to the* street tree requirements *or exemptions to the requirements* may be granted by the director on a case-by-case basis.

(2) Exemptions shall be granted *if it can be documented that one or more of the following applies to the site*:

(a) ~~If t~~*T*he location of a proposed tree would cause potential problems with existing utility lines;

(b) ~~If t~~*T*he tree would cause visual clearance problems; ~~or~~

(c) ~~If t~~*T*here is not adequate space in which to plant street trees *within the public right-of-way; or*

(d) The ground conditions within the public right-of-way are unable to support street trees.

(3) The director may allow trees closer to specified intersections which are signalized, provided the provisions of Chapter 17.76 SHMC, Visual Clearance Areas, are satisfied.

(4) If one or more conditions described in SHMC 17.72.060(2)(a) through (d) are shown to exist on the site, the director may require the following to fulfill the street tree requirements of this chapter:

(a) A landscaping easement outside the public right-of-way for the purposes of accommodating street trees. The location of the landscaping easement shall be located on-site. A public utility easement may be used for this purpose.

(b) An applicant may, with the consent of the director, elect to compensate the city for costs commensurate with the number of street trees that would have otherwise been required for the site. The fee, established by resolution of the City Council, will be generally based on the city's approved street tree list in Chapter 17.72 SHMC and market value of the tree(s).

Chapter 17.84
ACCESS, EGRESS, AND CIRCULATION

17.84.030 Joint access *and reciprocal access easements*.

Owners of two or more uses, structures, or parcels of land may agree to utilize jointly the same access and egress when the combined access and egress of both uses, structures, or parcels of land satisfies the combined requirements as designated in this code, provided:

(1) Satisfactory legal evidence shall be presented in the form of deeds, easements, leases, or contracts to establish the joint use; and

(2) Copies of the deeds, easements, leases, or contracts are placed on permanent file with the city.

17.84.040 Public Street Access.

(1) All vehicular access and egress as required in SHMC 17.84.070 and 17.84.080 shall connect directly with a public or private street approved by the city for public use and shall be maintained at the required standards on a continuous basis.

(2) Vehicular access to structures shall be provided to residential uses and shall be brought to within 50 feet of the ground floor entrance or the ground floor landing of a stairway, ramp, or elevator leading to the dwelling units.

(3) Vehicular access shall be provided to commercial or industrial uses, and shall be located to within 50 feet of the primary ground floor entrances.

(4) Access to State Streets, Highways, and Interchanges. Access to a transportation facility under the jurisdiction of the Oregon Department of Transportation (ODOT) shall be subject to the requirements of OAR 734-051. ODOT's current access spacing requirements for Highway 30 reflect the functional classification of Highway 30 as both a Statewide Highway and Freight

Route. Table 17.84.040-1 illustrates the access spacing standards for public and private approaches along Highway 30 within St. Helens.

TABLE 17.84.040-1: HIGHWAY 30 ACCESS SPACING STANDARDS FOR PRIVATE AND PUBLIC APPROACHES[1]

Posted Speed (miles per hour)	Minimum Space Required *(feet)
≤25	520
30 and 35	720
40 and 45	990
50	1,100
≥55	1,320

[1] These access management spacing standards do not apply to approaches in existence prior to April 1, 2000 except as provided in OAR 734-051-0115(1)(c) and 734-051-0125(1)(c).
* Measurement of the approach road spacing is from center to center on the same side of the roadway.

(5) Spacing Standards for Access to City Streets. The following are the minimum spacing requirements for access points and intersections for streets under the jurisdiction of the City of St. Helens.

TABLE 17.84.040-2: ACCESS SPACING STANDARDS ON CITY STREETS

Functional Classification	Public Street (feet)	Private Access Drive (feet)
Local Street	150	50[1]
Collector	300	100
Minor Arterial	350 or block length	200 or mid-block
Major Arterial[2]	350 or block length	350 or block length
[1]For single-dwelling units, attached, on local streets only, 25 feet is allowed.		
[2]Access standards identified in the Oregon Highway Plan supersede this table on all state highways.		

(6) Measuring Distance between Access Points. The distance between access points shall be measured from the centerline of the proposed driveway or roadway to the centerline of the nearest adjacent roadway or driveway.

(7) Development Fronting Onto an Arterial Street.

(a) New residential land divisions fronting onto an arterial street shall be required to provide secondary (local or collector) streets for access to individual lots. When secondary streets cannot be constructed due to topographic or other physical constraints, access may be provided by consolidating driveways for clusters of two or more lots (e.g., includes flag lots and mid-block lanes).

(b) Non-residential projects proposed on arterials shall include a frontage or service road and shall take access from the frontage or service road rather than the arterial. Frontage or service road design shall conform to applicable jurisdictional design standards. This access *requirement may be met through the use of interconnecting parking lots that abut the arterial provided the necessary easements and agreements are obtained.*

(8) Number of Access Points. For single-family (detached and attached) and duplex housing types, one street access point is permitted per lot, except that two access points may be permitted for duplexes on corner lots (i.e., no more than one access per street), subject to the access spacing standards in Subsection 5, above. The number of street access points for multiple dwelling unit residential, commercial, industrial, and public/institutional developments shall be minimized to protect the function, safety and operation of the street(s) and sidewalk(s) for all users. Shared access may be required, in conformance with SHMC 17.84.040(9), in order to maintain the required access spacing, and minimize the number of access points.

(9) Shared Driveways. The number of driveway and private street intersections with public streets shall be minimized by the use of shared driveways with adjoining lots where feasible. The city shall require shared driveways as a condition of land division or site development review, as applicable, for traffic safety and access management purposes in accordance with the following standards:

(a) Shared driveways and frontage streets may be required to consolidate access onto a collector or arterial street. When shared driveways or frontage streets are required, they shall be stubbed to adjacent developable parcels to indicate future extension. "Stub" means that a driveway or street temporarily ends at the property line, but may be extended in the future as the adjacent parcel develops. "Developable" means that a parcel is either vacant or it is likely to receive additional development (i.e., due to infill or redevelopment potential).

(b) Reciprocal access easements (i.e., for the benefit of affected properties) shall be recorded for all shared driveways, including pathways, at the time of final plat approval or as a condition of site development approval.

(c) Exception. Shared driveways are not required when existing development patterns or physical constraints (e.g., topography, parcel configuration, and similar conditions) prevent extending the street/driveway in the future.

17.84.050 Required walkway location.

(1) Walkways shall extend from the ground floor entrances or from the ground floor landing of stairs, ramps, or elevators of all commercial, institutional, and industrial uses, to the streets which provide the required access and egress. Walkways shall provide convenient connections between buildings in multibuilding commercial, institutional, and industrial complexes. *Walkways also shall provide access to existing and planned transit stops adjacent to the development site.* Unless impractical, walkways should be constructed between a new development and neighboring developments.

17.84.070 Minimum Requirements – Residential Use

(1) Vehicular access and egress for single-dwelling units, duplexes or attached single-dwelling units on individual lots, residential use, shall ~~not be less than~~ *comply with* the following:

RESIDENTIAL DWELLING USE

Figure 15

Number Dwelling Units/Lot	Minimum Number of Driveways Required	Minimum / *Maximum* Access Width	Minimum Pavement Width
1 or 2	1	15' */ 24'*	10'
3 to 6	1	~~25'~~ *24' / 30'*	20'

(6) Vehicular access and egress for multiple-dwelling unit uses shall ~~not be less than~~ *comply with* the following:

MULTIDWELLING UNIT USE

Figure 16

Dwelling Units	Minimum Number of Driveways Required	Minimum / *Maximum* Access Required	Minimum Pavement Sidewalks, Etc.
3 to 19	1	*24' /* 30'	24' if two-way, 15' if one-way; curbs and 5' walkway required
20 to 49	1 or 2	*24' /* 30'	24' if two-way, 15' if one-way; curbs and 5' walkway required
50 to 100	2	*24' /* 30'	24' curbs and 5' walkway required
over 100	2 plus 1 additional driveway to a public street		

	for every 200 units or portion thereof in excess of 100 units		

17.84.080 Minimum requirements – Commercial and industrial use.

(1) Vehicle access, egress and circulation for commercial and industrial use shall ~~not be less than~~ *comply with* the following:

COMMERCIAL AND INDUSTRIAL USE

Figure 17

Required Parking Spaces	Minimum Number of Driveways Required	Minimum / *Maximum* Access Width	Minimum Pavement
0 to 100	1	30' */ 40'*	24' curbs required
over 100	2	30' */ 40'*	24' curbs required
over 100	1	*40' /* 50'	40' curbs required

(2) Additional requirements for truck traffic *or traffic control* may be placed as conditions of site development review or *conditional use permit*.

17.84.120 Variances to access standards.

In all zoning districts where access and egress drives cannot be readily designed to conform to code standards within a particular parcel, access with an adjoining property shall be considered. If access in conjunction with another parcel cannot reasonably be achieved, the director may grant a variance to the access requirements of this chapter based on the standards set forth in SHMC 17.84.150. *This does not apply to highway access.*

17.84.150 Approval standards.

The director may approve, approve with conditions, or deny a request for an access variance based on findings that:

(1) It is not possible to share access;

(2) There are no other alternative access points on the street in question or from another street;

(3) The access separation requirements cannot be met;

(4) *There are unique or special conditions that make strict application of the standards impractical;*

(5) No engineering or construction solutions can be applied to mitigate the condition;

~~(4)~~ *(6)* The request is the minimum variance required to provide adequate access;

~~(5)~~ *(7)* The approved access or access approved with conditions will result in a safe access *and will not result in the degradation of operational and safety integrity of the transportation system*; ~~and~~

~~(6)~~ *(8)* The visual clearance requirements of Chapter 17.76 SHMC will be met*; and*

(9) No variance shall be granted where such hardship is self-created.

Chapter 17.96
SITE DEVELOPMENT REVIEW

17.96.180 Approval standards.

The director shall make a finding with respect to each of the following criteria when approving, approving with conditions, or denying an application:

(1) Provisions of the following chapters:

(l) Chapter 17.152 SHMC, Tree Removal; ~~and~~

(m) Chapter 17.152 SHMC, Street and Utility Improvement Standards; *and*

(n) Chapter 17.156 SHMC, Transportation Impact Analysis.

Chapter 17.108
VARIANCE

17.108.020 Applicability of provisions.

(1) The variance standards are intended to apply to individual platted and recorded lots/parcels only.

(2) An applicant who is proposing to vary a specification standard for lots yet to be created through a subdivision process may not utilize the variance procedure unless otherwise specified in Chapter 17.136 SHMC, Land Division – Subdivision.

(3) The provisions of this chapter shall apply to building setback requirements in all zoning districts *and pursuant to other chapters of the Development Code.*

Chapter 17.136
LAND DIVISION – SUBDIVISION

17.136.070 Application submission requirements – Preliminary plat.

(2) The preliminary plat map and data or narrative shall include the following:

(s) Supplemental information including proposed deed restrictions, if any, proof of property ownership, and a proposed plan for provision of subdivision improvements; ~~and~~
(t) Existing natural features including rock outcroppings, wetlands, and marsh areas~~.~~*; and*
(u) A Traffic Impact Analysis (TIA), as applicable, pursuant to Chapter 17.156 SHMC.

Chapter 17.140
LAND DIVISION – LAND PARTITIONING – LOT LINE ADJUSTMENT

17.140.040 Partition approval criteria.
A request to partition land shall meet all of the following criteria:

(3) Adequate public facilities are available to serve the proposal *(To address transportation facilities in this regard, a Traffic Impact Analysis shall be prepared as applicable, pursuant to Chapter 17.156. SHMC)*;

Chapter 17.152
STREET AND UTILITY IMPROVEMENT STANDARDS

17.152.030 Streets.

(5) Minimum Rights-of-Way and Street Widths. Unless otherwise indicated on an approved street plan, or as needed to continue an existing improved street, street right-of-way and roadway widths shall not be less than the minimum width described in Figure 19. Where a range is indicated, the width shall be determined by the decision-making authority based upon anticipated average daily traffic (ADT) on the new street segment. (The city council may adopt, by resolution, design standards for street construction and other public improvements. The design standards will provide guidance for determining improvement requirements within the specified ranges.) (See "City of St. Helens Engineering Department Public Facilities Construction Standards Manual.")

(a) The planning director shall recommend, to the decision-making body, desired right-of-way width and pavement width of the various street types within the subdivision or development after consideration of the following:

(i) The type of road as set forth in Figure 19, Road Standards;

ROAD STANDARDS

MINIMUM RIGHTS-OF-WAY AND STREET WIDTHS (see Transportation Systems Plan [TSP] *Figures 7-2 and 7-3*)

Figure 19

Type of Street	Right-of-Way	Roadway Width	Moving Lanes	Bicycle Lanes*

	Width			
Major Arterial	*101'* *minimum*	*74'*	*4*	*2 @ 6'*
Minor Arterial *(Typical)*	60'	~~36 – 48'~~ *36'*	~~2 – 4~~ *2*	~~2 – 6'~~ *2 @ 6'*
Minor Arterial (One-Way, Uptown)	*80'*	*46'*	*2*	*1 @ 6'*
Minor Arterial (Two-Way, Downtown)	*80'*	*52'*	*2*	*2 @ 6'*
Collector	60'	~~24 – 40'~~ *36'*	~~2 – 3~~ *2*	~~2 – 5'~~ *2 @ 6'*
~~Local – Commercial, Industrial~~ *Local*	50'	34'	~~2~~ *1 – 2*	~~2 – 4'~~ *None*
~~Local – Residential~~ *Local "Skinny" Street*	~~50'~~ *40*	~~34'~~ *20' or 26'*	~~2~~ *1 – 2*	~~2 – 4'~~ *None*
~~Residential Access – through street with less than 50 ADT~~	~~40 – 46'~~	~~24 – 28'~~	~~1 – 2~~	~~0~~
~~Residential Access – cul-de-sac dead ends (not more than 400 feet long and serving not more than 20 dwelling units)~~	~~36 – 44'~~	~~24 – 28'~~	~~1 – 2~~	~~0~~
~~Turnarounds for dead ends in industrial and commercial zones only~~	~~50' radius~~	~~42' radius~~		~~0~~
~~Turnarounds for cul-de-sac dead ends in residential zones only~~	~~42' radius~~	~~35' radius~~		~~0~~
~~Alley~~ ~~Residential~~ ~~Business or Industrial~~	~~16'~~ ~~20'~~	~~16'~~ ~~20'~~		~~0~~

* Applies to bicycle lanes required in Transportation Systems Plan (TSP) or Public Facilities Plan (PFP)

(ii) Anticipated traffic generation;
(iii) On-street parking needs;
(iv) Sidewalk and bikeway requirements;
(v) Requirements for placement of utilities;
(vi) Street lighting;
(vii) Drainage and slope impacts;
(viii) Street tree location;
(ix) Planting and landscape areas;
(x) Safety for motorists, bicyclists, and pedestrians; and

(xi) Access needs for emergency vehicles;

(11) Cul-de-Sacs. *A cul-de-sac street shall only be used when environmental or topographical constraints, existing development patterns, or compliance with other standards in this code preclude street extension and through circulation. When cul-de-sacs are provided, all of the following shall be met:*

(a) A cul-de-sac shall be no more than 400 feet long nor provide access to greater than 20 dwelling units:

(i) All cul-de-sacs shall terminate with a turnaround *in accordance with the Engineering Standards Manual*. Use of turnaround configurations other than circular shall be approved by the city engineer;

(ii) 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; and

(iii) An intersecting street must lead to another street or be a future street with the practical ability to be extended someday;

(b) If a cul-de-sac is more than 300 feet long, a lighted direct pathway to an adjacent street may be required to be provided and dedicated to the city.

(27) Local "Skinny" Streets. Such streets, as set forth in Figure 19 Road Standards of this Chapter, may be allowed provided:

(a) The street will provide access to land uses whose combined average daily trip rate (ADT) is 200 ADT or less; and

(b) Where the roadway/pavement width will be 20 feet, on-street parking shall be prohibited.

17.152.060 Sidewalks.

(1) Sidewalks shall be constructed, replaced or repaired to city design standards as set forth in the standard specifications manual and located as follows:

(a) On both sides of arterial and collector streets to be built at the time of street construction;

(b) On both sides of all other streets and in pedestrian easements and rights-of-way, except as provided further in this section or per SHMC 17.152.030(1)(d), to be constructed along all portions of the property designated for pedestrian ways in conjunction with development of the property~~; and~~

~~(c) On at least one side of any industrial street to be constructed at the time of street construction or after determination of curb cut locations~~.

(2) A planter strip separation of at least five feet between the curb and the sidewalk shall be required in the design of any arterial *or collector* street ~~where parking is prohibited adjacent to the curb~~, except where the following conditions exist: there is inadequate right-of-way; the curbside sidewalks already exist on predominant portions of the street; ~~or~~ it would conflict with the utilities*; or as indicated otherwise by the Transportation Systems Plan (TSP) (see TSP Figures 7-2 and 7-3) or an adopted street plan*.

(3) Maintenance. Maintenance of sidewalks, curbs, and planter strips is the continuing obligation of the adjacent property owner.

(4) Application for Permit and Inspection. If the construction of a sidewalk is not included in a performance bond of an approved subdivision or the performance bond has lapsed, then every

person, firm or corporation desiring to construct sidewalks as provided by this chapter shall, before entering upon the work or improvement, apply for a street opening permit to the engineering department to so build or construct:

(a) An occupancy permit shall not be issued for a development until the provisions of this section are satisfied *or a fee in lieu has been paid to the city pursuant to SHMC 17.152.060(6)*;

(b) The city engineer may issue a permit and certificate allowing temporary noncompliance with the provisions of this section to the owner, builder or contractor when, in his opinion, the construction of the sidewalk is impractical for one or more of the following reasons:

(i) Sidewalk grades have not and cannot be established for the property in question within a reasonable length of time;

(ii) Forthcoming installation of public utilities or street paving would be likely to cause severe damage to the new sidewalk;

(iii) Street right-of-way is insufficient to accommodate a sidewalk on one or both sides of the street; or

(iv) Topography or elevation of the sidewalk base area makes construction of a sidewalk impractical or economically infeasible;

(c) The city engineer shall inspect the construction of sidewalks for compliance with the provision set forth in the standard specifications manual.

(5) Council Initiation of Construction. In the event one or more of the following situations are found by the council to exist, the council may adopt a resolution to initiate construction of a sidewalk in accordance with city ordinances:

(a) A safety hazard exists for children walking to or from school and sidewalks are necessary to eliminate the hazard;

(b) A safety hazard exists for pedestrians walking to or from a public building, commercial area, place of assembly or other general pedestrian traffic, and sidewalks are necessary to eliminate the hazard;

(c) Fifty percent or more of the area in a given block has been improved by the construction of dwellings, multiple dwellings, commercial buildings or public buildings and/or parks; and

(d) A criterion which allowed noncompliance under subsection (4)(b) of this section no longer exists and a sidewalk could be constructed in conformance with city standards.

(6) Fee in lieu option. An applicant may request or the City may require the applicant to pay a fee in lieu of constructing sidewalks to be approved by the city engineer.

(a) A fee in lieu may be approved given conditions including but not limited to the following:

(i) There is no existing or planned sidewalk network in the area.

(ii) There is a planned sidewalk or multi-use pathway in the vicinity of the site, or an existing multi-use pathway stubbing into the site, that would provide better pedestrian connectivity.

(iii) When physical improvements are present along an existing or proposed street that would prevent a reasonable installation within the right-of-way.

(iv) When sidewalks would be located on land with cross slopes greater than nine percent (9%), or other conditions that would create a potential hazard.

(v) Other situations unique to the site.

(b) The fee shall be not less than 125% of the cost to perform the work, as determined by the City Engineer, based on the applicable city standards in effect at the time of application.

The fee shall be paid prior to plat recording or issuance of a building or development permit.

(c) All fees paid shall be used for construction of a sidewalk or multi-use pathway, or repair and maintenance of an existing sidewalk or pathway within the City of St. Helens.

17.152.080 Water services.

(1) Water Supply (Required). Municipal water system shall be installed to serve each new development and to connect development to existing mains in accordance with the provisions set forth in the standard specification manual and the adopted policies of the St. Helens comprehensive plan.

(2) Water Supply Plan Approval. The city engineer shall approve all water supply plans and proposed systems prior to issuance of development permits involving water service. *Such plans and systems shall be designed by a registered Professional Engineer.*

(3) Oversizing. Proposed water systems shall include consideration of additional development within the area as projected by the St. Helens comprehensive plan.

(4) Permits Denied. Development permits may be restricted by the commission *or council (i.e. the applicable approval authority)* where a deficiency exists in the existing water system or portion thereof which cannot be rectified within the development and which if not rectified will result in a threat to public health or safety, surcharging of existing mains, or violations of state or federal standards pertaining to operation of the water system.

(5) In some cases, a municipal water system may not be required, such as for nonconsumption purposes like landscape irrigation or industrial processing. The city engineer and building official shall decide when this exception is to be allowed.

(6)Extension of water mains shall be public (i.e. under control of a public authority) except where a variance is approved per Chapter 17.108 SHMC.

17.152.090 Sanitary sewers.

(1) Sewers (Required).

(a) *Public* ~~S~~sanitary sewers shall be installed to serve all properties being developed and having to comply with plumbing codes adopted by the city of St. Helens except where a variance is approved ~~by the director~~ per Chapter 17.108 SHMC.

(b) Any proposed installation of sanitary sewers shall comply with this section.

(2) Sewer Plan Approval. The city engineer shall approve all sanitary sewer plans and proposed systems prior to issuance of development permits involving sewer service. *Such plans and systems shall be designed by a registered Professional Engineer.*

(3) Oversizing. Proposed sewer systems shall include consideration of additional development within the area as projected by the St. Helens comprehensive plan.

(4) Permits Denied. Development permits may be restricted by the commission *or council (i.e. the applicable approval authority)* where a deficiency exists in the existing sewer system or portion thereof which cannot be rectified within the development and which if not rectified will result in a threat to public health or safety, surcharging of existing mains, or violations of state or federal standards pertaining to operation of the sewage treatment system.

(5) For the purpose of this section "public sanitary sewer" means a sewer in which all owners of abutting properties have equal rights, and is controlled by the City.

17.152.100 Storm drainage.

(1) Storm Drainage – General Provisions. The director and city engineer shall issue a development permit only where adequate provisions for storm water and floodwater runoff have been made, *which may require storm water facilities,* and:

(a) The storm water drainage system *or storm water facilities* shall be separate and independent of any sanitary sewerage system;

(b) Where possible, inlets shall be provided so surface water is not carried across any intersection or allowed to flood any street; and

(c) Surface water drainage patterns shall be shown on every development proposal plan.

(2) Easements. Where a subdivision is traversed by a watercourse, drainageway, channel or stream, there shall be provided a storm water easement or drainage right-of-way conforming substantially with the lines of such watercourse and such further width as will be adequate for conveyance and maintenance.

(3) Accommodation of Upstream Drainage (Must Comply with State and Federal Requirements). A culvert or other drainage *or storm water* facility shall be large enough to accommodate potential runoff from its entire upstream drainage area, whether inside or outside the development, and:

(a) The city engineer shall approve the necessary size of the *storm water* facility, based on the provisions of the city's adopted master drainage plan.

(4) Effect on Downstream Drainage. Where it is anticipated by the city engineer that the additional runoff resulting from the development will overload an existing drainage *or storm water* facility, the director and engineer shall withhold approval of the development until provisions have been made for improvement of the potential condition or until provisions have been made for storage of additional runoff caused by the development in accordance with the city's current master drainage plan.

(5) Any storm water facility shall be designed by a registered Professional Engineer.

(6) Any storm water facility shall be public (i.e. under control of a public authority) and located on city owned property, city right-of-way or city easement except where a variance is approved per Chapter 17.108 SHMC or where such facility is determined to be private by the city engineer (e.g. private detention ponds for commercial or industrial development).

(7) For the purpose of this section "storm water facility" means any structure(s) or configuration of the ground that is used or by its location becomes a place where storm water flows or is accumulated including, but not limited to, pipes, sewers, street gutters, manholes, catch basins, ponds, open drainageways and their appurtenances. Milton Creek, McNulty Creek, and the Columbia River are not storm drain facilities.

17.152.110 Bikeways.

(3) Minimum width for bikeways within the roadway is ~~five~~ *six* feet per bicycle travel lane. Minimum width for two-way bikeways separated from the road is eight feet.

Chapter 17.156
TRAFFIC IMPACT ANALYSIS (TIA)

Sections:
17.156.010 Purpose.

17.156.020 Typical Average Daily Trips and Level-of-Service Standards.
17.156.030 Applicability.
17.156.040 Traffic Impact Analysis Requirements.
17.156.050 Study Area.
17.156.060 Analysis Periods.
17.156.070 Peak Hour Analysis.
17.156.080 Approval Criteria.
17.156.090 Conditions of Approval.

17.156.010 Purpose.

The purpose of this section of the code is to implement OAR 660-012-0045(2)(e) of the State Transportation Planning Rule that requires the city to adopt a process to apply conditions to development proposals in order to protect and minimize adverse impacts to transportation facilities. This section establishes the standards for when a proposal must be reviewed for potential traffic impacts; when a Traffic Impact Analysis must be submitted with a development application in order to determine whether conditions are needed to minimize impacts to and protect transportation facilities; what must be in a Traffic Impact Analysis; and who is qualified to prepare the analysis.

17.156.020 Typical Average Daily Trips and Level-of-Service standards.

(1) The latest edition of the Trip Generation, published by the Institute of Transportation Engineers (ITE) shall be used as standards by which to gauge average daily vehicle trips.

(2) Pursuant to the Transportation Systems Plan (TSP) (see TSP Section 4), the following minimum operating standards apply to City-maintained intersections. As measured using the Highway Capacity Manual, latest edition, Level of Service "D" is considered acceptable at signalized and all-way stop controlled intersections if the intersection volume-to-capacity ratio is not higher than 1.0 for the sum of critical movements. Level of Service "E" is considered acceptable for the poorest operating approach at two-way stop intersections. Level of Service "F" is allowed in situations where a traffic signal is not warranted.

17.156.030 Applicability.

A Traffic Impact Analysis shall be required to be submitted to the city with a land use application, when the application involves one or more of the following actions:

(1) A change in zoning or a comprehensive plan amendment designation, except when the change will result in a zone or plan designation that will result in less vehicle trips based on permitted uses (e.g. from a high density residential district to a lower density residential district or from a commercial district to a residential district);

(2) The site proposes to take access on Highway 30 or on an approach to Highway 30; or

(3) The development shall cause one or more of the following effects, which can be determined by field counts, site observation, traffic impact analysis or study, field measurements, crash history, Institute of Transportation Engineers Trip Generation; and information and studies provided by the local reviewing jurisdiction(s) and/or ODOT:

*(a) The proposed action is estimated to generate *250 Average Daily Trips (ADT) or more or 25 or more weekday AM or PM peak hour trips (or as required by the City Engineer);*

(b) The proposed action is projected to further degrade mobility at the Deer Island Road/Highway 30, Pittsburg Road/Highway 30, Wyeth Street/Highway 30, Gable Road/Highway 30, or Millard Road/Highway 30, intersections;

(c) An increase in use of adjacent streets by vehicles exceeding the 20,000 pound gross vehicle weights by 10 vehicles or more per day;

(d) The location of the access driveway does not meet minimum intersection sight distance requirements, or is located where vehicles entering or leaving the property are restricted, or such vehicles queue or hesitate, creating a safety hazard;

(e) The location of the access driveway does not meet the access spacing standard of the roadway on which the driveway is located; or

(f) A change in internal traffic patterns that may cause safety problems, such as back up onto the highway or traffic crashes in the approach area.

**As an example, 250 ADT is roughly equivalent to 25 single family homes, 37 apartments, 22,000 square-feet of office space, or a 2,300 square foot supermarket. This example is not a substitute for determination of vehicle trips per SHMC 17.156.020.*

17.156.040 Traffic Impact Analysis Requirements.

(1) Preparation. A Traffic Impact Analysis shall be prepared by an Oregon Registered Professional Engineer that is qualified to perform traffic engineering analysis and will be paid for by the applicant.

(2) Transportation Planning Rule Compliance. See Chapter 17.08.060 SHMC Transportation Planning Rule Compliance.

(3) Pre-application Conference. The applicant will meet with the City Engineer prior to submitting an application that requires a Traffic Impact Analysis. The city has the discretion to determine the required elements of the TIA and the level of analysis expected.

17.156.050 Study Area.

The following facilities shall be included in the study area for all Traffic Impact Analyses (unless modified by the City Engineer):

(1) All site-access points and intersections (signalized and unsignalized) adjacent to the proposed site. In particular, if the proposed site fronts an arterial or collector street, the analysis shall address all intersections and driveways along the site frontage, including those serving parcels on the opposite side of the street(s).

(2) Roads through and adjacent to site.

(3) Any intersection of two streets, each with a classification of collector or arterial, where site traffic will exceed 20 vehicles during a peak hour or, in the case of a rezone, if the trip differential resulting from the rezone will exceed 20 vehicles during a peak hour.

(4) All intersections needed for signal progression analysis.

(5) In addition to these requirements, the City Engineer may determine any additional intersections or roadway links that may be adversely affected as a result of the proposed development.

17.156.060 Analysis Periods.

Analysis Periods. To adequately assess the impacts of a proposed land use action, the following study periods, or horizon years, should be addressed in the transportation impact analysis where applicable:

(1) Existing Year.

(2) Background Conditions, Future Year. The conditions in the year in which the proposed land use action will be completed and occupied, but without the expected traffic from the proposed land use action. This analysis should include all in-process developments, or city approved developments that are expected to be fully built out in the proposed land use action horizon year. It should also account for all in-process/planned transportation system improvements.

(a)Depending on funding or project development issues, it may not be appropriate to assume that certain planned transportation system improvements will be in place on opening day. Applicants should contact the City Engineer to confirm appropriate assumptions.

(3) Full Buildout. The background condition plus traffic from the proposed land use action assuming full build-out and occupancy.

(4) Phased Years of Completion. If the project involves construction or occupancy in phases or for master plans, the applicant shall assess the expected roadway, intersection, and land use conditions resulting from major development phases. Phased years of analysis will be determined in coordination with city staff.

(5) 20-Year or TSP Horizon Year. For master plans, zone changes, and conditional uses, the applicant shall assess the expected future roadway, intersection, and land use conditions resulting from deviations from approved comprehensive planning documents.
A twenty-year or TSP Horizon Year analysis will not be required for out-right permitted uses under the current zoning.

17.156.070 Peak Hour Analysis.

(1) The Traffic Impact Analysis shall address the weekday AM and PM peak hours when the proposed land use action is expected to generate 25 trips or more during the peak time periods. If the applicant can demonstrate that the peak hour trip generation of the proposed land use action is fewer than 25 trips during one of the two peak study periods and the peak trip generation of the land use action corresponds to the roadway system peak, then only the worse of the two peak periods must be analyzed.

(a) This does not mean, however, that all aspects of the other peak period can be ignored. The applicant should consider, for example, the possibility that inbound and outbound trips at the site driveway have specific operational issues that may need to be addressed for both peak hours.

(2) Depending upon the proposed land use action and the expected trip generating characteristics of that development, other time periods may be specified, either as a substitute for, or in addition to the AM and PM peak hours. Examples of land uses that have non-typical trip generating characteristics include schools, movie theatres, and churches. Applicants should assume that the city will require additional analysis periods for certain uses as summarized below:

(a) Schools – End of the school day (early afternoon) peak hour.
(b) Churches and worship facilities – Peak period prior to and after worship services.
(c)Restaurants – Mid-day weekday peak hour.
(d) Theaters – Friday theater peak hour.

The above list is not necessarily an all-inclusive list of uses for which additional analysis periods is required. The City Engineer and applicant should discuss the potential for additional study periods prior to the start of the Traffic Impact Analysis.

17.156.080 Approval Criteria.

When a Traffic Impact Analysis is required, approval of the development proposal requires satisfaction of the following criteria:

(1) The Traffic Impact Analysis was prepared by an Oregon Registered Professional Engineer using the analysis procedures of the Highway Capacity Manual, latest edition;

(2) If the proposed development shall cause one or more of the effects per SHMC 17.156.030 or other traffic hazard or negative impact to a transportation facility, the Traffic Impact Analysis shall include mitigation measures that meet the city's adopted Level-of-Service standards (per the Transportation Systems Plan and noted under SHMC 17.156.020) and are satisfactory to the City Engineer and ODOT, when applicable; and

(3) The proposed site design and traffic and circulation design and facilities, for all transportation modes, including any mitigation measures, are designed to:

(a) Have the least negative impact on all applicable transportation facilities;

(b) Accommodate and encourage non-motor vehicular modes of transportation to the extent practicable;

(c) Make the most efficient use of land and public facilities as practicable;

(d) Provide the most direct, safe and convenient routes practicable between on-site destinations, and between on-site and off-site destinations; and

(e) Otherwise comply with applicable requirements of the SHMC.

17.156.090 Conditions of Approval.

The city may deny, approve, or approve a development proposal with appropriate conditions needed to meet operations and safety standards and provide the necessary right-of-way and improvements to develop the future planned transportation system. Conditions of Approval that should be evaluated as part of land divisions, conditional use permits, and site development reviews include:

(1) Crossover or reciprocal easement agreements for all adjoining parcels to facilitate future access between parcels.

(2) Access for new developments that have proposed access points that do not meet the designated access spacing policy and/or have the ability to align with opposing access driveways.

(3) Right-of-way dedications for future planned roadway improvements.

(4) Half-street improvements along site frontages that do not have full-buildout improvements in place at the time of development.

Chapter 19.08
GENERAL GOALS AND POLICIES

19.08.040 Transportation goals and policies.

(3) Policies. It is the policy of the city of St. Helens to:

(p) Support connectivity in the transportation network by permitting cul-de-sacs only when environmental or topographical constraints or exiting development patterns preclude local street connectivity. Where cul-de-sacs are proposed and built, there shall be pedestrian and bicyclist connections and pathways provided to the surrounding street system.

Chapter 19.16
AMENDMENTS TO COMPREHENSIVE PLAN

19.16.010 Amendments to the Comprehensive Plan.

(1) Preface. It is the intent of this section to give direction for amending the St. Helens Comprehensive Plan.

(2) Goal. To create a process that complies with state and local laws for amending the acknowledged St. Helens Comprehensive Plan.

(3) Policy. All proposed amendments to this plan shall follow state laws and local laws. In particular they shall comply with ORS Chapters 195 and 215.

(a) See SHMC 17.08.060 for Transportation Planning Rule Compliance.

Attachment "C"

Findings of Fact and Conclusions of Law

CITY OF ST. HELENS PLANNING DEPARTMENT
FINDINGS OF FACT AND CONCLUSIONS OF LAW
Development Code & Comprehensive Plan Amendments CPZA.1.11

APPLICANT: City of St. Helens
PROPOSAL: Adopt updated Transportation Systems Plan as an addendum to the Comprehensive Plan and related text amendments to the Community Development Code (Title 17 SHMC) and Comprehensive Plan (Title 19 SHMC)

The 120-day rule (ORS 227.178) for final action for this land use decision is n/a.

PUBLIC HEARING & NOTICE

Hearing dates are as follows:
July 12, 2011 before the Planning Commission
July 20, 2011 before the City Council

Notice was published in the The Chronicle on June 22, 2011. Notice was sent to the Oregon Department of Land Conservation and Development on May 26, 2011.

APPLICABLE CRITERIA, ANALYSIS & FINDINGS

SHMC 17.20.120(1) – Standards for Legislative Decision

The recommendation by the commission and the decision by the council shall be based on consideration of the following factors:

(a) The statewide planning goals and guidelines adopted under ORS Chapter 197;

(b) Any federal or state statutes or guidelines found applicable;

(c) The applicable comprehensive plan policies, procedures, appendices and maps; and

(d) The applicable provisions of the implementing ordinances.

(a) Discussion:

The statewide planning goals that technically apply or are related to this proposal are Goal 1, Goal 2, Goal 9, Goal 10, Goal 11 and Goal 12.

Statewide Planning Goal 1: Citizen Involvement.
Goal 1 requires the development of a citizen involvement program that is widespread, allows two-way communication, provides for citizen involvement through all planning phases, and is understandable, responsive, and funded.

Generally, Goal 1 is satisfied when a local government follows the public involvement procedures set out in the statutes and in its acknowledged comprehensive plan and land use regulations.

The City's Development Code is consistent with State law with regards to notification requirements. Pursuant to SHMC 17.20.080 at least one public hearing before the Planning Commission and City Council is required. Legal notice in a newspaper of general circulation is required too. The City has met these requirements and notified DLCD of the proposal.

The plan has been publicly vetted, having been developed with the help of an ad hoc Citizen Advisory Committee and Technical Advisory Committee who met multiple times. The City also developed a Public Participation Plan (PPP) for this process as found in TSP Appendix 1. The Planning Commission and City Council had multiple work sessions all that were open to and attended by the public. This City had two workshops for and attended by the public. An interactive website was also available for public comment (the availability of which was advertised per the PPP), the comments of which are memorialized in Appendix 2.

Given the public vetting for the plan, scheduled public hearings, and notice provided, Goal 1 is satisfied.

Statewide Planning Goal 2: Land Use Planning.
This goal requires that a land use planning process and policy framework be established as a basis for all decisions and actions relating to the use of land. All local governments and state agencies involved in the land use action must coordinate with each other. City, county, state and federal agency and special districts plans and actions related to land use must be consistent with the comprehensive plans of cities and counties and regional plans adopted under Oregon Revised Statues (ORS) Chapter 268.

This proposal involves an addendum to the Comprehensive Plan. It will expand the information and guidance of the Comprehensive Plan, which can be used as a basis for future land use decisions, plans (e.g. the Transportation Systems Plan currently being updated), and other actions (e.g. development and budgeting).

It is also consists with federal, state and regional documents, as they, along with City level documents provide the framework for transportation planning in the City. The applicable documents are many and derived from all aforementioned layers of government. They can be found in Appendix 2.

In addition, the TSP update process included representation from several agencies (e.g. those on the Technical Advisory Committee) as well as opportunities for multiple agency input.

Comprehensive Plan consistency is addressed further below.

Given the inclusion of local, state, regional and federal documents, laws, participation and opportunity for feedback as applicable, Goal 2 is satisfied.

Statewide Planning Goal 9: Economic Development.
This goal requires that local comprehensive plans and policies contribute to a stable and healthy economy in all regions of the state.

Economic well-being is dependant on mobility. The transportation systems in the City must function for freight, commuting, emergency response, livability, efficiency, etc. The updated TSP and implementation laws are intended to maintain and enhance multi-modal transportation in the City's urban growth boundary. A disorganized and poorly managed and coordinated transportation system would be an obstacle to economic development as well as quality of life. Note that the TSP was developed, partially based on anticipated job growth within the 20 year plan period.

As the updated TSP and the related implementation laws are intended to manage the transportation system, Goal 9 is satisfied.

Statewide Planning Goal 10: Housing.
This goal requires that City plans provide for the appropriate type, location and phasing of public facilities and services sufficient to support housing development in areas presently developed or undergoing development or redevelopment.

Housing is only viable if you can reasonably get to and from it. Moreover, housing by itself means only so much without quality of life. As noted under Goal 9 above, the purpose of the TSP and the related implementation laws is to manage the transportation system for all modes or travel. This equates to mobility and quality of life and supports local employment, all of which are necessary aspects to support housing. Note that the TSP was developed, partially based on anticipated housing growth within the 20 year plan period.

As the updated TSP and the related implementation laws are intended to manage the transportation system, Goal 10 is satisfied.

Statewide Planning Goal 11: Public Facilities and Services.
Goal 11 requires cities and counties to plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development. The goal requires that urban and rural development be "guided and supported by types and levels of urban and rural public facilities and services appropriate for, but limited to, the needs and requirements of the urban, urbanizable and rural areas to be served."

Transportation facilities are considered a primary type of public facility. The TSP documents existing conditions and future needs for the transportation system in St. Helens. Proposed improvements and implementation measures in the TSP and related proposed law are tailored to meet those future needs.

Goal 11 is satisfied.

Statewide Planning Goal 12: Transportation.
Goal 12 requires cities, counties, metropolitan planning organizations, and ODOT to provide and encourage a "safe, convenient and economic transportation system." This is accomplished through development of Transportation System Plans based on inventories of local, regional and state transportation needs. Goal 12 is implemented through OAR 660, Division 12, also known as the Transportation Planning Rule ("TPR"). The TPR contains numerous requirements governing transportation planning and project development.

Goal 12 is satisfied as the City is updating its Transportation Systems Plan, which amongst other things, implements the TPR as applicable.

(b) Discussion:

Some state statutes/guidelines are applicable: ORS 227.186(2), the Oregon Transportation Plan (2006), Oregon Highway Plan (1999), OAR 660 Division 12 Transportation Planning Rule (TPR), and OAR 734, Division 51.

ORS 227.186(2).
All legislative acts relating to comprehensive plans, land use planning or zoning adopted by a city shall be by ordinance.

The TSP and related implementation law will be adopted by ordinance.

Oregon Transportation Plan (2006)
The Oregon Transportation Plan (OTP) is the state's long-range multimodal transportation plan. The OTP is the overarching policy document among a series of plans that together form the state transportation system plan (TSP). A TSP must be consistent with applicable OTP goals and policies. The most applicable OTP policies are as follows:

POLICY 1.2 *– Equity, Efficiency and Travel Choices*
It is the policy of the State of Oregon to promote a transportation system with multiple travel choices that are easy to use, reliable, cost-effective and accessible to all potential users, including the transportation disadvantaged.
POLICY 2.1 *- Capacity and Operational Efficiency*
It is the policy of the State of Oregon to manage the transportation system to improve its capacity and operational efficiency for the long term benefit of people and goods movement.
POLICY 2.2 *– Management of Assets*
It is the policy of the State of Oregon to manage transportation assets to extend their life and reduce maintenance costs.
POLICY 3.1 *– An Integrated and Efficient Freight System*
It is the policy of the State of Oregon to promote an integrated, efficient and reliable freight system involving air, barges, pipelines, rail, ships and trucks to provide Oregon a

competitive advantage by moving goods faster and more reliably to regional, national and international markets.
POLICY 3.2 *– Moving People to Support Economic Vitality*
It is the policy of the State of Oregon to develop an integrated system of transportation facilities, services and information so that intrastate, interstate and international travelers can travel easily for business and recreation.
POLICY 4.1 *- Environmentally Responsible Transportation System*
It is the policy of the State of Oregon to provide a transportation system that is environmentally responsible and encourages conservation and protection of natural resources.
POLICY 5.1 *– Safety*
It is the policy of the State of Oregon to continually improve the safety and security of all modes and transportation facilities for system users including operators, passengers, pedestrians, recipients of goods and services, and property owners.
POLICY 7.1 *– A Coordinated Transportation System*
It is the policy of the State of Oregon to work collaboratively with other jurisdictions and agencies with the objective of removing barriers so the transportation system can function as one system.
POLICY 7.3 *– Public Involvement and Consultation*
It is the policy of the State of Oregon to involve Oregonians to the fullest practical extent in transportation planning and implementation in order to deliver a transportation system that meets the diverse needs of the state.
POLICY 7.4 *- Environmental Justice*
It is the policy of the State of Oregon to provide all Oregonians, regardless of race, culture or income, equal access to transportation decision-making so all Oregonians may fairly share in benefits and burdens and enjoy the same degree of protection from disproportionate adverse impacts.

The TSP and implementation law supports multi-modal transportation to serve all. It also helps to manage those modes of transportation acknowledging capacity for the sake of efficiency. It helps to prioritize improvements for budget and capital infrastructure management; it also builds on existing facilities for efficiency.

US 30 (Columbia River Highway) is a Statewide Highway, a Freight Route, and part of the National Highway System (NHS). Improvements and implementation measures are intended to ensure the function of US 30.

Implementation of the TSP is intended to serve area within the city's Urban Growth Boundary, an area planned for efficient urban development. Moreover, by accommodating other modes of travel (pedestrian, bicycle, and transit), the system furthers environmental sustainability efforts.

From a safety standpoint, the TSP is based on a 20 year anticipated traffic model with the intent of managing the growth and related transportation demand. It also addresses traffic management such as driveway spacing. By doing so, hazards are mitigated, especially compared to a transportation system guided by no plan at all.

The TSP was developed in coordination with other jurisdictions and agencies (e.g. ODOT, Columbia County, Portland & Western RR, and Columbia River Fire and Rescue). The plan and related implementation laws furthers such coordination.

Public involvement efforts where extensive, as previously described. This included multiple means of participation as outlined in the Public Participation Plan. There is no evidence that environmental justice groups are disproportionately affected by the TSP.

Oregon Highway Plan
The 1999 Oregon Highway Plan (OHP) establishes policies and investment strategies for Oregon's state highway system over a 20-year period and refines the goals and policies found in the OTP. Policies in the OHP emphasize the efficient management of the highway system to increase safety and to extend highway capacity, partnerships with other agencies and local governments, and the use of new techniques to improve road safety and capacity. These policies also link land use and transportation, set standards for highway performance and access management, and emphasize the relationship between state highways and local road, bicycle, pedestrian, transit, rail, and air systems. The applicable policies of the OHP are as follows:

Policy 1A *(Highway Classification) defines the function of state highways to serve different types of traffic that should be incorporated into and specified through IAMPs.*
Policy 1C *(State Highway Freight System) states the need to balance the movement of goods and services with other uses.*
Policy 1B *(Land Use and Transportation) recognizes the need for coordination between state and local jurisdictions.*
Policy 1F *(Highway Mobility Standards) sets mobility standards for ensuring a reliable and acceptable level of mobility on the highway system by identifying necessary improvements that would allow the interchange to function in a manner consistent with OHP mobility standards.*
Policy 1G *(Major Improvements) requires maintaining performance and improving safety by improving efficiency and management before adding capacity. ODOT works with regional and local governments to address highway performance and safety.*
Policy 2B *(Off-System Improvements) helps local jurisdictions adopt land use and access management policies.*
Policy 2F *(Traffic Safety) improves the safety of the highway system.*
Policy 3A *(Classification and Spacing Standards) sets access spacing standards for driveways and approaches to the state highway system.*
Policy 3D *(Deviations) establishes general policies and procedures for deviations from adopted access management standards and policies.*
Policy 4B *(Alternative Passenger Modes) It is the policy of the State of Oregon to advance and support alternative passenger transportation systems where travel demand, land use, and other factors indicate the potential for successful and effective development of alternative passenger modes.*

US 30 (Columbia River Highway) in St. Helens is a Statewide Highway, a Freight Route, and part of the National Highway System (NHS). Access management and other implementation measures serve safety and mobility goals established for these types of facilities in their purpose statements the OHP.

As already described, there was significant coordination for the TSP update process. In addition implementation measures such as TIA requirements are ways of making connections between land use actions and the transportation system.

Several alternatives where evaluated in the TSP update process to evaluate performance and seek the preferred plan. Things such as access management, circulation plans, and code amendments are intended to improve efficiency and management to help minimize capacity increasing improvements. Local system circulation plans, access management measures, and improvements will help reduce traffic and improve conditions on US 30. This begets safety of the highway system.

The TSP acknowledges modes of travel beyond vehicles such as pedestrian, bicycle, and transit travel, with the intent of improve conditions for these alternative modes.

OAR 660 Division 12 Transportation Planning Rule (TPR)
The purpose of the TPR is "to implement Statewide Planning Goal 12 (Transportation) and promote the development of safe, convenient and economic transportation systems that are designed to reduce reliance on the automobile so that the air pollution, traffic and other livability problems faced by urban areas in other parts of the country might be avoided." A major purpose of the Transportation Planning Rule (TPR) is to promote more careful coordination of land use and transportation planning, to ensure that planned land uses are supported by and consistent with planned transportation facilities and improvements.

The updated TSP implements the TPR. The proposed code amendments constitute land use regulations designed to "to protect transportation facilities, corridors, and sites for their identified functions," as required by OAR 660-012-0045(2). This includes consistency with the provisions for timing of an update of a TSP, pursuant to OAR 6-012-0055. For example, proposed code amendments address Traffic Impact Analysis (TIA) requirements, access standards, connectivity, and other issues of TPR compliance.

OAR 734, Division 51. Highway Approaches, Access Control, Spacing Standards and Medians
OAR 734-051 governs the permitting, management, and standards of approaches to state highways to ensure safe and efficient operation of the state highways. OAR 734-051 policies address the following:

- *How to bring existing and future approaches into compliance with access spacing standards, and ensure the safe and efficient operation of the highway;*
- *The purpose and components of an access management plan; and*

- *Requirements regarding mitigation, modification and closure of existing approaches as part of project development.*

The TSP and related implementation laws address existing conditions and access management measures. State access standards will be incorporated into the City's Development Code.

(c) Discussion:

With regards to the City's Comprehensive Plan the TSP update effort doesn't conflict with SHMC Sections 19.08.010, 19.08.020, 19.08.030, 19.08.040 and 19.08.050 as explained with the respective Statewide Planning Goals described above and generally conforms, except 19.08.040(3)(c) specifically states:

> Support and adopt by reference road projects listed in the Six-Year Highway Improvement Program; specifically, work towards attaining left turn lanes and traffic lights on Highway 30.

As shown by Figure 7-7 of the TSP, three new traffic signals are planned for US 30. The Statewide goals are not that specific.

(d) Discussion:

With regards to the City's implementation ordinances, they are being updated in conjunction with the TSP adoption to ensure the TSP is properly implemented.

Finding: The TSP and implementation law meets and is not contrary to the applicable local, state, regional and federal laws, policies, plans, etc.

CONCLUSION & DECISION

Based upon the facts and findings herein, the City Council approves this Comprehensive Plan Addendum and text amendments to the Development Code and Comprehensive Plan.

Randy Petersen

Randy Petersen, Mayor

9/7/11

Date

St. Helens Transportation System Plan
Ordinance 3150

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Technical Appendices, Volume 2 (Separate Document)

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Appendix 2B .... Technical Memorandum #2: Existing Traffic Conditions
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Appendix 2D .... Technical Memorandum #4: Transportation Solutions

PREFACE

The progress of this plan was guided by the Project Management Team (PMT), the Technical Advisory Committee (TAC), and the Citizen Advisory Committee (CAC). The PMT, TAC, and CAC members are identified below, along with members of the consultant team. The TAC and CAC members devoted a substantial amount of time and effort to the development of the St. Helens Transportation System Plan (TSP) Update, and their participation was instrumental in the development of this document. The Consultant Team and PMT believe that the city's future transportation system will be better because of their commitment.

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Section 1 Introduction

1 INTRODUCTION

Overview

The City of St. Helens, in conjunction with the Oregon Department of Transportation (ODOT), initiated an update of the City's Transportation System Plan (TSP) in 2010. The TSP update will guide the management and implementation of the transportation facilities, policies, and programs, within St. Helens over the next 20 years. This plan is reflective of the community's vision, while remaining consistent with state and other local plans and policies. The plan also provides the necessary elements for adoption as the transportation element of the City's Comprehensive Plan. In addition, the plan provides ODOT and Columbia County with recommendations that can be incorporated into their respective planning efforts.

State of Oregon planning rules require that the TSP be based on the current comprehensive plan land use map and must provide a transportation system that accommodates the expected 20-year growth in population and employment that will result from implementation of the land use plan. The contents of this TSP update are guided by Oregon Revised Statute (ORS) 197.712 and the Department of Land Conservation and Development (DLCD) administrative rule known as the Transportation Planning Rule (TPR). These laws and rules require that jurisdictions develop the following:

- a road plan for a network of arterial and collector streets;
- a bicycle and pedestrian plan;
- an air, rail, water, and pipeline plan;
- a transportation financing plan; and
- policies and ordinances for implementing the TSP.

The TPR requires that the transportation system plan incorporates the needs of all users and abilities. In addition, the TPR requires that local jurisdictions adopt land use and subdivision ordinance amendments to protect transportation facilities and to provide bicycle and pedestrian facilities between residential, commercial, and employment/institutional areas. It is further required that local communities coordinate their respective plans with the applicable county, regional, and state transportation plans.

TSP Process

The St. Helens TSP was updated through a process that identified transportation needs, analyzed potential options for addressing those needs over the next 20 years, and provided an implementation plan and financing plan. The following steps were involved in this process:

- Review of state, regional, and local transportation plans and policies that the St. Helens TSP must either comply with or be consistent with.
- Gathering community input through public workshops at key points in the project.
- Working with technical and citizen advisory committees to establish goals and objectives, identify and assess alternatives, and prioritize future needs.
- Using a detailed inventory of existing transportation facilities and services as a foundation to establish needs near and long-term.
- Identifying and evaluating future transportation needs to support the land use vision and economic vitality of the city.
- Prioritizing improvements and strategies that are reflective of the community's vision and fiscal realities.
- Preparing for review and adoption by the St. Helens Planning Commission and City Council and subsequently by Columbia County as appropriate.

Public involvement

The TSP planning process provided the citizens of St. Helens with the opportunity to identify their vision and priorities for the future transportation system within the city. Expressing this vision into TSP goals and policies was a central element of the public involvement process. These goals and policies were used as a guide in identifying future system needs and priorities.

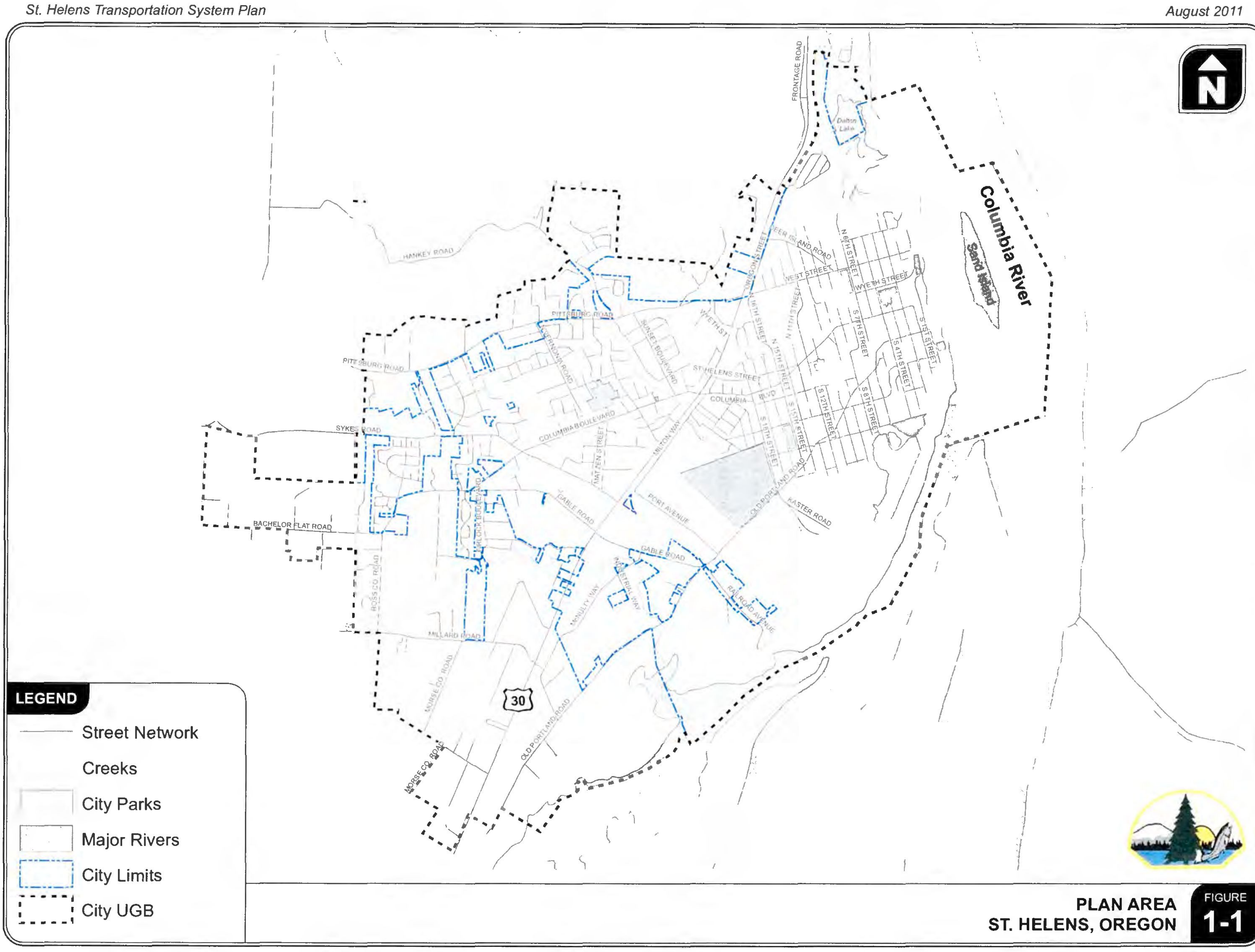
The planning process was guided by a Technical Advisory Committee (TAC) and a Citizen Advisory Committee (CAC). The TAC was comprised of key stakeholder agencies, including the St. Helens Planning, Public Works, and Engineering Departments, the Columbia County Transit and Roads departments, Columbia River Fire & Rescue, and the Oregon Department of Transportation Planning and Rail Divisions. The CAC was comprised of community leaders, local business owners and residents.

Members of the TAC and CAC reviewed the technical aspects of the TSP. They held four joint meetings that focused on all aspects of the TSP development, including the evaluation of existing deficiencies and forecast needs; the selection of transportation options; the presentation of the draft TSP and funding plan; and, the presentation of recommended ordinance amendments.

In addition to the established advisory committees, two community workshops were held at key junctures in the process to gather public input regarding transportation needs and priorities. This input was incorporated in the options analysis and final plan development. Finally, the draft plans were discussed with the Planning Commission and City Council at work sessions and at public hearings. Details of the public involvement process are provided in Volume 1, Appendix "A".

Plan Area

This TSP covers publicly owned facilities within the existing urban growth boundary (UGB) as reflected in Figure 1-1. Based on TPR, the plan focuses on arterial and collector streets and their intersections, pedestrian and bicycle facilities along the arterial and collector streets and at other off-street locations, public transportation, and other transport facilities and services, including rail service, air service, pipelines and water service.



PLAN AREA
ST. HELENS, OREGON
FIGURE
1-1

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TSP Organization and Methodology

Development of the TSP began with a review of the city's goals and policies that guide land use and transportation planning in the city. This review is presented in Section 2 of this plan. Section 3 summarizes an inventory of the existing transportation system within the UGB.

The transportation system inventory allowed for an objective assessment of the current system's operational performance, safety, and general function, which is summarized in Section 4. Development of long-term (year 2031) transportation system forecasts relied heavily on the Columbia County's population and employment growth projections. Based on these projections, and with input from the TAC, the potential for and location of future development activities was identified. Section 5 of this report details the development of anticipated long-term future transportation needs within the UGB.

Section 6 documents the development and prioritization of transportation options identified to meet the multimodal needs of the community. The impact of each of the identified options was considered relative to the goals and policies, potential costs and benefits, and conformance with and potential for conflicts within the land use, environmental and regulatory environment. Ultimately, based on comments received from the TAC and CAC, elected officials, and community, a long range implementation plan was developed that reflected a consensus on which elements should be incorporated into the city's long-term transportation system. The recommendations identified in Section 7, Transportation System Plan, include a Street Plan and a Pedestrian and Bicycle System Plan, as well as plans for other transportation modes serving St. Helens.

Section 8, Transportation Funding Plan, provides an analysis and summary of funding sources to finance the identified transportation system improvements. The recommended Ordinance Modifications presented in Section 9 include specific changes in local zoning policies to implement the TSP and to achieve compliance with the Oregon TPR (OAR 660 Division 12).

Sections 1 through 10, in combination with Appendices A through F, comprise Volume 1 of the TSP and provide the main substance of the plan. These are supplemented by Technical Appendices in Volume 2 that contain the technical memoranda documenting the existing conditions analysis, forecast needs, and alternatives analysis.

Section 2 Goals and Policies

2 Goals and Policies

The St. Helens Transportation System Plan (TSP) comprises the transportation element of the City's comprehensive plan. The goals and policies presented in this section are based on the content and format of Title 19 of the Municipal Code (the City's Comprehensive Plan). Upon adoption of the TSP, Title 19 will also be updated (it was last updated in February 2011). Ultimately, policies in both the TSP and the overall comprehensive plan document should be consistent.

The goals and objectives from the 1997 TSP were also considered in developing the update, but were not used as a basis for the updated policy language, primarily because they predate the more current transportation policies in the Comprehensive Plan. The labels used for each type of transportation goal in the 1997 TSP (e.g., transportation, community, economic development, etc.) provide a helpful organizational feature. A similar organization has been used in the TSP Update to help distinguish between different types of policies that support general transportation goals.

In addition to relevant existing City policy language, the goals and policies presented in this section reflect recent policy direction related to Columbia County transit planning, the City's Bicycle Friendly Community designation (Resolution 1446), the City's Safe Passages (Safe Routes to Schools) goals, the Lower Columbia River Rail Corridor Rail Safety Study, and the Draft Waterfront Development Plan.[1]

19.08.040 Transportation Goals and Policies

(1) PREFACE

The transportation goals and policies presented in this section are intended to guide development of the city's transportation system and provide a policy framework that ensures that the transportation system can support planned land uses and meet the needs of those that use the system. Policies for each goal are provided to identify and clarify the course of action necessary to achieve each goal. Detailed information on the goals and policies outlined below, including a brief description of goals and policies that have been revised as a result of this TSP update, is provided in Technical Appendix, Volume 2.

(2) TRANSPORTATION GOALS

a) To develop and maintain transportation facilities for moving people and goods that are:

[1] Only "Top and High Priority Waterfront Improvements" from the Waterfront Development Plan were modified and included in the TSP as proposed policies.

I. Responsive to the needs and preferences of citizens, business and industry;

II. Suitably integrated into the fabric of the urban community; and

III. Safe, economical and convenient to use.

b) To reduce existing congestion and prevent future congestion so that both crashes and travel time will be reduced.

c) To address cut through traffic traveling within residential areas.

d) To develop, maintain, and support a multi-modal transportation network that supports economic viability.

e) To ensure that streets can accommodate the future needs of cyclists, pedestrians, transit users, emergency response vehicles, and motorists.

f) To ensure future arterial rights-of-way are not encroached upon.

g) To encourage energy-conserving modes of transit.

h) To increase appropriate walking and bicycling opportunities.

i) To ensure adequate maintenance of transportation facilities.

j) To coordinate transportation and other improvements to roadways such as utilities, water and sewer lines and other infrastructure to minimize impacts on road users.

(3) TRANSPORTATION POLICIES

The transportation policies outlined in this section are divided into six categories based on the nature of the individual policies.

Safety and Efficiency Policies

It is the policy of the City of St. Helens to:

a) Require that all newly established streets are of proper width, alignment, design and construction to facilitate future multimodal needs and are in conformance with the development standards adopted by the City of St. Helens.

b) Review diligently all subdivision plats and road dedications to ensure the establishment of a safe and efficient street system that accommodates all modes of transportation appropriate for the surrounding land uses.

c) Support connectivity in the transportation network by permitting cul-de-sacs only when environmental or topographical constraints or exiting development patterns preclude local street connectivity. Where cul-de-sacs are proposed and built, there shall be pedestrian and bicyclist connections and pathways provided to the surrounding street system.

d) Support and adopt by reference street projects listed in the Six-Year Statewide Transportation Improvement Program (STIP); specifically, consider new left turn lanes, traffic signals and/or interchanges on US 30, where feasible and consistent with state planning guidelines, standards and policies.

e) Control or eliminate potential traffic hazards along the roadsides through building setbacks, dedications or regulation of access at the time of subdivision, zone change or construction.

f) Regulate signs and sign lighting to avoid distractions for motorists.

g) Work with the railroad owners and operators to improve the safety at railroad crossings.

h) Support the eventual closure of the St. Helens Yard and the interim efforts of the Portland & Western Railroad to place fencing between the rail yard and US 30.

i) Support an eventual extension of Pittsburg Road/West Road between Wyeth Street and Deer Island Road over or under both US 30 and the railroad to improve safety and mobility and reduce conflict between rail and road users.

j) Continue to work with Portland & Western Railroad, ODOT and other interested parties in identifying and preserving possible locations for future grade separated crossings and/or interchanges, consistent with long-term growth projections and associated increased needs for emergency access.

k) Continue to work with Portland & Western Railroad and interested parties in identifying unsignalized active rail crossings where local roadways can be terminated or rerouted to eliminate conflict points.

l) Plan and develop local street routes to alleviate US 30's traffic load.

m) Regulate or prevent development within areas required for future arterials or widening of rights-of-way.

n) Follow good access management techniques on all roadway systems within the city.

o) Continue to coordinate with Columbia County regarding development, land uses, and transportation planning in areas of future urban growth, outside of the current city limits, in order to ensure that transportation policies and practice result in an efficient, sound, and sustainable transportation system.

Non-motorized and Transit Modes Policies

It is the policy of the City of St. Helens to:

p) Develop a plan for walking trails.

q) Maintain, implement, and update the City's bikeway plan.

r) Provide safe and convenient bicycle access to all parts of the community through a signed network of on- and off-street facilities, low-speed streets, and secured bicycle parking.

s) Promote safe, convenient, and fun opportunities for children to bicycle and walk to and from schools.

t) Improve and expand walkways to existing and planned schools, parks, senior residential areas, and commercial areas.

u) Work with Columbia County and other agencies in their efforts to meet the needs of the transportation disadvantaged in the community.

v) Encourage increased opportunities for local and regional public transit facilities.

w) Support public transit planning in Columbia County. Transit improvements within city limits shall be guided by the findings and recommendations of the County Community-wide Transit Plan, as adopted by Columbia County.

x) Work in partnership with the County in planning for public transit facilities located within city limits and, when feasible, facilitate the citing and operation of such facilities.

Economic Development Policies

It is the policy of the City of St. Helens to:

y) Improve rail and water connections to enhance and provide economic opportunity.

z) Maintain a road network that contributes to the viability of existing commercial areas.

aa) Acknowledge and support future expansion of both freight and potential commuter rail operations along the Lower Columbia River and continue to work with ODOT and Portland & Western Railroad and Columbia County Rider to take advantage of this growth and to mitigate potential conflicts.

bb) Continue to explore the viability of waterfront shuttle service as an alternative to private vessel/vehicle use along the city's waterfront and to enhance connectivity to waterfront amenities and recreational venues.

Natural Resources and Recreation Policies

It is the policy of the City of St. Helens to:

cc) Develop a multi-modal transportation system that avoids reliance upon one form of transportation as well as minimizes energy consumption and air quality impacts.

dd) Encourage development patterns that decrease reliance on single occupancy vehicles.

ee) Minimize and mitigate the adverse impacts that transportation-related construction has on the natural environment, including impacts to wetlands, estuaries, and other wildlife habitat.

ff) Maintain and enhance access to parks and recreational and scenic resources. Look for opportunities to connect these community resources through pedestrian and bicycle trails.

gg) Create a nature trail around portions of Dalton Lake that provides recreational (e.g. walking, hiking and biking) opportunities for city residents and visitors.

hh) Create a trail system along the waterfront that will provide access to the river, and connect existing and potential waterfront parks and amenities.

Community Policies

It is the policy of the City of St. Helens to:

ii) Design, enhance, and maintain safe and secure access between residential neighborhoods and community gathering areas such as, parks, schools, natural areas.

jj) Provide transportation improvements that protect the area's historical character and neighborhood identity.

kk) Require new development to include pedestrian, bicycle, and transit-supportive improvements within the right-of-way in accordance with adopted city policies and standards.

Planning and Funding Policies

It is the policy of the City of St. Helens to:

ll) Coordinate and cooperate with neighboring cities, Columbia County, ODOT, and other transportation agencies to develop and fund transportation projects that benefit the city, region, and the State.

mm) Plan for an economically viable and cost-effective transportation system.

nn) Evaluate new innovative funding sources for transportation improvements.

oo) Ensure that the existing transportation network is conserved through maintenance and preservation.

pp) Build a transportation network that can be adequately maintained; ensure continued maintenance consistent with City of St. Helens standards and policies.

qq) Minimize impacts of road improvements on travelers and adjacent residents and business owners by effectively coordinating transportation, utility and other infrastructure improvements.

Section 3 Transportation System Inventory

3 Transportation System Inventory

This section summarizes the existing transportation system inventory within the St. Helens Urban Growth Boundary (UGB). An inventory of existing multimodal facilities along with rail, air, pipeline, and water service is presented herein. Details of the transportation system inventory are included in Technical Memorandum 2: Existing Conditions, which is provided in the Volume 2 Technical Appendix.

Policy and Code Review

This update needs to ensure that the City's TSP is consistent with local and state transportation policies and standards and that it is coordinated with the transportation plans of Columbia County. To meet these objectives, a review and evaluation of existing plans, policies, standards, and laws that are relevant to the TSP update was conducted. Detailed information from this review, including a complete list of the documents reviewed, can be found in Technical Memorandum #1: Background Document Review, which is provided in the Volume 2 Technical Appendix.

The summary of federal, state, regional, and local documents, as they relate to transportation planning in the St. Helens, provided the policy framework for the TSP planning process. State documents and requirements were summarized as they applied to the St. Helens TSP, as were Columbia County policies and regulations that had potential impacts on the St. Helens transportation system.

A number of local documents were also reviewed for policies that could impact the TSP. Documents reviewed include the *St. Helens Comprehensive Plan* (2006), the *St. Helens Transportation System Plan* (1997), the *St. Helens Bikeway Master Plan* (1988), the *City of St. Helens Public Facilities Plan* (1999), the *City of St. Helens Waterfront Development Plan* (2010) and the *City of St. Helens Economic Opportunity Analysis* (2008). Locally adopted policy documents were also reviewed (such as the *St. Helens Development Code* and the *St. Helens SDC Water, Wastewater, Stormwater, Transportation, and Parks System Development Charge Study Final Report* (2008)) to ensure consistency between adopted policy and the TSP.

The regulatory review includes an assessment of City Ordinances and how well they comply with the requirements of the State's TPR. The review summarizes the requirements of TPR Section 660-12-0045 (Implementation of the Transportation System Plan), lists the applicable implementation elements of the TPR, and demonstrates where the adopted City regulations comply, or where amendments to code language are needed to comply, with the TPR. The recommendations were executed by the development of draft code language (see Section 9, Ordinance Modifications).

Street System

Highways and streets are the primary means of mobility for St. Helens' citizens, serving the majority of trips over multiple modes. Pedestrians, bicyclists, public transportation, and motorists all utilize public roads for the majority of their trips.

JURISDICTION

Public roads within the UGB are operated and maintained by three separate jurisdictions: the City of St. Helens, Columbia County, and the Oregon Department of Transportation (ODOT). Each jurisdiction is responsible for the following:

- Determining the road's functional classification;
- Defining the roadway's major design and multimodal features;
- Maintenance and operations; and,
- Approving construction and access permits.

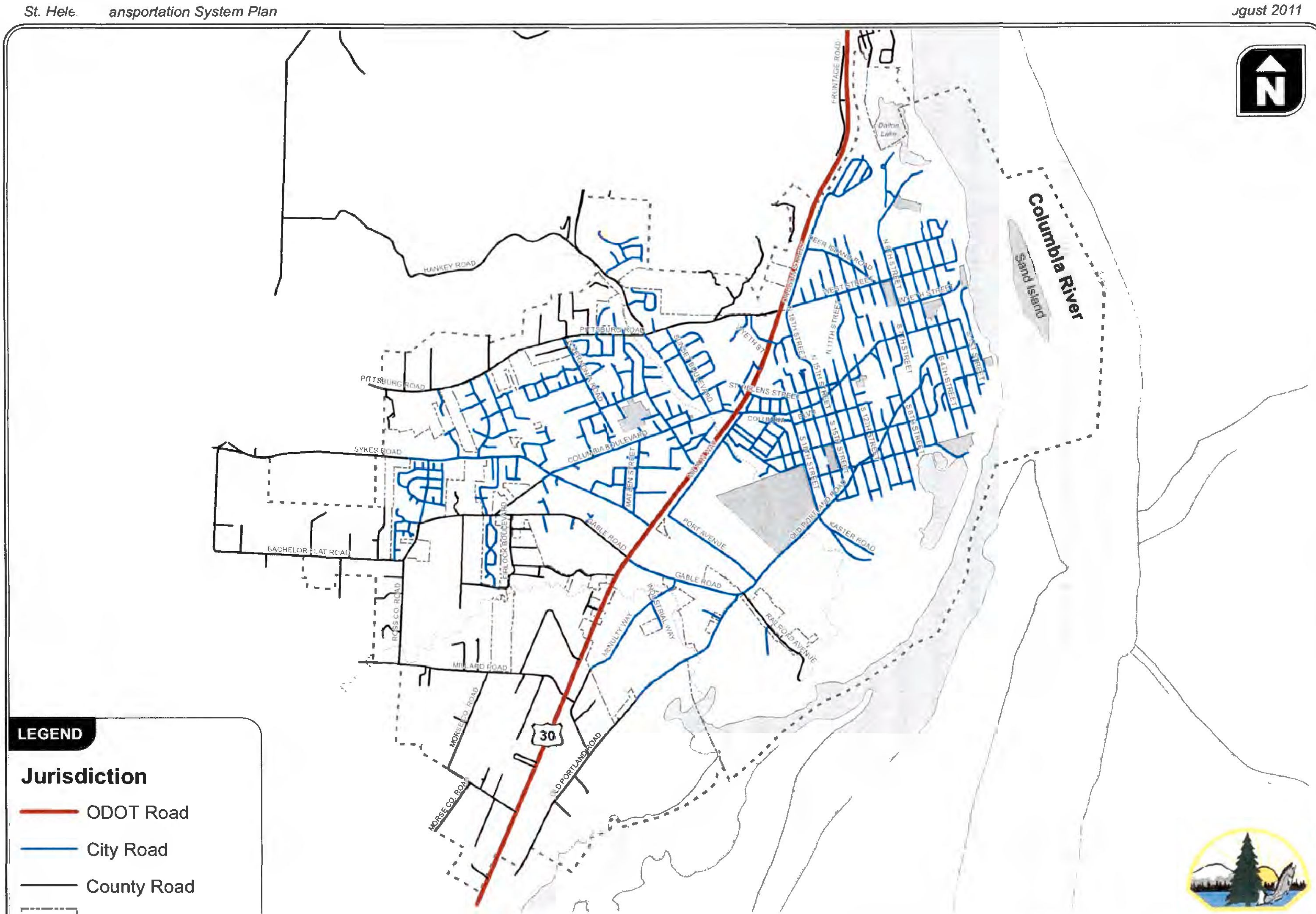
Coordination is required among the three jurisdictions to ensure that the transportation system is planned, operated, maintained, and improved to safely meet public needs. Figure 3-1 illustrates the existing street system and which agency is responsible for each street within the UGB.

FUNCTIONAL CLASSIFICATION

A street's functional classification reflects its role in the transportation system and defines desired operational and design characteristics such as pavement width, right-of-way requirements, driveway (access) spacing requirements, and the appropriate type of pedestrian and bicycle facilities. The City's 1997 TSP defines the functional classification hierarchy outlined below.

Major Arterials: These facilities carry the highest volumes of through traffic and primarily function to provide mobility within the community. Major arterials also provide continuity for intercity traffic through the urban area. The only major arterial in St. Helens is the Lower Columbia River Highway (US 30).

Minor Arterials: These facilities interconnect and augment the major arterial system and accommodate intracity and intercity trips. Minor arterials provide connections between residential, shopping, employment, and recreational activities within the community.



ROADWAY JURISDICTION
ST. HELENS, OREGON

FIGURE 3-1

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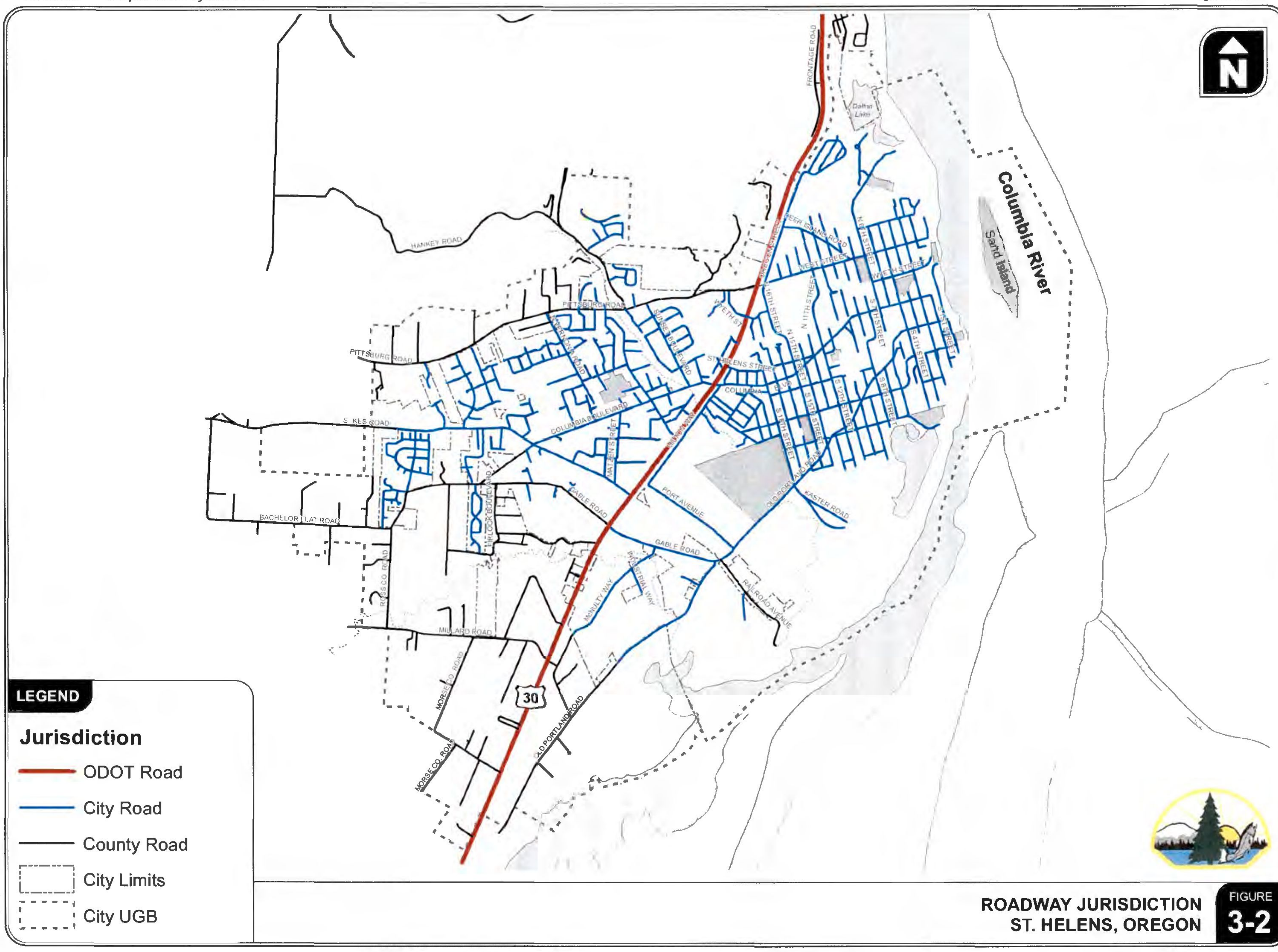
Collector: These streets provide both access and mobility within neighborhoods, and commercial and industrial areas. Collectors gather traffic from local streets and serve as connectors to arterials.

Local Streets: The primary function of these streets is to provide access to residential and other properties within neighborhoods. Ideally local streets should not intersect arterials; however, there are several locations where they do in St. Helens.

Figure 3-2 illustrates the current functional classification of the streets within the UGB. As shown, many of the roadways designated as minor arterials on the west side of US 30 have direct access from local streets. Further review indicates that many also provide direct access to residential driveways and are posted with comparatively low travel speeds. There are relatively few north-south roadways designated as collectors or minor arterials. Recommended changes to the functional classification system are presented in Section 7. ODOT has a separate classification system to guide the planning, management, and investment for state highways. The Oregon Highway Plan (OHP – Reference 1), designates US 30 as a Statewide Freight Route within the UGB. This designation reflects the roadway's function, providing the primary route linking communities such as Astoria, Clatskanie, Rainer, Prescott, and Columbia City to the north with St. Helens, Scappoose, and the greater Portland metropolitan area to the south.



ROADWAY JURISDICTION
ST. HELENS, OREGON

FIGURE
3-2

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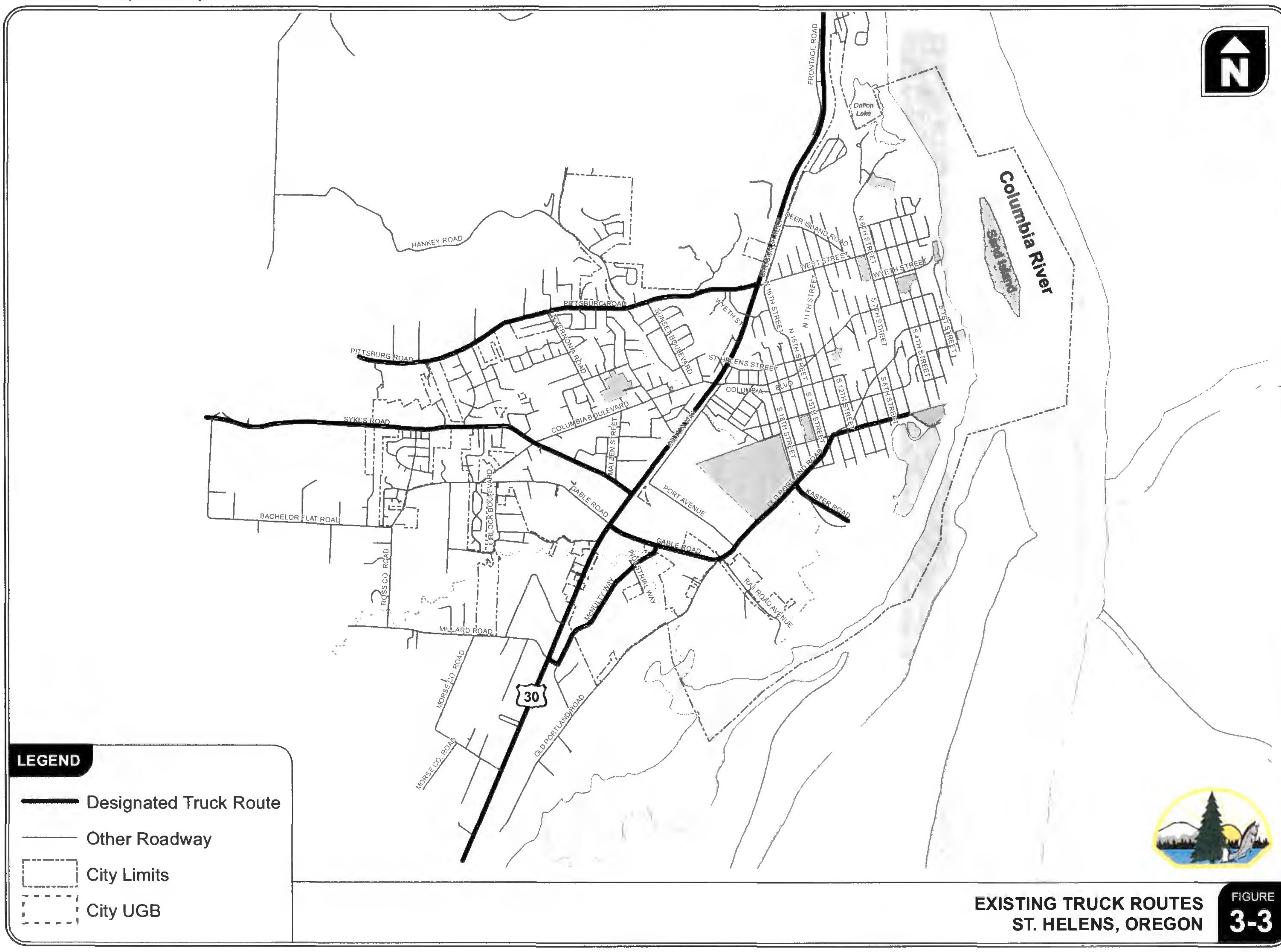
TRUCK ROUTES

The existing designated truck routes were established to limit heavy truck traffic on local streets while connecting the industrial areas within St. Helens to US 30. Figure 3-3 illustrates the existing designated truck routes through St. Helens.

Each of the truck routes were qualitatively evaluated to determine if there is sufficient width along the roadways and at intersections to accommodate wide turning movements associated with large trucks. West of US 30, both Sykes Road and Pittsburg Road are relatively narrow streets through predominantly residential areas; however, the routes are relatively straight and do not require significant turning movements. East of US 30, relatively few of the truck routes have curbs or sidewalks provided at the intersections, therefore, large trucks can utilize the extra shoulder space to turn. Where curbs do exist, such as at the Old Portland Road/Kaster Road intersection, the turning radii is sufficient to accommodate wide turning movements.

Currently, many of the truck trips to and from the industrial areas east of US 30 access US 30 at Gable Road because it is signalized. This routing pattern results in a relatively heavy volume of truck traffic on Gable Road that would otherwise use Old Portland Road to travel further south to US 30. Some of the longer trucks (such as power pole delivery trailers) have a difficult time completing turning movements at the Gable Road/US 30 intersection. Consequently, alternate routes are utilized. This has caused problems where such trucks reportedly have been struck by other vehicles as they attempt to negotiate a turn at the Bennett Road/US 30 intersection. Pilot vehicles are now being used to accompany power pole trucks through the intersection to alert other drivers of the wide turning movement.

While large vehicles can generally navigate the designated truck routes, many of the routes have incomplete pedestrian and/or bicycle facilities. Old Portland Road, for example, is a designated truck and bicycle route; however, the roadway has no sidewalks or bicycle lanes south of Gable Road and offers relatively narrow travel lanes. The future pedestrian and bicycle plans documented in Section 7 recommend provision of a separate multi-use path along the east side of the roadway in part to reduce interaction with truck traffic.



EXISTING TRUCK ROUTES
ST. HELENS, OREGON

FIGURE
3-3

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STREET SECTION STANDARDS

The 1997 TSP provided standard street cross sections for each of the functional classifications within the city. Per the TSP, these cross sections were intended to be implemented with some flexibility recognizing unique and special situations as appropriate. The cross section design standards from the 1997 TSP are summarized in Table 3-1 and illustrated in Figure 3-4.

TABLE 3-1: EXISTING STREET SECTION STANDARDS

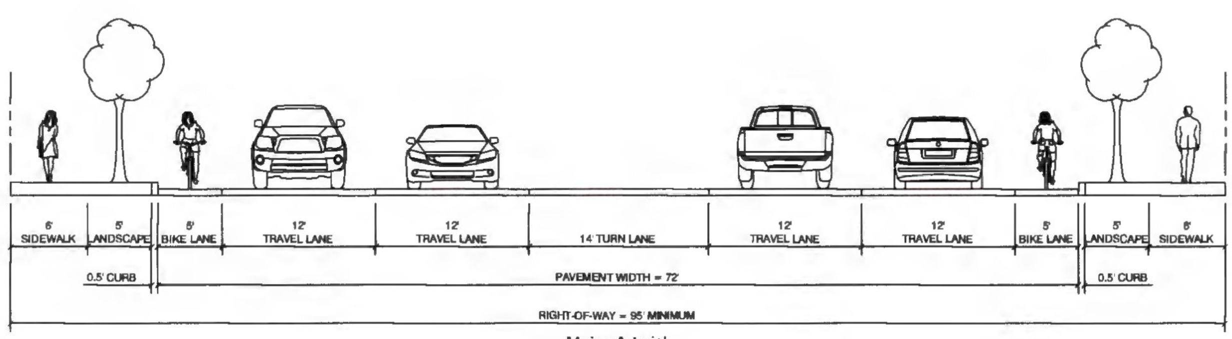
Functional Classification	Sidewalk	Landscaping	Bicycle Lanes	On-Street Parking	Travel Lanes	Right-of-Way (feet)
Major Arterial	6'	5'	5'	None	(5) 12'-14'	102'
Minor Arterial	6'	None	8' Parking or Bicycle Lanes	(2) 14'	60'	
Collector Street	5'	None	None	8'	(2) 11'	60'
Local Street	5'	None	None	7'	(1) 12'-13'	50'

While individual local streets are not reviewed as part of the TSP update, the Oregon TPR requires that local governments offer "skinny street" standards for local streets in order to minimize pavement width and right-of-way. The Department of Land Conservation and Development's Neighborhood Street Design Guidelines (DLCD - Reference 2), indicates a street with a paved section wider than 28 feet is by definition not a "narrow street." The DLCD guidelines cite benefits of streets with reduced pavement widths including improved livability, improved safety, slower vehicle speeds, and reduced environmental impacts. The guidelines further indicate that narrow streets must meet the operational needs, including pedestrian and bicycle circulation and emergency vehicle access.

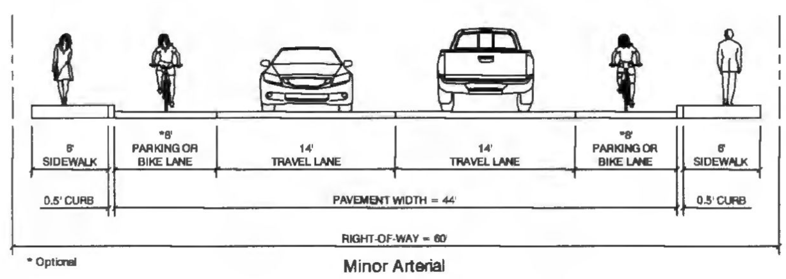
As shown in Figure 3-4, the cross sections provided in the TSP currently include two options that comply with the "skinny street" standard, showing the narrowest paved cross-section to be 20 feet wide[2]. While the curb-to-curb road section is relatively narrow, the 50-foot right-of-way shown for the two skinny streets is relatively wide. Recommended changes to the City's street cross sections are provided in Section 7.

In addition to the TSP, the City of St. Helens also published roadway standards in the City's Community Development Code. City staff indicate the Development Code standards have been used to guide transportation improvements constructed in conjunction with new developments, not the TSP. Table 3-2 displays the Road Standards shown in the City's Community Development Code.

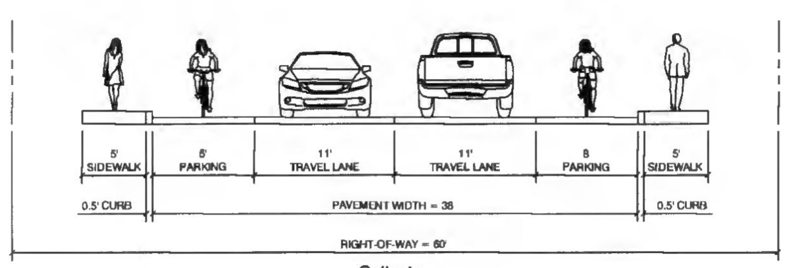
[2] Sidewalks are not considered part of the paved section.



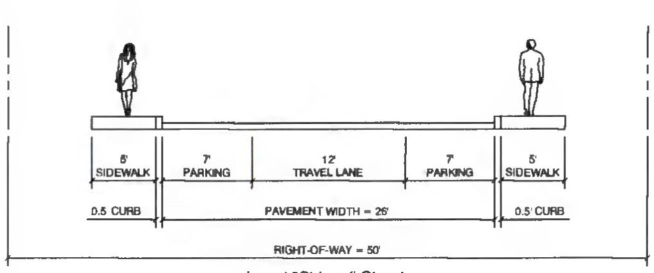
Major Arterial



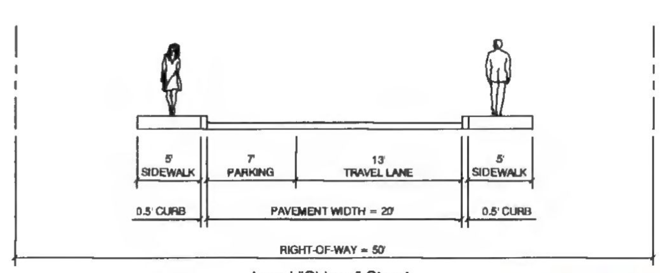
Minor Arterial



Collector



Local "Skinny" Street



Local "Skinny" Street

EXISTING ST. HELENS STREET STANDARDS
ST. HELENS, OREGON

FIGURE 3-4

Figure 3-4 and Table 3-2 show that the cross sections provided in the 1997 TSP are not consistent with the cross section standards shown in the City's Community Development Code. Recommended cross sections are provided in Section 7.

TABLE 3-2: DEVELOPMENT CODE REQUIRED MINIMUM RIGHT-OF-WAY AND STREET WIDTHS

Type of Street	Right-of-way Width	Roadway Width	Moving Lanes	Bicycle Lanes
Minor Arterial	60'	36-48'	2-4	2-6'
Collector	60'	24-40'	2-3	2-5'
Local – Commercial, Industrial	50'	34'	2	2-4'
Local – Residential	50'	34'	2	2-4'
Residential Access – through street with less than 500 ADT	40-46'	24-28'	1-2	
Residential Access – cul-de-sac dead-ends (not more than 400 feet long and serving more than 20 dwelling units)	36-44'	24-28'	1-2	
Turnarounds for dead-ends in industrial and commercial zones only	50' radius	42' radius		
Turnarounds for cul-de-sac dead-ends in residential zones only	42' radius	35' radius		
<u>Alley</u> Residential Business or Industrial	 16' 20'	 16' 20'		

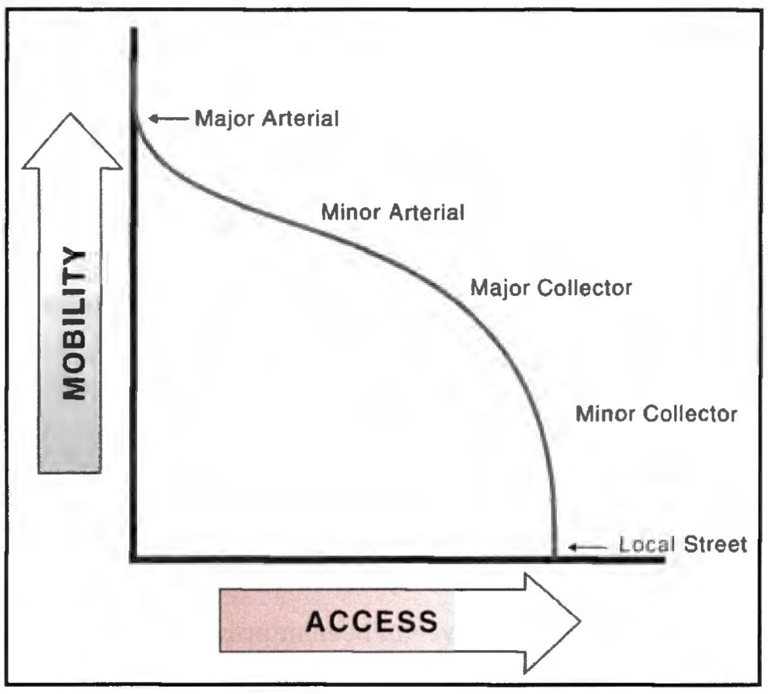
Source: City of St. Helens Community Development Code, Section 17.152.030 Street

ACCESS MANAGEMENT

Spacing requirements for public roadways and private driveways can have a profound impact on transportation system operations as well as land development. Access management strategies and implementation require careful consideration to balance the needs for access to developed land with the need to ensure movement of traffic in a safe and efficient manner.

Access management generally becomes more stringent as the functional classification level of roadways increases and the corresponding importance of mobility increases. Exhibit 3-1 illustrates the general relationship between access and mobility.

Exhibit 3-1: Relationship Between Access, Mobility, And Functional Classification



ODOT Access Spacing Standards

Access spacing requirements for US 30 are implemented by Oregon Administrative Rule (OAR) 734, Division 51[3] and relate directly to the functional classification of US 30 as both a Statewide Highway and Freight Route. Table 3-3 illustrates the current access spacing standards for public and private approaches along US 30 within St. Helens.

TABLE 3-3: CURRENT US 30 ACCESS SPACING STANDARDS FOR PRIVATE AND PUBLIC APPROACHES[1]

Posted Speed (miles per hour)	Minimum Space Required *(feet)
30 and 35	720
40 and 45	990
50	1,100
≥ 55	1,320

[1]These access management spacing standards do not apply to approaches in existence prior to April 1, 2000 except as provided in OAR 734-051-0115(1)(c) and 734-051-0125(1)(c).

* Measurement of the approach road spacing is from center to center on the same side of the roadway.

OAR 734-020-470 identifies a desired minimum spacing of ½ mile (2,640 feet) for signalized intersections on statewide highways such as US 30.

[3] Oregon Revised Statute (OAR) 734, Division 51, was amended in September 2005 to be consistent with August 2005 OHP revisions to Policy 1B. Specifically, the spacing standards in OAR 734-051 were amended to be consistent with the OHP tables in Appendix C, Access Management Standards.

US 30 has access points serving small commercial properties throughout the city that do not meet ODOT's access spacing standards for new construction. As private properties redevelop in the future, ODOT will review driveway spacing with respect to US 30 access spacing requirements and may determine that changes in land use require the consolidation or reconfiguration of existing accesses. ODOT retains the legal authority to close or restrict driveways on an as-needed basis if safety or other conditions warrant. In the interim, many of the existing driveways that do not conform with the access spacing standards may continue to operate acceptably due to: 1) relatively slow travel speeds, 2) separation of left and right-turn movements at many of the major intersections, and 3) the presence of a two-way left-turn lane (TWLTL) along US 30.

CURB AND GUTTER

The City requires curb and gutter be constructed along its street network in conjunction with adjacent development. Streets constructed in recent development areas generally provide curb, gutter, and sidewalks; however, many older roadways have not been improved with curb and gutter, which can limit the functionality of the roadway, particularly for pedestrians and bicycles.

OTHER STREET SYSTEM DEFICIENCIES

The following deficiencies were identified through review of the transportation network as well as through feedback from agency staff and the general public:

- Substandard pavement conditions were identified along a number of city roadways, including segments of Bachelor Flat Road, Ross Road, and Millard Road;
- Roadways within the city limits are generally not constructed to current city roadway standards;
- The traffic signal at the 18th Street/Old Portland Road intersection does not meet current Manual on Uniform Traffic Control Devices (MUTCD-Reference 3) standards. To correct existing deficiencies, the City of St. Helens should consider either of the following:
    - augment the existing intersection signal displays with a second signal head on each approach (this could be post-mounted in each quadrant) and consider adding pedestrian signal displays or,
    - Complete a traffic study per the requirements of the MUTCD and, based on the study findings, operate the intersection as either a two-way or all-way stop as appropriate, including provision of MUTCD-compliant signing and striping. If

two-way or all-way stop control is implemented, then the existing signal should either be turned off and removed or operated as a supplemental warning beacon in support of the new stop control per the engineering study recommendations.

- Significant queuing occurs during the morning and afternoon school peaks near the main entrance to Lewis and Clark Elementary School located near the 9th Street/Columbia Boulevard and 11th Street/Columbia Boulevard intersections and near the main entrance of McBride Elementary near the Columbia Boulevard/Sykes Road intersection.
    - Although morning and afternoon peak hour operations are not analyzed in the TSP Update, the City of St. Helens should consider how schools can be better served by the future transportation system.
- Turn lane vehicle storage deficiencies were identified by ODOT at the following intersections along US 30:
    - The southbound left-turn lane at Deer Island Road does not have enough left turn lane striping to meet minimum storage requirements.
    - The southbound right-turn lanes on US 30 at Deer Island Road, Pittsburg Road, Wyeth Street, and Achilles Road are substandard in length based on ODOT's current minimum storage and deceleration design requirements.
- Sight distance limitations were identified at the following intersections:
    - The eastbound approach to the US 30/Millard Road intersection has limited sight distance facing south along US 30 due to the placement of local advertising signs and the grading of the roadside.
    - The southbound approach to the 6th Street/Columbia Boulevard intersection has limited sight distance facing east due to the grade of 6th Street as well as on-street parking along Columbia Boulevard east of the intersection.
- The current Ross Road/Bachelor Flat Road intersection configuration confuses motorists.

Pedestrian System

Pedestrian facilities serve a variety of needs, including:

- Relatively short trips (generally considered to be under a mile) to major pedestrian attractors, such as schools, parks, and public facilities;

- Recreational trips (e.g., jogging or hiking) and circulation within parks;
- Access to transit (generally trips under 1/2-mile to bus stops); and,
- Commute trips, where mixed-use development is provided and/or people have chosen to live near where they work.

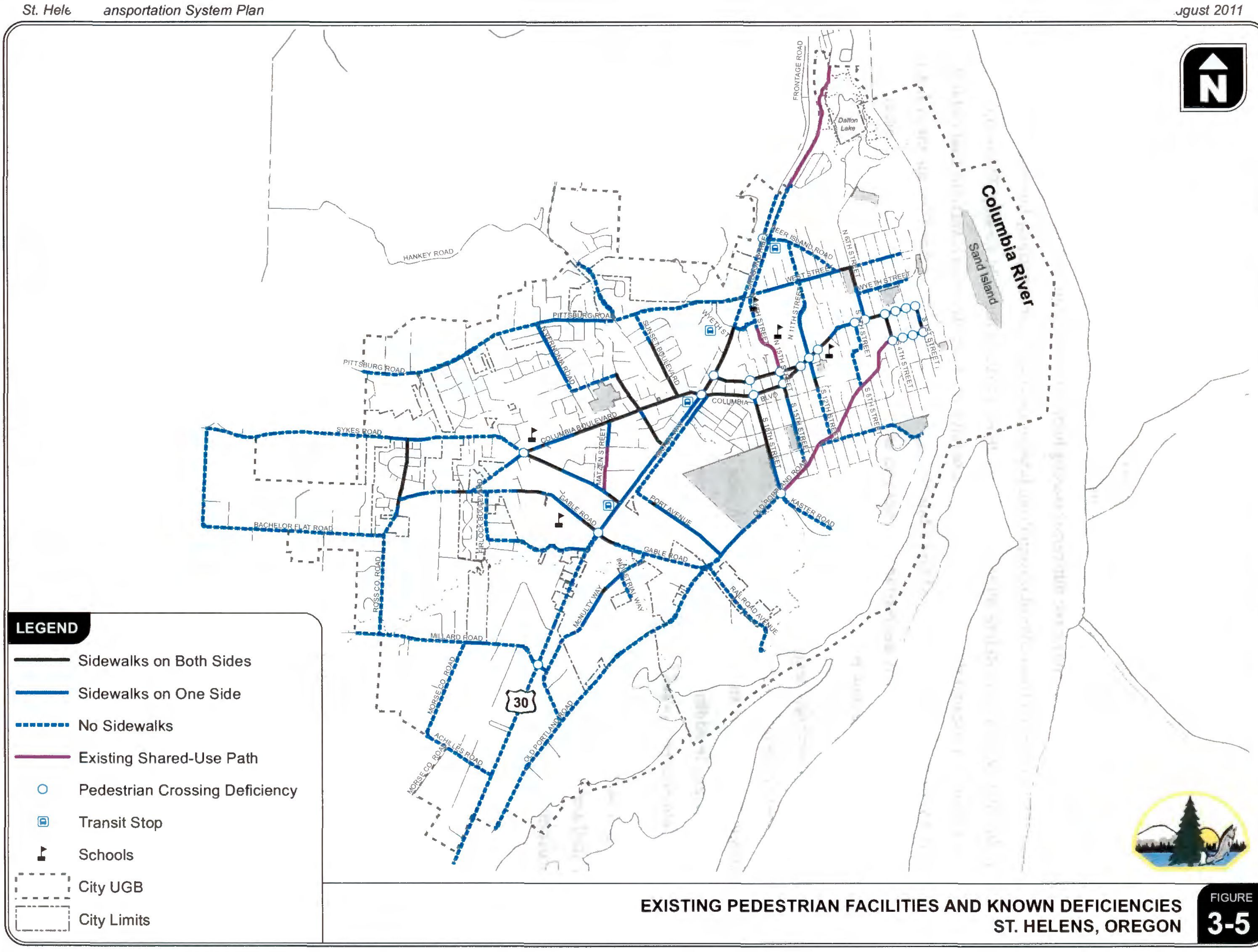
Pedestrian facilities should be integrated with transit stops and effectively separate pedestrians from conflicts with vehicular traffic. Furthermore, pedestrian facilities should provide continuous connections among neighborhoods, employment areas, and nearby pedestrian attractors. Pedestrian facilities usually refer to sidewalks or paths, but also include pedestrian crossing treatments for high volume roadways.

The existing pedestrian network serving St. Helens is shown in Figure 3-5 along with major pedestrian attractors such as public schools and transit stop locations. As shown in Figure 3-5, relatively few of the arterial and collector roadways in St. Helens currently have sidewalks on both sides of the street.

The following street segments have been identified as having key gaps in the pedestrian system:

- Sykes Road between Summit View Drive and Columbia Boulevard;
- Gable/Bachelor Flat Road between Summit View Drive and US 30, and;
- Columbia Boulevard between Sykes Road and Gable/Bachelor Flat Road.

Each of these three streets serves as a major connectors between the residential areas east of US 30 and the St. Helens High School, McBride Elementary, and retail uses along US 30. Despite their prominent function, each street has incomplete sidewalks, bike lanes, curbs, and gutters as well as locations with constrained right-of-way.



EXISTING PEDESTRIAN FACILITIES AND KNOWN DEFICIENCIES
ST. HELENS, OREGON

FIGURE 3-5

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PEDESTRIAN CROSSINGS AT INTERSECTIONS

All unsignalized intersections in Oregon are considered legal crosswalks and motor vehicles are required to yield the right of way to allow pedestrians to cross. However, compliance is not consistent statewide and pedestrians may have difficulty crossing high volume roadways. The city has several marked and unmarked crosswalks at unsignalized intersections along key roadway facilities such as Columbia Boulevard and St. Helens Street that rely on drivers to yield the right-of-way. These and other locations throughout the downtown area tend to have wide roadway cross sections that require pedestrians to cross not only the travel lanes, but also on-street parking lanes provided on one or both sides of a given roadway. The pedestrian environment at these locations could be enhanced and is further discussed in Section 6.

The City of St. Helens has been working to enhance pedestrian safety. For example, the North 6th Street/West Street intersection was converted to an all-way stop control intersection and a curb extension was added to the southwest corner in June 2010 to facilitate safe pedestrian movements at the intersection. In addition, all of the signalized intersections on US 30 in St. Helens as well as the 18th Street/Columbia Boulevard intersection have pedestrian crossing signals.

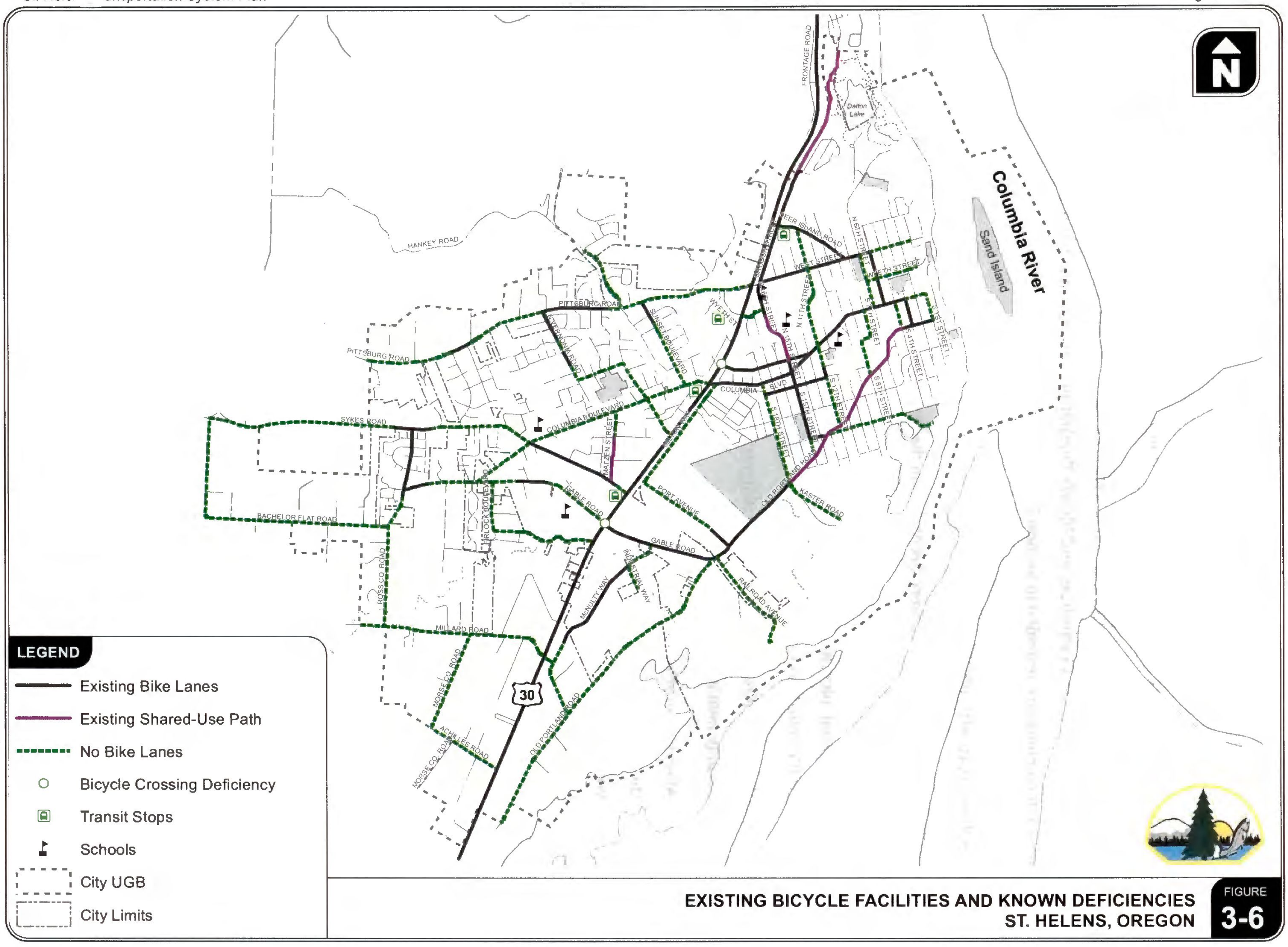
Figure 3-5 also illustrates the location of known pedestrian crossings deficiencies based on input from City staff and the general public through an internet-based interactive map. Recommended improvements at each of these intersections are provided in Section 7.

Bicycle System

Similar to pedestrian facilities, bicycle facilities (including dedicated bicycle lanes in the paved roadway, multi-use paths shared with pedestrians, etc.) serve a variety of trips. These include:

- Trips to major attractors, such as schools, parks and open spaces, retail centers, and public facilities;
- Commute trips;
- Recreational trips; and
- Access to transit, where bicycle storage facilities are available at the stop, or where space is available on bus-mounted bicycle racks.

Figure 3-6 summarizes the existing bicycle facilities in St. Helens. As shown, several roadways east of US 30 currently have complete bicycle facilities, while west of US 30 the only completed bicycle facilities are located on Sykes Road between US 30 and Columbia Boulevard. Similar to the previously



EXISTING BICYCLE FACILITIES AND KNOWN DEFICIENCIES
ST. HELENS, OREGON

FIGURE
3-6

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identified pedestrian issues, improvements are needed along Gable/Bachelor Flat Road and Columbia Boulevard to provide better access to schools and retail areas.

Figure 3-6 also shows the location of known bicycle crossing deficiencies based on input received from City Staff and the St. Helens Pedestrian and Bicycle Committee. Recommended improvements at each of these intersections are provided in Section 7.

OREGON BICYCLE AND PEDESTRIAN PLAN

The following general guidelines were derived from the Oregon Bicycle and Pedestrian Plan (Reference 4).

- Dedicated bicycle facilities should be provided along major streets where automobile traffic speeds are significantly higher than bicycle speeds.
- Bicycle facilities should connect residential neighborhoods to schools, retail centers, and employment areas.
- Allowing bicycle traffic to mix with automobile traffic in shared lanes is acceptable where the average daily traffic (ADT) on a roadway is less than 3,000 vehicles per day. Lower volume roadways should be considered for bike shoulders or lanes if anticipated to be used by children as part of a Safe Routes to School program.
- In areas where no street connection currently exists or where substantial out-of-direction travel would otherwise be required, a multi-use path may be appropriate to provide adequate facilities for bicyclists.

BICYCLE FACILITIES

The 1997 TSP implemented the 1988 St. Helens Bikeway Master Plan (Reference 5). The plan identified several facilities that were complete as of 1988, including US 30, Sykes Road between Columbia Boulevard and Matzen Street, Oregon Street north of West Street, West Street east of Oregon Street, 16th to 15th Street, and parts of 6th Street, 4th Street, and Old Portland Road. The plan also identified several proposed facilities, including along Pittsburg Road east of Vernonia Road, Vernonia Road, Columbia Boulevard, Gable Road, a connection between Millard Road and Old Portland Road, and others. As of 2011, the following facilities identified as needed in the 1988 plan have been completed:

- Columbia Boulevard east of US 30

- Gable Road east of US 30
- Old Portland Road north of Gable Road

Public Trail System

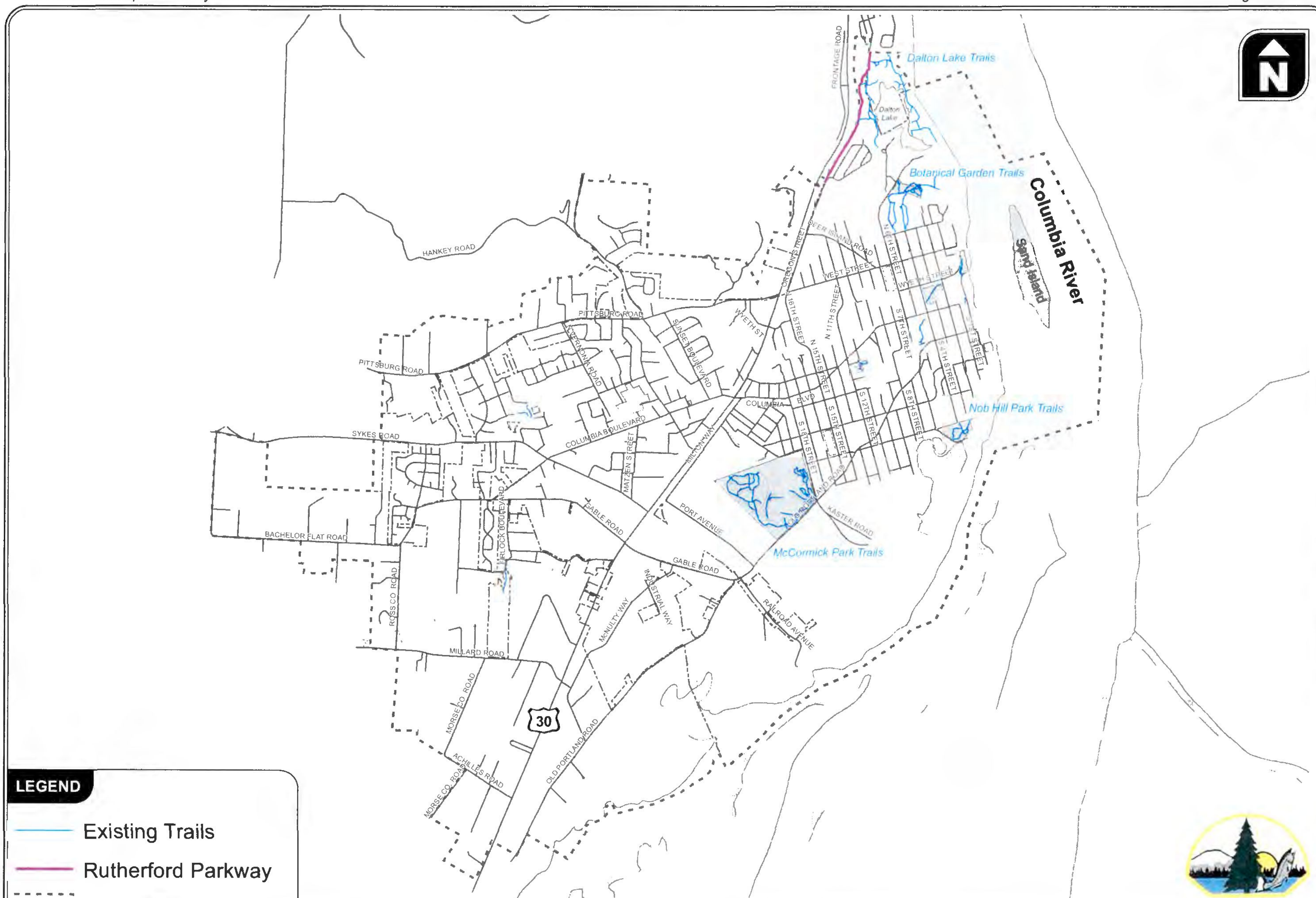
Figure 3-7 illustrates the public trail system located within the city, including facilities within the Dalton Lake Recreational Area. The Draft Conceptual Dalton Lake Recreational Plan, developed in July 2010, identifies several opportunities and constraints associated with each trail within the system, including the potential development of observation and picnic areas. In addition to several side trails and footpaths, the following major trails are located within the Dalton Lake Recreational Area:

- Rutherford Parkway: an existing 8-foot wide paved multi-use path that extends north of Oregon Street connecting St. Helens with Columbia City to the north.
- Dalton Lake West Path: a dirt road along existing electrical transmission lines that connects Rutherford Parkway to the trail system within the Dalton Lake recreational area.
- Dalton Lake East Path: a gated gravel road path that extends east of Rutherford Parkway and south along the edge of the Columbia River.
- Madrona Court Trail: a narrow trail that extends north from the Crestwood Mobile Home Court to Dalton Lake West Path.

Safe Routes to School

In Oregon, elementary-age children living within a mile of school and middle school-age children living within 1.5 miles of school typically are not eligible to receive bus service. An exception to this general rule is found in St. Helens where pedestrian routes that require crossing railroad tracks (such as the Portland & Western Railroad) are provided with bus service. Safe Routes to School (SRTS) seek to encourage and enhance walking and bicycling by students.

SRTS program efforts are typically administered by the local school district directed to these students and are built around 5'E's: Education, Encouragement, Enforcement, Engineering, and Evaluation. The goals of the Oregon SRTS program are to increase the ability and opportunity for children to walk and bicycle to school; promote walking and bicycling to school and encourage a healthy and active lifestyle at an early age; and facilitate the planning, development and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption and air pollution within two miles of a given school (Reference 6).



EXISTING PUBLIC TRAILS SYSTEM
ST. HELENS, OREGON

FIGURE **3-7**

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The St. Helens School District does not currently have a formal SRTS Program. While development of a SRTS program was not part of this TSP Update, identification of deficiencies within the pedestrian and bicycle network near the four major public schools in St. Helens was considered. In addition, an internet-based reporting mechanism was used to solicit specific information from students and the general public regarding inadequacies along key travel routes between neighborhoods and schools. Though not a comprehensive inventory, the following deficiencies were derived from the information collected, and could be used in part for a future SRTS program.

- There are virtually no sidewalks and no transit pullouts or shelters to serve several residential neighborhoods along Pittsburg Road.
- There are incomplete sidewalks along Gable Road from Columbia Boulevard to the St. Helens High School.
- There are no sidewalks or bike lanes between the Firlock Park development and the St. Helens High School, which serves as a transfer location for other schools in St. Helens.
- There are also no sidewalks or bike lanes between the Sherwood Estates area with either the St. Helens High School or McBride Elementary.

Public Transportation System

Public transportation within Columbia County includes fixed-route, flex-route, and dial-a-ride services provided by the Columbia County Transit Division. In addition, limited specialized dial-a-ride services are offered by various providers for special-needs populations, such as senior citizens. Each of these services is described below.

COLUMBIA COUNTY RIDER

The Columbia County Transit Division is the largest transit service provider in Columbia County, operating under the name Columbia County Rider (CCR). The types of services offered by CCR consist of the following:

- Fixed routes that operate on a fixed schedule along a specified route and stop only in designated locations;
- A flex route that operates on a fixed schedule and stops at certain designated locations on each trip, but is also allowed to make a limited number of deviations off-route each trip to pick up and drop off passengers at other locations; and

- Dial-a-ride service throughout the County that operates on an advance-reservation basis, picking up and dropping off passengers at locations of their choosing. Rides can be scheduled up to one week in advance, and depending on space availability, riders may be able to reserve on the day of their desired trip.

CCR provides fixed-route service through the County along US 30 and within the cities of St. Helens and Scappoose, as well as Dial-A-Ride service throughout the entire County.

FIXED-ROUTE SERVICE

CCR currently operates two fixed routes with the city:

- St. Helens – Portland; and
- St. Helens – PCC Rock Creek and Willow Creek Transit Center

The St. Helens – Portland route currently operates 10 times per weekday, with five morning and five afternoon departures. The first trip of the day leaves St. Helens Medical Mall at 5:50 a.m. and is scheduled to arrive in downtown Portland at 7:00 a.m., with intermediate stops in Warren and Scappoose. The last trip departs St. Helens Medical Mall at 5:00 p.m., arrives in downtown Portland at 6:00 p.m., and returns to St. Helens between approximately 7:00 and 7:10 p.m. Adult fares are currently $3.30 one-way for local trips between St. Helens and Scappoose and $4.80 one-way for trips between Columbia County and Portland. Reduced fares of $2.05 and $3.80, respectively are available for riders under 10 years old, students, riders 55 and over, and persons with disabilities. Monthly passes are available for $106.80 (adult) and $91.80 (reduced fare) and are valid on all Columbia County fixed-route services.

The St. Helens – Portland Community College (PCC) Rock Creek operates six times per weekday, with three morning and three afternoon departures. The routing is the same as the St. Helens – Portland route while in Columbia County; however, this route travels via Cornelius Pass Road to PCC Rock Creek, Tanasbourne Shopping Center, and TriMet's Willow Creek Transit Center in Washington County. The scheduled travel time for this route is approximately 80-90 minutes end-to-end. Departures are scheduled every two hours from St. Helens, between 6:30 a.m. and 4:30 p.m. Return trips from Willow Creek operate between 7:25 a.m. and 5:25 p.m., with departures from PCC occurring approximately 11 minutes later on each trip. Connections are available to several TriMet bus lines and the MAX Blue line, providing Columbia County residents the ability to reach other destinations in Washington County and beyond. Fares are the same as the downtown Portland route.

FLEX-ROUTE SERVICE

Columbia County recently started Flex-Route service between St. Helens and Scappoose in an effort to reduce the number of dial-a-ride trips between the two cities. The route operates with 90-minute headways. Its first run begins at 9:00 a.m. and the last run begins at 4:30 p.m., for a total of 7.5 hours of service. The Flex-Route operates differently than the fixed routes in that it will make a certain number of deviations from its standard route, upon request. Deviations are limited to a maximum of 10 minutes per trip. Flag-down stops are also allowed where safe within St. Helens (but not on US 30). The fare is $1.50 for all trips and riders.

Because the Flex-Route can deviate off-route to pick up passengers who are not able to travel to one of the standard stop locations, ADA "complementary paratransit" service is not required for this route.

DIAL-A-RIDE SERVICE

Dial-A-Ride service is available to all Columbia County residents. The service is available to operate from 6:30 a.m. to 6:30 p.m., Monday through Friday. The contractor is required to provide a minimum of 8 hours of service each weekday during this time period. Passengers may call ahead or submit an online request form to schedule a ride, from one day up to one week in advance. This service will transport the individual from the requested pick-up location to the requested drop-off location. Fares for travelers vary by distance, ranging from $1.80 for trips within the same city, up to $25.00 for the longest trips currently programmed.

Rail Service

PASSENGER RAIL

St. Helens currently has no passenger rail service. The closest passenger rail service is located approximately 26 miles north of St. Helens in Kelso, Washington where Amtrak provides service via the Kelso Station. Additional service is provided by Amtrak via the Union Station located approximately 35 miles south of St. Helens in Portland, Oregon.

FREIGHT RAIL

Freight rail service is provided through and within St. Helens by the Portland & Western Railroad. The "Portland-Astoria Line" connects the cities of Astoria, Clatskanie, Rainier, Columbia City, St. Helens, and Scappoose with Portland & Western's facilities and the Burlington Northern Santa Fe Railroad (BNSF) in Portland.

Two rail studies have been recently completed that considered freight rail needs in St. Helens: the Lower Columbia River Rail Corridor Study/US 30 Intersection Study and the Lower Columbia River Rail Corridor/Rail Safety Study (References 7 and 8). The Lower Columbia River Rail Corridor/Rail Safety Study reports between four and six trains per day currently travel through St. Helens.

TRACK CONDITIONS

The Portland & Western Railroad, working with the ODOT Rail Division, recently completed an upgrade of its track between the junction with BNSF in Portland and Port Westward (north of St. Helens). All but five miles of the 54-mile connection to Port Westward have been upgraded with heavy rail to allow for safe and efficient movement of heavy-haul unit trains along the corridor. The maximum authorized speed for freight trains in St. Helens is 25 miles per hour, reflecting a designation as Class 2 track under Federal Rail Administration rating criteria.

RAIL YARD

The Portland & Western Railroad operates a rail yard in St. Helens east of US 30 that is generally situated north of Gable Road and south of Columbia Boulevard. The rail yard supports local customers served by the railroad, offering a location to stage and switch rail equipment. Trespassing is prohibited, though the yard area is not currently fenced.

IMPROVEMENT NEEDS

The two rail studies examined existing and future rail needs and impacts to the US 30 corridor. Key existing conditions needs identified through the studies included:

- Fencing the St. Helens rail yard, particularly along US 30;
- Alternative roadway travel routes parallel to US 30;
- Removal of abandoned tracks near the former Stimson Lumber mill site adjacent to Deer Island Road[4];
- Lack of pedestrian attention to the rail crossing at Gable Road, especially related to students walking to St. Helens High School and unaware of approaching trains; and

[4] Note: the abandoned railroad tracks will be removed in conjunction with a planned transit center at the former mill site.

- Lack of eastbound storage for vehicles leaving US 30 and queued awaiting passage of a train; this was noted as a particular concern for southbound left-turns from US 30 who can be stopped by passing trains and trapped in their turn maneuver.

Air Service

There are three airports within close proximity to St. Helens, including:

- The Portland International Airport, located approximately 35 miles south of St. Helens, is a public airport that provides worldwide passenger and freight service.
- Scappoose Industrial Airpark, located approximately 7 miles south of St. Helens, is a public airport owned and operated by the Port of St. Helens that provides general aviation services to the St. Helens area.
- The Southwest Washington Regional Airport, located approximately 18 miles north of St. Helens in Kelso, Washington, is a public airport that provides general aviation services to southwest Washington and the St. Helens area.

Pipeline Service

A high pressure gas transmission line, owned and operated by Northwest Natural Gas, runs along the Rutherford Parkway at the northern end of the city, US 30, and along Old Portland Road.

Surface Water Transportation

The Columbia River provides an opportunity for surface water transportation for the City of St. Helens. The city currently has one public and five private marinas and boat docks. The Port of St. Helens is a deep draft[5] port with rail and highway connections.

[5] Deep draft ports provide sufficient clearance for large oceangoing vessels to come alongside a pier to offload cargo directly onto the dock.

Section 4 Current Intersection Operations

4 Current Intersection Operations

This section of the existing conditions assessment documents the current performance of the 15 study intersections selected for the TSP update. Additional information related to current intersection operations, including details of the operations analyses performed at the study intersections is included in Technical Memorandum 2: Existing Conditions, which is provided in the Volume 2 Technical Appendix.

Performance Standards

All operational analyses were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (Reference 9). In addition, all intersection operational evaluations were conducted based on the peak 15-minute flow rate observed during the weekday p.m. peak hour. The operational analysis results were compared with mobility standards used by the local agencies to assess performance and potential areas for improvement.

CITY INTERSECTIONS

Traffic operations at City intersections are generally described using a measure known as "level of service" (LOS). Level of service represents ranges in the average amount of delay that motorists experience when passing through the intersection. LOS is measured on an "A" (best) to "F" (worst) scale. At signalized and all-way stop-controlled intersections, LOS is based on the average delay experienced by all vehicles entering the intersection. At two-way stop-controlled intersections, LOS is based on the average delay experienced by the critical movement at the intersection, typically a left-turn from a stop-controlled street.

The City of St. Helens has not adopted level-of-service (LOS) or volume-to-capacity (V/C) ratio standards for signalized or unsignalized intersections. Therefore, the following minimum operating standards were applied to City intersections:

- LOS "D" is considered acceptable at signalized and all-way stop controlled intersections if the V/C ratio is not higher than 1.0 for the sum of critical movements.
- LOS "E" is considered acceptable for the poorest operating approach at two-way stop intersections. LOS "F" is allowed in situations where a traffic signal is not warranted.

A summary of the recommended performance standards at each of the study intersections under City jurisdiction is included in Table 4-1. These standards are recommended for incorporation into the City Ordinances, as described in Section 9.

TABLE 4-1: RECOMMENDED PERFORMANCE STANDARDS FOR CITY INTERSECTIONS

Intersection	Traffic Control[1]	Posted Speed Limit (mph)	Performance Standard
Columbia Boulevard/ N.-S. 6th Street	TWSC	25	LOS "E"
Columbia Boulevard/ N.-S. 12th Street	TWSC	25	LOS "E"
Columbia Boulevard/ N.-S. Vernonia Road	AWSC	25	LOS "D"
Columbia Boulevard/ Sykes Road	AWSC	25	LOS "D"
Columbia Boulevard/ Gable Road	TWSC	25	LOS "E"
Deer Island Road/ West Street	TWSC	25	LOS "E"
West Street/ N. 6th Street	AWSC	25	LOS "D"

[1]TWSC: Two-way stop-controlled (unsignalized); AWSC = All-way stop-controlled

ODOT INTERSECTIONS

ODOT uses volume-to-capacity ratio standards to assess intersections operations. Table 6 of the Oregon Highway Plan (OHP) provides maximum volume-to-capacity ratios for all signalized and unsignalized intersections outside the Portland Metro area. The ODOT controlled intersections within the UGB are located along US 30, which is a designated freight route on a Statewide Highway, and inside the urban growth boundary of a non-metropolitan planning organization (MPO). The minimum required performance standards are shown in Table 4-2 and reflect the posted speed limit and traffic control at the intersection.

In reviewing Table 4-2, it should be noted that two-way stop-controlled (TWSC) intersections operated and maintained by ODOT are evaluated using two performance standards: one for the major street highway approaches and one for the minor street approaches. Given that operations at one of the minor street approaches represent the critical V/C ratio for the intersection, only the mobility standards for the minor street approaches were shown in Table 4-2.

TABLE 4-2: SUMMARY OF ODOT INTERSECTION PERFORMANCE STANDARDS

Intersection	Traffic Control[1]	Posted Speed Limit (mph)	OHP Mobility Standard	ODOT HDM Mobility Standard[2]
US 30/Deer Island Road	Signal	50	V/C ≤ 0.70	V/C ≤ 0.70
US 30/Pittsburg Road	TWSC	40	V/C ≤ 0.85[3]	V/C ≤ 0.70
US 30/Wyeth Street	TWSC	40	V/C ≤ 0.85[3]	V/C ≤ 0.70
US 30/St. Helens Street	Signal	35	V/C ≤ 0.80	V/C ≤ 0.70
US 30/Columbia Boulevard	Signal	35	V/C ≤ 0.80	V/C ≤ 0.70
US 30/South Vernonia Road	TWSC	35	V/C ≤ 0.90[3]	V/C ≤ 0.70
US 30/Gable Road	Signal	35	V/C ≤ 0.80	V/C ≤ 0.70
US 30/Millard Road	TWSC	45	V/C ≤ 0.80[3]	V/C ≤ 0.70

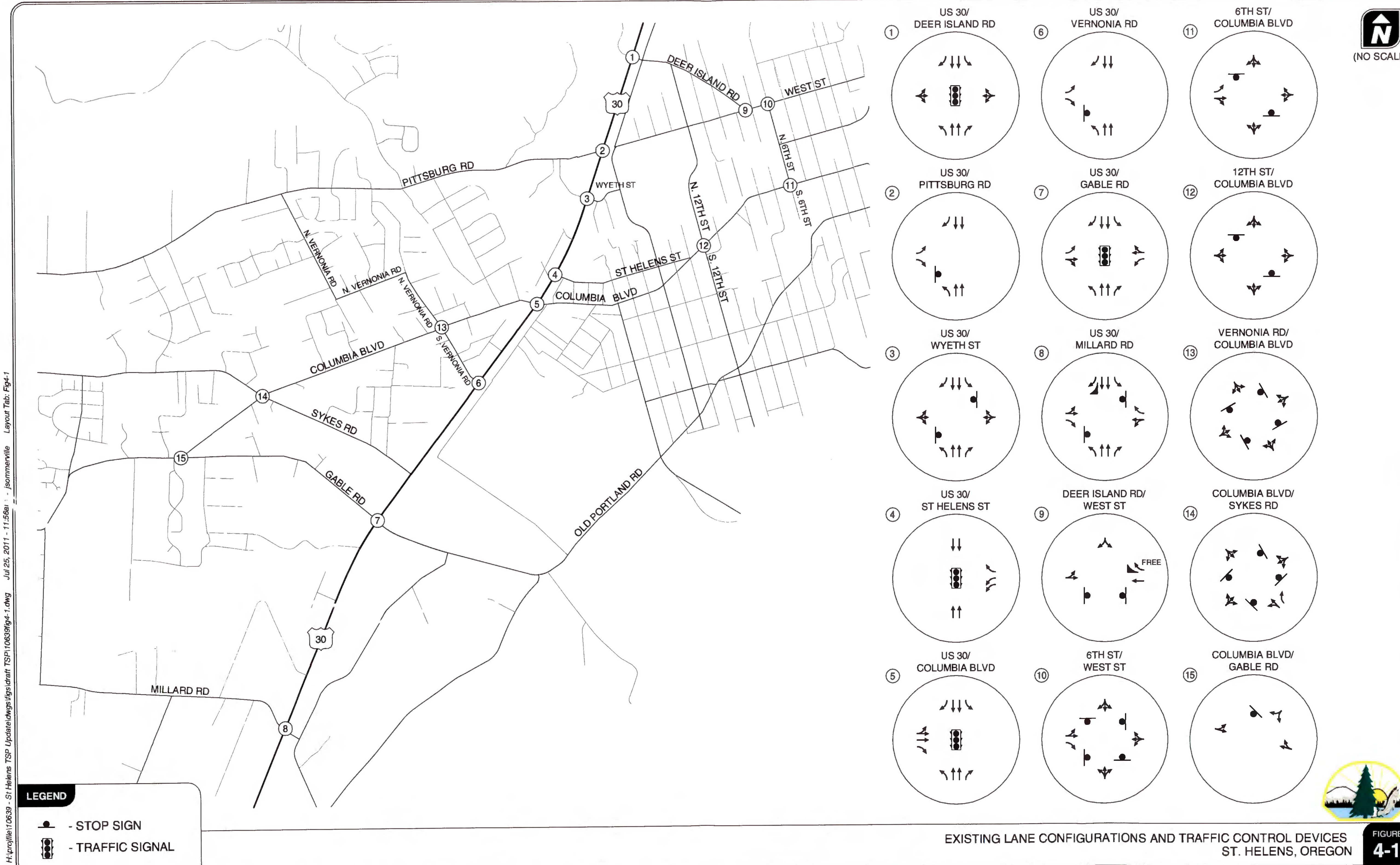
[1]TWSC: Two-way stop-controlled (unsignalized)
[2] HDM:ODOT Highway Design Manual
[3] V/C ratio reflects minor street approach

Figure 4-1 illustrates the existing lane configurations and traffic control devices at each of the study intersections.

Traffic Volumes

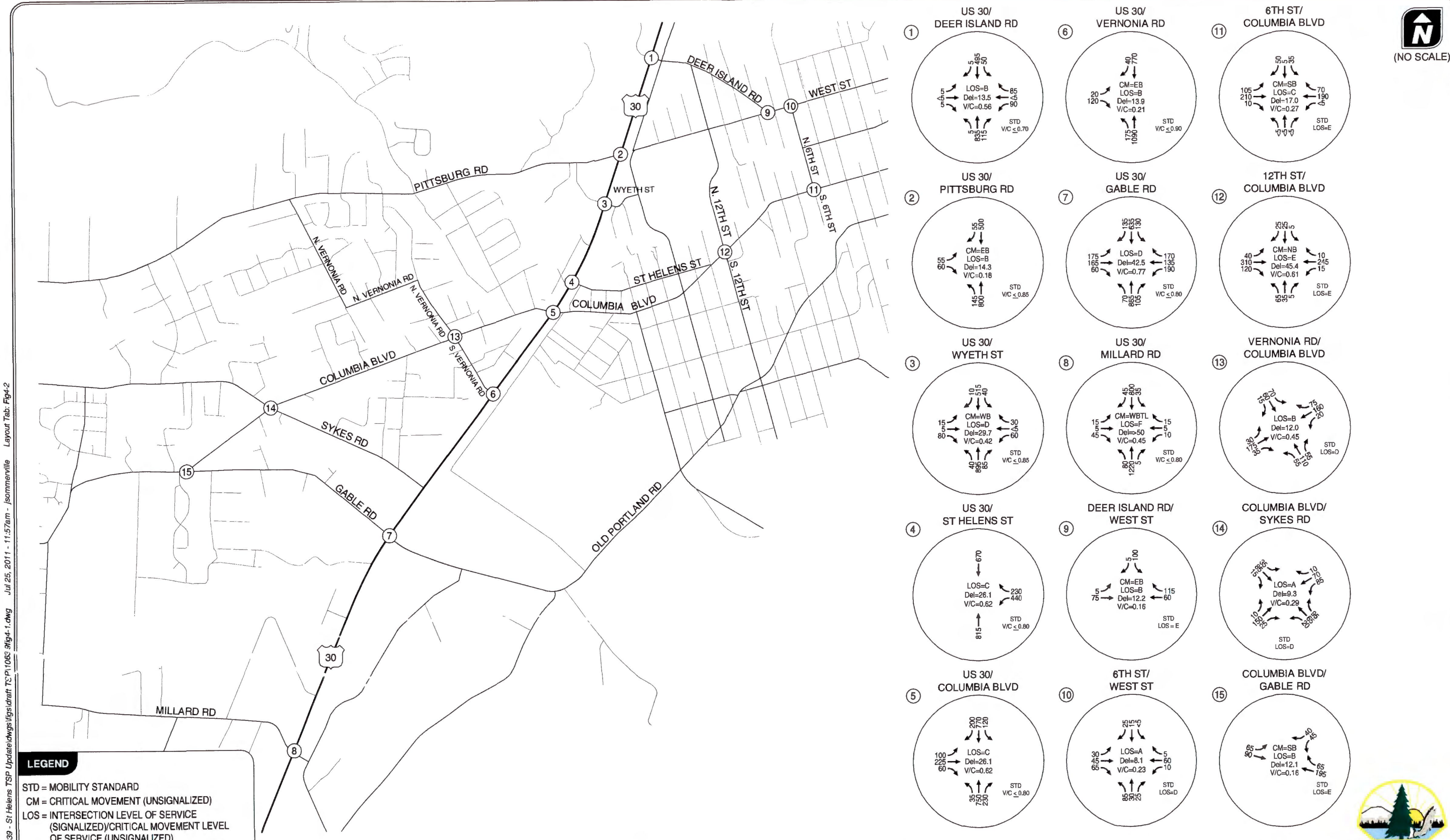
Manual turning-movement counts were obtained at most of the study intersections in May 2010[6]. The peak hour of intersections along the US 30 corridor was found to occur between 4:20 and 5:20 p.m., while the individual peak hours of the remaining study intersections were found to occur at different times throughout the p.m. peak period. Figure 4-2 provides a summary of the seasonally adjusted year 2010 turning movement counts, which are rounded to the nearest five vehicles per hour for the weekday p.m. peak hour. Figure 4-2 also reflects the existing operations at the intersections. As shown all study intersections currently meet the applicable mobility and level-of-service standards during the weekday p.m. peak hour.

[6] Traffic counts and analysis prepared for the *Lower Columbia River Rail Corridor Study* were used to represent the existing conditions analysis at the intersections of: US 30/Millard Road, US 30/Gable Road, US 30/Columbia Boulevard, US 30/St. Helens Street, and US 30/Deer Island Road. The 2008 data was judged to remain reflective of current peak seasonal conditions to the economic downturn that has occurred since 2008.



EXISTING LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES
ST. HELENS, OREGON

FIGURE 4-1



LEGEND

STD = MOBILITY STANDARD
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

EXISTING TRAFFIC CONDITIONS
ST. HELENS, OREGON

FIGURE 4-2

H:\projfile\10639 - St Helens TSP Update\dwgs\figs\draft TSP\1063 9fig4-1.dwg Jul 25, 2011 - 11:57am - jsommerville Layout Tab: Fig4-2

TURN LANE NEEDS

All of the study intersections along US 30 currently have separate left- and right-turn lanes provided where northbound and southbound turn movements are allowed. Review of unsignalized and signalized intersection queuing analyses found that 95th percentile queues at the US 30/Gable Road intersection extend beyond the available storage and into the adjacent travel lanes in the east and westbound directions.

Safety Analysis

Intersection and roadway segment safety were assessed based on the ODOT Safety Priority Index System and review of crash data provided by ODOT. The Statewide Priority Index System (SPIS) is a method developed by ODOT for identifying hazardous locations on state highways through consideration of crash frequency, crash rate, and crash severity. Within St. Helens, the US 30/Sykes Road and US 30/Gable Road intersections were listed in the top ten percent of ODOT's SPIS ranking program for 2008[7]. A description of the crash experience and potential mitigation measures identified by the SPIS program is presented below.

US 30/SYKES ROAD

Sykes Road is a signalized T-intersection at a location where US 30 has a posted speed limit of 35 miles per hour (mph) and a number of nearby accesses. Eleven crashes were reported at the intersection during the four-year period, of which 64 percent resulted in an injury and 36 percent resulted in property damage only. Further, 64 percent were rear-end crashes, 27 percent were turning crashes and 9 percent were sideswipe crashes. The SPIS program identifies a potential safety improvement involving installation of a traffic separator, median islands, and implementation of access management measures that would cost on the order of $1,250,000.

US 30/GABLE ROAD

Gable Road intersects US 30 as a four-way intersection at a location where the posted speed limit is 35 mph on the highway. It is the first signalized intersection drivers reach traveling north on US 30 as they enter the city of St. Helens. Separate northbound and southbound right-turn lanes are provided at the intersection. A total of 24 crashes were reported at the intersection during the four-year period, of which 40 percent resulted in an injury and 60 percent resulted in property damage only. Fifty percent

[7] It is important to note that the SPIS data reported for 2008 is based on 2005-2007 crash data whereas all other crash data analysis presented reflects the reporting period from January 2006 to December 2008.

of the crashes were rear-end and 25 percent were turning movement-related. The SPIS program identified a potential safety improvement that includes the provision of a dual left-turn lane from US 30 onto Gable Road in conjunction with installation of raised median and lane realignment treatments. The estimated cost of the improvements is $5,400,000.

CRASH DATA ANALYSIS

ODOT provided detailed crash data covering all crashes that occurred in the city of St. Helens for the three-year period from January 1, 2006 to December 31, 2008. These data were analyzed to determine crash rates for the study intersections and roadway segments.

Review of the crash data found that the segment of US 30 between Gable Road and St. Helens Street exceeds the statewide average for similar facilities. Close inspection of the crash data revealed that a majority of the crashes occurred at intersections, which is to be expected given the frequent and relatively closely spaced access points and street intersections along US 30.

The highest incidence of crashes occurred at the US 30/Gable Road intersection, with 19 reported crashes in the three-year period. At the time the TSP Update was prepared, ODOT was in the process of conducting a safety study of US 30 between Scappoose and St. Helens. Part of the review will include a Road Safety Audit (RSA) that will extend from Berg Road in Scappoose to Millard Road. The RSA is expected to offer specific findings and recommendations that will supersede the crash data review in the TSP update for this segment of roadway.

Section 5
Year 2031 Forecast Transportation Conditions

5 YEAR 2031 FORECAST TRANSPORTATION CONDITIONS

This section presents the year 2031 forecast transportation conditions for the St. Helens Area. Included in this section is a summary of the future "no-build" traffic conditions analysis conducted for St. Helens to identify transportation system deficiencies that may exist by the year 2031 if no additional improvements to the system are made in the next twenty years. This analysis was used to inform the identification and evaluation of transportation system options as summarized in Section 6. Additional information related to year 2031 forecast transportation conditions, including details on the operations analyses performed at the study intersections, is included in Technical Memorandum 4: Future Needs, which is provided in the Volume 2 Technical Appendix.

2031 Traffic Volume Forecast

Oregon's Transportation Planning Rule (TPR) requires communities to develop a 20-year transportation plan to support future land use and economic development. For St. Helens TSP Update, the year 2031 is an appropriate forecast horizon year.

The year 2031 traffic volumes were developed according to the Cumulative Analysis methodology described in the ODOT Analysis Procedures Manual (APM – Reference 10). This type of analysis combines growth in regional traffic volumes along US 30 with growth in local traffic volumes associated with the projected development of available land within the city[8]. A summary of the traffic volume projection process is presented below.

There are several steps required to prepare a cumulative analysis, including:

- Developing a growth rate projection for highway traffic volumes;
- Identifying where household and employment growth is likely to occur in the community;
- Developing estimates of the number of vehicle trips associated with household and employment growth, and;
- Allocating those trips across the city to various growth areas.

[8] A detailed technical explanation of this methodology and additional information on the forecasts are contained the methodology memorandum included in the Volume 2 Technical Appendix.

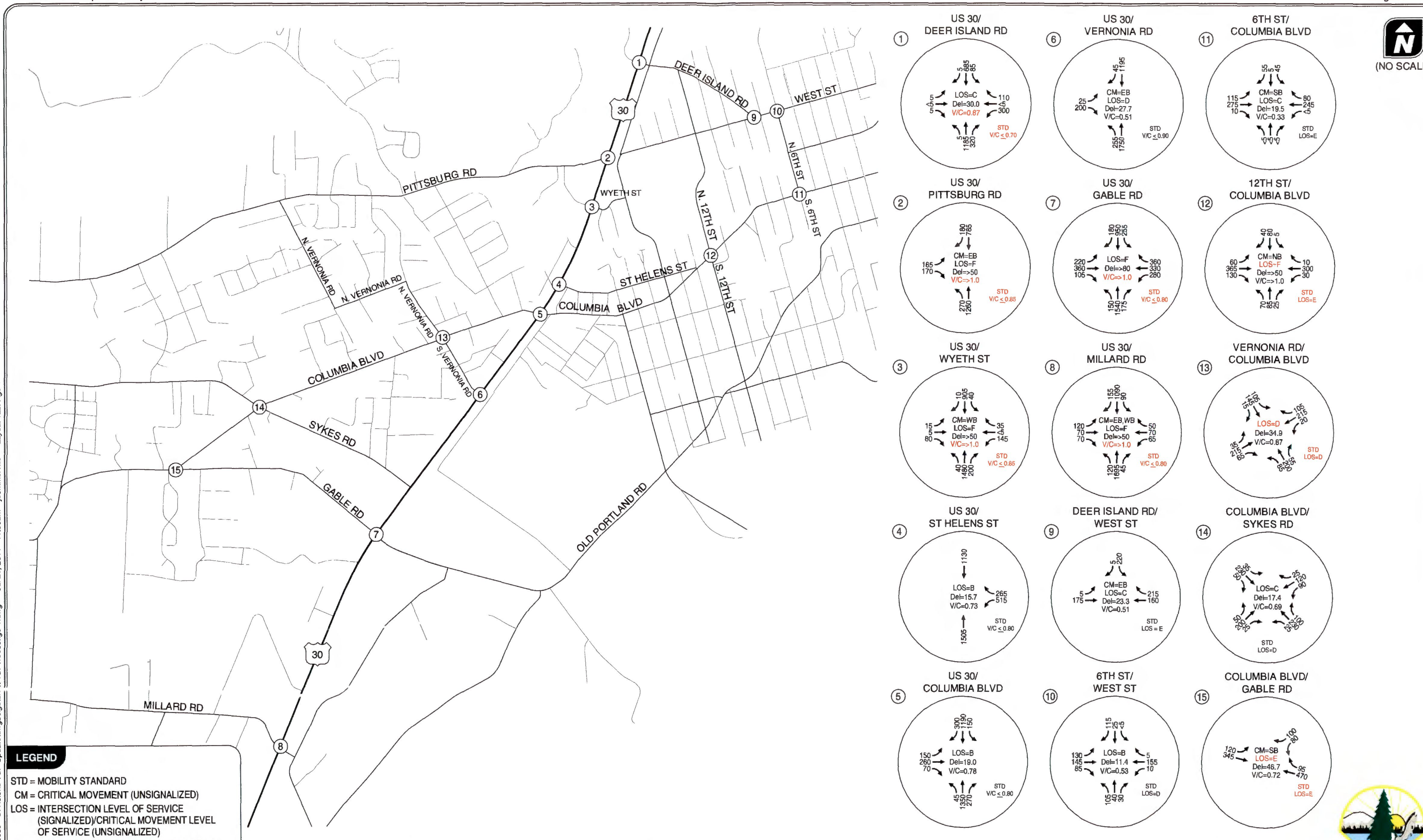
Key growth trends identified through the forecasting process include:

- Through traffic on US 30 is projected to increase by 41 percent over the 20-year planning period based on ODOT's Future Volume Tables.
- Anticipated housing growth tends to be focused in the north and central portions of the city both to the east and west of US 30. Modest housing growth is also anticipated in the downtown area.
- Commercial (office) development is expected in nearly all areas of the city but will be largely focused east of US 30 and south of the downtown core.
- Industrial growth is expected east of US 30, primarily in the areas south of downtown.
- Institutional uses (churches, schools, government offices, parks, etc.) will likely be spread throughout the city and particularly focused in the north and central areas on both sides of US 30. In total, 695,000 square feet of new institutional uses could be developed in the city during the next twenty years based on existing zoning designations and developable lands.
- Retail growth is largely anticipated to follow the residential growth areas, with the majority of the growth west of US 30. The amount of new retail building space within the core retail area along the west side of US 30 and in the downtown area is smaller than that anticipated in the northwestern portion of the city.

2031 Traffic Conditions

Forecast 2031 traffic volumes reflect new local and through trips derived by the cumulative analysis process and the seasonally adjusted existing traffic volumes. The 2031 forecast traffic volumes are shown in Figure 5-1, which also shows the results of an operations analysis performed at each of the study intersections.

Table 5-1 summarizes the operational information provided in Figure 5-1 for the intersections that are forecast to fail to meet mobility standards in the year 2031. The table also compares the results to the individual performance standard for ODOT and City intersections.



LEGEND

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V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

FORECAST TRAFFIC CONDITIONS
ST. HELENS, OREGON

FIGURE 5-1

TABLE 5-1: INTERSECTION OPERATIONS ANALYSIS, 2031 NO BUILD, WEEKDAY PM PEAK HOUR

Intersection	Existing Traffic Control[1]	Performance Standard	Forecast Intersection Operations	Meets Standard?
		ODOT Intersections		
US 30/Deer Island Road	Signal	V/C ≤ 0.70	0.88	**No**
US 30/ Pittsburg Road	TWSC	V/C ≤ 0.85[2]	>1.00	**No**
US 30/ Wyeth Street	TWSC	V/C ≤ 0.85[2]	>1.00	**No**
US 30/ Gable Road	Signal	V/C ≤ 0.80	>1.00	**No**
US 30/ Millard Road	TWSC	V/C ≤ 0.80[1]	>1.00	**No**
		City Intersections		
Columbia Boulevard/ 12th Street	TWSC	LOS "E"	LOS "F"	**No**

[1]TWSC=Two-way stop control

[2]V/C ratio reflects minor street approach

As shown in Table 5-1, six of the study intersections are projected to not meet ODOT or City performance standards under 2031 no-build traffic conditions. This is primarily due to growth in local and regional traffic volumes, but also to a general lack of connectivity within the city and a heavy reliance on US 30 for making local trips.

The alternatives analyses presented in Section 6 considers the relationship/interaction between the study intersections and explores opportunities to provide greater connectivity through alternative routes to each of the areas served by these intersections.

Additional issues identified through the future conditions analysis include:

- Limited north-south connectivity between major roadways along US 30;
- Limited connectivity between areas east and west of US 30 and the Portland & Western Rail Line. As a result each of the major intersections along US 30, such as Deer Island, Gable and Millard Road are overloaded under future conditions (as indicated above);
- A lack of north-south collector or arterial level routes on city streets parallel to US 30. As a result, local circulation tends to rely on US 30. For example, to get from the northeast part of the city to any area west of US 30, motorists must use US 30 or travel a significant distance out of direction on local streets;

- A lack of sufficient spacing between US 30 and the parallel roads that do exist east of the highway. For example, the close spacing between US 30 and Oregon Street along Deer Island Road and between US 30 and Milton Way along Columbia Boulevard can make use of the parallel facilities difficult.

Conclusions

The results of the future "no-build" traffic conditions analysis indicate that many of the intersections along US 30 will not meet minimum performance standards by 2031 without significant improvements to the transportation system.

It is unlikely the city and ODOT would allow development to occur without incremental improvements. Readers should understand the results shown in Figure 5-1 are an illustration of what would happen if growth occurred without corresponding improvements. This analysis offers insights as to probable "hot spots" where planning now can help avoid future congestion and capacity failures. Section 6 outlines potential improvement alternatives to address the forecast traffic growth.

Section 6 Transportation Options Analysis

6 Transportation Options Analysis

This section presents multimodal improvement options available to the City of St. Helens to address existing and future transportation system deficiencies. The options presented in this section include strategies to improve system operations, manage travel demand, and to provide multimodal facilities to improve capacity and connectivity.

The options are grouped into three packages. The first package ("Complete Streets Options") is limited to connectivity and street improvements that do not require major capital investments. The second package includes a majority of the recommendations from the 1997 Transportation System Plan (TSP). The third package includes elements identified in the 2009 Lower Columbia River Rail Corridor Plan. The transportation options included in each package are later evaluated as potential improvement projects for the City.

It is important to recognize that none of the packages evaluated in this section fully address the community's long-term transportation system needs on their own. As such, the final TSP documented in Section 7 was developed based on a combination of improvement projects based on community feedback and guidance received during the options analysis. Additional information related to the options analysis, including details on the operations analyses performed for each solutions package, is included in Technical Memorandum 5: Transportation Solutions, which is provided in the Volume 2 Technical Appendix.

Complete Streets Option

The Complete Streets Option seeks to improve the future transportation system through completion of existing facilities. No new intersection capacity-based improvements are included with this option. As a result, the intersections identified in Section 5 as operating unacceptably under the No Build Option will continue to operate unacceptably under the Complete Streets Option.

The Complete Streets option is organized as follows:

- Pedestrian System Improvements
- Bicycle System Improvements
- Multi-use Path System Improvements
- Transit System Improvements

- Potential Roadway Functional Classification Plan Revisions
- Potential Roadway Cross Section Standard Revisions

The Complete Streets Option includes many of the Transportation Demand Management (TDM) strategies recommended in the 1997 TSP, including many of the recommended pedestrian and bicycle facility improvements. Many new pedestrian and bicycle projects identified throughout the current TSP update process are included as well.

Pedestrian System Improvements

The pedestrian system within St. Helens includes sidewalks, multi-use paths, and trails as well as marked and unmarked, signalized and unsignalized pedestrian crossings.

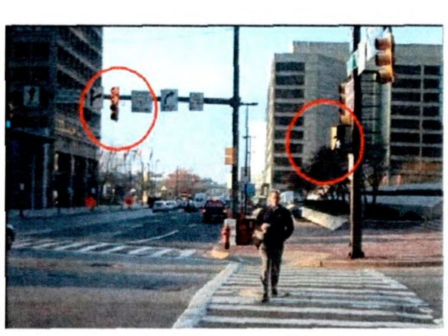
TYPES OF PEDESTRIAN IMPROVEMENTS

The potential pedestrian improvement projects identified for St. Helens have been separated into two categories: sidewalks and pedestrian crossings. The sidewalk improvement projects include installing sidewalks on one or both sides of an existing roadway to improve connections between residential areas and schools, transit stops, or employment areas as well as to fill in gaps in the pedestrian system. Some sidewalk projects require additional right-of-way acquisition and thus additional cost.

The pedestrian crossing improvement projects include a variety of potential treatments that could be implemented at key intersections and along corridors in St. Helens. A summary of these treatments, including advantages, challenges, and location considerations are presented below.

Leading Pedestrian Interval

Leading Pedestrian Intervals at signalized intersection allow pedestrians to begin crossing at a crosswalk before conflicting vehicles start moving. For example, left or right-turning vehicles may have a red light for five to seven seconds while pedestrians and through vehicles are allowed to begin moving through the intersection.



ADVANTAGES	CHALLENGES	LOCATION TYPE
• Minimal staff time for signal re-timing • Reduces vehicle/ pedestrian conflicts • Improves driver yielding	• Reduces green time for conflicting vehicles • Right-turn-on-red is often prohibited	• Signalized intersections with heavy turning volumes

Pedestrian Countdown Signals

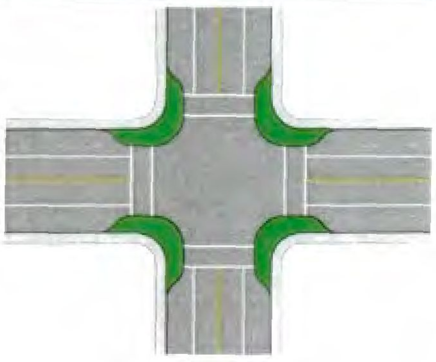
Pedestrian Countdown Signals inform pedestrians of the time remaining to cross the street with a countdown timer at the signalized crossing. The countdown should include enough time for a pedestrian to cross the full length of the street, or in rare cases, reach a refuge island. The 2009 Manual on Uniform Traffic Control Devices (MUTCD) requires all new pedestrian signals, and any retrofitted signals to include pedestrian countdown signals.

ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Complies with 2009 MUTCD ▪ Fewer pedestrians crossing the street late in countdown ▪ Fewer pedestrian left in crosswalk during steady don't walk phase	▪ None	▪ Signalized intersections without countdown heads

Curb Extensions

Curb extensions create additional space for pedestrians and allow pedestrians and vehicles to better see each other at crosswalks. Curb extensions are typically installed at intersections along roadways with on-street parking and help reduce crossing distances and the amount of exposure pedestrians have to vehicle traffic. Curb extensions can narrow the vehicle path, slow down traffic, and prohibit fast turns.

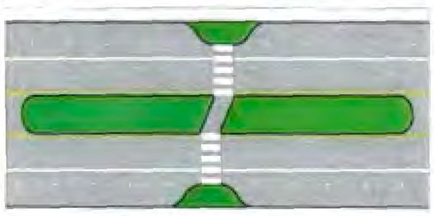
ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Shorter crossing distances for pedestrians ▪ Reduces motorist turning speeds ▪ Increased visibility between motorists and pedestrians ▪ Enables permanent parking ▪ Enables tree and landscape planting, and water runoff treatment	▪ Can only be used on streets with unrestricted on-street parking ▪ Physical barrier can be exposed to traffic ▪ Greater cost and time to install than high visibility crosswalks ▪ May require changes to roadway drainage system in retrofit applications	▪ Streets with on-street parking



Raised Median Islands

Raised median islands provide a protected area in the middle of a crosswalk for pedestrians to stop while crossing the street. The raised median island allows pedestrians to complete a two-stage crossing if needed. The ODOT Traffic Manual states that for state highways a raised median, in combination with a marked crosswalk, is desired when average daily traffic (ADT) volumes are greater than 10,000 vehicles per day, such as on US 30.

ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Reduces the number of crashes at marked and unmarked crosswalks ▪ Preferred on multi-lane streets ▪ Requires shorter gaps in traffic to cross the street ▪ Used to create entry point into area of high pedestrian activity	▪ Must have at least 6 feet of space to accommodate wheelchairs; not all streets will have adequate space ▪ Physical barrier in the street	▪ Areas with high volume traffic conflict or high pedestrian crash locations



Rectangular Rapid Flashing Beacon

Rectangular Rapid Flashing Beacons, or RRFBs, are user-actuated amber lights that have an irregular flash pattern similar to emergency flashers on police vehicles. These supplemental warning lights are used at unsignalized intersections or mid-block crosswalks to improve safety for pedestrians using a crosswalk.

ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Typically increases motorists yielding behavior ▪ Warning information to drivers at eye level ▪ May be used at unsignalized intersections and mid-block crossings ▪ May be installed on two-lane or multi-lane roadways ▪ Low-cost alternative to traffic signals and hybrid signals	▪ Motorists may not understand flashing lights ▪ Pedestrians may not activate flashing light	▪ Areas with high mid-block crossings

Pedestrian Hybrid Signal

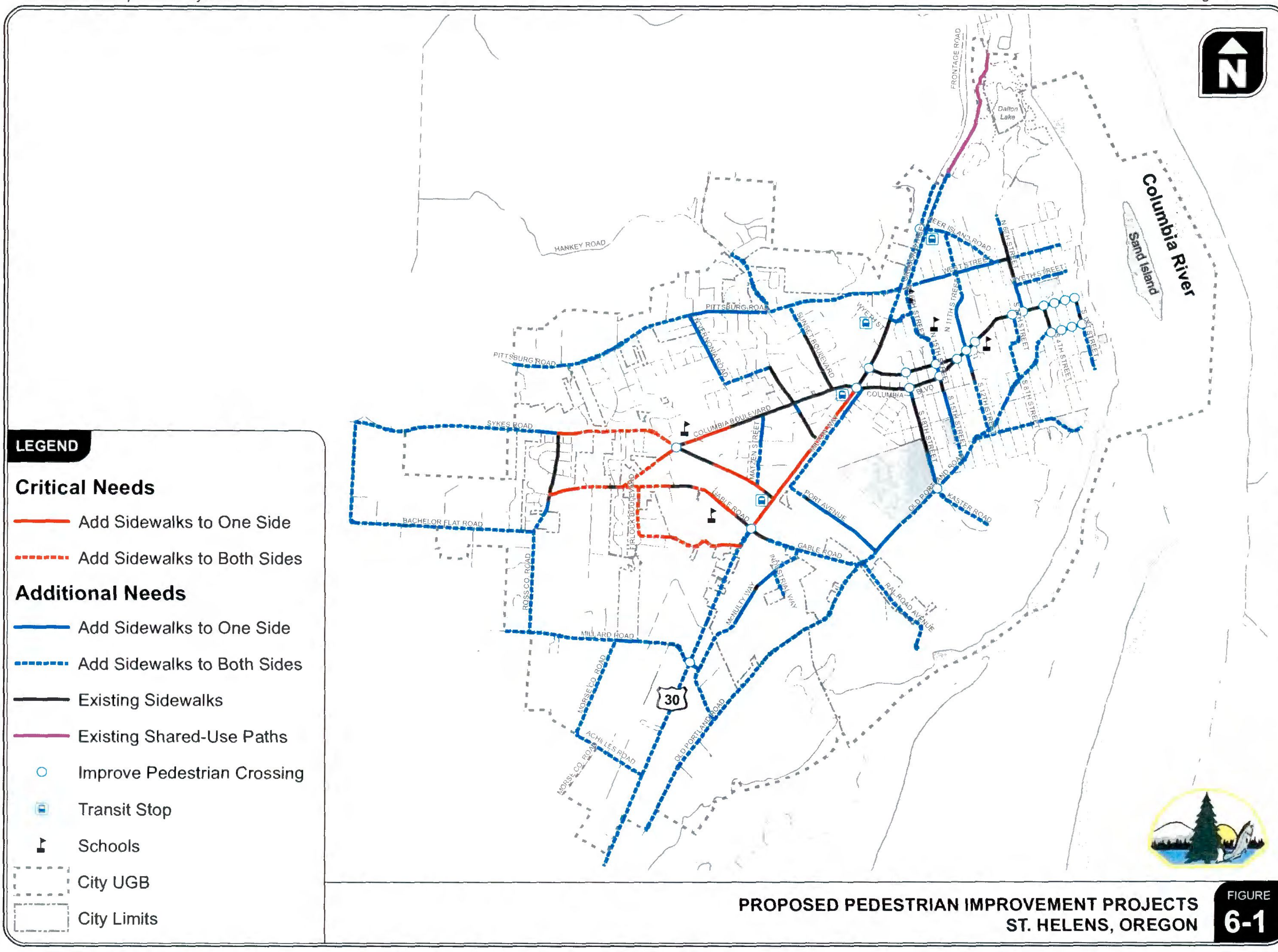
A pedestrian-actuated hybrid signal stops traffic on the mainline to provide a protected crossing for pedestrians at an unsignalized location. Warrants for the installation of pedestrian-actuated hybrid signal are based on the number of pedestrian crossings per hour (PPH), vehicles per hour on the roadway, and the length of the crosswalk. Thresholds are available for two types of roadways: locations where prevailing speeds are above 35 miles per hour (mph) and locations where prevailing speeds are below 35 mph.

ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ A very high rate of motorists yielding to pedestrians ▪ Drivers experience less delay at hybrid signals compared to other signalized intersections	▪ Expensive compared to other crossing treatments ▪ Requires pedestrian activation	▪ Larger roadways where mid-block crossing is difficult or crossing, opportunities are limited (e.g., Columbia Blvd.)

PROPOSED PEDESTRIAN SYSTEM IMPROVEMENTS

Figure 6-1 illustrates the location of the pedestrian improvement projects proposed as part of the Complete Streets Option. The roadway segments shown as solid lines involve the addition of a sidewalk to one side of the street (completing the pedestrian facilities as a sidewalk is already present on the other side of the road), while the roadway segments shown as dashed lines involve the addition of sidewalks on both sides of the street. The segments shown in red represent locations with a higher priority for pedestrian facilities based on City staff and community feedback.

Many of the proposed sidewalk improvement projects identified in Figure 6-1 require widening the roadway (and, in some cases, additional right-of-way) to accommodate the new facilities. Additional right-of-way requirements were not evaluated as part of the options analysis and are not reflected in the cost estimates for each project.



PROPOSED PEDESTRIAN IMPROVEMENT PROJECTS
ST. HELENS, OREGON

FIGURE **6-1**

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Bicycle System Improvements

The bicycle system within St. Helens includes bicycle lanes, shared roadways, and multi-use paths. Multi-use path improvements are discussed in a subsequent section because of their utility for both pedestrians and bicyclists.

TYPES OF BICYCLE IMPROVEMENTS

The bicycle improvement projects identified for St. Helens have been separated into three categories: bicycle lanes, bicycle crossings, and off-road facilities.

Shared Roadways

Any roadway without a dedicated bicycle facility is generally considered a shared roadway. Where traffic volumes are low, shared roadways are generally safe and comfortable facilities for cyclists. However, the ODOT Bicycle and Pedestrian Plan does not recommend shared roadways where automobile volumes or vehicle speeds are high. Thresholds for where shared-lanes are appropriate are based on several factors, including land-use and grade. Generally, bike lanes are preferred on most roadways with greater than 3,000 average daily trips or with a speed limit greater than 25 miles per hour. For these roadways, dedicated bicycle facilities, typically bicycle lanes, are recommended.

Shared-lane Pavement Marking

Shared-lane pavement markings (often called "sharrows") are a tool designed to help accommodate bicyclists on roadways where bicycle lanes are desirable but infeasible to construct. The sharrow marking indicates a shared roadway space, and are typically centered approximately four feet from the edge of the travelway to encourage cyclists to ride further away from parked and parking cars and/or the curb. Typically, sharrows are suitable on roadways with fewer than 3,000 average daily trips. For reference, Millard Road carries this level of traffic today.

ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Reduce wrong-way and sidewalk riding ▪ Improves cyclists positioning in the roadway ▪ Informs motorists of bicyclists ▪ Used on streets without adequate space for bike **lane markings**	▪ Pavement marking maintenance ▪ Not as effective as a bike lane	▪ Streets with moderate speeds and traffic volumes, and where space for bike lane markings is limited

Bicycle lanes

Bicycle lanes are striped lanes on the roadway dedicated for the exclusive use of bicycles. Typically, bicycle lanes are placed at the outer edge of pavement (but to the inside of right-turn lanes and/or on-street parking). Bicycle lanes improve bicycle safety, improve cyclist security, and (if comprehensive) can provide direct connection between origins and destinations. However, inexperienced cyclists often feel uncomfortable riding on busy streets, even when they include bicycle lanes. City of St. Helens street standards currently include bicycle lanes on all arterial and collector streets.

ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Improves safety and comfort by increasing the visibility and awareness of cyclists ▪ Provides facilities for bicyclists	▪ May still have conflicts with motorists (e.g, dooring) ▪ Motorists may illegally park in bike lane	▪ Non-local streets with adequate space for accommodation

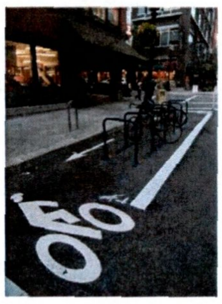
Bicycle Detection

Many traffic signals in St. Helens are actuated, meaning that green indications are only given to a movement when the signal detects the presence of a vehicle. However, actuating a signal as a cyclist is difficult if there is no information about the location of detection equipment. Pavement markings should be used, including actuated left-turn lanes, to show cyclists where to stand to actuate a signal. Additionally, the sensitivity of all loop detectors should be set to allow for bicycle activation.

OFF-STREET FACILITIES

Bicycle Parking

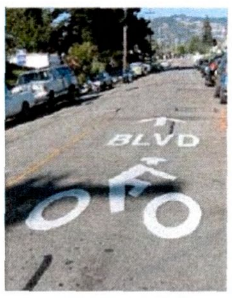
Bicyclists also benefit from several other types of bicycle support facilities, such as secure bicycle parking, either open or covered U-shaped racks, and storage lockers for clothing and gear. Areas that typically provide secured bicycle parking are often located at areas of high bicycle and pedestrian traffic such as transit stations, shopping centers, schools, and multi-use trails. The City currently requires bicycle parking included in all new commercial development as a condition of approval. Columbia County Rider buses are outfitted with bicycle racks that allow cyclists to bring their bikes with them on transit. Allowing bicycles on transit vehicles increases the range of trips possible by both transit and bicycling, and reduces cyclists' fears of being stranded in the event of a mechanical or physical breakdown.




ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Provides a secure location to store and lock bicycles ▪ Locations are generally very close to and visible from the point of interest ▪ Relatively inexpensive and easy installation ▪ Encourages community bicycle use	▪ Requires space in potentially busy area ▪ May remove an on-street parking space	▪ Bicycle parking could be either implemented or expanded at areas of high bicycle ridership and pedestrian traffic (e.g., busy bus stops, shopping centers, libraries, schools, etc.)

Wayfinding Signs

Wayfinding signs direct pedestrians and bicyclists towards destinations in the area. They typically include distances and average walk/cycle times.

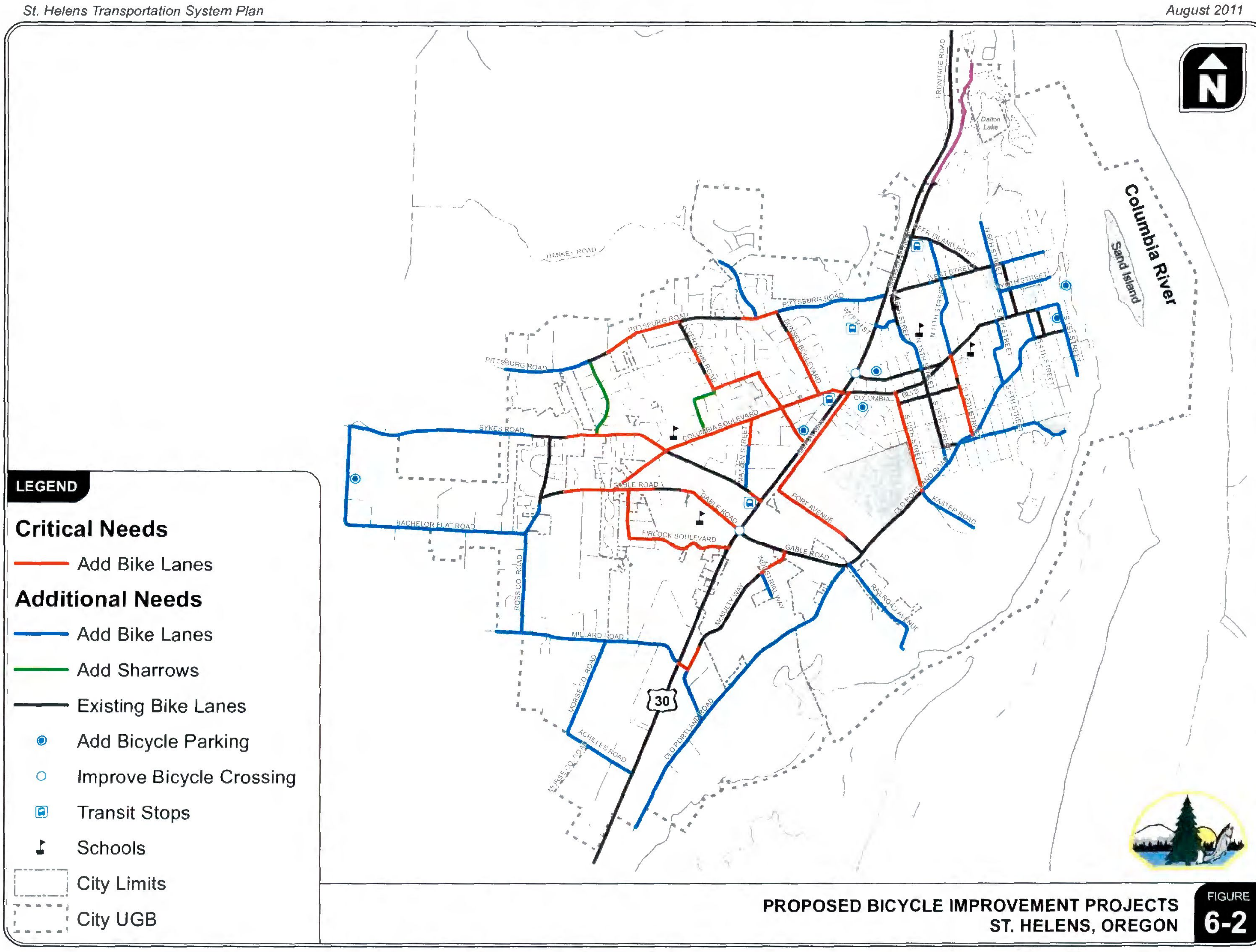


ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Eases navigation for residents and visitors by bicycle ▪ Provides guidance to destinations from streets and along multi-use trails ▪ Offers another indication to motorists of the presences of bicycles	▪ Maintenance and vandalism	▪ Areas adjacent to bicycle and pedestrian facilities

PROPOSED BICYCLE SYSTEM IMPROVEMENTS

Figure 6-2 illustrates the location of the bicycle improvement projects proposed as part of the Complete Streets Option. The roadway segments shown as thick red and blue lines involve the installation of bicycle lanes, while the roadway segments shown as thick green lines involve the installation of sharrows along the roadway. The roadway segments shown in red were identified as locations with a higher priority for bicycle facilities by City staff, the St. Helens Pedestrian and Bicycle Committee, and by the general public. The blue dots shown on the map represent areas where bicycle parking is recommended based on recommendations in the 1997 TSP as well as the location of Columbia County Rider park and ride and transit facilities.

Many of the proposed bicycle improvement projects identified in Figure 6-2 require widening the roadway and potentially additional right-of-way to accommodate the new facilities. Additional right-of-way requirements were not evaluated as part of the options analysis and are not reflected in the cost estimates for each project.



PROPOSED BICYCLE IMPROVEMENT PROJECTS
ST. HELENS, OREGON

FIGURE 6-2

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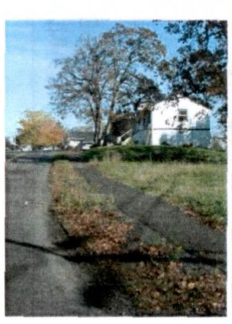
Multi-Use Paths and Trails

There are several multi-use paths and trails in St. Helens dedicated to pedestrians and bicyclists. These paths and trails have an integral role in recreation, commuting, and accessibility for residents. Rutherford Parkway is among the many paths and trails located within the City. It offers a paved, multi-use path extending north from Oregon Street to Columbia City. Rutherford Parkway also connects into the Dalton Lake Recreational Area, which includes a system of trails around Dalton Lake.

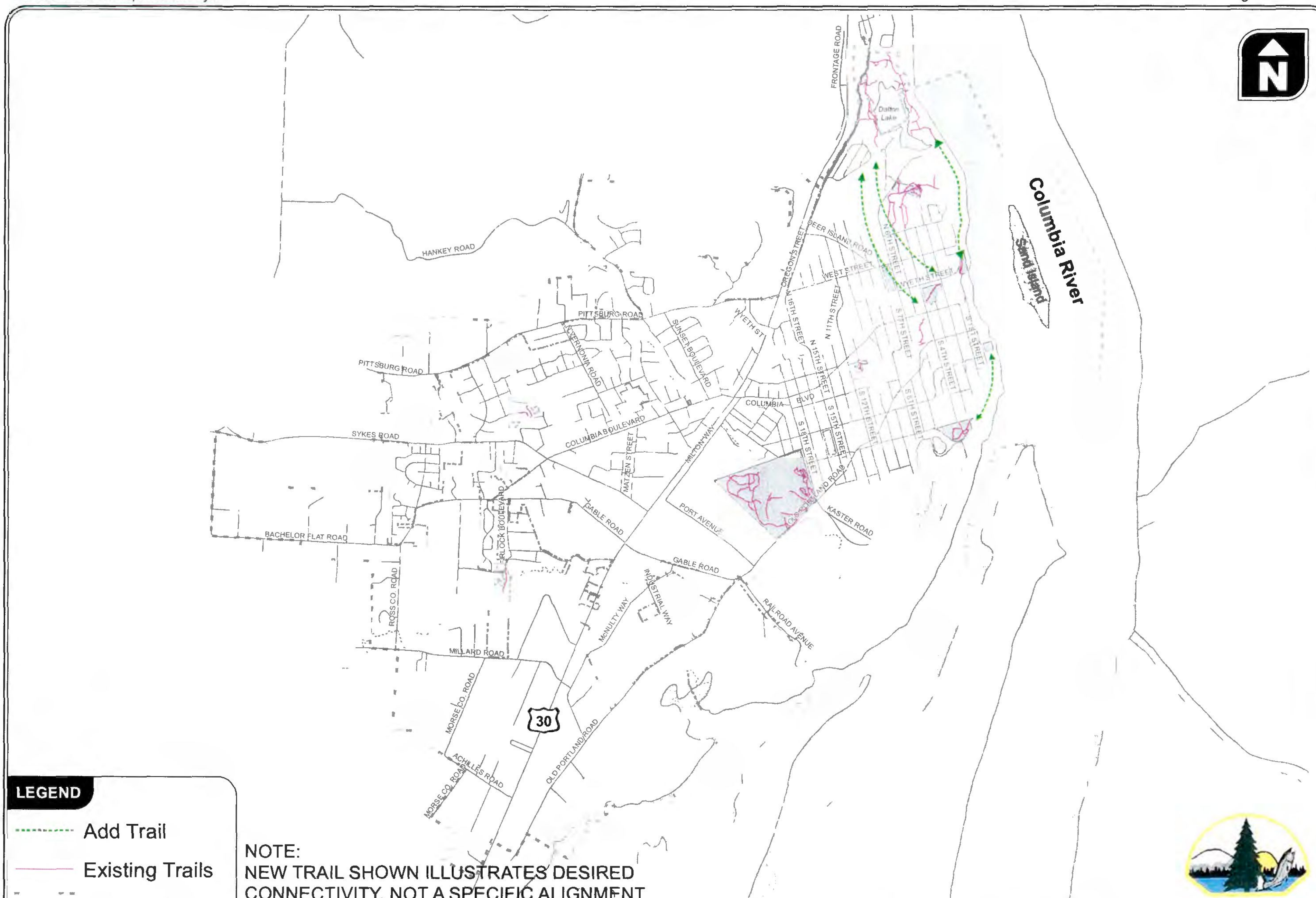
There are several other multi-use paths and trails throughout the city as well as new trail systems in various stages of planning and construction that can and will help provide short, local connections. Multi-use paths and trails can provide numerous benefits including:

- providing children and seniors with a safe, off-street alternatives to substandard roadways with no bike lanes, shoulders, or sidewalks;
- providing a safe, traffic-free path for walkers, joggers, cyclists, and others to exercise and enjoy the outdoors;
- supporting downtown economic development by providing an off-street transportation route to downtown businesses; and
- providing direct, non-motorized access to bus stops.



ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Separates bicyclists from vehicle traffic ▪ Combination of pedestrians and bicyclists requires less space than separate facilities for each	▪ Needs adequate space to accommodate buffer from street and width to allow the passing of bicyclists and pedestrians ▪ Bicycle and pedestrian conflicts ▪ Unsafe in highly urban areas or along roads with driveways	▪ Create new links to and expansion of Rutherford Parkway

Figure 6-3 illustrates the connectivity sought through a variety of potential trail improvement projects suggested as part of the Complete Streets Option. The trail improvement projects involve the installation of trails that connect the Dalton Lake trail system to the local street system and the downtown waterfront area per recommendations in the Conceptual Draft Dalton Lake Recreational Plan and the City's Waterfront Development Plan. Both plans include provisions for pedestrian access to waterfront areas through the development of a continuous trails system. The alignment of, and right-of-way required for, such trails would need to be further refined and may incorporate use of existing sidewalks as well as integration with roadway and intersection improvements.



PROPOSED TRAIL IMPROVEMENT PROJECTS
ST. HELENS, OREGON

FIGURE 6-3

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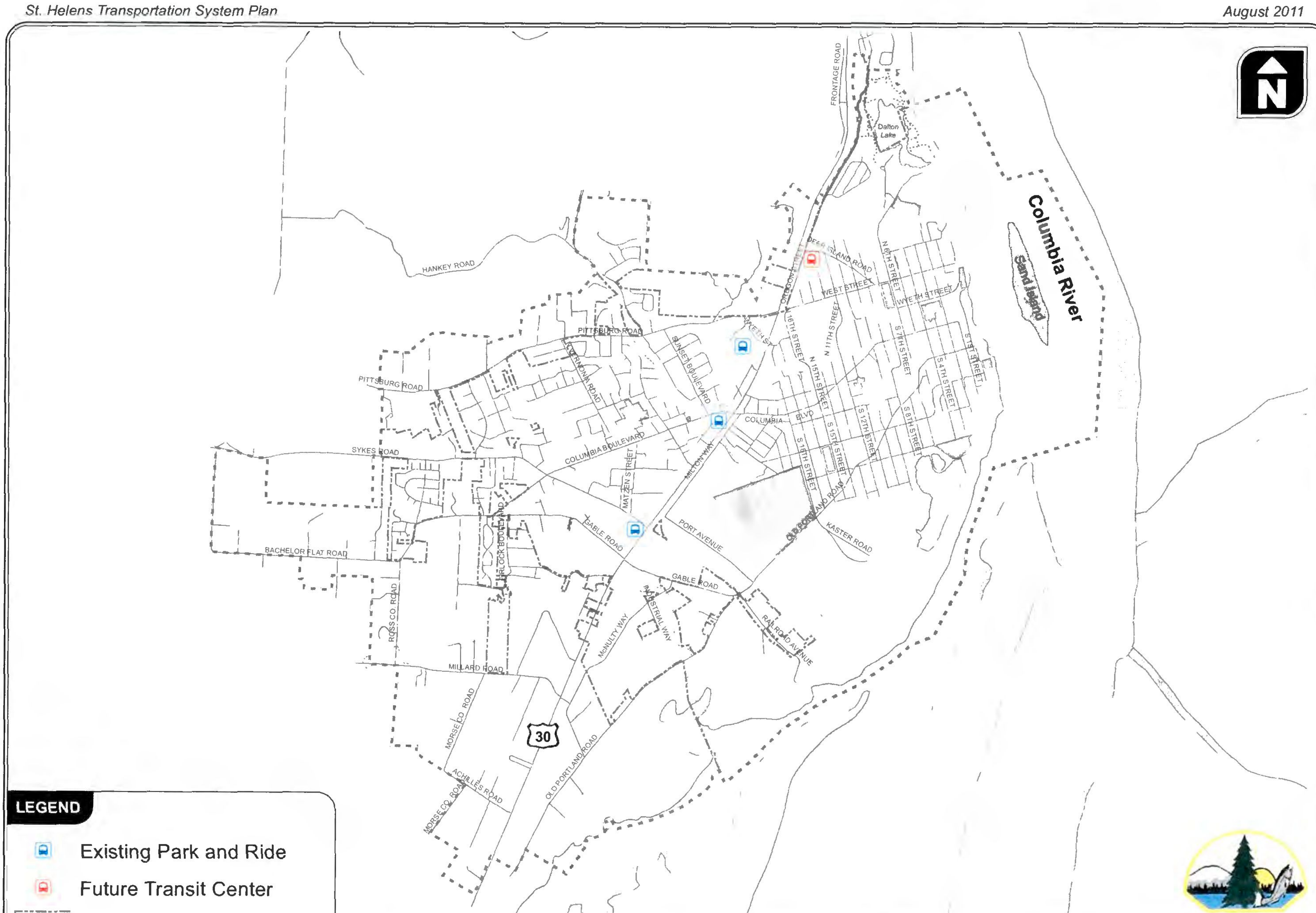
In addition to enhancing trails, the City continues to explore potential future river access to Sand Island. The possibility of some form of boat shuttle service has been considered, but no plans for implementation are currently underway.

Transit System Improvements

Columbia County completed a Transit Access Plan in 2009 that included the identification of specific transit improvements within St. Helens. The transit system improvements include the location and design of future transit stops and an evaluation of existing and future conditions at each stop. The recommendations were previously vetted through a community outreach process and are adopted by the County. As such, the City of St. Helens agreed to formally incorporate the recommendations into the TSP update. Figure 6-4 illustrates park and ride lots and a proposed transit center location within St. Helens. Further details about the individual adopted projects are included in Section 7.

Potential Functional Classification Plan Revisions

The City of St. Helens classifies roadways as major arterials, minor arterials, collectors, or local streets. Most of the City's functional classification designations are maintained as part of this update. However, it was observed that some streets designated as minor arterials have a considerable number of residential properties fronting the street where high traffic speeds and volumes may be undesirable and arterial access spacing standards are inappropriate. While these roadways should maintain an ability to distribute traffic between major arterials, collectors, and local streets, a lower functional classification may be more appropriate based on existing conditions. Other roadways have too low of a designation based on the form and function of the roadway. Table 6-1 summarizes proposed functional classification revisions and Figure 6-5 illustrates the proposed Functional Classification Plan.



LEGEND

Existing Park and Ride

Future Transit Center

City Limits

City UGB

EXISTING BUS STOP AND PROPOSED TRANSIT CENTER LOCATIONS
ST. HELENS, OREGON

FIGURE
6-4

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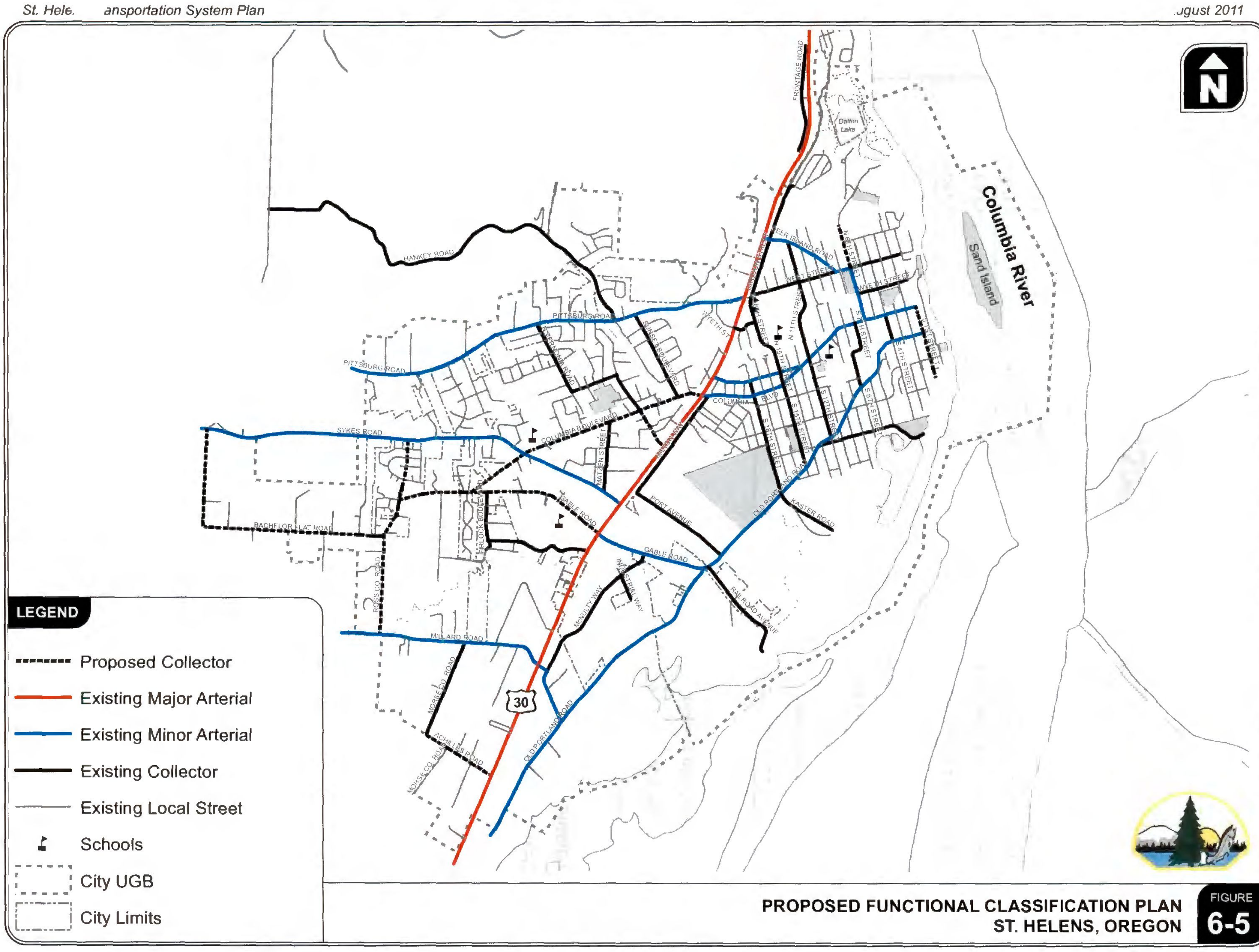

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TABLE 6-1: PROPOSED FUNCTIONAL CLASSIFICATION CHANGES

Roadway	1997 TSP	Proposed Change
Columbia Blvd. (West of US 30)	Minor Arterial	Collector
Vernonia Road (South of Columbia Blvd.)	Minor Arterial	Collector
Gable Road (West of US 30)	Minor Arterial	Collector
Bachelor Flat Road (Saulser to Columbia Blvd.)	Minor Arterial	Collector
Summit View Drive (north of Bachelor Flat Road)	Minor Arterial	Collector
Ross Road (Millard to Bachelor Flat Road)	Minor Arterial	Collector
Achilles Road (Morse Road to US 30)	Minor Arterial	Collector
S 1st Street (Columbia Blvd. to St. Helens Street	Minor Arterial	Collector
Saulser Road (Bachelor Flat to Sykes Road)	Local Street	Collector
N 6th Street (North of West Street)	Local Street	Collector
S 4th Street (south of St. Helens Street)	Local Street	Collector
S 1st Street (South of St. Helens Street)	Local Street	Collector

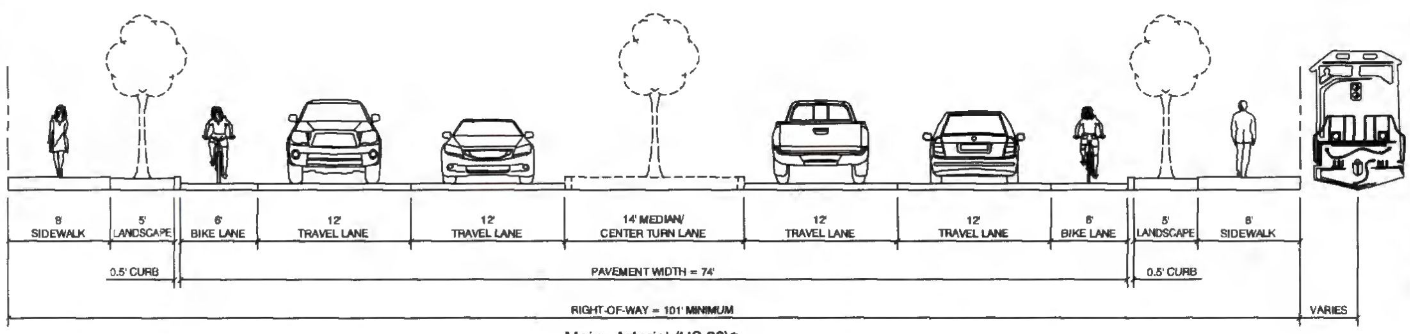
The proposed roadway changes are consistent with Columbia County's roadway network plans as presented in the Columbia County Transportation System Plan (Reference 11). For example, Columbia County currently classifies Bachelor Flat Road as a Minor Collector roadway.

In considering potential functional classification plan changes, it should be noted that Federal funding of roadway improvement projects through grants and other funding packages is generally targeted to roadways that have an arterial or higher classification. While collector facilities are less likely to receive external federal funding for improvements, there are state grants available for collector street improvements.

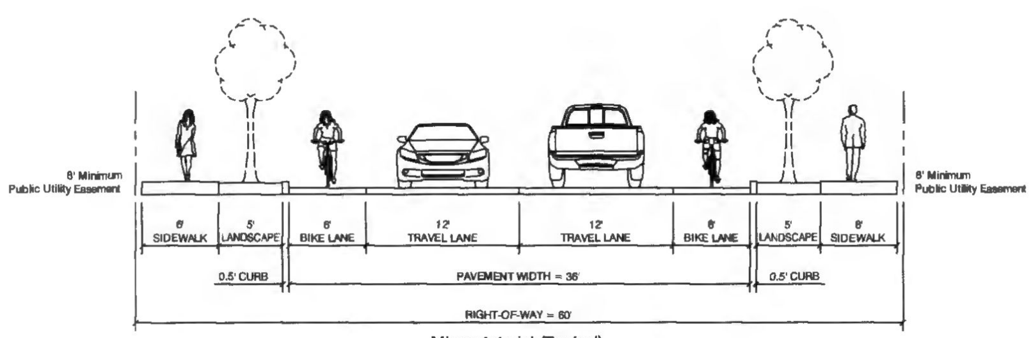
Potential Roadway Cross Section Standard Revisions

As documented in the Section 3, the roadway cross sections shown in the 1997 TSP are inconsistent with the street cross section information included in the City's Community Development Code. Therefore, new cross sections were developed for each of the functional classifications with assistance from City staff. Figures 6-6 and 6-7 illustrate the proposed street cross sections included in the Complete Streets Options.

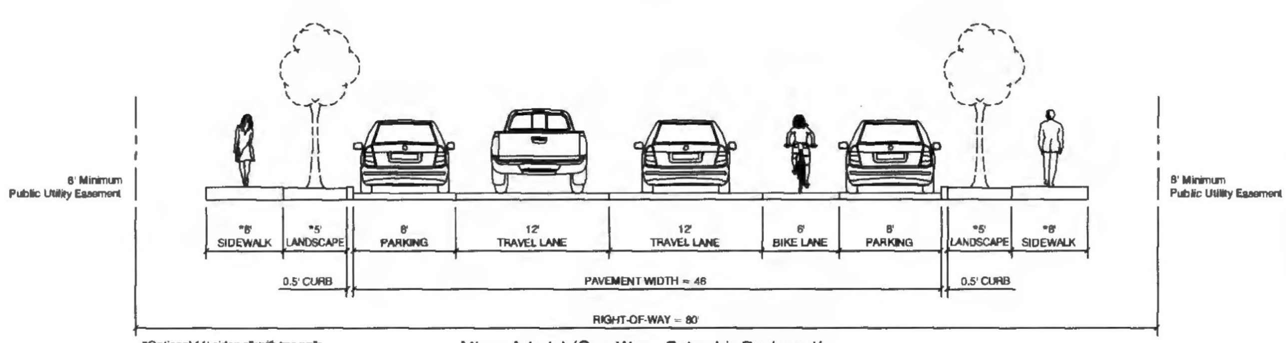
As shown in the figures, standard cross sections are provided for US 30 as well as St. Helens Street and Columbia Boulevard. Landscape strips and the potential for streets trees were incorporated into the standard cross sections based on community feedback and direction provided by the City. The addition



Major Arterial (US 30)*

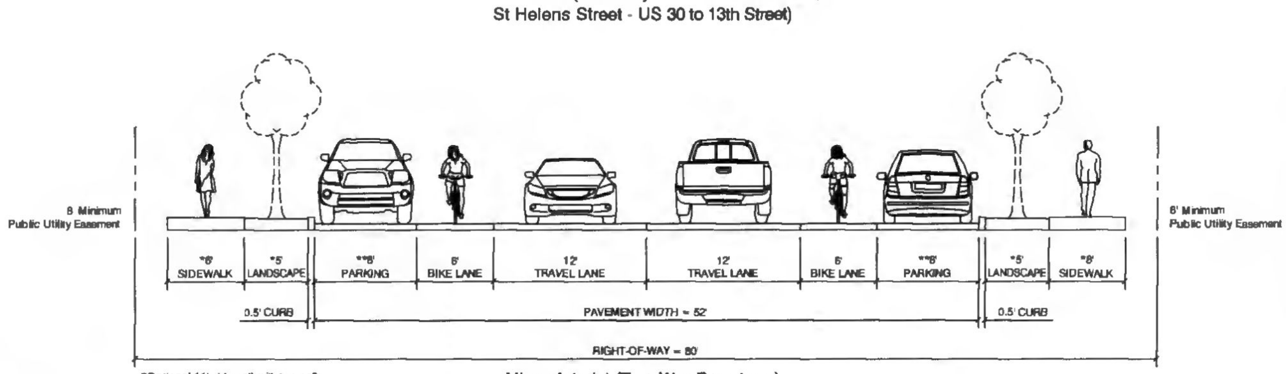


Minor Arterial (Typical)



*Optional 11' sidewalk with tree wells.

Minor Arterial (One-Way - Columbia Boulevard/ St Helens Street - US 30 to 13th Street)



*Optional 11' sidewalk with tree wells.
**On street parking may be reduced to allow for installation of a left-turn lane where needed.

Minor Arterial (Two-Way Downtown)

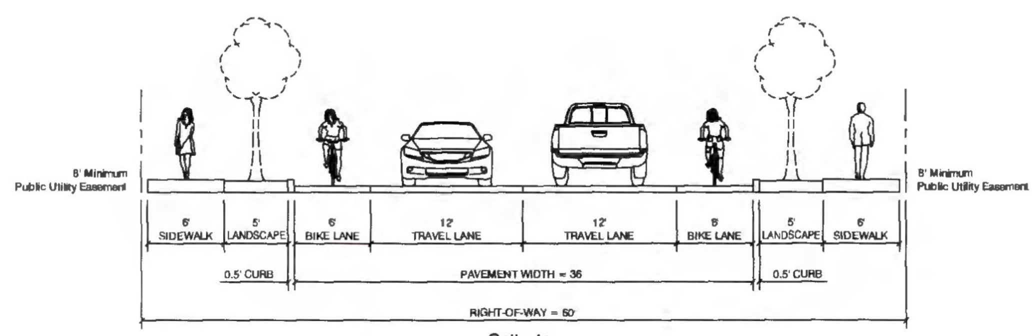
LEGEND

TREES TO BE PROVIDED AS APPROPRIATE PER CITY CODE AND LOCATION SPECIFIC CONSIDERATIONS

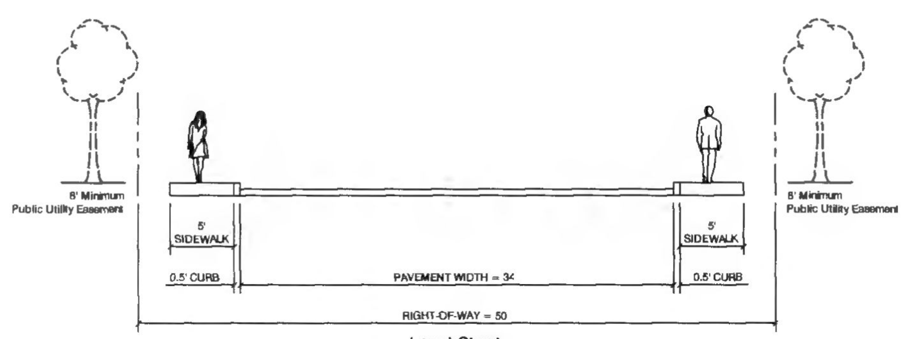
The US 30 Cross-Sections are shown to be consistent with ODOT Standards. Specific roadway designs will be developed through a refinement plan or project development process. Design and future improvements to US 30 must also address ORS 366.215 (Reduction in Vehicle Carrying Capacity) on this national freight network facility.

PROPOSED STREET CROSS SECTIONS
ST. HELENS, OREGON

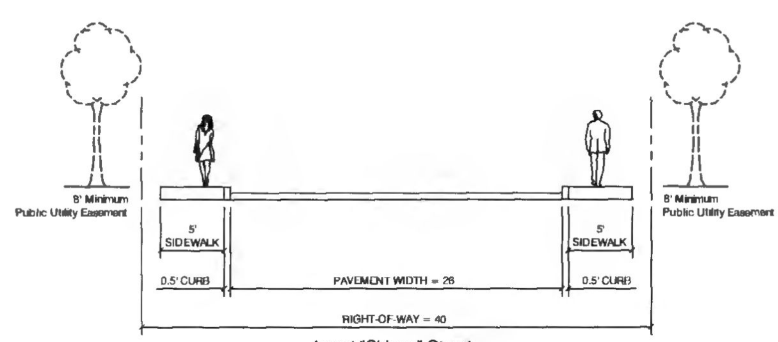
FIGURE **6-6**



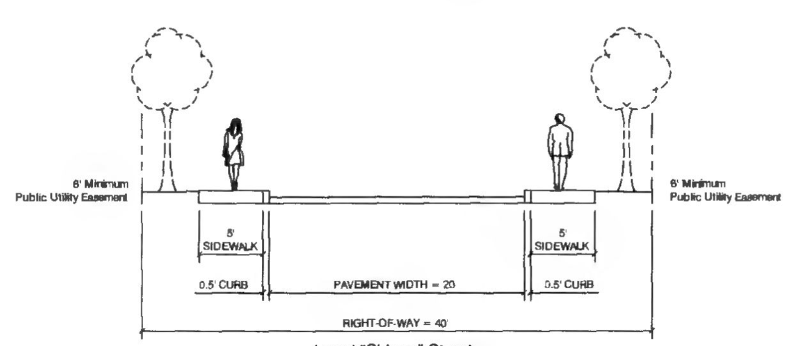
Collector



Local Street



Local "Skinny" Street



Local "Skinny" Street

LEGEND

TREES TO BE PROVIDED AS APPROPRIATE PER CITY CODE AND LOCATION SPECIFIC CONSIDERATIONS

PROPOSED STREET CROSS SECTIONS
ST. HELENS, OREGON

FIGURE
6-7

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of street trees was approved and adopted by the City on December 1, 2010. Incorporating street trees and landscaping offers benefits including reduced travel speeds, an enhanced pedestrian experience, and beautification of the roadway.

Complete Streets Options Recommended for Inclusion in the Updated TSP

While the Complete Streets projects do not provide intersection vehicular capacity mitigation per se, they provide critical pedestrian and vehicular improvements and are recommended for inclusion in the TSP Update. Tables 6-2 through 6-5 summarize the pedestrian and bicycle improvement projects included in the complete streets option that are part of the TSP Update.

SIDEWALK IMPROVEMENT PROJECTS

The estimated project costs shown in Table 6-2 reflect the planning level costs associated with the installation of sidewalks and/or curbs on one or two sides of a given roadway in accordance with the proposed street cross sections. The costs also include estimates for mobilization, landscaping, traffic control, architectural/ engineering, and construction management. The costs do not include the purchase of additional right-of-way or widening the road (road widening is accounted for in the bicycle improvement projects).

TABLE 6-2: PEDESTRIAN IMPROVEMENT PROJECTS

Project No.	Project Location	Project Description	Estimated Cost
P01	Sunset Blvd. (Pittsburg Road to Columbia Blvd.)	Add curbs and sidewalks	$668,000
P02	Columbia Blvd. (Sykes Road to US 30)	Add curbs and sidewalks	$1,353,000
P03	Sykes Road (Summit View Drive to Columbia Blvd.)	Add curbs and sidewalks	$805,000
P04	Sykes Road (Columbia Blvd. to US 30)	Add curbs and sidewalks	$190,000
P05	Bachelor Flat Road (Ross Road to Columbia Blvd.)	Add curbs and sidewalks	$804,000
P06	Columbia Blvd. (Gable Road to Sykes Road)	Add curbs and sidewalks	$400,000
P07	Gable Road (Bachelor Flat to US 30)	Add curbs and sidewalks	$995,000
P08	Vernonia Road (Pittsburg Road to US 30)	Add curbs and sidewalks	$1,319,000
P09	McNulty Way (Millard Road to Gable Road)	Add curbs and sidewalks	$749,000
P10	16th Street (West Street to Middle School Driveway	Add curbs and sidewalks	$266,000
P11	Firlock Park Road (Gable Road to US 30)	Add curbs and sidewalks	$1,103,000
P12	18th Street (Columbia Blvd. to Old Portland Road)	Add curbs and sidewalks	$638,000
P13	12th Street (Columbia Blvd. to Old Portland Road)	Add curbs and sidewalks	$580,000
P14	Matzen Street (Columbia Blvd. to Sykes Road)	Add curbs and sidewalks	$94,000
P15	Old Portland Road (Gable Road to St. Helens Street)	Widen roadway and add bike lanes	$2,199,000
P16	Pittsburg Road (Barr Road to Vernonia Road)	Add curbs and sidewalks	$680,000
P17	Pittsburg Road (Vernonia Road to Sunset Blvd.)	Add curbs and sidewalks	$402,000
P18	Port Avenue (Milton Way to Old Portland Road)	Add curbs and sidewalks	$453,000
P19	Milton Way (Port Avenue to Columbia Blvd.)	Add curbs and sidewalks	$756,000
P20	Oregon Street (West Street to Rutherford Parkway)	Add curbs and sidewalks	$841,000
P21	Deer Island Road (US 30 to West Street)	Add curbs and sidewalks	$591,000

INTERSECTION IMPROVEMENT PROJECTS

Table 6-3 summarizes pedestrian facility improvement projects at key intersections throughout the City, along with the corresponding planning level cost estimate.

TABLE 6-3: PEDESTRIAN FACILITY IMPROVEMENT PROJECTS AT INTERSECTIONS

Project No.	Project Location	Project Description	Estimated Cost
P22	Columbia Blvd./Sykes Road	Install 2 striped crosswalks and 6 new ADA ramps	$19,000
P23	18th Street/Old Portland Road	Install 2 striped crosswalks and new 6 ADA ramps	$19,000
P24	Columbia Blvd./St. Helens Couplet	Install curb extensions (4 locations)	$106,000
P25	Columbia Blvd. Couplet to 2nd Street	Install curb extensions and island refuges (8 locations)	$200,000
P26	Columbia Blvd./1st Street	Install 1 striped crosswalk and 3 new ADA ramps	$10,000
P27	St. Helens Street	Install curb extensions (4 locations)	$106,000
P28	US 30 Corridor	Install Pedestrian Countdown Heads (5 Locations)	$15,000

BICYCLE IMPROVEMENT PROJECTS

The estimated project costs shown in Table 6-4 reflect the total planning level costs associated with widening on one or two sides of a given roadway to accommodate bicycle lanes if needed and installing bicycle pavement markings. The costs also include estimates for relocating storm drains, signing and striping, mobilization, traffic control, architectural/ engineering, and construction management. The costs do not include the purchase of additional right-of-way.

TABLE 6-4: BICYCLE LANE IMPROVEMENT PROJECTS

Project No.	Project Location	Project Description	Estimated Cost
B01	Cherrywood Drive (Vernonia Road to Columbia Blvd.)	Add sharrows	$4,500
B02	Barr Avenue (Pittsburg Road to Sykes Road)	Add sharrows	$5,500
B03	Sunset Blvd. (Pittsburg Road to Columbia Blvd.)	Add bike lanes	$15,000
B04	Columbia Boulevard (Sykes Road to US 30)	Add bike lanes	30,000
B05	Sykes Road (Summit View Drive to Columbia Blvd.)	Widen roadway and add bike lanes	$643,000
B06	Bachelor Flat Road (Ross Road to Columbia Blvd.)	Widen roadway and add bike lanes	$461,000
B07	Columbia Blvd. (Gable Road to Sykes Road)	Widen roadway and add bike lanes	$304,000
B08	Gable Road (Bachelor Flat to US 30)	Widen roadway and add bike lanes	$502,000
B09	Vernonia Road (Pittsburg Road to US 30)	Widen roadway and add bike lanes	$482,000
B10	McNulty Way (Millard Road to Gable Road)	Widen roadway and add bike lanes	$337,000
B11	Firlock Park Road (Gable Road to US 30)	Widen roadway and add bike lanes	$891,000
B12	18th Street (Columbia Blvd. to Old Portland Road)	Widen roadway and add bike lanes	$242,000
B13	12th Street (Columbia Blvd. to Old Portland Road)	Widen roadway and add bike lanes	$364,000
B14	Matzen Street (Columbia Blvd. to Sykes Road)	Widen roadway and add bike lanes	$51,000
B15	Old Portland Road (Gable Road to St. Helens Street)	Widen roadway and add bike lanes	$1,048,000
B16	Old Portland Road (Millard Road to Gable Road)	Add 10-foot Multi-Use Path on east side of roadway	$872,000
B17	Old Portland Road (City Limits to Millard Road)	Add 10-foot Multi-Use Path on east side of roadway	$517,000
B18	Pittsburg Road (Barr Road to Vernonia Road)	Widen roadway and add bike lanes	$562,000
B19	Pittsburg Road (Vernonia Road to Sunset Blvd.)	Widen roadway and add bike lanes	$242,000
B20	Port Avenue (Milton Way to Old Portland Road)	Widen roadway and add bike lanes	$340,000
B21	Milton Way (Port Avenue to Columbia Blvd.)	Widen roadway and add bike lanes	$709,000

BICYCLE CROSSING IMPROVEMENT PROJECTS

Table 6-5 summarizes bicycle crossing improvement projects at key intersections on US 30, along with the corresponding planning level cost estimate.

TABLE 6-5: BICYCLE CROSSING IMPROVEMENT PROJECTS

Project No.	Project Location	Project Description	Estimated Cost
B22	US 30/St. Helens Street	Reconfigure bike lane striping across right turn lane	$5,000
B23	US 30/Gable Road	Enhance existing bicycle facilities with pavement markings and signage	$5,000

1997 TSP OPTION

The 1997 TSP Option includes many of the capacity improvements recommended in the currently adopted TSP unless otherwise noted. This option incorporates the Transportation System Management (TSM) strategies identified in the 1997 TSP, including the addition of several new roadway facilities and the installation of several new traffic signals at key study intersections.

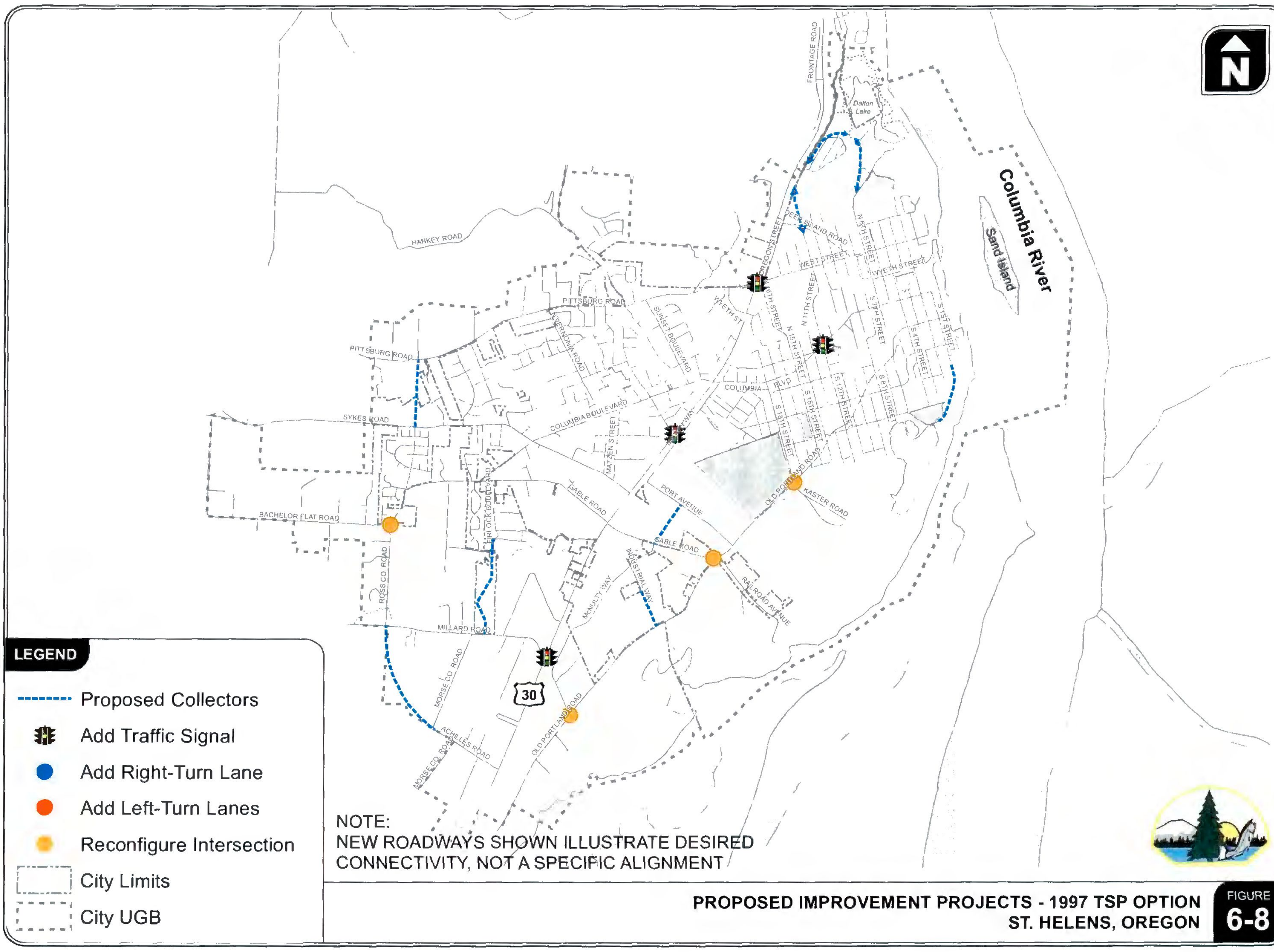
ROADWAY IMPROVEMENTS

Several of the new roadway facilities recommended in the 1997 TSP have been completed or are in various stages of completion, while several others are no longer considered viable. This option includes many of the same new roadway facilities recommended in the 1997 TSP that have not yet been completed as well as new roadway facilities identified throughout the TSP update process. Figure 6-8 illustrates the location of the new roadway facilities and the potential alignment of two future facilities included in the 1997 TSP Option. All of the new roadway facilities shown in Figure 6-8 would include the addition of sidewalks, bicycle lanes, travel lanes, and on-street parking based on the functional classification of the individual roadway. Each facility is intended to improve circulation throughout the city while reducing reliance on US 30.

Roadway Improvement Projects Proposed For Removal from 1997 TSP

Based a review of existing development patterns and feedback from City staff, the following roadway projects recommended in the 1997 TSP now appear impractical:

- St. Helens Street Extension (US 30 to Columbia Boulevard): this project no longer appears viable given its significant impact on existing developments west of US 30, the challenges associated with connecting St. Helens Street and Columbia Boulevard at a new intersection west of US 30, and the minimal operational improvement gained.
- US 30 Frontage Roads: a system of frontage roads west of, and parallel to, US 30 was identified in the 1997 TSP but has proven nearly impossible to implement since the TSP was adopted. The project is now considered infeasible given significant impacts on existing developments west of US 30 and the amount of right-of-way required for each segment of new roadway.
- Milton Way Extension (Port Avenue to Gable Road): the alignment shown in the 1997 TSP would require an at-grade railroad crossing at a skewed angle that may not be feasible. The new alignment shown in Figure 6-8 is intended to provide the same level of connectivity without the skew, improving the potential for obtaining a new at-grade railroad crossing.



LEGEND

- Proposed Collectors
- Add Traffic Signal
- Add Right-Turn Lane
- Add Left-Turn Lanes
- Reconfigure Intersection
- City Limits
- City UGB

NOTE:
NEW ROADWAYS SHOWN ILLUSTRATE DESIRED CONNECTIVITY, NOT A SPECIFIC ALIGNMENT

PROPOSED IMPROVEMENT PROJECTS - 1997 TSP OPTION
ST. HELENS, OREGON

FIGURE
6-8

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INTERSECTION IMPROVEMENTS

This option includes several of the intersection capacity improvement projects identified in the 1997 TSP as well as several new improvement projects identified through the TSP update process, including:

- the addition of a right-turn lane at US 30/Gable Road intersection,
- the reconstruction of the Old Portland Road/Gable Road intersection to emphasize through movements on Old Portland Road,
- the reconstruction of the Columbia Boulevard/Sykes Road intersection to provide left-turn lanes on Columbia Boulevard,
- the reconstruction of the Ross Road/Bachelor Flat Road intersection to provide left-turn lanes, and,
- the provision of traffic signals at four locations, including:
  - US 30/Millard Road
  - US 30/Vernonia Road
  - US 30/Pittsburg Road
  - Columbia Boulevard/12th Street

The need to coordinate the new traffic signals along US 30 with the existing traffic signals and to retime and optimize the entire signal system was also identified as a priority under this option. It should be noted that the US 30/Vernonia Road and US 30/Pittsburg Road intersections may require approval of a deviation to the access spacing standards to accommodate signalization. Figure 6-8 illustrates the location and type of intersection improvement projects included in the 1997 TSP Option.

In addition to the capacity improvements identified above, regrading of the southwest corner of the US 30/Millard Road intersection is recommended to provide clear sight distance for eastbound drivers looking in the southern direction. Further, available sight lines for eastbound drivers facing south at the intersection can be enhanced by removing temporary and permanent signs located on the intersection corner that limit drivers view. If the intersection is signalized, the sight distance improvements will be less important.

Intersection Improvement Projects Proposed For Removal from 1997 TSP

Based on the intersection operations assessment and community feedback, some of the intersection improvements included in the 1997 TSP are either no longer considered viable and/or other alternative mitigation measures have been identified. Improvement projects contained in the current TSP that are no longer recommended for implementation are discussed below.

The 1997 TSP recommended the installation of traffic signals at two additional intersections when warranted. However, based on the 2031 traffic volume projections, signalization of these intersections is not anticipated to be warranted within the 20-year planning horizon and the intersections are forecast to continue to operate acceptably from a capacity perspective. The two locations are:

- Columbia Boulevard/Vernonia Road
- Columbia Boulevard/6th Street

Other types of traffic control, such as all-way stop control, could be considered at the Columbia Boulevard/6th Street intersection for safety or capacity reasons as traffic volumes increase. Roundabouts could also be considered at several locations throughout the city as a way of mitigating safety concerns at unsignalized intersections or operational issues at intersections that do not meet mobility standards, but do not meet signal warrants. The following intersections have been identified as potential roundabout locations:

- Columbia Boulevard/12th Street: Although the 1997 TSP recommended a traffic signal at this location, a traffic signal is not expected to be warranted based on evaluation of preliminary signal warrants. A roundabout in this location, however, could improve traffic operations and serve as a gateway treatment into the commercial areas along Columbia Boulevard and St. Helens Street as well as into the downtown. In addition to serving a traffic control function, roundabouts present opportunities to create community focal points, landscaping, and other gateway features within an intersection form that is safe and efficient.
- Columbia Boulevard/Sykes Road: Both this intersection and the Columbia Boulevard/12th Street intersection are near schools. A primary benefit of a roundabout is enhanced safety and the reduction of vehicle speeds in and around the roundabout. Roundabouts improve pedestrian crossing opportunities, providing mid-block refuge and the ability for pedestrians to focus on one traffic stream at a time while crossing with or without crossing guards.
- 1st Street/Cowlitz Street: A roundabout at this intersection, or perhaps further to the south, could serve as another gateway treatment into the downtown area when the Plymouth Street extension is complete. A roundabout could also enhance the U-turn movement that has occurred at this location for some time.

Additional information related to roundabouts, including general characteristics, user and location considerations, and potential benefits are well documented and can be found in the FHWA's *Technical Summary on Roundabouts* (Reference 12) and NCHRP Report 672, *Roundabouts: An Informational Guide, Second Edition* (Reference 13).

The 1997 TSP also recommended installation of a second westbound left-turn lane at the US 30/Gable Road intersection. For reasons explained further later in this section, installation of a second westbound left-turn lane on Gable Road is no longer recommended.

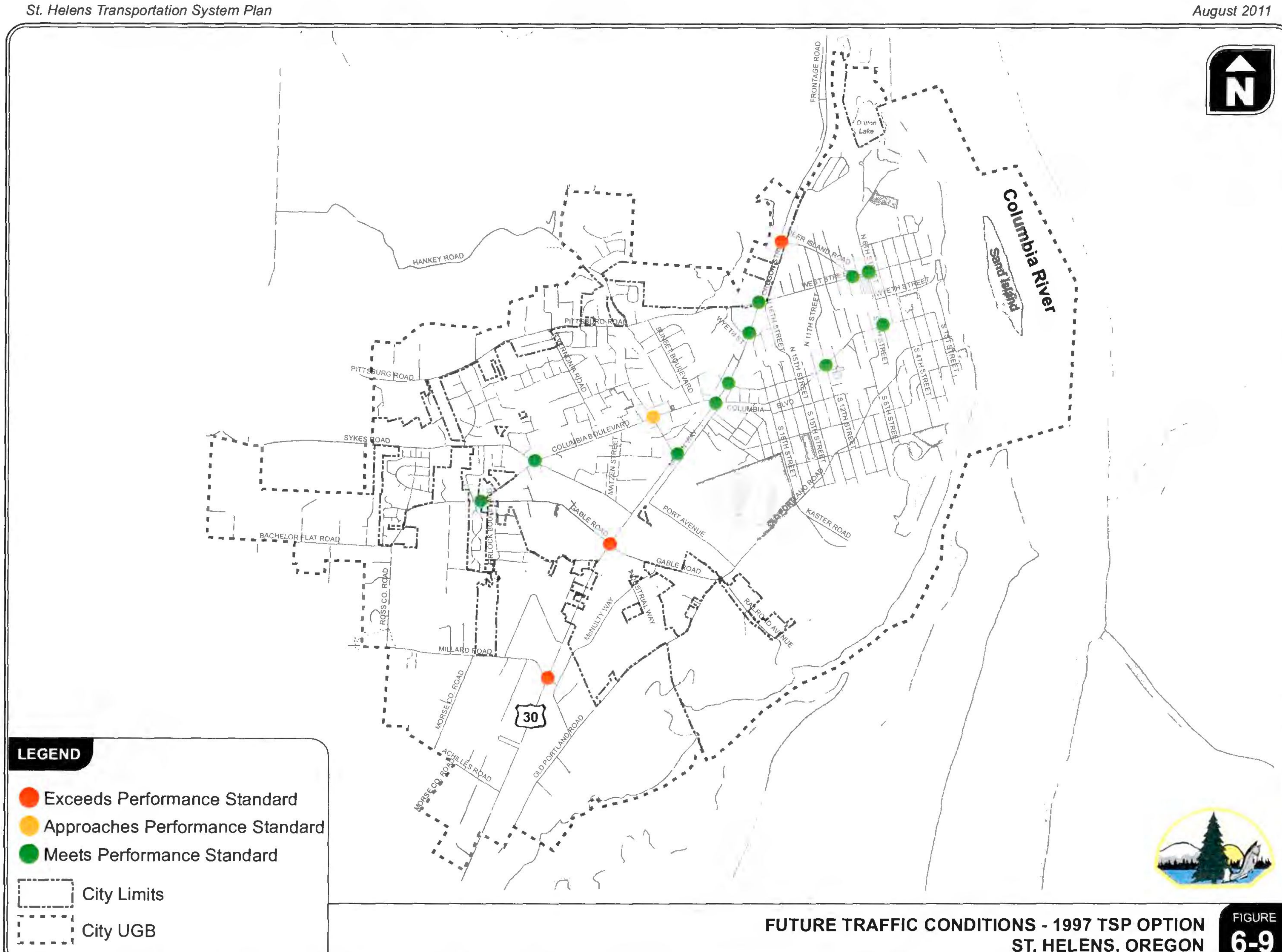
Study Intersection Operations Impact

Figure 6-9 summarizes those intersections that operate acceptably, unacceptably, and near capacity assuming the improvements identified in the 1997 TSP Option. As shown in the figure, the US 30/Millard Road, US 30/Gable Road, and US 30/Deer Island Road intersections would operate unacceptably under the TSP Option. Additional and/or alternative mitigation measures at these intersections are provided below. Also shown in Figure 6-9, operations at the Bachelor Flat/Gable Road intersection improve as compared to the no-build as east-westbound vehicles re-route toward the south with the provision of a traffic signal at the US 30/Millard Road intersection.

1997 TSP Options Recommended for Inclusion in the Updated TSP

While the TSP Option projects do not mitigate all of the forecast transportation system needs, many of the individual improvement projects are applicable for inclusion in the TSP Update. Tables 6-6 and 6-7 summarize the roadway and intersection improvement projects included in the 1997 TSP Option that are recommended to become part of the final TSP update based on feedback from the community and City, County, and ODOT staff[9].

[9] Before a signal can be installed on the State system, OAR 734-020-0440 requires a traffic engineering investigation that shows how traffic signal warrants and highway design and spacing standards are met with the proposed signal and how the proposed signal would improve the overall safety and operation of the intersection. A progression analysis would be required as per OAR 734-020-0470 for signals that will not meet the one half mile minimum spacing standard for traffic signals on State highways. Signals may not be installed until signal warrants are satisfied and the installation request and design has been approved by the State Traffic Engineer (OAR 734-020-0410).



FUTURE TRAFFIC CONDITIONS - 1997 TSP OPTION
ST. HELENS, OREGON

FIGURE 6-9

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TABLE 6-6: STREET IMPROVEMENT PROJECTS (NEW ROADWAYS)

Project No.	Project Roadway	From/To	Order-of-Magnitude Project Cost
S01	Summit View Drive Extension	Install roadway, curbs, and sidewalks	$1,656,000
S02	Achilles Road Extension	Install roadway, curbs, and sidewalks	$2,952,000
S03	Industrial Way Extension	Install roadway, curbs, and sidewalks	$1,000,000
S04	Plymouth to 1st Street Extension	Install roadway, curbs, and sidewalks	$1,505,000
S05	Firlock Park Extension	Install roadway, curbs, and sidewalks	$2,260,000
S06[1]	Milton Way Extension	Install roadway, curbs, and sidewalks	$1,767,000
S07	Millard Road	Reconstruct roadway to City street standards	$2,892,000
S08	Ross Road	Reconstruct roadway to City street standards	$1,617,000

[1]Project will require coordination/approval by ODOT Rail Division. In addition to the estimated roadway construction costs, the order-of-magnitude cost includes the provision of left-turn lanes along Gable Road, detection along the spur track, and crossing gates with warning lights and bells at the rail crossing.

TABLE 6-7: INTERSECTION IMPROVEMENT PROJECTS

Project No.	Project Roadway	Project Description	Order-of-Magnitude Project Cost
S09	Ross Road/Bachelor Flat Road	Conduct a study and implement AWSC if warranted	$12,000
S10	US 30/Millard Road	Regrade southwest corner to provide adequate sight distance	$20,000
S11	18th Street/Old Portland Road	Reconfigure intersection to stop control or upgrade signal to current standard	$100,000
S12[1]	US 30/Deer Island Road	Install westbound right-turn lane	$485,000
S13[1,2]	US 30/Millard Road Intersection	Install traffic signal and reconfigure the McNulty Way/Millard Road intersection to accommodate heavy truck turning movements	$1,000,000
S14	Columbia Boulevard/Sykes Road	Install left-turn lanes on Columbia Boulevard	$368,000
S15	Ross Road/Bachelor Flat Road	Reconfigure intersection to emphasize the northbound-through movement	$769,000
S16	Old Portland Road/Millard Road	Widen intersection to accommodate heavy truck turning movements	$60,000
S17[1]	US 30/Gable Road	Install westbound right-turn lane	$485,000
S18[2]	US 30/Pittsburg Road	Install traffic signal	$400,000
S19[2]	US 30/Vernonia Road	Install traffic signal	$400,000
S20[2]	12th Street/Columbia Blvd.	Install traffic signal or roundabout	$250,000
S21	Old Portland Road/Gable Road	Realign intersection to emphasize northbound movement	$2,785,000

[1]Project will require coordination/approval by ODOT and ODOT Rail Division. Engineering studies, traffic analysis, and conformance with ODOT standards will be evaluated as projects are developed.
[2]Project must meet traffic signal warrants and receive approval from State Traffic Engineer. Engineering studies, signal warrant and traffic analysis, and conformance with ODOT standards will be evaluated as projects are developed.

RAIL CORRIDOR OPTION

The primary focus of the Rail Corridor Option is the development of an ultimate highway/rail grade crossing plan along the Portland and Western Railroad (PNWR)/US 30 corridor. This option includes improvements to key study intersections, rail crossings, and other related facilities identified in the Lower Columbia River Rail Corridor Plan (LCRRC).

RAIL CORRIDOR IMPROVEMENTS

Grade Crossings

Grade crossings are classified by the type of protection provided and are considered either active or passive. Active crossing systems generally have an electronic train detection system with flashing lights that warn the motorist when a train is approaching or at the crossing. Although an active crossing system is relatively expensive to install and maintain, it provides a safer grade crossing as compared to a passive system. A passive system simply denotes the location of the crossing (typically through signing or pavement markings) and depends on the motorist to detect and yield the right-of-way to the train. Depending on the available sight distance and train speeds, passive crossings require a comparatively high level of awareness on the part of the motorist. All of the PNWR railroad crossings adjacent to US 30 in St. Helens have active crossing systems.

Preemption and Interconnect Requirements

For safety reasons, traffic signals on US 30 in St. Helens adjacent to the PNWR grade crossings are able to communicate with each other using "interconnect" between the traffic signal equipment and the railroad equipment. The interconnect link allows the railroad equipment to communicate the approach and presence of a train to the traffic signal equipment.

Interconnect is currently provided at the grade crossings of Gable Road, Columbia Boulevard, St. Helens Road, and Deer Island Road. When a train approaches each of these crossings, the adjacent traffic signal's normal operations are pre-empted and the traffic signal shifts focus to moving vehicles off of the roadway approach with the grade crossing. Signs are also illuminated on the highway to prevent highway traffic from turning onto the grade crossing.

Potential Railroad Grade Crossing Closures

Within St. Helens, the LCRRC study recommends studying the potential closure of the Wyeth Street railroad grade crossing, which would require westbound vehicles currently using the intersection to reroute either toward the south via St. Helens Street or toward the north via Deer Island Road.

Pedestrians and bicyclists would also have to reroute and access US 30 from either the grade crossing at Deer Island Road or St. Helens Street. The LCRRC study provides context for closing grade crossings as follows:

- Eliminating redundant or unnecessary roadway/railroad at-grade crossings is an important part of improving safety of rail corridors. Yet, closing a road is a serious, and possibly contentious, undertaking. Property owners must be provided access to the transportation network, and even with alternative access, there is often resistance to changing long-standing travel patterns. Thus, the goals of safety, public necessity, convenience, economics and the right to access property along a railroad alignment must be balanced, when considering closing roads.

The ODOT (Rail Division) has the authority, within Oregon, to eliminate highway/rail at grade crossings (ORS Section 824.206 (1998)). Closure requests can be initiated by ODOT, the railroad or the local jurisdiction. In an effort to make closures more attractive to local communities, ODOT Rail offers assistance in improving intersections at locations near those which can be closed. Because at-grade crossing safety upgrades are expensive ODOT Rail's approach to closures enables more frequently used crossings to receive the needed safety upgrades.

ROADWAY-FOCUSED SOLUTIONS

US 30 Turn Lane Capacity Near Railroad Crossings

Traffic, especially during the evening peak period, can begin to queue to make right turns onto streets with at-grade highway/rail crossings along US 30. Without adequate storage, these queues can block through traffic on US 30, and create the potential for rear-end collisions or other crashes. The LCRRC study recommends extending the right-turn lane storage at the US 30/Columbia Boulevard intersection by 65-feet and will also require a standard ODOT taper length.

Similarly, southbound motorists wishing to make left hand turns onto cross streets with highway/rail grade crossings can be blocked by trains. Queues at signalized US 30 intersections can back up significantly during peak periods (notably morning peaks). This situation adds to congestion, and poses a safety concern as motorists encounter a long queue and/or try to go around it. Additional storage and/or signalization is recommended at several locations on the corridor as part of the Rail Corridor Option.

Figure 6-10 illustrates the changes to affected study intersection lane configurations and traffic control devices under the Rail Corridor Option as per the LCRRC Plan. Other non-intersection improvements are summarized below.

Relocated St. Helens Switching Operations

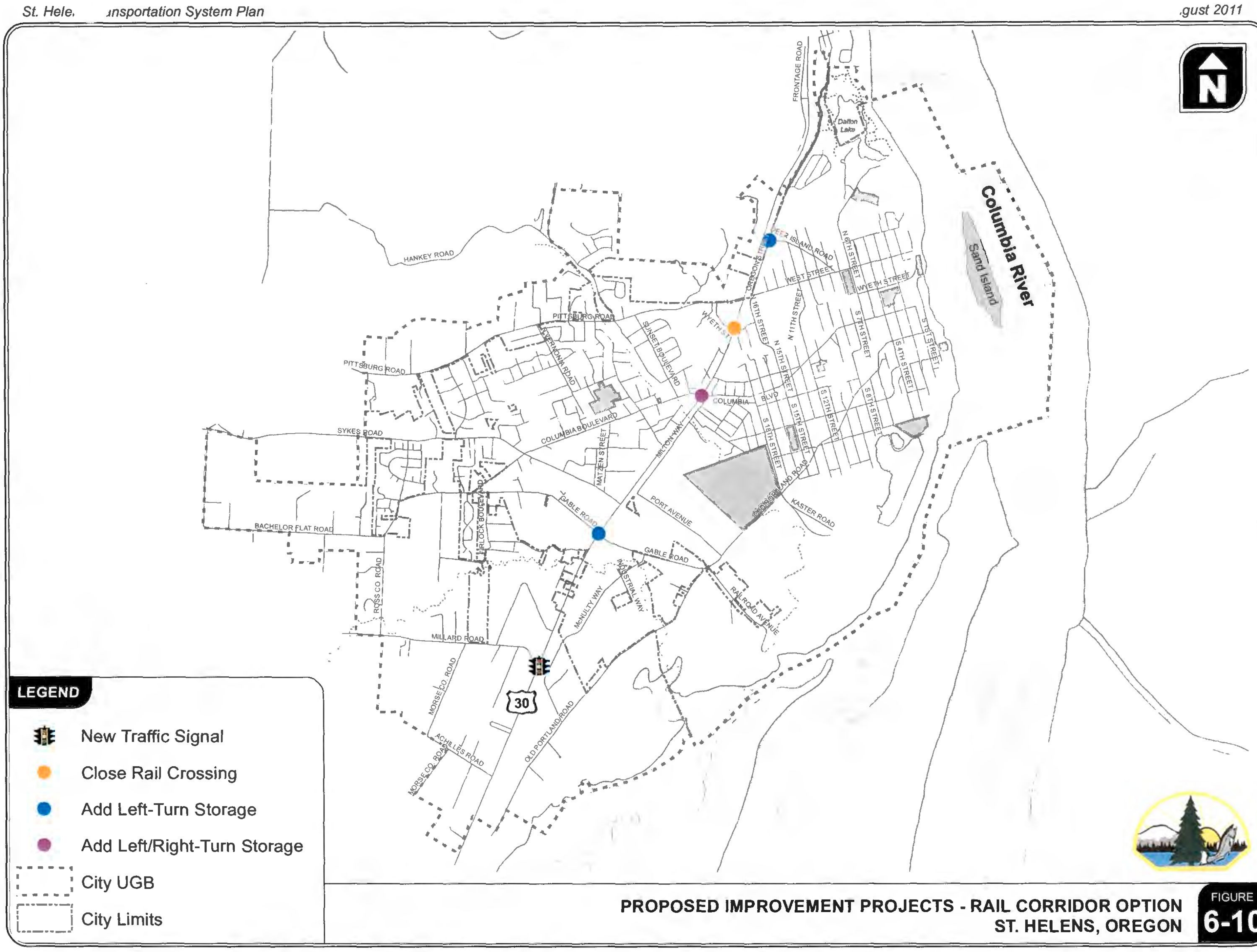
St. Helens Yard is a rail yard that supports local rail-served customers. It also creates a mobility barrier within the community for motor vehicle and pedestrian traffic. As indicated in the existing conditions analysis, both the community and the railroad are concerned about trespassing, as it represents a potential safety risk and liability issue. The LCRRC Plan noted the potential option of relocating the rail yard outside City limits. The Plan further notes that PNWR will continue to serve customers in the St. Helens area and that it may be impossible for the railroad to completely vacate the yard. With an estimated $3.67 million relocation cost (without land acquisition costs) and no currently identified suitable replacement site, the timeline for any potential relocation is unknown.

Fencing or Landscape Barriers

The LCRRC Plan recommended installation of fencing along St. Helens yard as a partial solution to trespassers. The plan estimated an order-of-magnitude chain-link fencing cost of $84,000 not including maintenance and further noted that more visually appropriate fencing solutions (such as incorporating sight-obscuring slats or landscape elements) would involve additional costs.

Study Intersection Operations Impact

Figure 6-11 summarizes those intersections that operate acceptably, unacceptably, and near capacity assuming the improvements identified in the Rail Corridor Option. As shown in the figure, a majority of the intersections continue to operate in failure under the Rail Corridor Option. As in the previous option, operations at the Bachelor Flat/Gable Road intersection improve as east-westbound vehicles re-route toward the south with the provision of a traffic signal at the US 30/Millard Road intersection.



PROPOSED IMPROVEMENT PROJECTS - RAIL CORRIDOR OPTION
ST. HELENS, OREGON

FIGURE 6-10

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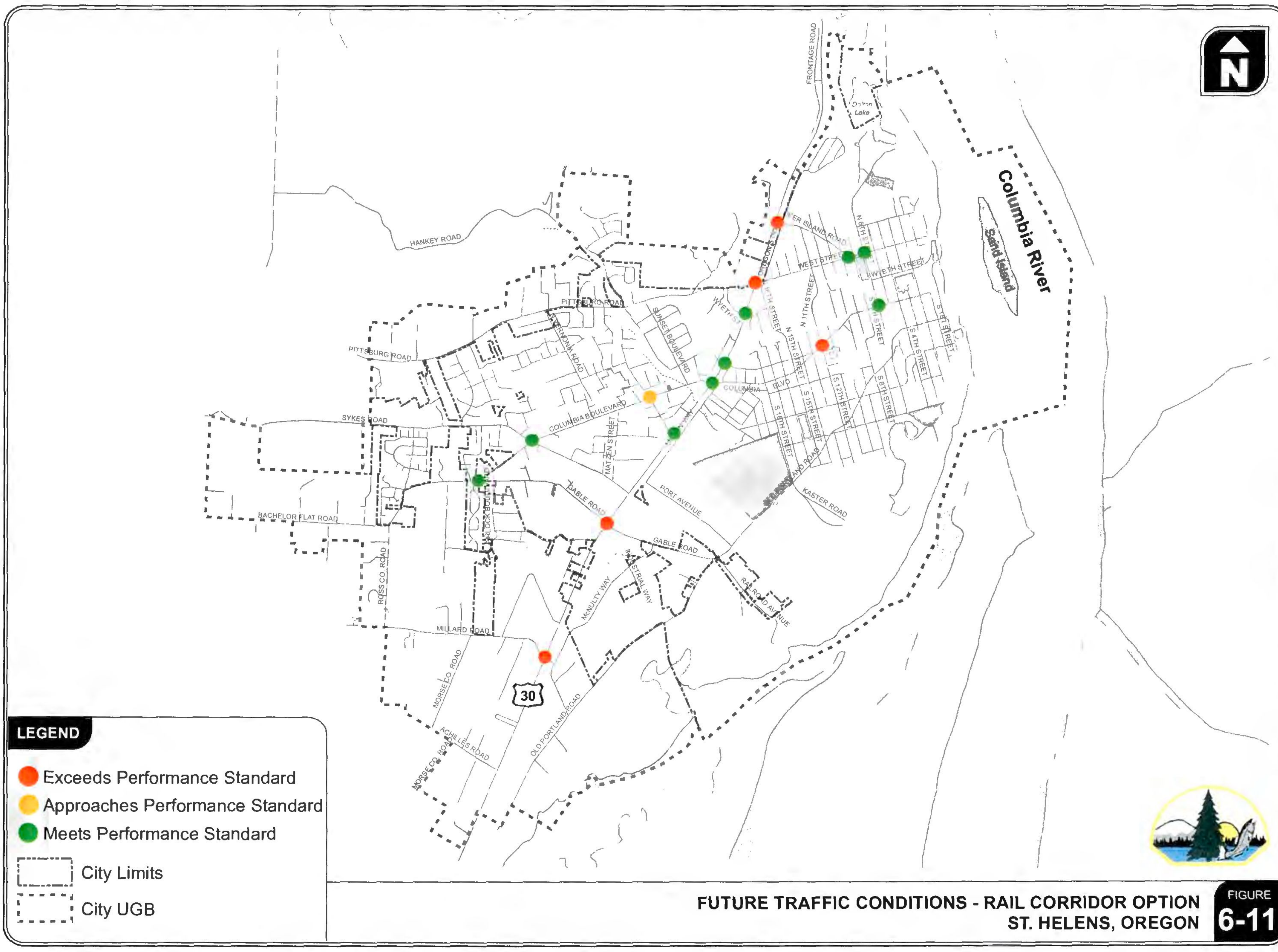

FUTURE TRAFFIC CONDITIONS - RAIL CORRIDOR OPTION
ST. HELENS, OREGON

FIGURE 6-11

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Rail Corridor Options Recommended for Inclusion in the Updated TSP

The LCRRC study was conducted as a joint effort involving Columbia County, ODOT, ODOT Rail, and cities along the corridor including St. Helens. The recommendations in the Rail Corridor Option are generally all applicable to the TSP Update, though there is no expectation that they will all be funded by the City. For example, the LCRRC plan identifies the potential future signalization of the US 30/Millard Road intersection and notes several improvements along Deer Island Road that will be provided in conjunction with the new transit center now under construction.

Table 6-8 summarizes the intersection and roadway improvement projects included in the Rail Corridor Option that are recommended for inclusion in the TSP Update. The order-of-magnitude costs shown were obtained from the LCRRC report.

TABLE 6-8: INTERSECTION IMPROVEMENT PROJECTS

Project No.	Intersection	Project Description	Order-of-Magnitude Project Cost
R01	US 30/Wyeth Road	Study potential closure	TBD
R02[1]	US 30/Columbia Blvd.	Close pedestrian access or adjust signal timing to provide sufficient crossing time for pedestrians	$0
R03	US 30/Columbia Blvd.	Add 215 feet southbound left turn queue storage	$56,800
R04	US 30/Columbia Blvd.	Add 65 feet to existing northbound right-turn storage	$17,200
R05[1]	US 30/Millard Road	Install traffic signal inter-tied with existing railroad crossing protection (8-phase signal)	$250,000 (per LCRRC study)
R06	US 30/Millard Road	Install at-grade pedestrian sidewalk across the crossing	$45,000
R07	US 30/Deer Island Road	Remove abandoned rail line and restripe the intersection of Deer Island Road/Oregon Road	$25,000
R08	US 30/Deer Island Road	Relocate gate, design for future transit center	$25,000
R09	US 30/Deer Island Road	Install at-grade pedestrian sidewalk across the crossing	$45,000
R10	US 30/Deer Island Road	Add 150 feet southbound left turn queue storage	$62,265
R11	US 30/St. Helens Street	Install at-grade pedestrian sidewalk across the crossing	$45,000
R12	US 30/St. Helens Street	Replace obsolete gate	$90,000
R13	US 30/Gable Road	Add 210 southbound left-turn queue storage	$55,400
R14	US 30/Gable Road	Install ADA compliant pedestrian/bicycle overpass over railroad and US 30	$6,100,000

[1] Project will require coordination/approval by ODOT and ODOT Rail Division and requires State Traffic Engineer approval. Engineering studies, traffic analysis, and conformance with ODOT standards will be evaluated as projects are developed.

Potential Additional Mitigation Measures

As previously indicated, none of the three options packages fully mitigated all of the study intersections. Potential additional mitigation measures were reviewed at the intersections that are forecast to operate unacceptably, as summarized below.

US 30/DEER ISLAND

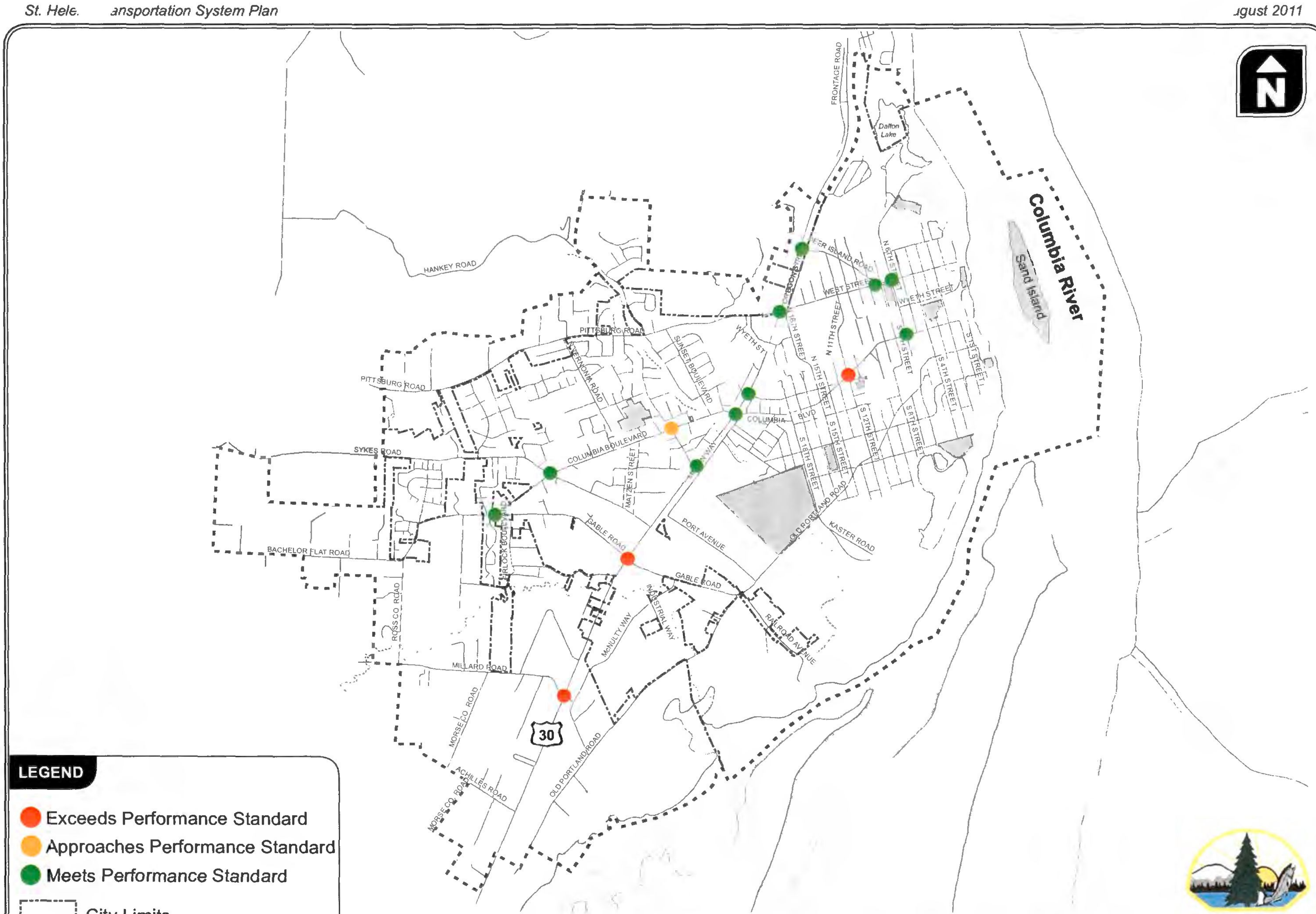
The US 30/Deer Island Road intersection is forecast to operate over capacity under all three options and the No Build. In addition, queuing at the US 30/Deer Island Road intersection is shown to exceed 550-feet in the westbound direction and would block access to/from Oregon Street and the site of the future St. Helens Transit Center.

Installation of a separate westbound left-turn lane would improve the intersection operations to a v/c ratio of 0.75 and would reduce westbound queuing. The addition of the left-turn lane would require widening and reconstruction of the adjacent PNWR grade crossing as well as part of the traffic signal and may involve right-of-way acquisition. The cost associated with this mitigation would be substantial yet queuing at the intersection will likely continue to extend past Oregon Street, effectively rendering Oregon Street to a right-in/right-out only. As such, additional outlets or a re-alignment of Oregon Street further east should be considered in the future.

US 30/PITTSBURG ROAD-WEST STREET OVERPASS

The LCRRC study highlighted the potential need for an overpass in St. Helens near the US 30/Pittsburg Road intersection, although the project was not included in the final study recommendations. Based on the study, the future overpass would extend over both US 30 and the railroad and cost between $5.6 and $9 million dollars and would likely have to be funded as a State Transportation Improvement Program (STIP) project.

Figure 6-12 illustrates the results of an operations analysis at the study intersections with the overpass assumed to be in place and the Wyeth Street access to US 30 assumed to be closed. As shown in the figure, operations at the US 30/Deer Island intersection improve with the overpass assuming a majority of the westbound left-turn movements would reroute toward the overpass. Constructed in isolation without other US 30 intersection improvements, a northern overpass would not mitigate the US 30/Gable Road and US 30/Millard Road intersection.



FUTURE TRAFFIC CONDITIONS - RAIL CORRIDOR OPTION - NORTHERN OVERPASS
ST. HELENS, OREGON

FIGURE
6-12

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The grade separation project would improve emergency services dispatch options during the passage of trains through the City and/or in the event that a train blocked crossings for an extended period due to a derailment. School buses crossing US 30 and the railroad tracks could also be directed to the new overpass to reduce their delay in crossing the PNWR rail line.

US 30/GABLE ROAD

The US 30/Gable Road intersection also operates over-capacity under all of the options considered. Viewed as a stand-alone intersection, installation of dual left-turn lanes and separate right-turn lanes on all four intersection approaches would be necessary. This mitigation would require widening the Gable Road approaches to seven lanes (for example, on the south approach there would be two southbound through lanes, two northbound left-turn lanes, two northbound through lanes, and one northbound right-turn lane). Widening to accommodate the additional lanes would increase pedestrian exposure, increase the rail crossing width (likely requiring median channelization for a center railroad crossing gate), and necessitate significant right-of-way acquisition. Further, the US 30/Gable Road intersection would likely become the most heavily traveled intersection on the corridor, complicating the ability to implement coordinated signal timing along the highway corridor through St. Helens.

Even with these improvements, unless additional left turns can be diverted to other intersections such as Millard Road and Bennett Road to the south, the resulting v/c ratio (0.87) does not meet the applicable mobility standard. As such, additional alternative mitigation options were examined as described below.

US 30/MILLARD ROAD

Installation of a traffic signal at the US 30/Millard Road intersection was assumed under both the 1997 TSP Option and the Rail Corridor Option. With the anticipated rerouting of truck traffic to the newly signalized intersection, the nearby intersection of Millard Road/Old Portland Road will require reconstruction to facilitate truck turns. Currently, the skew of the Millard Road approach to Old Portland Road complicates truck turn movements at the intersection.

Signalization of the US 30/Millard Road intersection would significantly benefit the intersection in the near-term; however, a signal at this location is forecast to operate with a v/c ratio of 0.94 in the year 2031. The following additional improvements could be considered to mitigate the intersection to meet ODOT standards:

- Install separate right-turn lanes on the east and westbound approaches to the intersection. Note the additional right-turn lane at the westbound approach would require widening and reconstruction of the adjacent PNWR grade crossing. The cost associated with this mitigation would be substantial yet, similar to Gable Road, the resulting v/c ratio (0.87) still does not meet the applicable mobility standard.
- Install dual left-turn lanes, a separate through lane, and a separate right-turn lane on the east-west intersection approaches. Widening to accommodate the additional lanes will increase the rail crossing width (likely requiring median channelization for a center railroad crossing gate), and necessitate right-of-way acquisition.

Given that Gable Road and Millard Road still do not fully meet ODOT operating standards even with significant widening, additional alternative mitigation options were examined as described below.

SOUTHERN OVERPASS

The construction of an overpass at the southern portion of St. Helens would enhance operations at the US 30/Millard Road intersection and the US 30/Gable Road intersection by 1) shifting westbound left-turns (trips headed south out of St. Helens) and truck traffic further south, 2) creating alternative east-west connectivity across US 30 and the railroad tracks, and 3) providing a higher-capacity intersection treatment at US 30/Millard Road. Ideally, the overpass would be situated to create a loop connection linking Old Portland Road on the east side of the City with Millard Road and the future north-south collector network on the west side of the City. Compared to an overpass at Pittsburg Road, this improvement would likely have a more dramatic impact on operations all along US 30, including:

- Improved vehicular access and circulation to the residential areas east and west of US 30.
- Improved truck circulation to the industrial area east of US 30 assuming trucks would access US 30 at the overpass (reducing the potential for rail/truck interaction).
- Improved access and circulation for emergency response vehicles to areas both east and west of US 30.

In addition, as a majority of the traffic in St. Helens occurs near the southern end of the city, a southern overpass would improve operations through the City on the US 30 corridor (including the US 30/Gable Road intersection) by shifting a greater portion of local traffic circulation from US 30 onto the City roadway network before it reaches the more congested areas.

A preliminary concept was developed for the US 30/Millard Road intersection that includes provision of an overpass that spans both the highway and the rail line, but continues to rely on the existing intersection for right-in/right-out turning movements. Based on information provided by ODOT, complete intersection grade separation is not practical at this location given the close proximity of the rail line to the highway and the need to get vehicles, including large trucks, up and an over the rail line. Figure 6-13 illustrates a conceptual sketch of the overpass.

Figure 6-14 summarizes the results of intersection operations analysis with the overpass concept in place. As shown in the figure, operations at the US 30/Millard Road intersection improve with the overpass because all of the left-turn movements are converted to right turn movements and all of the east-west through movements are completed on the overpass. Also shown in the figure, operations at the US 30/Gable Road intersection improve. The improvement at Gable Road reflects trips shifting to the higher-capacity overpass. Similar assumptions were made all along the US 30 corridor as a majority of the previously forecast northbound left-turn movements, including those at US 30/Pittsburg Road, were assumed to occur at the overpass. This redistribution of trips is predicated on the assumption that the adjacent roadway network is improved prior to, or along with the development of the overpass. The reduction in the northbound left-turns does not fully mitigate all of the capacity needs along US 30. As with the northern overpass option, some of the remaining unsignalized study intersections on US 30 would continue to fail.

Locating a southern overpass further to the south near Achilles Road was also considered; however, the PNWR rail corridor elevation is above the highway elevation south of Millard Road. As a result of the elevation difference and the rail line's proximity to US 30, ODOT's preliminary engineering team indicated that building a structure over both US 30 and the PNWR line would be difficult and potentially cost prohibitive.

SOUTHERN OVERPASS CONCEPTUAL DESIGN
ST. HELENS, OREGON

FIGURE 6-13

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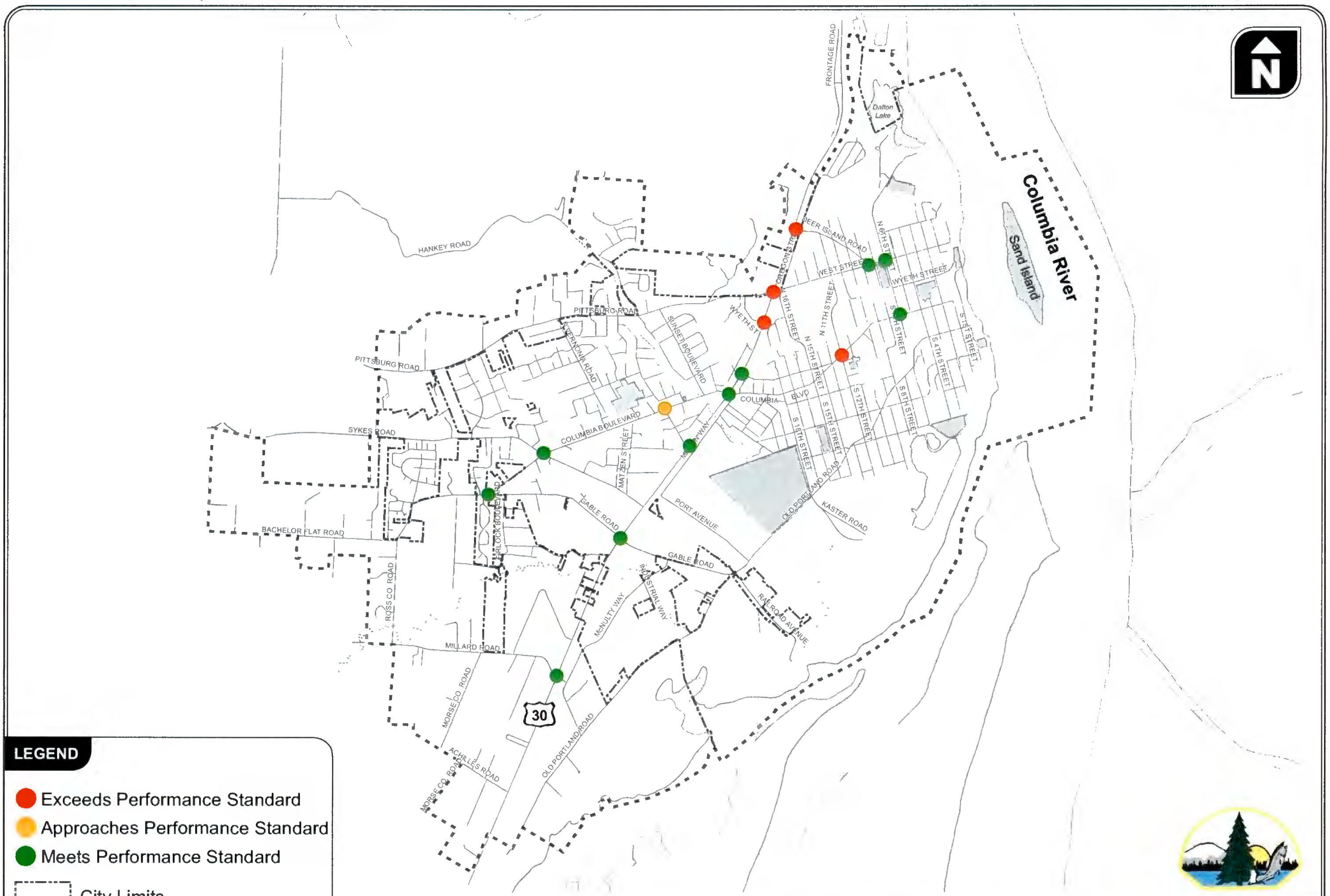

FUTURE TRAFFIC CONDITIONS - SOUTHERN OVERPASS
ST. HELENS, OREGON

FIGURE **6-14**

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US 30/BENNETT ROAD SIGNAL

While outside of the City of St. Helens UGB and the TSP study area, the US 30/Bennett Road intersection has the potential to significantly impact the City's transportation system. For example, signalizing the US 30/Bennett Road intersection could improve operations at the US 30/Millard Road and US 30/Gable Road intersections by diverting a large number of vehicles (particularly northbound right and westbound left-turns) off of US 30 at the new signal. This route offers vehicles (and particularly trucks) traveling south of St. Helens a relatively straight path to US 30 that would avoid impacting the US 30/Millard Road and US 30/Gable Road intersections. Both Gable Road and Millard Road are expected to carry substantial east-west through traffic in the future as they link employment areas on the east side of US 30 with the residential areas on the west as well as the commercial area along Gable Road. Given the potential for relatively heavy eastbound through movements at Gable Road and Millard Road, shifting the truck traffic and a substantial number of westbound left-turns south to Bennett Road would benefit US 30 by minimizing conflicting east-west turn movement demand (and green time) at Gable Road and Millard Road.

ODOT traffic and preliminary engineering staff have expressed concern about signalizing the US 30/Bennett Road intersection, citing safety concerns involving the relatively rural and high speed nature of US 30 at the intersection, the potential to increase rear-end crashes, the current low Bennett Road traffic volumes and a general desire to avoid rural traffic signals. ODOT's Road Safety Audit (RSA) project to be completed in 2011 is expected to focus in part on potential intersection treatments at Bennett Road.

GABLE/SYKES ROAD COUPLET

The conversion of Gable Road to a one-way westbound roadway between US 30 and Columbia Boulevard and Sykes Road to a one-way eastbound roadway between Columbia Boulevard and US 30 was considered as a potential solution to address the capacity needs identified at the US 30/Gable Road intersection. A preliminary review of the existing roadway network suggests that a one-way couplet system would severely limit access to the residential and commercial properties adjacent to Gable Road as well the St. Helens High School. This is primarily due to the lack of north/south roadways between Gable and Sykes Roads between Columbia Boulevard and St. Helens Street. Based on these observations it was determined that a one-way couplet system at this location is not feasible at this time.

Intersection and Roadway Recommendations for the Updated TSP

Based on review of the forecast intersection failures, the alternatives discussed above, and the desire to avoid substantial widening of Gable Road, the following mitigation measures are recommended for inclusion in the Updated TSP[10].

- Installation of a separate westbound left-turn lane at the US 30/Deer Island Road intersection.
- Signalize the US 30/Millard Road intersection, including installation of separate right-turn lanes on the east and westbound approaches to the intersection.
- Install a separate westbound right-turn lane at the US 30/Gable Road intersection, including related rail crossing widening.
- Provide an overpass near the US 30/Millard Road intersection in the long-term. The need for, and timing, of such an improvement will depend in part on the outcome of the future operations of the US 30/Bennett Road intersection (for example, if signalization is provided, Gable Road and Millard Road will benefit from trips re-routing to Bennett Road)

Although implementation is likely well beyond the planning horizon of the current TSP, the concept of a potential future overpass near the US 30/Pittsburg Road intersection should be preserved for future consideration.

[10] Before a signal can be installed on the State system, OAR 734-020-0440 requires a traffic engineering investigation that shows how traffic signal warrants and highway design and spacing standards are met with the proposed signal and how the proposed signal would improve the overall safety and operation of the intersection. A progression analysis would be required as per OAR 734-020-0470 for signals that will not meet the one half mile minimum spacing standard for traffic signals on State highways. Signals may not be installed until signal warrants are satisfied and the installation request and design has been approved by the State Traffic Engineer (OAR 734-020-0410).

Section 7 Transportation System Plan

7 Transportation System Plan

This section presents the individual elements of the St. Helens Transportation System Plan (TSP). The TSP addresses those components necessary for the development of the future transportation network including:

- Roadway System Plan
    - Functional Classification Plan
    - Street Design Standards
    - Access Management Plan
- Pedestrian Plan
- Bicycle Plan
- Transit Plan
- Rail Plan
- Marine/Air/Water/Pipeline System Plan
- Implementation Plan

The transportation elements presented in this section were developed in accordance with the requirements of Oregon's Transportation Planning Rule (TPR). These elements reflect the existing and future forecast conditions analysis findings, the options analysis, and a balance sought amongst the interests of multiple stakeholders, including citizens, business owners, and governmental agencies within the City of St. Helens. The final TSP elements were selected and prioritized based on feedback obtained from the Technical Advisory Committee (TAC), Citizens Advisory Committee (CAC), Planning Commission, City Council, and citizen input during the plan's development. The decision process was guided in part by the goals and policies enumerated in Section 2.

Roadway System Plan

The roadway system plan provides guidance on how to best facilitate vehicular travel over the next twenty years, as well as identifying key elements of a future vision of transportation facilities serving the city. This plan seeks to address the identified existing and anticipated future operational and circulation needs.

FUNCTIONAL CLASSIFICATION PLAN

The purpose of the functional classification plan is to create a mechanism through which a balanced transportation system can be developed that facilitates mobility for all modes of transportation as well as access to adjacent land uses. A roadway's functional classification determines its intended purpose, the amount and character of traffic it is expected to carry, the degree to which non-auto travel is emphasized, and the roadway's design standards and overall management approach. It is imperative that a roadway's classification consider the adjacent land uses and the transportation modes that should be accommodated. The public right-of-way must also provide sufficient space for utilities to serve adjacent land uses.

The functional classification plan for the City of St. Helens is shown in Figure 7-1. The new roadway alignments shown on the plan should be considered as conceptual. The end points of the streets are generally fixed where they make essential connections to other roadways while the alignments between intersections may vary depending on design requirements and right-of-way available at the time a given facility is constructed.

The functional classification plan incorporates three functional categories: arterials (major and minor), collectors, and local streets.

Arterials

Arterials are roadways that are primarily intended to serve traffic entering and leaving the urban area. While arterials may provide access to adjacent land, that function is subordinate to the mobility service provided to major traffic movements.

Major Arterials

Major arterials are typically longest-distance, highest-volume roadways within the urban growth boundary (UGB). Although the streets focus on serving longer distance trips, they also serve local pedestrian and/or bicycle activities, which should be accommodated in the arterial streetscape.

The only major arterial serving St. Helens is the Columbia River Highway (US 30). US 30 is a Statewide Highway and designated Freight Route. US 30 runs north-south through the city, connecting St. Helens to Columbia City, Rainier, and the Oregon Coast to the north and Scappoose and the Portland to the south. The current cross-section of US 30 is four to five lanes within the city's UGB. The TSP has been developed with the intention of maintaining a maximum five-lane cross-section through the city not withstanding right-turn deceleration lanes at key intersections. This can be accomplished by developing a more efficient network of local roadways that serve city traffic off the highway.

The TSP identifies the need for several improvement projects along US 30, such as new traffic signals at several key intersections. All projects along US 30 are subject to ODOT plans, policies, and standards and all changes and/or improvements must conform with the ODOT approval and permitting process[11].

At the time of this writing, ODOT is conducting a study along US 30 between Scappoose and St. Helens that will evaluate alternatives to improve the safety of the corridor. A detailed Road Safety Audit will be completed between Bere Road in Scappoose and Millard Road in St. Helens. The audit could result in recommendations for improvements at Bennett Road and Millard Road that directly impact the recommendations contained in this TSP. ODOT will work with the City of St. Helens in developing the safety corridor and the St. Helens City Council may be asked to adopt the plan and amend the TSP, if necessary.

Minor Arterials

Minor arterials provide a higher degree of access than major arterials. The primary function of minor arterials is to serve local and through traffic between neighborhoods and to community and regional facilities.

Collectors

Collector streets generally facilitate the movement of traffic within the city's UGB. Collectors provide for circulation and mobility for all users of the system. Collectors carry lower volumes than arterials and typically have two-lane cross-sections with on-street parking. They serve as the primary routes into residential neighborhoods. Although they carry higher volumes than local streets, they are intended to provide direct access to adjacent land rather than serving through traffic.

Local Streets

Local streets are primarily intended to provide access to abutting land uses. Local street facilities offer the lowest level of mobility and consequently tend to be short, low-speed facilities. As such, local streets should primarily serve passenger cars, pedestrians, and bicyclists; heavy truck traffic is discouraged. On-street parking is common. Sidewalks are typically present, though the relatively low travel speeds and traffic volumes allow bicycles to share the vehicle travel lanes.

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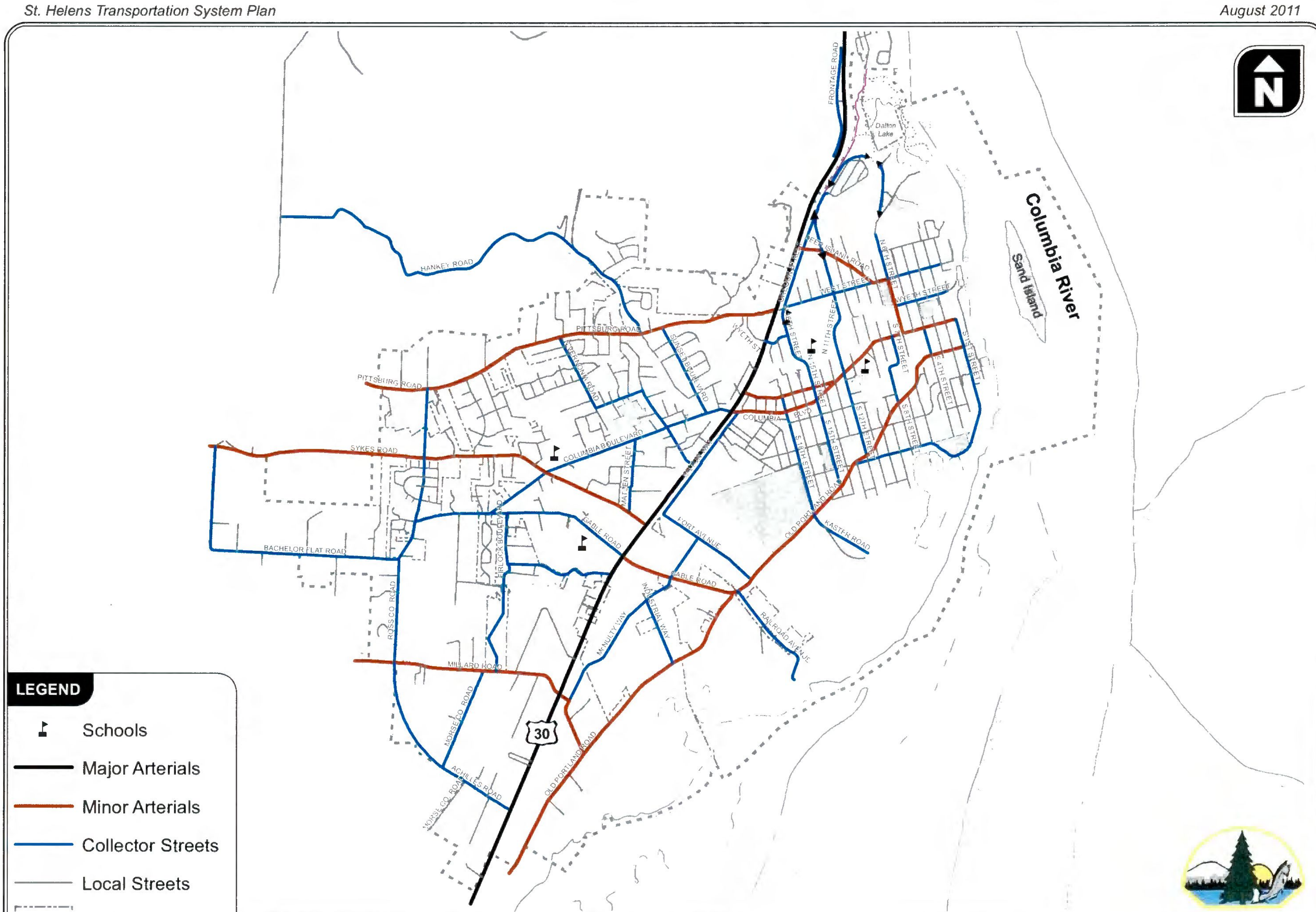
[11] Before a signal can be installed on the State system, OAR 734-020-0440 requires a traffic engineering investigation that shows how traffic signal warrants and highway design and spacing standards are met with the proposed signal and how the proposed signal would improve the overall safety and operation of the intersection. A progression analysis would be required as per OAR 734-020-0470 for signals that will not meet the one half mile minimum spacing standard for traffic signals on State highways. Signals may not be installed until signal warrants are satisfied and the installation request and design has been approved by the State Traffic Engineer (OAR 734-020-0410).



FUNCTIONAL CLASSIFICATION PLAN
ST. HELENS, OREGON

FIGURE **7-1**

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STREET DESIGN STANDARDS

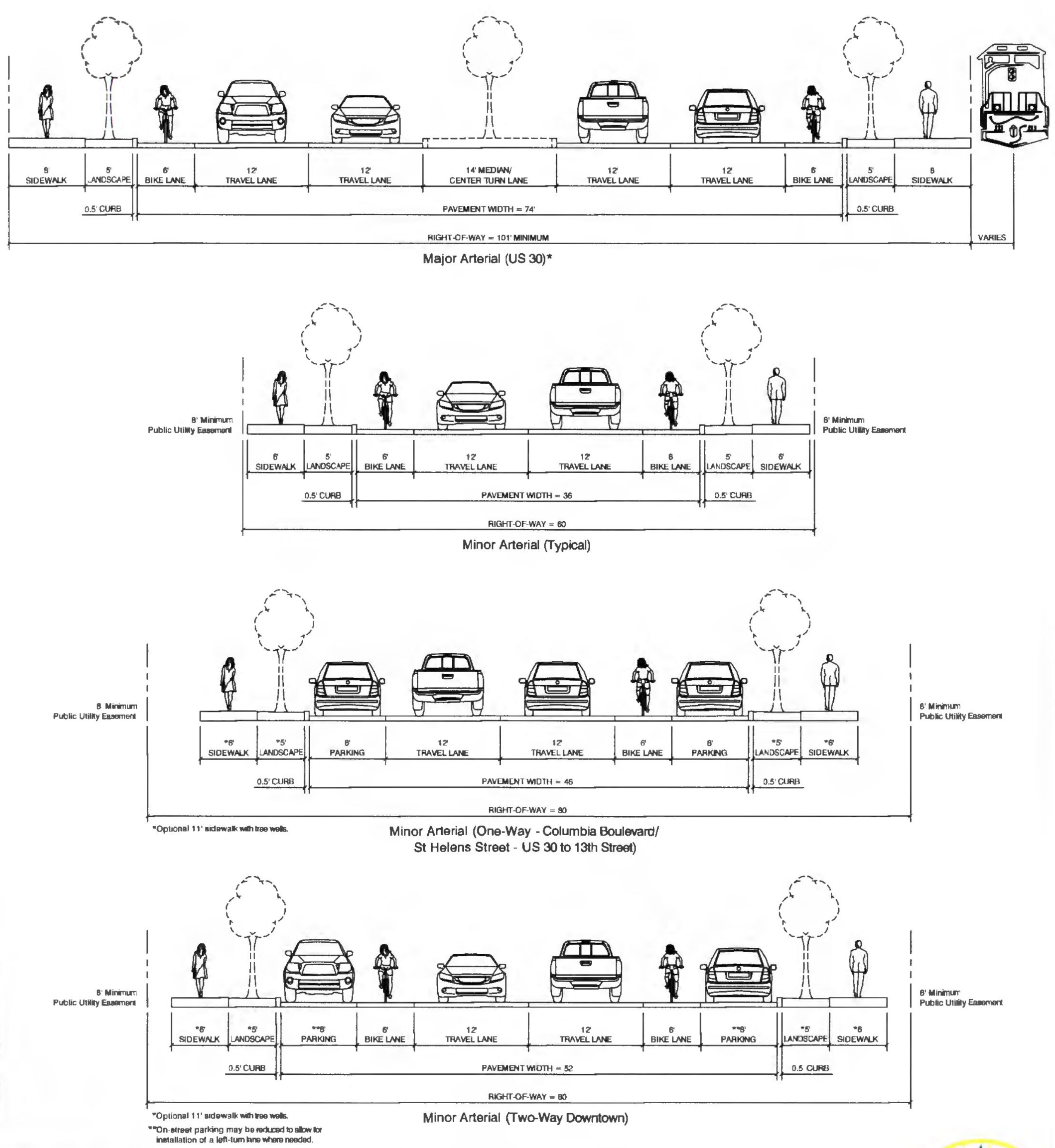
Street design standards support the functional and operational needs of the community's roadway network. The standards provide guidance on the operations, appearance and function of a roadway by defining factors such as the type of pedestrian and bicycle facilities, the number of travel lanes, capacity, operating speed, and safety. The standards are necessary to ensure that the system of streets, as it develops, will be capable of safely and efficiently serving the traveling public while also accommodating the orderly development of adjacent lands.

The street design standards are shown as cross sections in Figures 7-2 and 7-3. The cross sections are intended to be used for planning purposes for new road construction, as well as for those locations where it is physically and economically feasible to improve existing streets. Detailed design elements, such as cross-slopes, are not shown in the figures, but should be added when the City of St. Helens updates its standard engineering drawings. On-street parking has been identified as an optional element in some of the street sections where right-of-way is limited or a left-turn lane is needed. Also, additional width for turn lanes may be needed at specific intersections based on an engineering investigation; these are not shown in the street design standards. The standards shown are intended to define typical cross-sections of streets between intersections.

Many of the city's existing streets are wider than the proposed cross sections. As a result, retrofitting streets to add bike lanes, sidewalks, landscaping strips or different travel lane widths/turn lanes may be possible at a number of locations without requiring right-of-way acquisition.

Finally, it should be noted that many agencies are developing "green street" programs that incorporate stormwater management features involving natural absorption and treatment. While green street treatments are independent of functional class, they may require modification of the landscape area or other street design standards to accommodate this evolving practice. The street design standards shown are not intended to preclude green street treatments.

As shown in Figure 7-3, there are three cross sections provided for minor arterial streets; including one typical cross section, one cross section specific to the one-way - St. Helens Street/Columbia Boulevard couplet between US 30 and 13th Street, and a cross section for the two-way downtown area. The cross section for the segment of Columbia Boulevard east of 13th Street provides for an optional center left-turn lane in lieu of on-street parking. The presence of a center left-turn lane near the 12th Street/Columbia Boulevard intersection could help to improve operations near the Lewis Clark Elementary School during school peak hours as vehicles turning into the school will not be blocking the through travel lane in the southbound direction.



LEGEND

TREES TO BE PROVIDED AS APPROPRIATE PER CITY CODE AND LOCATION SPECIFIC CONSIDERATIONS

****The US 30 Cross-Sections are shown to be consistent with ODOT Standards. Specific roadway designs will be developed through a refinement plan or project development process. Design and future improvements to US 30 must also address ORS 366.215 (Reduction in Vehicle Carrying Capacity) on this national freight network facility.***

STANDARD CROSS SECTIONS
ST. HELENS, OREGON

FIGURE **7-2**

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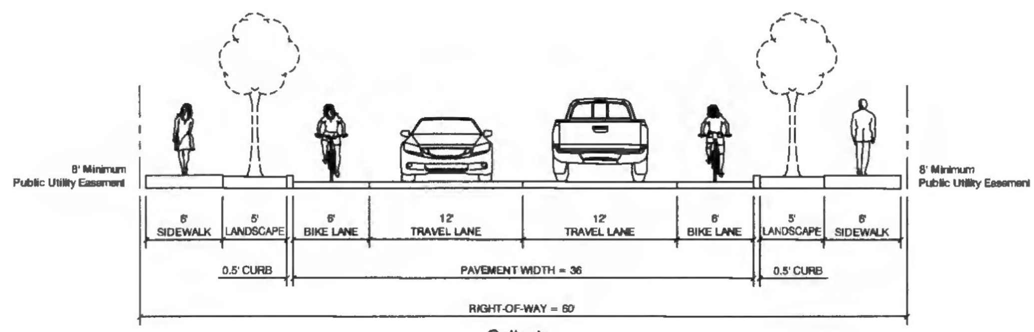
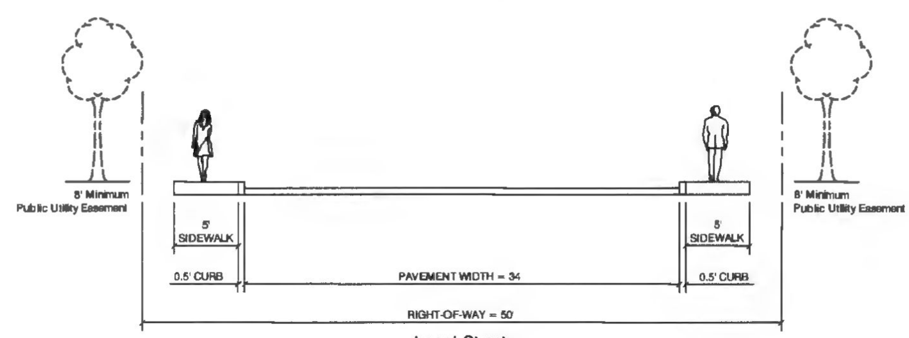
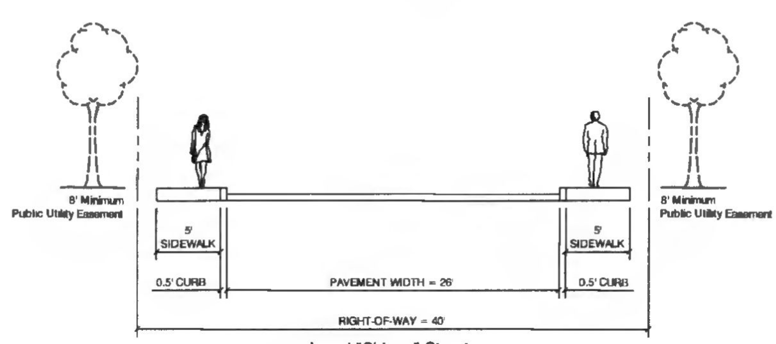


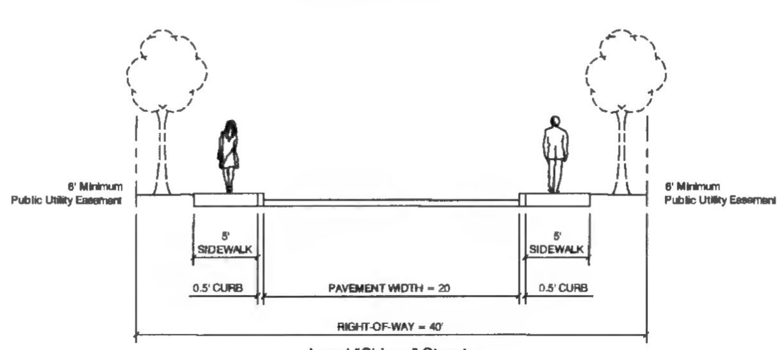
Collector



Local Street



Local "Skinny" Street



Local "Skinny" Street

LEGEND

TREES TO BE PROVIDED AS APPROPRIATE PER CITY CODE AND LOCATION SPECIFIC CONSIDERATIONS

STANDARD CROSS SECTIONS
ST. HELENS, OREGON

FIGURE **7-3**

LOCAL STREET OPTIONS

The standard cross-section for local streets includes a total paved width of 30 feet, which is intended to accommodate parking on one or both sides of the street. Two skinny street options are identified for application in local street settings where low traffic volumes and narrow roadway elements are desired. Skinny streets typically result in slower vehicle speeds, making them attractive in residential areas. Other benefits include reduced impervious surface area (reduced stormwater and environmental impact) and improved pedestrian and bicycle safety related to the lower vehicle speeds.

On-street parking along skinny streets can pose challenges for emergency vehicles as well as other service providers such as refuse/recycling trucks, school busses, and other delivery vehicles. The City of St. Helens can permit construction of 20 to 26 feet wide streets that accommodate parking on only one side of the street. These options are most appropriate for lower volume streets (typically less than 400 vehicles per day).

LANDSCAPING

Landscaping Area

Each of the City's street design standards includes a landscape strip separating the roadway curb from the sidewalk. This landscaping strip serves to better separate motorized vehicle and pedestrian traffic and creates an opportunity for landscaping in the form of street trees or other elements. The City of St. Helens seeks to incorporate street trees in all street landscaping areas where possible. In situations where street trees are not feasible (basalt below, etc.), the City of St. Helens may require fee-in-lieu contributions/payments.

Design Variations

The street design standards are intended to provide uniformity for city streets. It may be necessary to deviate from the design standards in situations where:

- Existing right-of-way constraints, structures, topographic features, environmentally sensitive areas, or other constraints preclude designing to the standards; or
- An alternative design that is functionally equal or superior to the standard design is proposed; or
- Green Streets design elements are incorporated in a way that preserving the function and integrity of the roadway; or

- The City Engineer otherwise determines that a deviation is in the public interest.

GUIDELINES FOR ARTERIAL/COLLECTOR INTERSECTION IMPROVEMENTS

In addition to roadway cross-section standards, the City of St. Helens should adopt standards for intersection improvements (note that improvements on state highways must meet ODOT operating and design criteria). As intersection improvements are made at arterial/collector intersections in the city, the following general guidelines should be considered:

- maintain adequate signing of side-streets (stop signs and visible street signs);
- restrict parking and potential sight obstructions in the intersection vicinity;
- provide intersection illumination to increase visibility;
- provide proper channelization (striping, raised medians, etc.) of movements;
- provide a paved apron on unpaved side-street approaches to create a smooth transition to and from the major street;
- install right-turn transition tapers or lanes at high-speed unsignalized intersections and right-turn lanes at signalized intersections on US 30 approaches when warranted;
- install left-turn lanes when warranted to reduce interruptions in the flow of through traffic; and,
- locate traffic signals or roundabouts with consideration of appropriate spacing requirements and impacts on side-street traffic patterns.

ACCESS MANAGEMENT PLAN

As the city continues to grow, its street system will become more heavily traveled. Consequently, it will become increasingly important to manage access on the arterial and collector street system as new development occurs. This will preserve those streets' function for carrying through traffic. ODOT has legal authority to regulate access points along US 30 within the city's urban growth boundary. The City of St. Helens and Columbia County jointly manage several roadways within the city's UGB to ensure the efficient movement of traffic and enhance safety. The City of St. Helens independently manages access on all other collector and local streets within its jurisdiction.

The Oregon Transportation Planning Rule defines access management as a set of measures regulating access to streets, roads, and highways, from public roads and private driveways. The TPR requires that new connections to arterials and state highways be consistent with designated access management categories. This TSP includes an access management policy that maintains and enhances the integrity (capacity, safety, and level of service) of the city's streets.

Access management standards vary depending on the functional classification and purpose of a given roadway. Roadways on the higher end of the functional classification system (i.e., arterials and collectors) tend to have higher spacing standards, while local streets allow more closely spaced access points. These standards apply to new development or redevelopment. Existing accesses are allowed to remain as long as the land use does not change and no safety problem is posed. As a result, access management is a long-term process in which the desired access spacing to a street slowly evolves over time as redevelopment occurs.

In implementing access management standards, parcels cannot be land-locked; they must have some way of accessing the public street system. This may mean allowing closer access spacing than would otherwise be allowed or implementation of shared access with a neighboring parcel, where possible. Where a property has frontage on two roadways, access on the roadway of lower classification is preferred, all other things being equal. The following discussion presents the hierarchical access management system for roadways in the St. Helens UGB.

ODOT ACCESS MANAGEMENT STANDARDS

The OHP specifies an access management classification system for state facilities based on its highway classification system. As indicated in the existing conditions analysis, the OHP classifies US 30 as a Statewide Highway and a Freight Route. Future developments along US 30 (new development, redevelopment, zone changes, and/or comprehensive plan amendments) will be required to meet the OHP Access Management policies and standards. Table 7-1 summarizes ODOT's current access management standards for US 30 per the 1999 OHP.

TABLE 7-1: US 30 ACCESS SPACING STANDARDS

Posted Speed (MPH)	Spacing Standards (Feet)[1]
≤ 25	520
30 and 35	720
40 and 45	990
50	1,100
≥ 55	1,320

[1] These access management spacing standards do not apply to approaches in existence prior to April 1, 2000 except as provided in OAR 734-051-0115(1)(c) and 734-051-0125(1)(c).

CITY ROADWAY ACCESS STANDARDS

Table 7-2 identifies the minimum public street intersection and private access spacing standards for the city's roadway network as they relate to new development and redevelopment. Minimum and maximum standard widths for private driveways are summarized in Table 7-3. County facilities within the city's UGB should also be planned and constructed in accordance with these street design standards.

TABLE 7-2: CITY STREET ACCESS SPACING STANDARDS

Functional Classification	Public Street (feet)	Private Access Drive (feet)
Local Street	150	50
Collector	300	100
Minor Arterial	350 or block length	200 or mid-block

TABLE 7-3: PRIVATE DRIVEWAY WIDTH STANDARDS

Land Use	Minimum (Feet)	Maximum (Feet)
Single Family Residential	12	24
Multi-Family Residential	24	30
Commercial	30	40
Industrial	30	40

Access spacing variances may be provided to parcels whose highway/street frontage, topography, or location would otherwise preclude issuance of a conforming permit and would either have no reasonable access or cannot obtain reasonable alternate access to the public road system. In such a situation, a conditional access permit may be issued by ODOT or the City of St. Helens, as appropriate, for a connection to a property that cannot be accessed in a manner that is consistent with the spacing standards. The permit can carry a condition that the access may be closed at such time that reasonable access becomes available to a local public street. The approval condition might also require a given land owner to work in cooperation with adjacent land owners to provide either joint access points, front and rear cross-over easements, or a rear access upon future redevelopment.

The requirements for obtaining a deviation from ODOT's minimum spacing standards are documented in OAR 734-051. For streets under the City's jurisdiction, the City may reduce the access spacing standards, at the discretion of the City Engineer, if the following conditions exist:

- Joint access driveways and cross access easements are provided in accordance with the standards;
- The site plan incorporates a unified access and circulation system in accordance with the standards;
- The property owner enters into a written agreement with the City of St. Helens that pre-existing connections on the site will be closed and eliminated after construction of each side of the joint use driveway; and/or,
- The proposed access plan for redevelopment properties moves in the direction of the spacing standards.

The City Engineer may modify or waive the access spacing standards for streets under the City's jurisdiction where the physical site characteristics or layout of abutting properties would make development of a unified or shared access and circulation system impractical, subject to the following considerations:

- Unless modified, application of the access standard will result in the degradation of operational and safety integrity of the transportation system.
- The granting of the variance shall meet the purpose and intent of these standards and shall not be considered until every feasible option for meeting access standards is explored.
- Applicants for variance from these standards must provide proof of unique or special conditions that make strict application of the standards impractical. Applicants shall include proof that:
    - Indirect or restricted access cannot be obtained; and
    - No engineering or construction solutions can be applied to mitigate the condition; and,
    - No alternative access is available from a road with a lower functional classification than the primary roadway.
- No variance shall be granted where such hardship is self-created.

ACCESS MANAGEMENT MEASURES

From an operational perspective, access management measures limit the number of redundant access points along roadways. This enhances roadway capacity and benefits circulation. Enforcement of the access spacing standards should be complemented with provision of alternative access points.

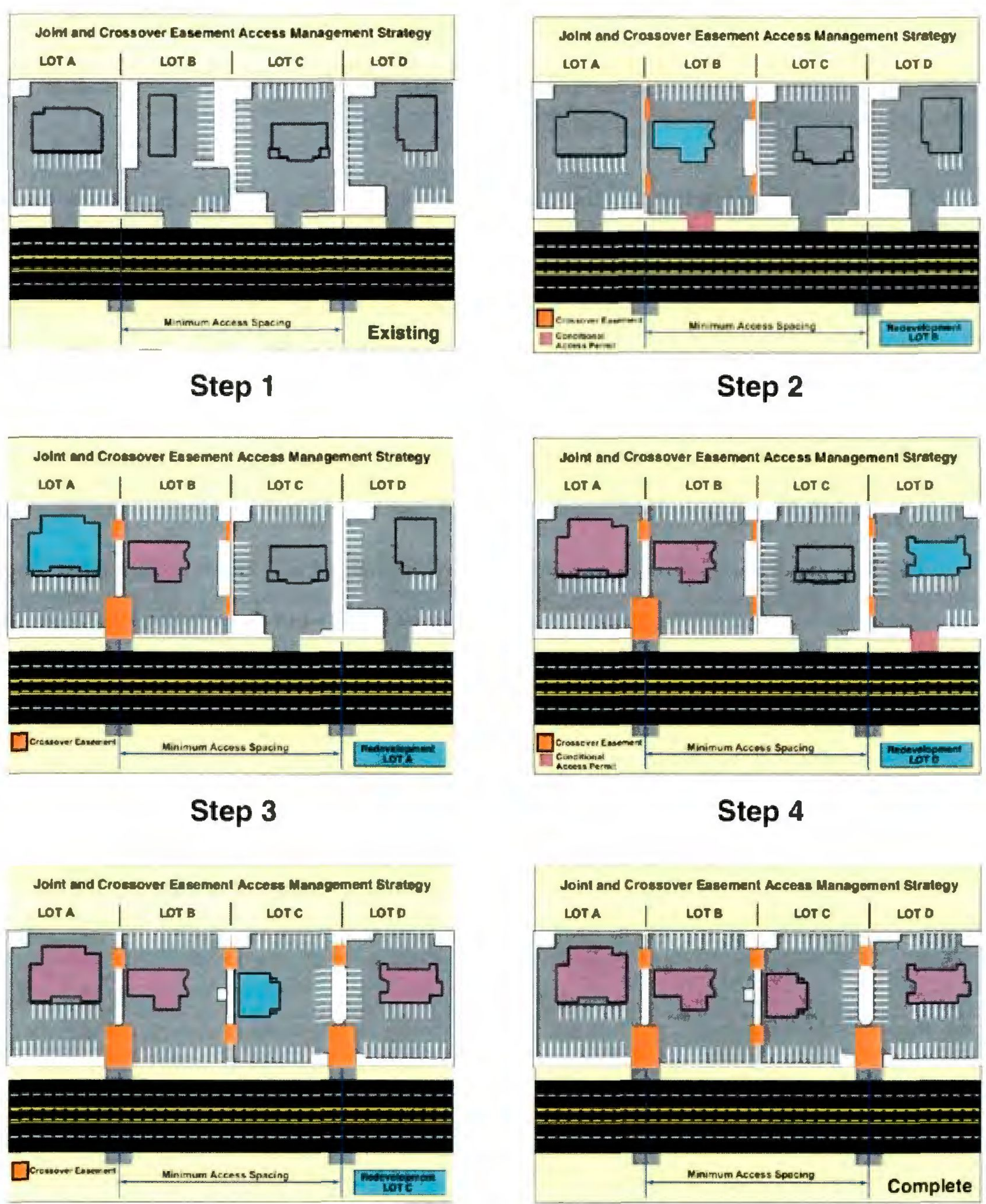
Purchasing right-of-way and closing driveways without a parallel road system and/or other local access could seriously affect the viability of the impacted properties. Thus, if an access management approach is taken, alternative access should be developed to avoid "land-locking" a given property.

As part of every land use action, the City of St. Helens will evaluate the potential need for conditioning a given development proposal with the following items in order to maintain and/or improve traffic operations and safety along the arterial and collector roadways.

- Provision of crossover easements on all compatible parcels (considering topography, access, and land use) to facilitate future access between adjoining parcels.
- Issuance of conditional access permits to developments having proposed access points that do not meet the designated access spacing policy and/or have the ability to align with opposing driveways.
- Right-of-way dedications to facilitate the future planned roadway system in the vicinity of proposed developments.
- Half-street improvements (sidewalks, curb and gutter, bike lanes/paths, and/or travel lanes) along site frontages that do not have full build-out improvements in place at the time of development.

Figure 7-4 illustrates the application of cross-over easements and conditional access permits over time to achieve access management objectives. The individual steps are described in Table 7-4. As illustrated in the figure and supporting table, using these guidelines, all driveways along the highways can eventually move in the overall direction of the access spacing standards as development and redevelopment occur along a given street.

Proposed Access Management Strategy



Step 1 Step 2

Step 3 Step 4

Step 5 Step 6

CROSSOVER EASEMENT
ST. HELENS, OREGON

FIGURE **7-4**

TABLE 7-4: EXAMPLE OF CROSSOVER EASEMENT/INDENTURE/CONSOLIDATION

Step	Process
1	EXISTING – Currently Lots A, B, C, and D have site-access driveways that neither meet the access spacing criteria of 500 feet nor align with driveways or access points on the opposite side of the highway. Under these conditions motorists are into situations of potential conflict (conflicting left turns) with opposing traffic. Additionally, the number of side-street (or site-access driveway) intersections decreases the operation and safety of the highway
2	REDEVELOPMENT OF LOT B – At the time that Lot B redevelops, the City would review the proposed site plan and make recommendations to ensure that the site could promote future crossover or consolidated access. Next, the City would issue conditional permits for the development to provide crossover easements with Lots A and C, and ODOT/City would grant a conditional access permit to the lot. After evaluating the land use action, ODOT/City would determine that LOT B does not have either alternative access, nor can an access point be aligned with an opposing access point, nor can the available lot frontage provide an access point that meets the access spacing criteria set forth for segment of highway.
3	REDEVELOPMENT OF LOT A – At the time Lot A redevelops, the City/ODOT would undertake the same review process as with the redevelopment of LOT B (see Step 2); however, under this scenario ODOT and the City would use the previously obtained cross-over easement at Lot B consolidate the access points of Lots A and B. ODOT/City would then relocate the conditional access of Lot B to align with the opposing access point and provide and efficient access to both Lots A and B. The consolidation of site-access driveways for Lots A and B will not only reduce the number of driveways accessing the highway, but will also eliminate the conflicting left-turn movements the highway by the alignment with the opposing access point.
4	REDEVELOPMENT OF LOT D – The redevelopment of Lot D will be handled in same manner as the redevelopment of Lot B (see Step 2)
5	REDEVELOPMENT OF LOT C – The redevelopment of Lot C will be reviewed once again to ensure that the site will accommodate crossover and/or consolidated access. Using the crossover agreements with Lots B and D, Lot C would share a consolidated access point with Lot D and will also have alternative frontage access the shared site-access driveway of Lots A and B. By using the crossover agreement and conditional access permit process, the City and ODOT will be able to eliminate another access point and provide the alignment with the opposing access points.
6	COMPLETE – After Lots A, B, C, and D redevelop over time, the number of access points will be reduced and aligned, and the remaining access points will meet the access spacing standard.

Pedestrian and Bicycle System Plan

Providing connections between major activity centers is a key objective of the pedestrian and bicycle system plans. Major activity centers are defined as locations that typically attract high levels of pedestrian and bicycle activity on a regular basis. Within St. Helens, these activity centers include the commercial areas along US 30, Columbia Boulevard, and St. Helens Street, as well as the downtown core, city parks, and city schools. This section identifies specific pedestrian and bicycle priorities for local connectivity and access.

PEDESTRIAN SYSTEM COMPONENTS

The recommended pedestrian improvement projects include the provision of sidewalks and off road trails to facilitate pedestrian travel throughout the transportation system, as well as treatments to aid pedestrians crossing traffic. The street design standards presented in this TSP can help ensure that pedestrian facilities are provided in conjunction with all new or substantially reconstructed public streets. For existing roadways without sidewalks, the inclusion of sidewalks should be required with any redevelopment of adjacent properties or with significant improvements in the roadways.

The sidewalk improvement projects prioritized in the TSP represent specific improvements that have been identified to improve pedestrian conditions in a number of areas throughout the city. Many of the priority areas surround existing school sites and could benefit from completion of a Safe Routes to School (SRTS) assessment by the St. Helens school district. As discussed in Section 9, preparation of a SRTS program could also enhance the community's ability to secure grant funding for pedestrian facility improvements.

Figure 7-5 and the project summary tables (7-5 through 7-7) at the end of this section present the recommended pedestrian facilities. In addition to sidewalk improvements, several pedestrian crossing improvement projects are also recommended for prioritization. Examples of the types of crossing improvements needed are discussed below.

Pedestrian Countdown Signals

Pedestrian Countdown Signals are recommended at each of the signalized intersections along US 30, including Deer Island Road, St. Helens Street, Columbia Boulevard, and Gable Road. Future traffic signals at Pittsburg Road, Vernonia Road, and Millard Road should also be equipped with pedestrian countdown signals per the MUTCD. The countdown signals will help inform pedestrians of the time remaining to cross the street.

Curb Extensions

Curb extensions are recommended at 16 locations along Columbia Boulevard and St. Helens Street to provide shorter crossing distances for pedestrians at intersections as well as to encourage reduced travel speeds by motorists. The curb extensions will occupy the portion of the roadway in close proximity to the intersection that is currently used for on-street parking.

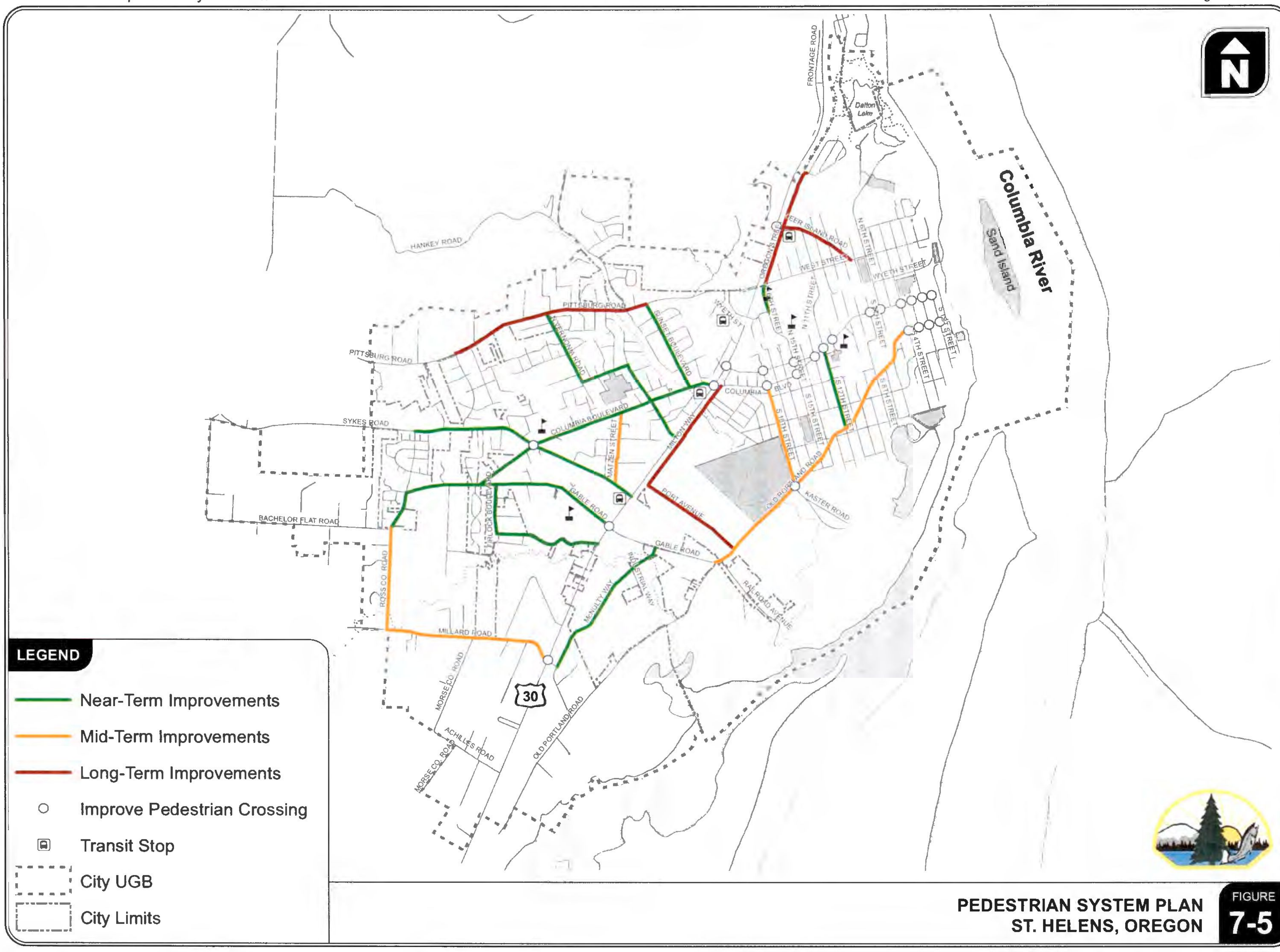
Raised Median Islands

Raised median islands are included in the recommended street design standards for US 30 and Columbia Boulevard. Raised median islands can provide pedestrians with a refuge area within the crosswalk to stop while crossing the street and complete a two-stage crossing if needed.

Other Pedestrian Crossing Treatments

Several additional pedestrians crossing treatments are presented in Section 6 that can also be applied on future projects, such as:

- leading pedestrian intervals which allow pedestrians to begin crossing before conflicting motorists are given a green light, and



PEDESTRIAN SYSTEM PLAN
ST. HELENS, OREGON

FIGURE
7-5

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- other enhanced pedestrian crossing treatments such as the Rectangular Rapid Flash Beacons and the Pedestrian Hybrid Signals.

As part of all street and intersection improvement projects in the future, the City should consider application of treatments to further enhance the comfort, convenience and safety of pedestrian crossings at intersections throughout the City.

BICYCLE SYSTEM COMPONENTS

The bicycle plan is intended to establish a network of bicycle lanes and routes that connect the city's bicycle generators and provide a safe and effective system. Although bicycle lanes should be provided along all arterials and collectors per City code, many of the arterial and collector roadways in St. Helens do not have sufficient width to accommodate bicycle lanes. Therefore, the projects recommended in the TSP represent a prioritization of the most important bicycle facility needs (some roadways will require widening, while other will only require striping). These designated facilities will provide essential connections between many of the residential neighborhoods, commercial areas, schools, and various recreational areas within the city. The recommended bicycle improvement projects are shown in Figure 7-6 and are included in the project summary tables (7-5 through 7-7). The various types of bicycle facilities included in the bicycle system plan are described below.

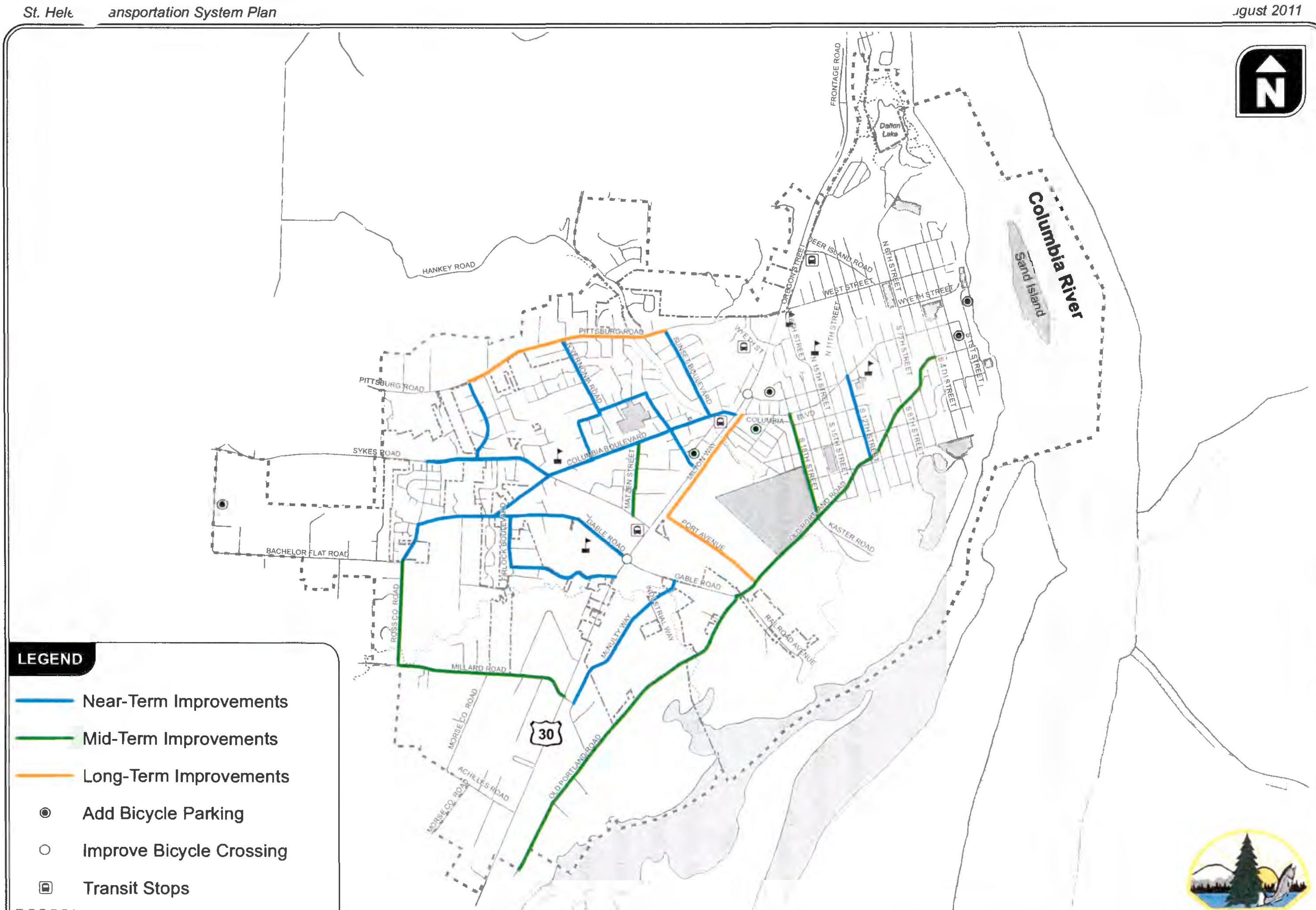
Shared Roadways and Shared-Lane Pavement Markings

Although any roadway without a dedicated bicycle facility is generally considered a shared roadway, Barr Avenue and Cherrywood Drive would benefit from shared-lane pavement markings (sharrows) to help communicate to bicyclists as well as motorists that the roadways are priority bicycle routes. Both roadways are currently designated by the City as Local streets, without any accommodations for striped bike lanes. Sharrows on these roadways can help better facilitate bicycle travel without requiring additional right-of-way.

To enhance the bicycling environment, the City should consider installing sharrows on other collector and arterial facilities commonly used by cyclists where right-of-way constraints limit the ability to add bike lanes in the future. This is a low cost solution with benefits to both motorists and cyclists.

Bicycle Lanes

A majority of the bicycle improvement projects prioritized in the TSP update involve widening City and County roadways to accommodate striped bicycle lanes. Striped bicycle lanes can improve bicycle



LEGEND

- Near-Term Improvements
- Mid-Term Improvements
- Long-Term Improvements
- Add Bicycle Parking
- Improve Bicycle Crossing
- Transit Stops
- City UGB
- City Limits

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BICYCLE SYSTEM PLAN
ST. HELENS, OREGON

FIGURE
7-6

safety along high speed and higher volume roadways, by separating slower moving bicyclists from faster moving motorists. A comprehensive system of bicycle lanes can provide direct connections between neighborhoods, the downtown, retail and employment areas, bus stops along US 30, and the future transit center. Sunset Boulevard and Columbia Boulevard currently have sufficient width to accommodate bicycle lanes and were therefore included in the short-term recommendations. Due to limitation of future financial resources, the recommended TSP project list for mid-term and long-term includes the addition of bike lanes on only those roadways that are anticipated to facilitate the predominance of bicycle demand in the future. Any arterial or collector improvement project should include bike lanes, even if that roadway is not listed as a priority in the TSP list.

Bike Parking

Additional bicycle parking facilities are recommended in several areas throughout the city, including the commercial areas along US 30, Columbia Boulevard, and St. Helens Street, as well as the Old Town, Downtown, and Riverfront areas, and the Columbia County Fairgrounds.

Bicycle Crossings

The need for bicycle crossing improvements was identified in the existing conditions analysis at the US 30/St. Helens Street and US 30/Gable Road intersections. The recommended improvements at the US 30/St. Helens Street intersection include restriping the westbound approach to accommodate a bicycle lane between the left- and right-turn lanes. The recommended improvements at the US 30/Gable Road intersection include enhancing the existing bicycle facilities in the near-term to include pavement markings and signage that directs bicyclist's through the intersection. The existing curb ramp in the northeast corner of the intersection could also be maintained in the near-term to accommodate bicyclists who choose to dismount their bikes and use the crosswalk as a pedestrian. Long-term roadway improvements at the US 30/Gable Road intersection include provision of a separate westbound right-turn lane when needed. At that time, the westbound approach should be restriped to accommodate a bicycle lane between the thru and right-turn lanes, similar to the near-term improvements at the US 30/St. Helens Street intersection.

The city should periodically review other key intersections throughout the city to determine whether additional bicycle treatment improvements are needed to ensure the comfort and safety of cyclists.

Multi-Use Paths and Trails

The continued use of the existing multi-use paths and trails as well as the future development of new paths is recommended as part of the prioritized TSP project list. It is recommended though to replace the existing multi-use path along Old Portland Road north of Gable Road with bicycle lanes, curbs, and sidewalks given its significant role in the pedestrian system. Further, the section of Old Portland Road south of Gable Road should be considered for a new multi-use path. Both projects would help to provide a continuous network of pedestrian facilities that connect the entire east side of the city (and all areas west of US 30 that connect to Old Portland Road) with the down town area.

Public Transportation Plan

The City of St. Helens (along with Columbia County and other impacted communities) adopted the Columbia County Community-Wide Transit System Plan (Reference 14) in 2009. The adopted plan includes transit related improvements along the US 30 corridor needed within a 10-year period. Recommended improvements to the transit stops located in St. Helens are described below.

Safeway/Rite Aid at Gable Road:

- Install an information display case on the existing shelter
- Install a new shelter, bus stop sign and information display case
- Install a sidewalk into the Safeway/Rite Aid site with five curb ramps
- Install two park-and-ride signs

Ace Hardware at Columbia Boulevard:

- Install a new bus stop sign and information display
- Install a new sidewalk on the south side of Columbia Boulevard across the railroad tracks between US 30 and Milton Way along with 12 new/reconstructed curb ramps

Columbia Commons at Pittsburg Road:

- Install information display on existing bus shelter
- Install three bollards between the bus shelter and the parking lot
- Install three new park-and-ride signs

Simpson Site at Deer Island Road (funded and under construction):

- Redevelop site to accommodate transit center including new buildings, park-and-ride lot, and frontage improvements
- Install four park-and-ride signs
- Restripe southbound left-turn lane on US 30
- Install transit signal priority along US 30

Air Service

Passenger and/or commercial air service is beyond the scale of what St. Helens can pursue independently. However, the city should remain aware of changes or opportunities to bring other air travel options to the community and should support those efforts, as they are able. In the interim, air service will continue to be accessible at the Portland International Airport, the Scappoose Industrial Airpark, and the Southwest Regional Airport in Kelso Washington.

Marine System Plan

The Columbia River provides an opportunity for surface water transportation for the City of St. Helens. The City should continue to pursue opportunities to utilize the Columbia River for both recreational and commercial activities, including provision of access to Sand Island through some form of boat shuttle service.

Rail Service

Columbia County (in conjunction with Clatsop County) conducted a study of the Lower Columbia River Rail Corridor which included several recommendations for improvements to key study intersections/rail crossings along US 30. The following summarizes the recommended improvements in St. Helens.

- Study the potential closure of the US 30/Wyeth Street intersection
- As indicated later in this section, this should be considered in conjunction with the provision of a westbound left-turn lane at the US 30/Deer Island Road intersection and a traffic signal at the US 30/Pittsburg Road intersection.
- Close pedestrian access or adjust signal timing to provide sufficient crossing time for pedestrians at the US 30/Columbia Boulevard intersection.
- Add 215 feet of southbound left-turn storage and 65 feet of northbound right-turn storage to the US 30/Columbia Boulevard intersection.
- Install a traffic signal inter-tied with the existing railroad crossing and add an at-grade pedestrian sidewalk across the railroad tracks to the US 30/Millard Road intersection.
- Install an at-grade pedestrian sidewalk across the railroad tracks and add 150 feet of southbound left-turn storage to the US 30/Deer Island Road intersection.

- Install an at-grade pedestrian sidewalk across the railroad tracks and replace the obsolete gates at the US 30/St. Helens Street intersection.
- Add 210 feet of southbound left-turn storage and an ADA compliant pedestrian/bicycle overpass at the US 30/Gable Road intersection.

Future consideration should be given to the potential for long-term passenger rail service in St. Helens. The addition of passenger rail service would increase activity along the Portland and Western Railroad which would impact operations at each of the existing rail crossings and would likely require additional pedestrian facilities for access to the service.

Pipeline and Transmission Systems Plan

The existing high pressure natural gas transmission line that runs along the Rutherford Parkway at the northern end of the city, US 30, and along Old Portland Road should be maintained and enhanced as necessary by its owner/operator (Northwest Natural Gas) to ensure adequate 20-year capacity is provided.

Implementation Plan

This section outlines specific transportation system improvement projects as well as a recommended timeline for implementation. The sequencing plan presented is not detailed to the point of a schedule identifying specific years when infrastructure should be constructed, but rather prioritizes projects to be developed within near-term (2011 to 2016), mid-term (2017 to 2021), and long-term (2022 to 2031) horizons. In this manner, implementation of identified system improvements has been staged to spread investment in the city's transportation infrastructure over the life of the plan. The City of St. Helens will need to periodically update its TSP and will review the need and timing for longer-term improvements as conditions evolve.

In addition, several potential projects have been identified for the "long-range vision." Such projects may not be feasible within the twenty-year planning horizon, for reasons of both need and resources. However, they represent a vision for an efficient transportation system in the future and they have been identified to support the preservation of improvement opportunities as future conditions may warrant them. The City of St. Helens, Columbia County, and ODOT should take the appropriate steps to prevent actions and/or development that would preclude these projects in the future.

The construction of roads, water, sewer, and electrical facilities in conjunction with local development activity should be coordinated to ensure the city develops in an orderly and efficient way. Consequently, the planned improvements identified in the TSP should be considered in light of evolving infrastructure sequencing plans, and may need to be modified accordingly.

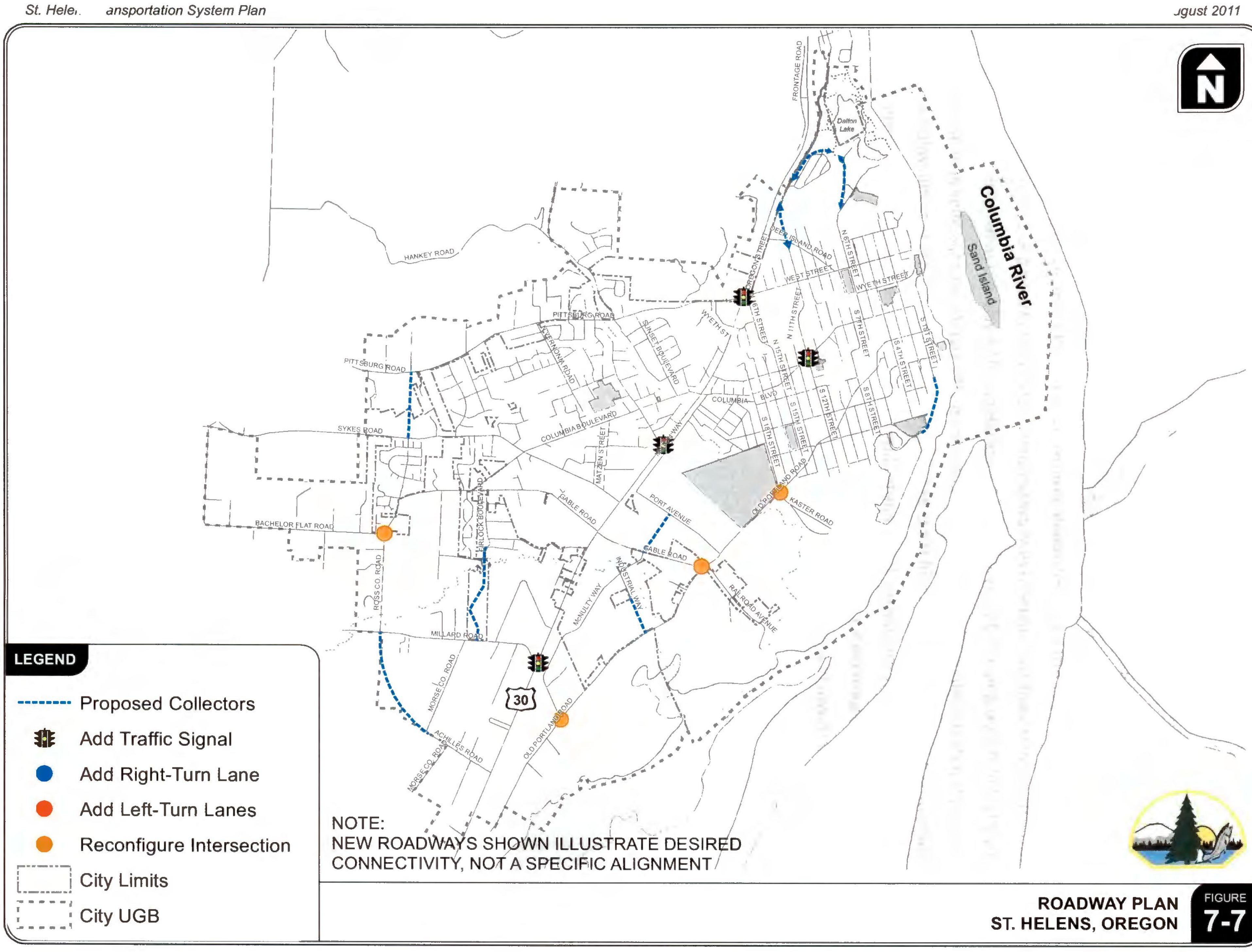
PLANNED IMPROVEMENTS

The planned improvement projects enhance rail, motor vehicle, bicycle, and pedestrian travel within and through the city. While site specific projects such as traffic signals and turn lanes have been included to improve conditions at particular locations, the plan also seeks to develop an efficient transportation network that will reduce reliance on US 30 through development of parallel facilities. New roadways or roadway extensions are planned to serve all modes. These include road segments to fill gaps in the existing street system, new roads to serve development on adjacent properties, and new arterials and collectors to create an efficient grid system of future roadways.

A prioritization of transportation improvements in the city for the near-term, mid-term, and long-term as well as for the future vision of the city are listed in Tables 7-5 through 7-7, respectively. The tables include pedestrian and bicycle improvement projects, which are depicted in Figures 7-5 and 7-6, as well as roadway improvement projects shown in Figure 7-7.

The implementation plan recognizes that only a certain amount of money will be available to fund projects. As a result, a number of lower-cost improvements with immediate benefit are shown in the near-term (2011 to 2015) time frame. The longer project timelines reflect a combination of anticipated future needs and the reality that it will take time to accumulate the required funds.

It should be recognized that the inclusion of proposed projects and actions in this plan does not obligate or imply obligations of funds by any jurisdiction for project-level planning or construction. Instead, the inclusion of proposed projects and actions serves as an opportunity for the, to be included, if appropriate, in the State Transportation Improvement Program (STIP) and the City of St. Helens Capital Improvement Program. Such inclusion is not automatic, but it is incumbent on the State, City of St. Helens, Columbia County, and the general public to take action to encourage and support inclusion of projects in the STIP or the CIP at the appropriate time. Because a project must have identified funding to be included in the STIP or CIP, the ultimate number of projects that can be included in these documents is constrained by available funding.



ROADWAY PLAN
ST. HELENS, OREGON
FIGURE 7-7

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NEAR-TERM IMPROVEMENTS

Table 7-5 summarizes the near-term transportation improvement program for the St. Helens TSP update. This program is intended to address deficiencies in the existing transportation system that were identified as priorities during the TSP update process. As shown, the near-term improvements primarily focus on increasing the comfort, convenience, and safety of pedestrian and bicycle travel within the city. Per the existing conditions analysis, the prevalence of bicycle and pedestrian improvement projects included in the near-term program reflect the significant gaps identified in the existing networks and the opportunity to fill those gaps before significant increases in traffic volumes require vehicular capacity improvements. The projects shown in Table 7-5 are divided into roadway, bicycle, and pedestrian improvement projects and are in order by their estimated costs (least to highest). The projects shown in grey are along roadways operated and maintained by Columbia County.

TABLE 7-5: NEAR-TERM (2011 TO 2016) TRANSPORTATION IMPROVEMENT PROGRAM

Project No.	Project Location	Project Description	Estimated Cost
		Roadway Improvement Projects	
N01	Ross Road/Bachelor Flat Road	Study and implement all-way stop control, if warranted[1]	$12,000
N02	US 30/Millard Road	Regrade southwest corner to provide adequate sight distance	$20,000
N03	18th Street/Old Portland Road	Reconfigure intersection to stop control or upgrade signal to current standard	$100,000
		Bicycle Improvement Projects	
N04	Firlock Park Road (Gable Road to US 30)	Widen roadway and add bike lanes	$891,000
N05	12th Street (Columbia Blvd. to Old Portland Road)	Widen roadway and add bike lanes	$364,000
N06	Cherrywood Drive (Vernonia Road to Columbia Blvd.)	Add sharrows	$4,500
N07	Barr Avenue (Pittsburg Road to Sykes Road)	Add sharrows	$5,500
N08	Sunset Blvd. (Pittsburg Road to Columbia Blvd.)	Add bike lanes	$15,000
N09	Columbia Boulevard (Sykes Road to US 30)	Add bike lanes	30,000
N10	Sykes Road (Summit View Drive to Columbia Blvd.)	Widen roadway and add bike lanes	$643,000
N11	Bachelor Flat Road (Ross Road to Columbia Blvd.)	Widen roadway and add bike lanes	$461,000
N12	Columbia Blvd. (Gable Road to Sykes Road)	Widen roadway and add bike lanes	$304,000
N13	Gable Road (Bachelor Flat to US 30)	Widen roadway and add bike lanes	$502,000
N14	Vernonia Road (Pittsburg Road to US 30)	Widen roadway and add bike lanes	$482,000
N15	McNulty Way (Millard Road to Gable Road)	Widen roadway and add bike lanes	$337,000
N16	US 30/St. Helens Street	Reconfigure bike lane striping across right turn lane	$5,000
N17	US 30/Gable Road	Enhance existing bicycle facilities with pavement markings and signage	$5,000
		Pedestrian Improvement Projects	
N18	Firlock Park Road (Gable Road to US 30)	Add curbs and sidewalks	$1,103,000
N19	12th Street (Columbia Blvd. to Old Portland Road)	Add curbs and sidewalks	$580,000
N20	16th Street (West Street to Middle School Driveway	Add curbs and sidewalks	$266,000
N21	Sunset Blvd. (Pittsburg Road to Columbia Blvd.)	Add curbs and sidewalks	$668,000
N22	Columbia Blvd. (Sykes Road to US 30)	Add curbs and sidewalks	$1,353,000
N23	Sykes Road (Summit View Drive to Columbia Blvd.)	Add curbs and sidewalks	$805,000
N24	Sykes Road (Columbia Blvd. to US 30)	Add curbs and sidewalks	$190,000
N25	Bachelor Flat Road (Ross Road to Columbia Blvd.)	Add curbs and sidewalks	$804,000
N26	Columbia Blvd. (Gable Road to Sykes Road)	Add curbs and sidewalks	$400,000
N27	Gable Road (Bachelor Flat to US 30)	Add curbs and sidewalks	$995,000
N28	Vernonia Road (Pittsburg Road to US 30)	Add curbs and sidewalks	$1,319,000
N29	McNulty Way (Millard Road to Gable Road)	Add curbs and sidewalks	$749,000
N30	Columbia Blvd./Sykes Road	Install 2 striped crosswalks and 6 new ADA ramps	$19,000
N31	18th Street/Old Portland Road	Install 2 striped crosswalks and new 6 ADA ramps	$19,000
		-Continued on the next page -	

Project No.	Project Location	Project Description	Estimated Cost
		-Continued from the previous page -	
N32	Columbia Blvd./St. Helens Couplet	Install curb extensions (4 locations)	$106,000
N33	Columbia Blvd. Couplet to 2nd Street	Install curb extensions and island refuges (8 locations)	$200,000
N34	Columbia Blvd./1st Street	Install 1 striped crosswalk and 3 new ADA ramps	$10,000
N35	St. Helens Street	Install curb extensions (4 locations)	$106,000
N36	US 30 Corridor	Install Pedestrian Countdown Heads (5 Locations)	$15,000
		Total Near-Term Estimated Costs	$13,888,000

[1] The study should evaluate the potential to reopen the Nobel Street connection to Bachelor Flat Road.

In addition to the projects shown in Table 7-5, the City/ODOT should complete a corridor master plan for US 30 through St. Helens. The master plan should consider streetscape options and gateway treatments that incorporate the St. Helens Arts & Cultural commission recommendations to make city more inviting and attractive by creating "Gateways." The City should also complete a corridor master plan for Columbia Boulevard/St. Helens Street (east of US 30) that examines in more detail lane widths, sidewalks, landscaping, lighting, pedestrian and bicycle amenities, street furniture, guide/way finding signs, etc. Many of these types of treatments are addressed in "Creating Livable Streets: Street Design Guidelines for 2040" (Reference 15) and "Green Street: Innovative Solutions for Stormwater & Stream Crossing" (Reference 16).

Mid-Term Improvements

Table 7-6 summarizes the mid-term transportation improvement program for the St. Helens TSP update. This program includes a mixture of connectivity improvements for pedestrians, cyclists and motorists as well as capacity-based projects along US 30 and on the city's arterial and collector street network. The projects shown in grey are along roadways operated and maintained by Columbia County (only a portion of Old Portland Road from Millard Road to Gable Road is under the County's jurisdiction).

The timing of construction of the capacity-based projects shown in Table 7-6 is an important consideration given that changes made in one location may result in a change in traffic volumes, patterns and/or operations at another. For example, the installation of a traffic signal at the US 30/Millard Road intersection should be accompanied by improvements along Millard Road and Ross Road as well as the reconfiguration of the Ross Road/Bachelor Flat road intersection (to accommodate the anticipated increase in traffic volumes along those roadways) and the Millard Road/Old Portland Road (to better accommodate truck turns)[12].

TABLE 7-6 MID-TERM (2017 TO 2021) TRANSPORTATION IMPROVEMENT PROGRAM

Project No.	Project Location	Project Description	Estimated Cost
		Roadway Improvement Projects	
M01[1]	US 30/Deer Island Road	Install westbound right-turn lane	$485,000
M02[1,2]	US 30/Millard Road Intersection	Install traffic signal and reconfigure the McNulty Way/Millard Road intersection to accommodate heavy truck turning movements	$1,000,000
M03	Columbia Boulevard/Sykes Road	Install left-turn lanes on Columbia Boulevard	$368,000
M04	Ross Road/Bachelor Flat Road	Reconfigure intersection to emphasize the northbound-through movement	$769,000
M05	Old Portland Road/Millard Road	Widen intersection to accommodate heavy truck turning movements	$60,000
M06	Millard Road	Reconstruct roadway to City street standards	$2,892,000
M07	Ross Road	Reconstruct roadway to City street standards	$1,617,000
		Bicycle Improvement Projects	
M08	18th Street (Columbia Blvd. to Old Portland Road)	Widen roadway and add bike lanes	$242,000
M09	Matzen Street (Columbia Blvd. to Sykes Road)	Widen roadway and add bike lanes	$51,000
M10	Old Portland Road (Gable Road to St. Helens Street)	Widen roadway and add bike lanes	$1,048,000
M11	Old Portland Road (Millard Road to Gable Road)	Add 10-foot Multi-Use Path on east side of roadway	$872,000
M12	Old Portland Road (City Limits to Millard Road)	Add 10-foot Multi-Use Path on east side of roadway	$517,000
		Pedestrian Improvement Projects	
M13	18th Street (Columbia Blvd. to Old Portland Road)	Add curbs and sidewalks	$638,000
M14	Matzen Street (Columbia Blvd. to Sykes Road)	Add curbs and sidewalks	$94,000
M15	Old Portland Road (Gable Road to St. Helens Street)	Widen roadway and add bike lanes	$2,199,000
		Total Mid-Term Estimated Costs	$12,852,000

[1]Project will require coordination/approval by ODOT and ODOT Rail Division. Engineering studies, traffic analysis, and conformance with ODOT standards will be evaluated as projects are developed.
[2]Project must meet traffic signal warrants and receive approval from State Traffic Engineer. Engineering studies, signal warrant and traffic analysis, and conformance with ODOT standards will be evaluated as projects are developed.

In addition to the projects shown in Table 7-6, the eastbound and westbound left-turn movements at the US 30/Wyeth Street intersection will likely need to be restricted as traffic volumes along US 30

[12] Before a signal can be installed on the State system, OAR 734-020-0440 requires a traffic engineering investigation that shows how traffic signal warrants and highway design and spacing standards are met with the proposed signal and how the proposed signal would improve the overall safety and operation of the intersection. A progression analysis would be required as per OAR 734-020-0470 for signals that will not meet the one half mile minimum spacing standard for traffic signals on State highways. Signals may not be installed until signal warrants are satisfied and the installation request and design has been approved by the State Traffic Engineer (OAR 734-020-0410).

increase. The provision of a westbound right-turn lane at the US 30/Deer Island Road intersection and the long-term provision of a traffic signal at the US 30/Pittsburg road intersection should accommodate the impact of these restrictions as well as the long-term goal of complete closure as described below.

Long-Term Improvements

Table 7-7 summarizes the long-term transportation improvement program. This program is intended to address anticipated multimodal deficiencies in the transportation system that are unlikely to be funded in the next ten years. This program also includes improvements that may be constructed with future developments. The projects shown in grey are along roadways operated and maintained by Columbia County.

In addition to the projects included in Table 7-7, the US 30/Wyeth Street intersection should be closed per recommendations in the Lower Columbia River Rail Corridor study (LCRRC).

As shown in Table 7-7, provision of a southern overpass was included as part of the long-term transportation improvement program despite its significant impact to the total long-term estimated costs. Additional information related to the southern overpass is included in Section 6 of the TSP as well as below.

TABLE 7-7 LONG-TERM (2022 TO 2031) TRANSPORTATION IMPROVEMENT PROGRAM

Project No.	Project Location	Project Description	Estimated Cost
		Roadway Improvement Projects	
L01[1]	US 30/Gable Road	Install westbound right-turn lane	$485,000
L02[2]	US 30/Pittsburg Road	Install traffic signal	$400,000
L03[2]	US 30/Vernonia Road	Install traffic signal	$400,000
L04	12th Street/Columbia Blvd.	Install traffic signal or roundabout	$250,000
L05	Old Portland Road/Gable Road	Realign intersection to emphasize northbound movement	$2,785,000
L06	Summit View Drive Extension	Install roadway, curbs, and sidewalks	$1,656,000
L07	Achilles Road Extension	Install roadway, curbs, and sidewalks	$2,952,000
L08	Industrial Way Extension	Install roadway, curbs, and sidewalks	$1,000,000
L09	Plymouth to 1st Street Extension	Install roadway, curbs, and sidewalks	$1,505,000
L10	Firlock Park Extension	Install roadway, curbs, and sidewalks	$2,260,000
L11	Milton Way Extension	Install roadway, curbs, and sidewalks	1,767,000
L12	US 30/Millard Road	Install partial interchange	$15,000,000
		Bicycle Improvement Projects	
L13	Pittsburg Road (Barr Road to Vernonia Road)	Widen roadway and add bike lanes	$562,000
L14	Pittsburg Road (Vernonia Road to Sunset Blvd.)	Widen roadway and add bike lanes	$242,000
L15	Port Avenue (Milton Way to Old Portland Road)	Widen roadway and add bike lanes	$340,000
L16	Milton Way (Port Avenue to Columbia Blvd.)	Widen roadway and add bike lanes	$709,000
		Pedestrian Improvement Projects	
L17	Pittsburg Road (Barr Road to Vernonia Road)	Add curbs and sidewalks	$680,000
L18	Pittsburg Road (Vernonia Road to Sunset Blvd.)	Add curbs and sidewalks	$402,000
L19	Port Avenue (Milton Way to Old Portland Road)	Add curbs and sidewalks	$453,000
L20	Milton Way (Port Avenue to Columbia Blvd.)	Add curbs and sidewalks	$756,000
L21	Oregon Street (West Street to Rutherford Parkway)	Add curbs and sidewalks	$841,000
L22	Deer Island Road (US 30 to West Street)	Add curbs and sidewalks	$591,000
		Total Long-Term Estimated Costs	$36,036,000

[1]Project will require coordination/approval by ODOT and ODOT Rail Division. Engineering studies, traffic analysis, and conformance with ODOT standards will be evaluated as projects are developed.
[2]Project must meet traffic signal warrants and receive approval from State Traffic Engineer. Engineering studies, signal warrant and traffic analysis, and conformance with ODOT standards will be evaluated as projects are developed. Projects may also require approval for a deviation to the access spacing standards for a traffic signal along US 30.

Long-Term Vision

The long-term vision for the City's transportation system involves completion of a safe and efficient multimodal transportation system that can accommodate all travel modes along all major roadways.

The plan also anticipates an off-street multi-use path and trail system that is integrated with the existing trail and street system throughout the city.

The projects shown in Table 7-5, 7-6, and 7-7 make significant progress toward providing a balanced multimodal transportation system within the city, and also provide for much of the vehicular capacity that will likely be needed within the 20-year planning horizon. Notwithstanding these improvements, it is recommended that the completion of at least one overpass of US 30 within the city limits be included in the city's long-term vision. As indicated in Section 6, provision of an overpass at the northern end of the city near the US 30/Pittsburg Road intersection or at the southern end of the city near the US 30/Millard Road intersection can be considered.

The concept of a northern overpass was included in the previous TSP effort as well as other City and regional planning documents. Conceptually the facility is attractive because it could connect Pittsburg Road west of US 30 and West Road east of US 30 while crossing over both US 30 and the PNWR rail line. The northern overpass would provide significant improvements in traffic operations near the north end of the city while providing access to local school and commercial activities for local residents.

While the northern overpass concept is attractive, more traffic, including heavy truck traffic, enters and exits the city from the south. Provision of the southern overpass, and the resultant re-routing of local traffic off of US 30 as it enters the city, improves operations all along the US 30 corridor. Ultimately, the concept of a southern overpass near the US 30/Millard Road intersection was identified as a higher-priority alternative and included in the long-term transportation improvement program based on the benefits provided, including:

- Improved vehicular access and circulation to the residential areas east and west of US 30.
- Improved truck circulation to the industrial area east of US 30 assuming trucks would access US 30 at the overpass (reducing the potential for rail/truck interaction).
- Improved access and circulation for emergency response vehicles to areas both east and west of US 30.

While it is unlikely that an overpass will be constructed in the next 20 years, the City of St. Helens and ODOT should take appropriate steps to further conceptual planning for a southern overpass.

Section 8 Transportation Funding Plan

8 TRANSPORTATION FUNDING PLAN

Financing the improvement needs identified in Section 7 will be a formidable challenge; however, there are a variety of options available to fund transportation improvements within St. Helens. This section identifies funding sources that have contributed to projects within St. Helens over the past five years and forecasts potential future revenue the City may generate. Because the existing funding sources will not meet the projected transportation needs, potential additional funding sources are also highlighted.

It should be recognized that the inclusion of proposed projects and actions in this plan does not obligate or imply obligations of funds by any jurisdiction for project-level planning or construction. Instead, the inclusion of proposed projects and actions serves as an opportunity for the, to be included, if appropriate, in the State Transportation Improvement Program (STIP) and the City of St. Helens Capital Improvement Program. Such inclusion is not automatic, but it is incumbent on the State, City of St. Helens, Columbia County, and the general public to take action to encourage and support inclusion of projects in the STIP or the CIP at the appropriate time. Because a project must have identified funding to be included in the STIP or CIP, the ultimate number of projects that can be included in these documents is constrained by available funding.

Historical Transportation Funding

Key funding sources that have contributed to transportation projects within the city over the past five years are summarized below.

TRANSPORTATION SYSTEM DEVELOPMENT CHARGES

A transportation system development charge (SDC) is a one-time fee imposed on new development (and some types of re-development) at the time of building permit issuance. The fee is intended to recover a fair share of the costs of existing and planned facilities that provide capacity to serve new growth. The City's existing transportation SDCs are based on projected trip generation by land use. More specifically, new development is charged by adjusted daily trip ends (daily trip-ends adjusted for diverted linked trips) at a rate of $402 per trip. The existing residential transportation SDCs are shown in Table 8-1 (commercial development SDC assessments vary by land use type).

TABLE 8-1: EXISTING TRANSPORTATION SDC

Building Type	Average Daily Trips	Pass-By Trip Factor	SDC Assessment
Single Family	9.57	1	$3,847
Apartment	6.72	1	$2,701

Revenue generated from SDCs is required to be spent on qualified projects identified in the City's Capital Improvement Plan, which relies heavily on the implementation plan outlined in the City's Transportation System Plan. While the total costs associated with some projects qualify for SDC revenue, others are only partially covered by the program. The remainder of those project costs are financed with other revenue sources. The City should update the current SDC program to reflect the projects identified in Section 7 and a new six-year capital plan.

COLUMBIA COUNTY SDC PROGRAM

Columbia County also has a SDC Ordinance based on the "Feasibility and Implementation of System Development Charges: Parks & Transportation" report. Section IV - SDC Application in the Urban Growth Areas (UGA) of the County report states, "The identified "service provider" would be the recipient of related system development charges collected on its behalf in the UGA."

The City of St. Helens and Columbia County are in the process of clarifying, through urban services agreements, who is the "service provider" of transportation and park facilities in the UGA. The service provider of the facility would be the recipient of the SDC's. Accordingly, either the County or the City would be the recipient of the SDC's for both Parks and Transportation, and those SDC's would only be spent in the UGB.

It is recommended that the County and City collaborate on an updated SDC program to meet the local transportation needs. The two agencies may want to consider developing and adopting a joint-area transportation SDC that addresses SDC assessments within the City UGB. Funds collected could then be allocated to projects within the joint SDC area. Clackamas County and the City of Happy Valley have a joint transportation SDC program that may serve as a model for Columbia County and St. Helens to consider.

FEE IN LIEU FUNDS

Fee in Lieu of Construction funds could be collected from developers when required frontage improvements cannot be provided for reasons deemed acceptable by the City Engineer. For example, street trees, sidewalks or other features may not be possible in some locations due to topographic or geologic constraints and a fee in lieu could be assessed. The collected fees could be aggregated and used by the City of St. Helens to construct transportation infrastructure improvements that benefit the community.

STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM

The Oregon Statewide Transportation Improvement Program (STIP - Reference 17) is the state's four-year transportation improvement program for state and regional transportation systems, including federal land and Indian reservation road systems, interstate, state, and regional highways, bridges, and public transportation. It covers all state and federally-funded system improvements for which funding is approved and that are expected to be undertaken during a four-year period.

The current STIP identifies projects funded during the 2010-2013 period throughout the state of Oregon, including one project in St. Helens. The project involves improvements to Columbia Boulevard between US 30 and North 1st Street that are already underway, including: grinding and resurfacing the roadway, removal and reconstruction of sidewalks, and installation of new curb and gutter. The draft STIP identifies a $264,000 design/construction cost and commencement in 2010.

OTHER REVENUE SOURCES

Table 8-2 displays the total revenue by source used to fund transportation projects within the city over the past five years.

TABLE 8-2: REVENUE SOURCE HISTORY

Revenue Source	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	Average
Motor Vehicle Tax	$560,000	$555,700	$525,200	$470,900	$510,400	$524,400
State Grants	$47,400	$0	$0	$537,700	$105,900	$138,200
System Development Charges	$376,400	$160,200	$229,900	$55,500	$88,000	$182,000
Other[1]	$14,300	$17,600	$11,200	$4,100	$14,200	$12,300
Total Revenue	***$998,100***	***$733,500***	***$766,300***	***$1,068,200***	***$718,500***	***$856,900***

FY=Fiscal year

[1] Other revenue sources generally include miscellaneous revenue, donations, and interest.

Based on the information shown in Table 8-2, St. Helens has generated an average of approximately $856,900 per year in total revenue for transportation related projects. Also shown, the largest revenue sources for the city have traditionally been the motor vehicle tax and the SDC, representing approximately 90 percent of total revenue over the last five-year period. SDCs will likely increase again following the economic recovery and continue to be a viable source for city revenue.

EXPENDITURE HISTORY

Table 8-3 displays the total expenditures on transportation related projects within St. Helens over the last five years.

TABLE 8-3: EXPENDITURE HISTORY

Revenue Source	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	Average
Street Lighting	$106,600	$102,000	$103,800	$95,300	$60,800	$93,700
Street Signs	$6,400	$5,000	$6,900	$6,400	$12,800	$7,500
Road Paving	244,000	$0	$592,300	$491,500	$5,700	$266,700
Sidewalk Projects	$0	$0	$0	$0	$163,700	$32,700
Bicycle Path Construction	$0	$0	$16,300	$155,400	$193,700	$73,100
Consulting Services	$11,400	$31,000	$26,500	$39,300	$88,100	$39,300
Construction Expenses	$73,100	$4,700	$313,000	$0	$19,800	$82,100
Equipment Purchases	$0	$31,900	$284,100	$96,900	$159,600	$114,500
Total Capital Expenditures	$441,500	$174,600	$1,342,900	$884,800	$704,200	$709,600
Total Other Expenditures[1]	$287,000	$299,700	$292,200	$306,300	$346,100	$306,300
Total Expenditures	***$728,400***	***$474,200***	***$1,635,100***	***$1,191,100***	***$1,050,200***	***$1,015,800***

[1] Other expenditures include general maintenance and overhead costs.

Based on the information shown in Table 8-3, the City of St. Helens has spent an average of $709,600 per year on capital improvement projects (or approximately 70 percent of available resources) and $306,300 on maintenance and overhead (or approximately 30 percent of available resources). The information shown in Tables 8-2 and 8-3 were used to project the availability of future funding for transportation improvement projects as described below.

PROJECTED TRANSPORTATION FUNDING

Table 8-4 provides a summary of the potential future project funding (in year 2010 dollars) over the next five, ten, and twenty years based on an assumed average funding level of approximately $857,000 per year.

TABLE 8-4: FUTURE TRANSPORTATION FUNDING

Revenue Source	Average Annual	5-Year Forecast	10-Year Forecast	20-Year Forecast
Total Revenue	$857,000	$4,286,600	$8,569,300	$17,138,600
Revenue For Capital Improvements (70%)	$598,600	$2,992,800	$5,985,700	$11,971,400
Revenue for Operations and Maintenance (30%)	$258,400	$1,291,800	$2,583,600	$5,167,200

As shown in Table 8-4, it is anticipated that approximately $17.1 million will be available for transportation project funding over the next 20 years using existing funding sources. Approximately $12.0 million of the 17.1 million can reasonably be assumed to be available for funding the transportation plan while the remaining $5.1 million will be needed for operations and maintenance.

TABLE 8-5: ESTIMATED TRANSPORTATION IMPROVEMENT COSTS

Type	Short-Term	Mid-Term	Long-Term	Total
Roadway	$132,000	$7,191,000	$28,693,000	$36,016,000
Bicycle	$4,049,000	$2,730,000	$1,853,000	$8,632,000
Pedestrian	$9,707,000	$2,931,000	$3,723,000	$16,361,000
Total	$13,888,000	$12,852,000	$36,036,000	$62,776,000
Available	$2,992,800	$2,992,800	$5,985,600	$11,971,200
Funding Shortfall	$10,895,200	$9,859,200	$30,050,400	$50,804,800

Based on the estimated projected funding available and the estimated costs of the transportation improvement projects included in Section 7, the City will need to identify additional funding sources to pay for transportation improvements over the next 20 years.

Potential Funding Sources

The remainder of this section provides an overview of funding and financing options that are available for consideration and may be of interest to the City of St. Helens. Funding describes methods that generate revenue for transportation projects, while financing refers to how projects are paid for over time. For each of the funding options listed below, there is a brief description and a short discussion. No effort has been made to screen funding options according to their political or legal feasibility. The funding environment is dynamic so the list shown should not be considered exhaustive.

FEDERAL RESOURCES

SAFETEA-LU[13]

The current federal transportation funding bill is the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (commonly known by its acronym, SAFETEA-LU), which authorizes funding for the nation's surface transportation programs. It was signed into law in August 2005 and replaced the expired Transportation Equity Act for the 21st Century (TEA-21). The law establishes funding levels and policies for the federal government's highway, highway safety, transit, motor carrier, and some rail programs administered by the U.S. Department of Transportation (DOT). Funds to local agencies within the State of Oregon are primarily allocated by the Oregon Department of Transportation (ODOT) unless dedicated to a local agency through a specific project earmark. SAFETEA-LU expired on September 30, 2009 and has since been operating on congressionally authorized extensions. Congress is currently debating development of a new transportation funding bill to replace SAFETEA-LU; however the timing for approval of a new six-year funding package is unknown.

Potential: The potential for St. Helens to take advantage of the next bill will likely be through lobbying to get their projects on the next ODOT STIP and applying for funds dedicated to specific types of projects, such as pedestrian and bicycle projects or downtown revitalization, for local agencies. No specifics are available at this time to what the future bill may include or how much funding will be available for local agencies.

Community Development Block Grants (CDBG)

Community Development Block Grants (CDBG) are offered through the Federal Department of Housing and Urban Development. To receive CDBG funds, cities must compete for grants based upon a formula that includes factors such as rural/urban status, demographics, local funding match, and potential benefits to low-to-moderate income residents, including new job creation. CDBG funds can also be used for emerging public work needs.

Potential: In small rural communities this program has limited application but may be a source of street funds for roads serving new developments supporting job creation or multifamily housing. CDBG funding requests should be coordinated through Columbia County.

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[13] Source: http://www.oregon.gov/ODOT/HWY/SAFETEA-LU.shtml

Federal Economic Development Administration (EDA)

The Federal Economic Development Administration provides annual grant funding on a competitive basis for public works improvements that directly generate or retain jobs in local communities. These funds can be used for local utilities and transportation facilities that serve new development sites.

Potential: EDA funds are difficult to obtain but could be considered for targeted improvements for local industry expansion. Funding requests for EDA grants should be coordinated with Columbia County and the Oregon Economic and Community Development Department (OECDD).

STATE FUNDING OPTIONS

State Motor Vehicle Tax Fund

The State of Oregon currently collects the following fuel and vehicles fees for the State Motor Vehicle Fund:

- State Gas Tax $0.30 per gallon[14]
- Regular Vehicle Registration Fees[15]
  - Light Trailer $86.00 two-year fee
  - Low-Speed Vehicle $86.00 two-year fee
  - Motorcycles/Mopeds $43.00 two-year fee
  - Passenger Vehicles $86.00 two-year fee
  - Snowmobiles $10.00 two-year fee

In addition, a weight-mile tax is assessed on freight carriers to reflect their use of state highways. The revenue from the fund is used by ODOT and distributed to cities and counties throughout the state with each city's distribution based on a city's share of statewide population, and the county distribution based on a county's share of statewide vehicle registration.

Existing Application: ODOT Region 1, Columbia County, and the City of St. Helens each receive funds from the state Motor Vehicle Fund. ODOT uses their allocation from the State Motor Vehicle Fund for maintenance and capital purposes. Columbia County and the City of St. Helens typically use their

[14] Source: http://www.oregon.gov/ODOT/CS/FTG/current_ft_rates.shtml
[15] Source: http://www.oregon.gov/ODOT/DMV/fees/vehicle.shtml#RegularReg. Several additional registration fees are identified on ODOT's webpage, including fees for registering vehicles for disabled veterans, as well as for campers, charitable non-profit vehicles, etc.

funding allocation for street maintenance; however it could be used for other types of projects such as pedestrian and bicycle projects.

The state currently distributes approximately 16 percent of the State Motor Vehicle Fund to cities and 24 percent to counties based on a per capita rate (cities) and vehicle registration (counties)[16]. The remaining amount in the State Motor Vehicle Fund is used to maintain and enhance the state highway system. The state operates a grant program available to cities for bicycle-related transportation system improvements and one percent of the fuel tax returned to cities and counties is designated for bike paths and lanes.

Potential: With an increase in population, number of registered vehicles, and fuel sales, the total revenue from the State Motor Vehicle Fund will rise but if the fees (tax per gallon) remain at current levels, there will be a reduction in buying power due to inflation. The gas tax will however continue to be a source of funds for the City of St. Helens through ODOT for highway and pedestrian and bicycle projects.

Special Public Works Funds (SPWF) and Immediate Opportunity Funds (IOF) — Lottery Program

Description: The State of Oregon, through the Economic and Community Development Department (OECDD), provides grants and loans to local governments to construct, improve, and repair public infrastructure in order to support local economic development and create new jobs.

Existing Application: SPWF and IOF funds have been used in a number of cities for the construction of water, sewer, and limited street improvements.

Potential: These funds are limited to situations where it can be documented that a project will contribute to economic development and family-wage job creation. An example of the application of these funds in St. Helens may be for street improvements along Columbia Boulevard and St. Helens Street such as medians, landscape strips, curb extensions, and sidewalks to better facilitate access to businesses located on both sides of the streets and facilitate walking trips for customers accessing downtown retail businesses. Funding applications should be coordinated with Columbia County, OECDD, and ODOT.

State Bicycle-Pedestrian Grants

Description: ODOT's Bicycle and Pedestrian Program administers two grant programs to assist in the development of walking and bicycling improvements: local grants and Small-Scale Urban Highway Pedestrian Improvement (SUPI) programs. For both these grants, cities that have adopted plans with

[16] Source: http://governor.oregon.gov/ODOT/CS/FS/hwy_rev.shtml

identified projects will be in the best position to secure grant funds. Cities and counties can apply for local grants for bicycle and pedestrian projects within the right-of-way of local streets. Local grants up to $100,000 are shared 80 percent State and 20 percent local. Projects that consider the needs of children, elderly, disabled, and transit users are given special consideration.

To apply, there must be support for the project from local elected officials. Applications for the Local Grant program are mailed out to all Oregon jurisdictions every other year. In the SUPI process, cities and counties help ODOT identify sections of urban highways where improvements are needed. Examples of eligible projects include:

- completing short missing sections of sidewalks;
- ADA upgrades;
- crossing improvements (e.g., curb extensions, refuges, crosswalks); and,
- intersection improvements (e.g., islands and realignment).

SUPI projects are located on highways that have no modernization projects scheduled for the foreseeable future. Projects that have a local funding match are typically viewed the most favorably because this indicates strong local support. Projects on highways that cost more than $100,000, require right-of-way, or have environmental impacts need to be submitted to ODOT for inclusion in the STIP. Cities and counties can apply annually for bike path or sidewalk grants of projects they have selected. Grants for projects on local street systems have a match of 20 percent and projects next to state highways have a lower match requirement. Bicycle-pedestrian grants are generally below $125,000 per project. Project evaluation and selection is made annually statewide by the Statewide Bicycle/Pedestrian Committee.

Potential: Communities throughout Oregon have successfully received these grants for bicycle and sidewalk improvements. St. Helens may be able to do the same.

ODOT Enhancement Program[17]

Description: The Transportation Enhancement program provides federal highway funds for projects that strengthen the cultural, aesthetic, or environmental value of the transportation system. The funds are available for twelve "transportation enhancement activities," that are categorized as:

- Pedestrian and bicycle projects;
- Historic preservation related to surface transportation;

[17] Source: http://www. oregon.gov/ODOT/HWY/LGS/enhancement.shtml

- Landscaping and scenic beautification; and
- Environmental mitigation.

Existing Application: The Enhancement Program funds special or additional activities not normally required on a highway or transportation project. So far, Oregon has funded more than 190 projects for a total of $97 million.

Potential: The City of St. Helens could seek Enhancement Program funds for bicycle and sidewalk projects including the recommended multi-use path along Old Portland Road.

State Parks Funds[18]

Description: Recreational Trails Grants are national grants administered by the Oregon Parks and Recreation Department (OPRD) for recreational trail-related projects, such as hiking, running, bicycling, off-road motorcycling and all-terrain vehicle riding.

Existing Application: OPRD distributes more than $4 million annually to Oregon communities for outdoor recreation project, and has awarded more than $40 million in grants across the state since 1999. Grants can be awarded to non-profits, cities, counties, and state and federal agencies.

Potential: Funding is primarily intended for recreational trail projects, so the City of St. Helens could seek funding for the completion of the Dalton Park or Waterfront Trail systems.

LOCAL FUNDING OPTIONS

The following local funding programs are commonly used by cities in the funding of transportation improvements.

General Obligation Bonds (G.O. Bonds)

Description: Bonds are often sold by a municipal government to fund transportation (or other types) of improvements, and are repaid with property tax revenue generated by that local government. Under Oregon Measure 50, voters must approve G.O. Bond sales with at least a 50 percent voter turnout.

Existing Application: Cities all over the state use this method to finance the construction of transportation improvements. For smaller jurisdictions, the cost of issuing bonds vs. the amount that they can reasonably issue creates a problem. Underwriting costs can become a high percentage of the total cost for smaller issues. According to a representative of the League of Oregon Cities, the state is

[18] Source: http://www.oregon.gov/OPRD/GRANTS/trails.shtml

considering developing a "Bond Pool" for smaller jurisdictions. By pooling together several small bond issues, they will be able to achieve an economy of scale and lower costs.

Potential: Within the limitations outlined above, G.O. bonding can be a viable alternative for funding transportation improvements when focused on specific projects.

Serial Levy/Property Taxes within the Limits of Ballot Measure 50

Description: Local property tax revenue (city or county) could be used to fund transportation improvements through a serial bond levy.

Existing Application: Revenue from property taxes ends up in the local government general fund where it is used for a variety of purposes. Precedents for the use of property taxes as a source of funding for transportation capital improvements can be found throughout the state. However, with the limitations resulting from Measure 50, use of property taxes for transportation capital improvements will continue to compete with other general government services under the three percent assessed value increase allowed by Measure 50 and the local tax limits of $15 per $1,000 of assessed value established under Measure 5. Under Measure 50, however, there is no limit on assessed value generated by new construction.

Potential: Because the potential for increased funding from property tax revenue is limited by Ballot Measures 5 and 50 and by competition from other users who draw funds from the general fund, serial levies and/or property taxes are not practical sources for financing major local street improvements but could finance a package of minor improvement projects.

Local Street Utility/User Fee

Description: This maintenance fee is premised on viewing public streets as utilities used by citizens and businesses similar to a public water or sewer system. Fees are typically assessed by usage (e.g., average number of vehicle trips per property).

Existing Application: Many Oregon cities assess street user fees through a monthly fee charged to local dwelling units and businesses. The assessment formulas range from a flat rate per dwelling unit and per business to fees tied to trip rates calculated for each property individually based on the Institute of Transportation Engineers Trip Generation. For example, the City of Hillsboro charges a flat fee of $3.10 per residential unit, while businesses government agencies, schools, and non-profits are assessed based on the number of trips generated by their employees, vendors and customers. By comparison, the City of Oregon City charges single-family residential properties $4.50 per month the first year and gradually increases the fee over the next five years to $11 per month. The revenues generated by these fees are used for operations and maintenance (as opposed to capital projects).

Potential: In St. Helens, a $5.00 monthly fee charged to the estimated 5,299 households would generate approximately $317,940 per year in revenue from residential uses alone. As households grow to an estimated 7,089 in 2031, revenues would grow to $425,340 annually. The ability to use these fees for capital projects, including pedestrian and bicycle projects should be explored.

Local Improvement District (LID)

Description: Under a local improvement district (LID), a street or other transportation improvement is built and the adjacent properties that benefit are assessed a fee to pay for the improvement.

Existing Application: LID programs have wide application for funding new or reconstructed streets, sidewalks, water/sewer or other public works projects. The LID method is used primarily for local or collector roads, though arterials have been built using LID funds in certain jurisdictions.

Potential: LIDs continue to offer a good mechanism for funding projects such as new sidewalks and street surface upgrades. The City of St. Helens may be able to fund the cost of sidewalks on collector streets to provide a connected pedestrian system for current and future residents in the previously developed areas of the city lacking sidewalks. Similarly, an LID could be used to enhance the Old Portland Road corridor or upgrades to the Columbia Boulevard/St. Helens Street couplet.

Urban Renewal District

Description: An Urban Renewal District is an area that is designated by a community as a "blighted area" to assist in revitalization. Funding for the revitalization is provided by urban renewal taxes that are generated by the increase in total assessed values in the district from the time it was first established.

Existing Application: Urban Renewal Districts have been formed in over 50 cities in Oregon, generally focused on revitalizing downtowns.

Potential: Urban Renewal dollars can be used to fund infrastructure projects such as roadway, sidewalk, or transit improvements. Because funding relies on taxes from future increases in property value, the City of St. Helens may seek to create a District where such improvements will likely result in such an increase (for example, along the riverfront).

Developer Dedications of Right-of-Way and Local Street Improvements

Description: New local streets required to serve new development areas are provided at the developer's expense in accordance with the tentative and final plan approvals granted by the City Council.

Existing Application: Current City ordinance requires local streets and utilities to be provided in accordance with the adopted Land Use Plan, and the zoning ordinance and subdivision ordinance. This includes dedication of street/utility right-of-way and construction of streets, pedestrian/bicycle facilities, and utilities to City design standards.

Potential: Private developer street dedications are an excellent means of funding new local street/utility extensions, and are most effective if guided by a local roadway network plan. This funding mechanism could apply to all new local street extensions in St. Helens within the 20-year planning period.

SAFE ROUTES TO SCHOOL PROGRAMS[19]

Description: The Oregon Safe Routes to School (SRTS) Program administers federal funds received from the 2005 SAFETEA-LU transportation bill. The Oregon program received over $5 million in federal funds through the initial 2005-2009 period for projects at schools serving grades K-8.

The national Safe Routes to School Program has not been reauthorized but is operating on a continuing resolution. $2.2 million infrastructure funds are available for construction for 2012-2013. The call for applications opened October 1, 2010.

The goals of the program are to increase the ability and opportunity for children to walk and bicycle to school, promote walking and bicycling to school and encourage a healthy and active lifestyle at an early age, and facilitate the planning, development and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption and air pollution within two miles of a given school.

Potential: The two types of project that can receive funding through the SRTS program include infrastructure projects within two miles of a school, and non-infrastructure activities such as education, encouragement, and traffic enforcement activities within two miles of a school.

[19] Source: http://www.oregon.gov/ODOT/TS/saferoutes.shtml

Infrastructure projects chosen for funding are selected through a statewide competitive process based on written applications and field review. Local matching funds are not required to receive SRTS funds. For St. Helens to pursue SRTS funding, the local school district will first have to complete a survey of its parents and students as part of a SRTS needs assessment. Infrastructure applications and information are available online.

TRANSPORTATION FINANCING SUMMARY

- Approximately $17.1 million is projected to be available for transportation funding over the next twenty years using existing funding sources. Approximately $12.0 million can reasonably be assumed to be available for funding the transportation plan while $5.1 million will be needed for operations and maintenance.
- Existing funding sources are not sufficient to pay for the improvement projects identified in the TSP; therefore, additional funding sources should be identified.
- The potential funding sources that appear to have the most potential include the following:
- Special Public Works Funds (SPWF) and Immediate Opportunity Funds (IOF) — Lottery Program
- State Bicycle-Pedestrian Grants
- ODOT Enhancement Grants
- Local Street Utility/User Fee
- Local Improvement District (LID)
- Urban Renewal District
- Safe Routes to School Program (SRTS)

Section 9 Implementation Ordinances

9 Implementation Ordinances

The TPR requires that local jurisdictions amend land use regulations to reflect and implement the TSP. To that end, proposed regulatory language was developed in order to comply with the TPR and to ensure that local ordinances are consistent with the updated TSP. Proposed implementation language can be found in the Volume 2 Technical Appendix, Recommended Ordinance Amendments. Proposed implementation language is based on the recommendations found in the amendment tables, which identify revisions needed to City ordinances in order to comply with the TPR. The memorandum provides specific text amendments to City Ordinances that meet TPR requirements. Suggested language can be considered "best practices" and, in some instances, the Model Development Code & Users Guide for Small Jurisdictions was used as a reference document for recommended code revisions.

To the extent possible, proposed amendments to City Ordinances were developed and formatted to be consistent with the existing structure of the regulatory document in order to expedite a code amendment process. In addition to those recommended in the memorandum, further amendments to City Ordinances may be necessary in order to ensure consistency within the document and to more seamlessly integrate new criteria with existing requirements. For this reason, the memorandum includes proposed amendments to the adopted land use ordinance but final recommended changes to the St. Helens municipal code will be part of a separate local adoption action.

Section 10 References

10 REFERENCES

1. The Oregon Department of Transportation. *Oregon Highway Plan*. 1999.
2. Department of Land Conservation and Development (DLCD). *Neighborhood Street Design Guidelines*.
3. Federal Highway Administration. *Manual on Uniform Traffic Control Devices*. 2003.
4. The Oregon Department of Transportation. *Oregon Bicycle and Pedestrian Plan*. 1995.
5. City of St. Helens. *St. Helens Bikeway Master Plan*. 1988.
6. Oregon Safe Routes to School. http://www.oregon.gov/ODOT/TS/saferoutes.shtml
7. Kittelson & Associates, *Lower Columbia River Rail Corridor Study/US 30 Intersection Study*. 2008.
8. HDR Engineering. Inc. *Lower Columbia River Rail Corridor/Rail Safety Study*. 2009.
9. Transportation Research Board. *Highway Capacity Manual*. 2000.
10. The Oregon Department of Transportation. *Analysis Procedures Manual*. 2006.
11. Columbia County Road Department. *Columbia County Rural Transportation System Plan*. 1998
12. Federal Highway Administration. *Technical Summary on Roundabouts*. 2010.
13. Transportation Research Board. *Roundabouts: An informational Guide, 2nd Edition*. 2010
14. Kittelson & Associates, Inc. *Columbia County Community-Wide Transit System Plan*. 2009
15. Metro. *Creating Livable Streets: Street Design Guidelines for 2040*. 2002
16. Metro. *Green Street: Innovative Solutions for Stormwater and Stream Crossings*. 2002
17. The Oregon Department of Transportation. *Statewide Transportation Improvement Program*. 2008.

APPENDIX, VOLUME 1

Appendix 1A .... Public Involvement Process

Appendix 1A Public Involvement Process

City of St. Helens

Transportation Systems Plan Update
Public Involvement Plan

May 28, 2010

Background

The City's Transportation Systems Plan (TSP) was last updated in 1997. Given the growth and change that has occurred since then, the TSP's effectiveness has decreased. As such, the City applied for and was awarded a Transportation & Growth Management (TGM) Grant from the Oregon Department of Transportation (ODOT) as financed by Federal SAFETEA-LU funds. This plan update is a land use planning process and public input is critical in developing a good plan that works for all interests of the community.

City of St. Helens citizens and stakeholders will be able to participate in this process by attending public meetings and public hearings, through online means, and via direct communication with staff. Their thoughts, feedback and ideas will be able to be conveyed by direct methods (in person, or by letter, phone or e-mail) and indirect methods (e.g. social networking internet sites, and the City's website**). By using multiple methods of communication, information will be available to the widest audience possible**.

Public involvement is essential because it:

- Leads to better, more informed plans and decisions.
- Provides opportunity for citizens who may not be involved otherwise.
- Engages citizens with the issues that concern them most.
- Provides opportunity for focused, in-depth, and pertinent discussion of key issues.
- Furthers democratic values by ensuring the interests of the majority of citizens are considered in decision-making.
- Achieves planning that is more attuned to the needs of different groups by recognizing diversity within the local community.

Oregon's Statewide Planning Goal #1 mandates the following:

- Provide widespread citizen involvement, including the establishment of a citizen advisory committee (CAC) broadly representative of geographic areas and interests.

- Assure effective two-way communication with citizens.
- Assure technical information is available in an understandable form.
- Assure that citizens receive a response from policymakers.
- Ensure adequate funding for citizen involvement in a planning budget.

The St. Helens Comprehensive Plan addresses citizen involvement, by the following general goals:

- Keep the citizens informed of opportunities for involvement.
- Develop programs to involve citizens in the land use planning process.

Public Outreach Objective
The primary objective for this project is to obtain public input on transportation needs for each mode of travel consistent with Statewide Planning Goal 1 and the City's Comprehensive Plan policies, and to design an outreach program that reaches all segments of the community.

PIP Component 1 – Citizen Advisory Committee (CAC)
The City will advertise for the CAC using the local newspaper, the City's website, and the City's quarterly newsletter (if timing permits). Staff will also inquire with the City Council, Planning Commission and other pertinent commissions (e.g. Bike and Pedestrian Commission). Up to six (depending on the level of interest) citizens will make up this committee. The City Council will appoint the committee members. If more than six applications are received, committee membership may be increased beyond six if the Council finds it is in the public interest to do so. The CAC should be a diverse group with a variety of transportation related experiences; diversity will depend on interest (i.e. applications received). The CAC is intended to be involved throughout the update process.

In the City of St. Helens, each Councilor is assigned to a specific department. The City Councilor assigned to Community Development will also be assigned to this committee.

PIP Component 2 – Agency/stakeholder coordination
Agencies/stakeholders that will be potentially affected by the revised Transportation Systems Plan will be notified and invited to participate in the process. Agencies/stakeholders will either be included on the Technical Advisory Committee or notified and provided opportunities to review and comment on project materials through other means. As organized by the intended or anticipated type of participation, the applicable agencies/stakeholders include:

Participation in the Technical Advisory Committee:

- City of St. Helens
- Columbia County Road Department
- Columbia County Land Development Services (Planning)
- Columbia County Rider
- Columbia River Fire & Rescue
- Oregon Department of Transportation

The following agencies will be provided notice to solicit their participation, including through review and comment on project deliverables:

- St. Helens School District
- Port of St. Helens
- Portland & Western Railroad, Inc.
- McNulty Water District
- Senior Center
- Local Oregon Department of Human Services office
- Columbia Health District-Public Health Authority
- Community Action Team

The following agencies will be informed about the project at the City's monthly utility coordination meetings and have an opportunity to comment at those meetings or separately via e-mail, facsimile or phone:

- Northwest Natural Gas
- Qwest
- Columbia River PUD

The Oregon Department of Land Conservation and Development will be involved in the actual plan adoption process through provision of 45-day notice and distribution of proposed adoption materials, including the TSP and related Comprehensive Plan and code amendments:

The following agencies will be notified as needed regarding specific planning issues which may affect them:

- Oregon Division of State Lands
- Army Corps of Engineers

PIP component 3 – Widespread citizen awareness
Keeping the general citizenry aware of this project is important. Although some citizens may not want to be involved in every minute detail of the project, all should have reasonable access to information and notices. That said the City will:

- Maintain a project page on the **City's website** to provide information as the project proceeds, including contact information. The City's website also includes a city meetings calendar that will be used to help notify people about times, dates and locations for public meetings held in the City.
- Use press releases for key events: **community workshops and joint Planning Commission/City Council work sessions**
- As applicable, use the **City's quarterly newsletter** to convey pertinent information.
- Use the **social networking sites** for which the City has an account (i.e. Facebook and Twitter) to convey pertinent information/meeting dates, including **community workshops and joint Planning Commission/City Council work sessions**
- Hold **public meetings** during the plan making process.
- Provide **regular updates to the City Council** through various means (monthly department reports, personal attendance at meetings, and interaction with staff) so they can convey information to their constituents. In a small town, word can spread fast.
- Have staff and up-to-date documents/materials available to answer questions (in person, by phone, or e-mail)

PIP Component 4 – TSP Adoption
In accordance with state and local land use law related to plan adoption (Comprehensive Plan amendments), the City will:

- Publish legal notices in the local newspaper to advertise public hearing dates for actual adoption of the Transportation Systems Plan.
- List public hearings on the City's website.
- Hold public hearings (at a minimum of one before the City Planning Commission and one before the City Council) for adoption of the Transportation Systems Plan.
- Record/air the public hearings on television (Comcast Channel 29)
- Have staff and draft Transportation Systems Plan available to answer questions (in person, by phone, or e-mail)

Comments
All agency, stakeholder, citizen, interest group and other comments will be considered in the Transportation Systems Plan update and adoption process. The city will maintain a record of comments received and how they were addressed during the process.

Outreach efforts to Title VI communities/populations for their involvement and input in this process are incorporated into this plan. Though the City doesn't have any specific concentration of minorities or low income residents, those populations are present throughout the City. Based on 2000 census data the racial makeup of the City was about 93% Caucasian and approximately 12% of the population was below the poverty line. Though a decade old, these figures are more-or-less accurate except poverty is assumed to have increased as a result of the recession. Outreach to these populations will be addressed by using different methods of communication as described above and by specifically notifying agencies that work with these populations: Senior Center, DHS, Columbia Health District-Public Health Authority, and Community Action Team.

TECHNICAL APPENDIX, VOLUME 2

Appendix 2A .... Technical Memorandum #1: Background Document Review
Appendix 2B .... Technical Memorandum #2: Existing Traffic Conditions
Appendix 2C .... Technical Memorandum #3: Future Traffic Conditions
Appendix 2D .... Technical Memorandum #4: Transportation Solutions

Appendix 2A Technical Memorandum #1: Background Document Review

Memorandum

Date: July 13, 2010

To: Technical Advisory Committee and Citizens Advisory Committee

cc: Chris Brehmer, Kittelson & Associates
Matt Bell, Kittelson & Associates

From: Matt Hastie
Darci Rudzinski

Re: City of St. Helens Transportation System Plan Update - Task 2.2
Technical Memorandum #1: Background Document Review

I. Introduction

This memorandum provides an overview of federal, state, regional, and local documents that comprise the policy framework for transportation planning in the City of St. Helens. Although each document reviewed contains many policies, only the policies and information most pertinent to the St. Helens Transportation System Plan (TSP) Update were chosen to help focus this work. The information in this memorandum is meant to provide a framework for this planning process. New policies considered for inclusion in the updated Draft St. Helens TSP should be consistent with the currently adopted policies reviewed here.

Section II contains summaries of regulatory documents that contain information pertinent to the development and adoption of an updated TSP for the City of St. Helens. State documents and requirements were reviewed for applicability to transportation planning in St. Helens. Regional planning documents that contain policies or regulations with potential impacts to the St. Helens transportation system are also reviewed. In the final subsection of this memorandum, the City's adopted land use and transportation policies and regulations are summarized

Appendix A is text from OAR 660-12-0020, the section of the TPR that lists the elements that are required to be included in local TSPs.

The following documents were reviewed for policies and regulations applicable to the City's transportation planning and resulting TSP Update. The page number (p.) where each document's review begins in this memorandum is included for quick reference in the list below.

State/ODOT

- Transportation System Planning Guidelines (2008) - p. 3
- Transportation Planning Rule (OAR 660-12, last amended 2005) - p. 4
- Oregon Transportation Plan (1992) - p. 5
- Oregon Highway Plan (1999, last amended 2005) - p. 7
- Oregon Bicycle and Pedestrian Plan (1995) - p. 11
- Oregon Public Transportation Plan (1997) - p. 12
- Access Management Rule (OAR 734-051) - p. 12
- Freight Moves the Oregon Economy (1999) - p. 12
- State Transportation Improvement Program (2000-present) - p. 13

Regional Plans

- Lower Columbia River Rail Corridor Study (2009) - p. 13
- Columbia County Community-Wide Transit Plan and US 30 Transit Access Plan (2009) - p. 15
- Columbia County Rural Transportation System Plan (1998) – p. 16

Local Plans and Ordinances

- St. Helens Comprehensive Plan (2006) - p. 17
- St. Helens Transportation System Plan (1997) - p. 18
- St. Helens Bikeway Master Plan (1988) - p 20
- City of St. Helens Public Facilities Plan (1999) - p. 20
- City of St. Helens Economic Opportunity Analysis (2008) - p. 21
- St. Helens Development Code - p. 21
- St. Helens SDC Water, Wastewater, Stormwater, Transportation, and Parks System Development Charge Study Final Report (2008) - p. 23

II. PLAN & POLICY REVIEW

STATE OF OREGON

Transportation System Planning Guidelines (2008)

ODOT's Transportation System Plan Guidelines is comprised of four chapters: an overview of transportation system planning (Chapter 1); guidance for the preparation of a jurisdiction's first TSP and of TSP updates (Chapters 2 and 3); and policy guidance on transportation and land use issues in a series of technical appendices (Chapter 4). The 2008 Guidelines differ from the 2001 Guidelines in that they focus more on TSP updates, make stronger connections between local transportation needs and the availability of transportation funding, and provide more guidance related to mobility standards, the OTP, and project financing in the technical appendices, in addition to new electronic links throughout the document for easy access to additional resources.

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 last two steps are relevant to the St. Helens TSP update, at this point in the planning process.

The TSP Guidelines direct TSP updates to address recent policy and regulatory changes, and calls out recent changes to the Oregon Transportation Plan, Oregon Highway Plan, and Transportation Planning Rule. A review of these documents and how they relate to the St. Helens TSP update are provided in other sub-sections of this section of the memorandum.

Several important changes have been made to state policy since the 1997 adoption of the St. Helens TSP. The 2006 Oregon Transportation Plan (OTP) update emphasizes maintaining assets in place, optimizing existing system performance through technology and better system integration, creating sustainable funding, and investing in strategic capacity enhancements. Amendments to the Oregon Highway Plan (OHP) that have potential relevance to transportation planning in St. Helens include changes to Policy 1B (Land Use and Transportation), which requires a management plan for STAs on state highways that are also designated as State Freight Routes, and revisions to Policy 1F (Mobility Standards) that allows for the adoption of alternative mobility standards where "practical difficulties make conformance with the highway mobility standards infeasible." OHP Appendix C (Access Management Spacing Standards) was revised in 2004 to be consistent with amendments to the Access Management Rule, OAR 734-051 (as reviewed later in this memorandum).

Amendments to the TPR have bearing on the St. Helens TSP update, as well as any other potential Comprehensive Plan amendments in the city. Section -0050 (Project Development) revisions protect determinations of need, mode, function and general location for projects identified in TSPs. Revisions to Section -0060, relating to plan amendments, include the following:

- *Require local jurisdictions to balance the need for development with the need for transportation improvements;*
- *Address "significant effect" by establishing the end of the planning period as the measure for determining whether proposed amendments would cause an imbalance between development and the transportation network serving that development;*

- *Identify the transportation improvements that a local government can consider in determining whether a proposed amendment will significantly affect transportation facilities; and*
- *Identify methods for local jurisdictions to determine whether or not a needed transportation facility is reasonably likely to be provided within the planning horizon.*

Transportation Planning Rule (TPR) (last amended 2005)

Statewide Planning Goal 12, Transportation, requires cities, counties, metropolitan planning organizations, and ODOT to provide and encourage a safe, convenient, and economic transportation system. This is accomplished through development of Transportation System Plans (TSPs) based on inventories of local, regional and state transportation needs. Goal 12 states that transportation plans shall:

- *consider all modes of transportation, including pedestrian, bicycle, highway, rail, mass transit, air, water, and pipeline*
- *be based upon an inventory of local, regional, and state transportation needs*
- *consider the differences in social consequences that would result from utilizing differing combinations of transportation modes*
- *avoid principal reliance on any one mode of transportation*
- *minimize adverse social, economic, and environmental impacts and costs and conserve energy*
- *meet the needs of the transportation disadvantaged*
- *facilitate the flow of goods and services so as to strengthen the local and regional economy*
- *conform with local and regional comprehensive land use plans*
- *be developed, adopted, amended and implemented in accordance with the standards set out in OAR 660, Division 12*

In 1991, the Land Conservation and Development Commission (LCDC), with the concurrence of ODOT, adopted the Transportation Planning Rule (TPR), OAR 660 Division 12, to implement State Planning Goal 12, Transportation (amended in May and September 1995, and March 2005). The TPR requires cities with a population of 2,500 or greater to prepare and adopt a Transportation System Plan. All counties are also required to prepare and adopt a TSP.

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 (OAR 660-012-0045(2))."

The applicable portion of the TPR is found in OAR Section 660-12-0045, Implementation of the Transportation System Plan. In summary, the Transportation Planning Rule requires that local governments revise their land use regulations to implement the TSP. The following TPR requirements are paraphrased from Section -0045:

- *Amend land use regulations to reflect and implement the Transportation System Plan.*
- *Adopt land use or subdivision ordinance measures, consistent with applicable federal and state requirements, to protect transportation facilities, corridors and sites for their identified functions, to include the following topics:*
  - *access management and control;*
  - *protection of public use airports;*
  - *coordinated review of land use decisions potentially affecting transportation facilities;*
  - *conditions to minimize development impacts to transportation facilities;*
  - *regulations to provide notice to public agencies providing transportation facilities and services of land use applications that potentially affect transportation facilities;*
  - *regulations assuring that amendments to land use applications, densities, and design standards are consistent with the Transportation System Plan.*
- *Adopt land use or subdivision regulations for urban areas and rural communities to provide safe and convenient pedestrian and bicycle circulation and bicycle parking, and to ensure that new development provides on-site streets and accessways that provide reasonably direct routes for pedestrian and bicycle travel.*
- *In MPO areas, adopt land use and subdivision regulations to reduce reliance on the automobile.*
- *Identify improvements to facilitate bicycle and pedestrian trips in developed areas.*
- *Establish street standards that minimize pavement width and total right-of-way.*

A review of the St. Helens Community Development Code is included in this memorandum, under the "Local Plans and Ordinances" subheading. This review highlights requirements within the local ordinance that comply with -0045 and where there may be deficiencies with regards to TPR compliance.[1]

Oregon Transportation Plan (2006)

Originally adopted in 1992, the Oregon Transportation Plan (OTP) is a policy document developed by ODOT in response to federal and state mandates for systematic planning for the future of Oregon's transportation system. The OTP is intended to meet statutory requirements (ORS 184.618(1)) to develop a state transportation policy and comprehensive long-range plan for a multi-modal transportation system that addresses economic efficiency, orderly economic development, safety, and environmental quality. The 2006 OTP expands on the policy objectives

[1] Draft implementation language will be prepared as part of Task 4: Draft TSP Preparation, which will include proposed text amendments to the Community Development Code that will address TPR compliance.

of the 1992 plan, with an emphasis on maintaining assets[2] in place, optimizing existing system performance through technology and better system integration, creating sustainable funding, and investing in strategic capacity enhancements.

The OTP's goals, policies and strategies guide the development of state multimodal, modal/topic[3] and facility plans and regional and local transportation system plans. The OTP provides the framework for prioritizing transportation improvements and funding, but it does not identify specific projects for development.[4] As required by Oregon and federal statutes, the OTP guides development and investment in the transportation system through:

- Transportation goals and policies,
- Transportation investment scenarios and an implementation framework, and
- Key initiatives to implement the vision and policies.

Goals in the OTP include: Mobility and Accessibility; Management of the System; Economic Vitality; Sustainability; Safety and Security; Funding the Transportation System; and Coordination, Communication and Cooperation. Policies and strategies under many of these goals emphasize increasing coordination and cooperation among federal and state agencies, regional and local governments and private entities to achieve these goals.

The Implementation Framework section of the OTP describes the implementation process and how state multimodal, modal/topic plans, regional and local transportation system plans and master plans will further refine the OTP's broad policies and investment levels. Local transportation system plans can further OTP implementation by defining standards, instituting performance measures, and requiring that operational strategies be developed.[5]

The Implementation section also describes three investment levels, examples of the investment priorities for each level of investment, and their impacts on the transportation system. These levels are described as "flat funding" (Level 1), "maintaining and improving existing infrastructure" (Level 2), and "expanding facilities and services and services" (Level 3). The recommendation in the OTP is for the State to invest at levels closer to Level 3 "in order to be competitive economically and to have the transportation infrastructure and services that allow communities to function well."

Finally, a list of "key initiatives" describes the OTP's implementation priorities. The key initiatives are intended to help frame plan implementation and reflect the directions of the OTP including system optimization, integration of transportation modes, integration of transportation, land use, the environment and the economy, and the need to make strategic investments using a sustainable

[2] The OTP defines "asset management" as a "systematic process of maintaining, upgrading and operating physical assets cost-effectively. It combines engineering principles with sound business practices and economic theory, and it provides tools to facilitate a more organized, logical approach to decision-making. Asset management provides a framework for handling both short- and long-range planning."

[3] Modal or topic plans, as developed by ODOT and other state agencies, include plans for aviation, bicycle and pedestrian facilities, highways, marine ports and waterways, public transportation and rail.

[4] Projects are identified through facility plans and regional and local transportation system plans, and sometimes through modal plans.

[5] As stated in the Implementation section of the OTP, requirements for regional and local transportation system plans (TSPs) are found in the Transportation Planning Rule (OAR 660-012). Regional and local TSPs must be consistent with the state TSP (the OTP), state multimodal, modal/topic and transportation facility plans.

funding structure. The key initiatives envision creating the sustainable funding plan using both traditional and new revenue sources.

Oregon Highway Plan (1999, last amended 2006)

The Oregon Highway Plan (OHP), an element and modal plan of the state's comprehensive transportation plan (OTP), guides the planning, operations, and financing of ODOT's Highway Division. Policies in the OHP emphasize the efficient management of the highway system to increase safety and to extend highway capacity, partnerships with other agencies and local governments, and the use of new techniques to improve road safety and capacity. These policies also link land use and transportation, set standards for highway performance and access management, and emphasize the relationship between state highways and local road, bicycle, pedestrian, transit, rail, and air systems.

The Oregon Transportation Commission adopted the Highway Plan on March 18, 1999. In July 2006, ODOT published an update that includes amendments made from November 1999 through January 2006. The updated St. Helens TSP will need to be consistent with the OHP and the planning process will review and reference the recent changes to the OHP, where applicable.

The policies found within the OHP that apply to the St. Helens TSP include:

Policy 1A: State Highway Classification System;

Policy 1B: Land Use and Transportation;

Policy 1F: Highway Mobility Standards;

Policy 1G: Major Improvements;

Policy 2B: Off-System Improvements;

Policy 2E: Intelligent Transportation Systems (ITS);

Policy 2F: Traffic Safety;

Policy 3A: Classification and Spacing Standards;

Policy 3B: Medians;

Policy 4A: Efficiency of Freight Movement;

Policy 4B: Alternative Passenger Modes;

Policy 4D: Transportation Demand Management; and

Policy 4E: Park-and-Ride Facilities.

<u>Policy 1A: State Highway Classification System</u>. The state highway classification system includes five classifications: Interstate, Statewide, Regional, District, and Local Interest Roads. In addition, there are four special purpose categories that overlay the basic classifications: special land use areas, statewide freight route, scenic byways, and lifeline routes. These special designations supplement the highway classification system and are used to guide management, needs analysis, and investment decisions on the highway system.

The Columbia River Highway (US 30) runs north-south through St. Helens, connecting the city with Portland in the south and Longview Washington and the Coast to the north. Through St. Helens, US 30 is part of the National Highway System (NHS), is a designated Freight Route, and is designated with a Statewide Level of Importance.

The federal Intermodal Surface Transportation Efficiency Act of 1991 required the establishment of a National Highway System (NHS) to provide an interconnected system of principal arterial routes that will serve "interstate and inter-regional travel." ODOT has an obligation to ensure that NHS roadways in Oregon adequately perform this function of serving a larger geographic area.

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

Policy 1B: Land Use and Transportation. This policy recognizes that state highways serve as the main streets of many communities and strives to maintain a balance between serving local communities (accessibility) and the through traveler (mobility). This policy recognizes the role of both the State and local governments related to the state highway system and calls for a coordinated approach to land use and transportation planning. Special Transportation Areas (STAs), Urban Business Areas (UBAs) and Commercial Centers (CCs) are included as action items under this policy.

Policy 1F: Highway Mobility Standards Access Management Policy. This policy addresses state highway performance expectations for planning and plan implementation or amendment, as well as providing guidance for managing access and traffic control systems. For St. Helens, this policy pertains to U.S. 30. Action 1F.1 states that highway mobility standards apply to all state highway sections; for areas outside of the Portland Metro area, the maximum volume to capacity ratios for peak hour operating conditions in Table 6 apply. 1F.5 states that within transportation system plans, where the volume-to-capacity (v/c) ratio is worse than the identified standards in the OHP and transportation improvements are not planned, the performance standard for the highway shall be to improve performance as much as feasible and to avoid further degradation of performance.

Among the TSP Update study intersections, the standards shown in Table 1 apply:

Table 1 Summary of ODOT Intersection Performance Standards

Intersection	Traffic Control[1]	Posted Speed Limit (mph)	OHP Mobility Standard
US 30/ Dear Island Road	Signal	50	V/C ≤ 0.70
US 30/ Pittsburg Road	TWSC	40	V/C ≤ 0.85
US 30/ Wyeth Street	TWSC	40	V/C ≤ 0.85
US 30/ St Helens Road	Signal	35	V/C ≤ 0.80
US 30/ Columbia Boulevard	Signal	35	V/C ≤ 0.80
US 30/ Vernonia Road	TWSC	35	V/C ≤ 0.90
US 30/ Gable Road	Signal	35	V/C ≤ 0.80
US 30/ Milliard Road	TWSC	45	V/C ≤ 0.80

[1]TWSC: Two-way stop-controlled (unsignalized
V/C = Volume-to-capacity ratio

Policy 1G: Major Improvements. This policy requires maintaining performance and improving safety by improving efficiency and management before adding capacity.

Policy 2B: Off-System Improvements. This policy recognizes that the state may provide financial assistance to local jurisdictions to make improvements to local transportation systems if the improvements would provide a cost-effective means of improving the operations of the state highway system.

Policy 2E: Intelligent Transportation Systems (ITS). This policy seeks to improve the safety and efficiency of transportation facilities, and to generally maximize operations in a cost-effective way. The policy requires coordination with the Oregon Intelligent Transportation Systems Strategic Plan.

Policy 2F: Traffic Safety. This policy emphasizes the state's efforts to improve safety of all users of the highway system. Action 2F.4 addresses the development and implementation of the Safety Management System to target resources to sites with the most significant safety issues.

Policy 3A: Classification and Spacing Standards. This policy addresses the location, spacing, and type of road and street intersections and approach roads on state highways. It includes standards for each highway classification. The adopted standards can be found in Appendix C of the Oregon Highway Plan; generally, the minimum access spacing distance increases as either the highway's importance or posted speed increases. The access management spacing standards established in the OHP are implemented by OAR 734, Division 51.[6] Table 2 illustrates the unsignalized intersection access spacing standards as they apply to US 30 within St. Helens.

Table 2 US 30 Access Spacing Standards for Private and Public Approaches[1]

Posted Speed (miles per hour)	Minimum Space Required (feet)
≤ 25	520
30 and 35	720
40 and 45	990
50	1,100
≥ 55	1,320

[1] These access management spacing standards do not apply to approaches in existence prior to April 1, 2000 except as provided in OAR 734-051-0115(1)(c) and 734-051-0125(1)(c).

* Measurement of the approach road spacing is from center to center on the same side of the roadway.

Traffic signal spacing standards supersede access management spacing standards for approaches. For signalized intersections on statewide highways such as US 30, OAR 734-020-470 identifies a desired minimum spacing of ½ mile (2,640 feet) be maintained between signalized intersections.

Policy 3B: Medians. This policy establishes the state's criteria for the placement of medians. It includes Action 3B.3 which requires the consideration of non-traversable medians for modernization of all urban, multi-lane Statewide (National Highway System) Highways. The criteria for consideration include:

- Forecasted average daily traffic greater than 28,000 vehicles per day during the 20-year planning period;
- A higher-than-average accident rate;
- Pedestrian crossing safety issues; and
- Topographic and alignment issues resulting in inadequate left-turn sight distances.

Policy 4A: Efficiency of Freight Movement. This policy emphasizes the need to maintain and improve the efficiency of freight movement on the state highway system. U.S. 30 is a designated State Highway Freight Route.

Policy 4B: Alternative Passenger Modes. This policy encourages the development of alternative passenger services and systems as part of broader corridor strategies and promotes the development of alternative passenger transportation services located off the highway system to help preserve the performance and function of the state highway system.

Policy 4D: Transportation Demand Management. This policy establishes the state's interest in supporting demand management strategies that reduce peak period single occupant vehicle travel, thereby improving the flow of traffic on the state highway system.

[6] Oregon Revised Statute (OAR) 734, Division 51, was amended in September 2005 to be consistent with August 2005 OHP revisions to Policy 1B. Specifically, the spacing standards in OAR 734-051 were amended to be consistent with the OHP tables in Appendix C, Access Management Standards.

Policy 4E: Park and Ride Facilities. This policy seeks to maximize the existing transportation system and passenger capacity by supporting and developing park-and-ride facilities. The Columbia County Community-Wide Transit Plan identifies three existing park and ride facilities in St. Helens, two associated with commercial business parking lots (see Table 6 in the Transit Plan). To improve access to the new Rainier–St. Helens flex route, the Transit Plan recommendations include a new park and ride as part of the proposed Deer Island Road Transit Center on Highway 30. The Lower Columbia River Rail Corridor Study identified the potential for commuter rail operations along the Lower Columbia River and recommends that local jurisdictions consider optimal locations for possible future commuter rail platforms, park and rides, and "other supporting services to facilitate multi-modal choices along the corridor (5.7.4)."

Policy 5A: Environmental Resources. This policy intends to protect the natural and built environment – including air quality, fish and wildlife habitat, migration routes, vegetation, and water resources from impacts from state highways and ODOT facilities. Impacts to identified natural resources must be avoided or mitigated by any proposed construction or reconstruction projects on state facilities in St. Helens.

Oregon Bicycle and Pedestrian Plan (1995)

The Oregon Bicycle and Pedestrian Plan is a modal element of the Oregon Transportation Plan and provides guidance for planning, design and operation of facilities for bicycle and pedestrian travel. The plan contains the standards and designs used on state highway projects for these facilities.

The plan includes two parts: the Policy and Action Plan and the Planning, Design, Maintenance, and Safety part. 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 rural highways by widening shoulders as part of modernization projects, as well as on many preservation overlays, where warranted. For urban highways, implementation may take place:

- 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 minor 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 second part ("Part Two") of the Oregon Bicycle and Pedestrian Plan governs the design of bicycle and pedestrian facilities on state-owned facilities. ODOT is currently updating the design section of the Oregon Bicycle and Pedestrian Plan.[7] Many new pedestrian and bicycle treatments have been developed and incorporated into the update. Once adopted, the updated Oregon Bicycle

[7] A July 2007 public review draft is available via ODOTs website: http://www.oregon.gov/ODOT/HWY/BIKEPED/bp_plan_update.shtml#Backgound_Information

and Pedestrian Plan Design Standards and Guidelines will be referenced where bicycle or pedestrian facilities are planned as part of improvements to U.S. 30.

Oregon Public Transportation Plan (1997)

The Oregon Public Transportation Plan forms the transit modal plan of the Oregon Transportation Plan. The vision guiding the Public Transportation Plan is as follows:

The public transportation plan builds on and begins implementing the OTP's long-range vision for public transportation in the State of Oregon. That vision includes:

- *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*
- *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 plan contains goals, policies, and strategies relating to the whole of the state's public transportation system. The plan is intended to provide guidance for ODOT and public transportation agencies regarding the development of public transportation systems.

Transit issues in St. Helens have recently been examined through the Columbia County Community-Wide Transit Plan. Proposed policies and projects that result from this TSP update process will be consistent with the findings in the County's Transit Plan and will be reviewed in consultation with the Transit District, Columbia County Rider.

Access Management Rule (OAR 734-051)

Oregon Administrative Rule 734-051 defines the State's role in managing access to highway facilities in order to maintain functional use and safety and to preserve public investment. The provisions in the OAR apply to U.S. 30, the only roadway under Oregon State jurisdiction within the City of St. Helens. The access management rules include spacing standards for varying types of state roadways.[8] It also lists criteria for granting right of access and approach locations onto state highway facilities.

Freight Moves the Oregon Economy (1999)

This report summarizes a variety of information about issues and needs surrounding the transport of freight by roads, rail lines, waterways, aircraft, and pipelines. The document's stated purpose is to

[8] "Spacing Standards" mean Access Management Spacing Standards as set forth in OAR 734-051-0115 and specified in Tables 2, 3, and 4, adopted and made a part of Division 51 rules.

demonstrate the importance of freight to the Oregon economy and identify concerns and needs regarding the maintenance and enhancement of current and future mobility within the state of Oregon.

The report describes the federal National Highway System (NHS), a classification system that identifies the most significant highways for moving people and freight. U.S. 30 is part of the NHS and included in the Oregon Highway Plan's State Highway Freight System. The report describes the State Highway Freight System as including all of the state's interstate highways and selected other highways important to moving freight. The importance of freight movement will be a consideration during the St. Helens TSP update as it pertains to access to U.S. 30 and how the local roadway system intersects with Portland & Western Railroad rail operations.

State Transportation Improvement Program (2000-present)

The State Transportation Improvement Program (STIP) is the programming and funding document for transportation projects and programs statewide. The projects and programs undergo a selection process managed by ODOT Regions or ODOT central offices. The document covers a period of four years and is updated every two years.

The 2008-2001 STIP did not identify any improvement projects in the City of St. Helens. The Draft 2010-2013 STIP has been released for public review and is tentatively expected to be approved in October 2010. The Draft 2010-2013 STIP includes two projects in St. Helens: a pavement preservation project on Columbia Boulevard between US 30 and 1st Street and funding for the new transit center to be located on Deer Island Road. The final project list and details are subject to the STIP adoption process.

Regional Plans

Lower Columbia River Rail Corridor Study (2009)

The Lower Columbia River Rail Corridor Study (study) focuses on rail safety implications of longer, more frequent freight trains ("unit trains") serving local industry in a transportation corridor between Portland and Astoria that includes the Portland & Western Railroad's Portland-Astoria Line and U.S. 30. The study covers the portion of the corridor from the Columbia/Multnomah county boundary on the south (or east) and Tongue Point, in Clatsop County. The study explored the impacts of increased rail use and changes in what is hauled along the corridor, including severing communities from business, residential, school, and emergency and law enforcement access; increased hazards from accidents; required sounding of train horns; and disruptions in school bus routes and transit routes.

Chapter 1 of the study recognizes the challenges for St. Helens in having both a highway and a railway bisect the community and how existing problems will be exacerbated by expected growth over the coming decades. Chapter 2 explores existing conditions in the corridor and makes reference to earlier planning work. Relevant to planning in St. Helens, the Transit Feasibility Study from the U.S. 30 Corridor Plan (1996) includes population projections that indicated commuter service would be an effective way of addressing work-related travel. The study notes that Columbia County has initiated commuter express service (CC Rider) to begin to address new commuter travel needs.

Existing rail conditions include the St. Helens Yard, a rail yard with multiple tracks for switching cars that create the potential for conflict between trains and automobiles, pedestrian, and bicycles (2.3.4.2.). The yard is an important facility for local rail-served business, but it also creates a mobility barrier within the community for motor vehicle and pedestrian traffic. The yard is not fenced and, because of safety risks and liability issues, both the community and the railroad are concerned about trespassing (p. 38).

Another existing condition is the location of St. Helens High School on Gable Road, on the opposite side of U.S. 30 from the railroad. According to the study, "the railroad has related some close calls with children on the sidewalk as they cross the tracks" (2.3.4.3). Generally, the railroad does not have a problem with the public crossings in St. Helens with regard to vehicle traffic. The one exception is a problem with storage for cars turning left from US 30, where vehicles are stopped at the railroad crossing protection gates and the crossing can hold only one or two vehicles (2.3.4.4.).

Chapter 3, Future Rail & Roadway Conditions, documents that St. Helens has four of the top ten public crossings in the active portion of the corridor, three of which experience the greatest daily delay (in vehicle hours per day) due to local and unit trains blocking crossings - Gable Road, St. Helens Street, and Columbia Blvd. Dear Island Road is sixth on this list. (See Section 3.3.)

Based on existing and expected future conditions, the study makes recommendations for improvements in the corridor in Chapter 5, including estimated costs for implementation (see Table 5.7-1: LCRRC Recommended Projects and Conceptual Cost Estimates). Solutions that impact St. Helens include fencing the St. Helens Rail Yard along U.S. 30 and relocating storage activities (5.3.4); a possible grade-separated pedestrian bridge at Gable Road (5.4.1.2); potential closure of the Wyeth Road crossing (5.4.2.2); and an eventual grade separation at Pittsburg Road/West Road, between Wyeth Street and Deer Island Road (5.7.2).

Other recommendations that relate to transportation planning in St. Helens include developing alternate local routes that parallel U.S. 30 (5.7.3) and transit planning in the corridor. Along with Scappoose, St. Helens is singled out as being particularly impacted by the lack of parallel alternatives, forcing local traffic to the highway to make short local trips and resulting in peak hour congestion and turn-lane storage problems on U.S. 30. The study states that St. Helens "may wish to develop local traffic plans that address the problem" and notes that major impediments to developing alternate routes include the disruption to local business and established circulation patterns and right-of-way acquisition costs. Regarding transit planning, the study notes that, at the time of its adoption, Columbia County was in the final phases of developing the Community-Wide Transit Plan. The study recommends that removal of abandoned tracks and repaving should occur prior to implementing the County's plans to develop the Stimson Lumber mill site (Deer Island Road) as a transit hub. The study also recommends that local jurisdictions consider optimal locations for possible future commuter rail platforms, park and rides, and "other supporting services to facilitate multi-modal choices along the corridor (5.7.4)."

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

Columbia County initiated the Community□wide Transit Plan Update (Plan) in 2008 to address existing and future transit needs of the community. The Plan provides direction to the County for planning and implementing transit services, operations, facilities, and funding within a 10□year horizon. The Plan also incorporates the US 30 Transit Access Plan for transit facility improvements along the US 30 transit corridor.

The CCCTP recommendations include a number of public transit improvements that will benefit the citizens of St. Helens, including new Vernonia flex-route service and the Deer Island Road Transit Center proposed to be located near Highway 30 within the city limits. With the notable exception of the proposed redevelopment of the Stimson Site for the new transit center, recommended physical improvements are confined to existing transit stops and include proposed street, parking, and signage improvements.

The Plan includes an Implementation Plan that includes policy and code amendments specific to St. Helens (Section 9). The Implementation Plan recommends that participating jurisdictions consider updating background text in the transportation sections of the locally adopted comprehensive plan or transportation system plan (TSP) to acknowledge Columbia County's role as a transit provider and the recent county-wide planning effort to update transit facilities and service. Recommended sample language is as follows:

> *Transit service to communities in Columbia County is provided by Columbia County Rider, a service of the Columbia County Transit Division. Columbia County Rider provides fixed-route bus, flex-route bus, and dial-a-ride transit service. In 2004, Columbia County adopted the Countywide Community Transit Plan, which established a set of recommendations to provide this transit service within the county. Recommendations included developing a governance structure to provide public oversight and maximize available resources and ways to increase and improve service. In 2009, Columbia County adopted an updated transit plan, the Columbia County Community-wide Transit Plan (CCCTP), which provides direction for planning and implementation over a 10-year planning horizon for transit services, operations, facilities, funding, and promotion and information services. The CCCTP was developed in conjunction with the findings and recommendations of the US 30 Transit Access Plan, which will guide transit facility access, siting, and design along US 30 through Columbia County, including within the cities of Clatskanie, Rainier, Prescott, Columbia City, St. Helens and Scappoose.*

The Implementation Plan further recommends that Plan recommendations regarding physical improvements, such as new bus stops, park and ride facilities, or transit centers along US 30, should be added to the transportation project list of each jurisdiction. Transportation improvements recommended for inclusion in the St. Helens' TSP are found below in Table 3 and in Table 1, US 30 Transit Access Plan Projects, in the Plan.

Table 3 US 30 Transit Access Plan Projects in St. Helens

Location	Project	Time Frame	Cost Estimate
Safeway/Rite-aid	Bus shelter and associated amenities	0-5 years	$8,500
Safeway/Rite-aid	Sidewalk and curb ramp construction/repairs (non-transit need)	0-5 years	$36,000
Ace Hardware	Sidewalk and curb ramp construction/repairs	0-5 years	$67,000
Stimson Site	Construct transit center and park-and-ride, including frontage improvements, and intersection improvements	0-5 years	$2,344,800

Proposed policy recommendations for St. Helens are intended to generally support public transit in the County and to specifically address the Plan's recommendation based on the Plan's recommendation to locate the proposed Deer Island Road Transit Center on Highway 30 in St. Helens. The following policy statements are recommended for inclusion in the TSP:

(n) Support public transit planning in Columbia County. Transit improvements within city limits shall be guided by the findings and recommendations of the Columbia County Community-wide Transit Plan, as adopted by Columbia County.

(o) Work in partnership with the County in planning for public transit facilities located within city limits and, when feasible, facilitate the citing and operation of such facilities.

The Implementation Plan also includes some proposed changes to the city's Community Development Code to strengthen requirements pertaining to transit (p. 9-30). Recommendations include adding language to ensure coordination with the transit provider regarding notification of land use proposals and decisions (17.24.130). A transit element under the Public Use section is recommended for inclusion in Chapter 17.152, Street and Utility Improvement Standards to facilitate public transit usage in the community. Proposed code language related to pedestrian access to transit stops is also recommended (17.152.070).

Columbia County Rural Transportation System Plan (1998)

The Columbia County Rural Transportation System Plan provides for transportation development in the rural areas of the County. While all modes of transportation are considered, the stated focus of project improvements is on preservation and reconstruction of the primary County roads that serve connections among the cities and rural communities. The TSP also assigns high priority to intersection improvements that improve safety at high accident locations, increase the efficiency of traffic flow, and improve conditions for trucks making turning movements.

Much of the background information in the county's TSP (Chapter 1) is out of date. For example, U.S. 30 was being expanded to a five-lane highway through St. Helens at the time the TSP was adopted. Echoing the city's TSP, the county's TSP also identifies the need for an alternative route to U.S. Highway between Pittsburg Road in St. Helens and Scappoose-Vernonia Road.

The Goals and Policies in Chapter 1 are the policy framework for transportation planning in the county. There are no policies that directly address coordination with the City of St. Helens. The following county policies are consistent with, or support, transportation planning in St. Helens:

Policies:

1. *The County shall undertake the development of a detailed transportation plan that should contain the following minimum elements:*
   C. The location of future arterial streets inside the urban growth boundaries.

4. *The County will work with the State Highway Department to limit the number of access points onto arterial roads. Direct access to U.S. Highway 30 will be limited as much as is practical in order to reduce the potential for congestion and conflicting traffic patterns which would disrupt the flow of traffic.*

6. *The County will support reducing the number of rail crossings.*

7. *The County will work with the Port of St. Helens to encourage the establishment and use of dock facilities.*

Chapter 4 of this document is the TSP, which includes the Road Plan (4.1), Transit Plan (4.2), Bicycle and Pedestrian Plan (4.3), and Air/Water/Rail/Pipeline Modes (4.5). Again, information relevant to transportation planning in St. Helens is out of date, but ultimately the recommendations that result from the St. Helens TSP update will need to be consistent with the Rural TSP. The updated St. Helens TSP may include recommendations to the county for updates to the Rural TSP.

LOCAL PLANS AND ORDINANCES

St. Helens Comprehensive Plan

This city's Comprehensive Plan was first developed in 1978 in response to Oregon Revised Statute 197 and Senate Bill 100 and was acknowledged by the Department of Land Conservation and Development in 1984. Last updated in 2006, the following Comprehensive Plan transportation policies are more current than those in the city's TSP's.

19.08.040 Transportation goals and policies.

(2) Goals.

- *(a) To develop and maintain methods for moving people and goods which are:*
  - *(i) Responsive to the needs and preferences of individuals, business and industry;*
  - *(ii) Suitably integrated into the fabric of the urban communities; and*
  - *(iii) Safe, rapid, economical and convenient to use.*
- *(b) To remove existing congestion and prevent future congestion so that accidents and travel times would both be reduced.*

(c) To create relatively traffic-free residential areas.
(d) To strengthen the economy by facilitating the means for transporting industrial goods.
(e) To maintain a road network that is an asset to existing commercial areas.
(f) To provide a more reliable basis for planning new public and private developments whose location depends upon transportation.
(g) To cooperate closely with the county and state on transportation matters.
(h) To assure that roads have the capacity for expansion and extension to meet future demands.
(i) To ensure future arterial rights-of-way are not encroached upon.
(j) To encourage energy-conserving modes of transit.
(k) To increase appropriate walking and bicycling opportunities.

(3) Policies. It is the policy of the city of St. Helens to:
(a) Require all newly established streets and highways are of proper width, alignment, design and construction and are in conformance with the development standards adopted by the city.
(b) Review diligently all subdivision plats and road dedications to ensure the establishment of a safe and efficient road system.
(c) Support and adopt by reference road projects listed in the Six-Year Highway Improvement Program; specifically, work towards attaining left turn lanes and traffic lights on Highway 30.
(d) Control or eliminate traffic hazards along road margins through building setbacks, dedications or regulation of access at the time of subdivision, zone change or construction.
(e) Regulate signs and sign lighting to avoid distractions for motorists.
(f) Work with the railroad owners and operators to improve the safety at railroad crossings.
(g) Plan and develop street routes to alleviate Highway 30's traffic load.
(h) Regulate or prevent development within areas required for future arterials or widening of rights-of-way.
(i) Follow good access management techniques on all roadway systems within the city.
(j) Develop a plan for walking trails.
(k) Maintain, implement, and update the bikeway plan.
(l) Work with Columbia County and other agencies in their efforts to meet the needs of the transportationally disadvantaged in the community.
(m) Encourage increased opportunities for public local and regional transit facilities.

Upon adoption, the updated TSP policies will replace the Transportation element of the City's Comprehensive Plan. The revised goals and policies in the TSP will update the City's adopted long-range vision for transportation planning.

St. Helens Transportation System Plan (1997)

The current TSP project will update the 1997 St. Helens Transportation System Plan (TSP).
The stated purpose of the 1997 TSP is to serve as a guide for the management of existing transportation facilities and for the design and implementation of future transportation facilities. It is a

multi-modal transportation plan and establishes goals and policies to guide transportation planning in the City. The TSP documents existing conditions and estimates transportation needs based on traffic forecasts. Based on these needs, the TSP presents an implementation plan that includes recommended projects by mode and a financing plan (Chapter 8).

Chapter 7 of the document includes the plans for each transportation mode (Street System, Pedestrian System, Bicycle Plan, Public Transportation Plan, and Air/Rail/Pipeline Plan). The Street System Plan includes new roadways and improvements to the city's existing streets (Table 7.1 and 7.2), as well as recommended new traffic signals. The TSP includes a description of the functional classification system and categorizes each road within the city (p. 7.7, p. 7.9); Recommended Street Design Standards for each classification are illustrated in Figure 7.3.

The goal of the Pedestrian Plan is to provide a connected sidewalk system that enhances safety for the pedestrian and provides opportunities to walk, rather than drive. Table 7.3 in the TSP lists the recommended improvements to the pedestrian network and Figure 7.5 shows the recommended pedestrian network. The Pedestrian Plan states that sidewalks will also be installed as part of all new arterial and collector street projects, as well as major reconstruction projects. In residentially zoned areas, sidewalks are required to be 5 feet in width; new sidewalks in commercial and industrial areas and along arterial streets must be at least 6 feet wide. Policies in the Pedestrian Plan state that the City should require sidewalks on all new roadway and reconstruction projects and that sidewalks provided as part of development projects should be connected to the pedestrian system. The Pedestrian Plan also discusses street crossing opportunities and safety for pedestrians. Locations for crosswalk improvements are listed on p. 7-17.

The Bicycle Plan includes the objectives of the 1988 Bikeway Master Plan and, based on these objectives, presents the recommended Bicycle Plan in Figure 7.6. Table 7.4 lists the recommended bicycle improvements and cost estimates needed to implement the Bicycle Plan. The stated main objective of the Bicycle Plan is "to provide bicycle routes that enable safe and efficient travel for both the everyday bicycle commuter as well as the occasional recreational rider." The Bicycle Plan recommends striped lanes on many, but not all, of the city's arterials and collectors. Local streets have been identified as the bicycle route where it has been determined that they provide good parallel facilities. As with the Pedestrian Plan, the Bicycle Plan also has been designed to connect major destinations to residential neighborhoods. The Bicycle Plan was also intended to provide additional off-street, multi-use paths for recreational use. This plan notes that many of the desired improvements have already been implemented on the east side of St. Helens, but that the west side has a very limited bicycle network. The standards and policies section of this plan (p. 7-18) emphasizes the need for a routine maintenance program and law enforcement policies to increase safety by ensuring that both motorists and cyclists follow traffic requirements.

The background information in the Public Transportation Plan is based on a 1996 feasibility study and is out of date. The information and analysis in the 2009 Columbia County Community-Wide Transit Plan (see review in this memorandum) will inform the TSP update to a greater extent than the recommendations of the 1997 TSP. The TSP update planning process also will review the sections of the adopted TSP that cover Air, Rail and Pipeline transportation. Currently, the TSP catalogues existing facilities in each of these modes and states the city's recognition of their importance and support of various improvements.

St. Helens Bikeway Master Plan (1988)

The Bikeway Master Plan reexamines the city's priorities for providing bicycle facilities, as they were identified in a 1979 City Council proposal, and updates the project list. The Bikeway Master Plan also includes the following goals and objectives:

> *Goal:*
>
> *Provide a safe, convenient, useful and attractive system of bicycle paths and routes through the City and Urban Growth Area which will accommodate commuters, tourists and recreational users.*
>
> *Objectives:*
>
> 1. *Complete the bikeways in the old town area which will tie in with the existing routes in the downtown area.*
> 2. *Provide a safe system of bikeways which will be a show case for St. Helens.*
> 3. *Provide a system of bikeways which will link major community centers (i.e. Eisenschmidt Pool, Junior High School, McCormick Park) with residential areas.*
> 4. *Provide bikeways in the residential area west of US Hwy 30 that will provide access to schools and parks on the east side of town and eventually tie in with existing routes on the east side of US Hwy 30.*
> 5. *Provide for maintenance of bicycle facilities.*
> 6. *Provide adequate areas for parking bicycles for those uses that attract bicycles (e.g. parks).*
> 7. *Minimize unsafe conflicts between bicycles, pedestrians and motorized traffic.*

City of St. Helens Public Facilities Plan (1999)

The City's Public Facilities Plan (PFP) includes a transportation chapter that describes the overall transportation system, lists the roadways in the city according to functional classification, and summarizes the pedestrian system, bikeway system, and the public transportation plan. This information is taken from, and is largely identical to the information found in the 1997 TSP.

Under "Future Needs," the PFP states that connecting Achilles Road and Pittsburg Road will be vital to carry north-south traffic on the west side of town and reducing reliance on U.S. 30. Adding capacity on designated arterials and bridges is also identified as a need. The Deficiencies and Needs section identifies existing funding mechanisms (systems development charge for new street improvements and local improvement district for maintenance), but concludes that an "alternative method of financing the upgrading of arterial streets with in the City's UGB is necessary in order for

St. Helens to continue to adequately move traffic (p.19)." The list of transportation improvement priorities, costs, and timing is PFP Appendix D.

City of St. Helens Economic Opportunity Analysis (2008)

The purpose of the Economic Opportunity Analysis (EOA) is to comply with Oregon Statewide Planning Goal 9 (Economic Development), including quantifying employment projections and land needs. The EOA documents that St. Helens has increasingly become a bedroom community for the greater Portland area over past 15 years and that an important community goal is to broaden the city's employment (and fiscal) base. The Economic Overview section provides recent population projections, a breakout of employment by sector, and an opportunities and constraints analysis regarding job creation.

The EOA does not contain recommendations for transportation system improvements. However, many of the economic goals and policies in the EOA - such as making waterfront development a priority, allocating adequate amounts of land for economic growth, and developing local tourist and recreation sectors – have implications for transportation system planning in the community. Notably, the EOA concludes that the city has a surplus of industrial land over the 20-year planning horizons and, therefore, no UGB expansion is necessary to accommodate the city's employment needs. However, the EOA also documents a shortage of commercial land and recommends that the city should "adjust its zoning to transfer some industrial lands to commercial lands to meet the 20 year needs for more commercial lands (p. 21, ORD 3101 – Attachment A)

St. Helens Community Development Code

The St. Helens Community Development Code (CDC) is Title 17 of the city's Municipal Code. Development codes implement the land use plan established in jurisdictions' Comprehensive Plans. **Chapter 17.32 Zones and Uses** in the CDC establishes the zoning in the City, the uses permitted under each zoning (land use) category, and the regulations that apply in each zone.

The CDC allows "minor public facilities" outright in all zone districts, with the exception of the R10 and R7, which are the City's low-density residential zones, and the Olde Towne zone, a mixed-use zone in the historic downtown. The definition of minor public facilities includes street improvements within existing development including sidewalks, curbs, gutters, catch basins, paving, signs and traffic control devices and street lights and transit improvements, such as shelters or pedestrian and bicycle safety improvements, located within public right-of-way or on public property (17.16.010 General and Land Use Definitions). A major public facility is defined as "any public service improvement or structure developed by or for a public agency that is not defined as a minor public facility." Major public facilities are a conditional use in all the city zone districts. The Planning Commission has decision-making authority to approve, approve with conditions, or deny conditional uses permits. Planning Commission approval is based on how well the proposal meets the criteria in Chapter 17.100, Conditional Use.

The following sections of the CDC contain provisions that regulate transportation facilities and improvements in the city:

- Chapter 17.76 Visual Clearance Areas
- Chapter 17.80 Off-Street Parking and Loading Requirements
- Chapter 17.84 Access, Egress, and Circulation
- Chapter 17.136 Land Division – Subdivision
- Chapter 17.148 Planned Development
- Chapter 17.152 Street and Utility Improvement Standards

Chapter 17.76 Visual Clearance Areas requires that proper sight distances be maintained on the corners of all property adjacent to the intersection of two streets, a street and a railroad, or a driveway providing access to a public or private street in order to reduce the hazard from vehicular turning movements.

Chapter 17.80 Off-Street Parking and Loading Requirements addresses parking space dimensions, bicycle parking standards (17.80.020.15), parking structure design standards, and minimum and maximum off-street parking requirements. The code allows for the conversion of up to 10 percent of existing required parking spaces to accommodate transit supportive facilities (17.80.030.(3)).

Provisions in **Chapter 17.84 Access, Egress, and Circulation,** address joint access, public street access, required walkway location, and inadequate or hazardous access. Tables in this chapter provided for the vehicular access and egress requirements for residential, commercial, and industrial uses; the requirements address the minimum number of driveways, minimum access width, and minimum pavement width per number of units for residential uses and number of required parking spaces for non-residential uses.

Section 17.84.050 requires commercial, institutional, and industrial uses to have walkways connecting ground floor entrances to streets and providing safe access to other uses within developments and between developments. This section also requires attached housing and multi-unit developments to have walkways connecting each residential dwelling to vehicular parking areas and common open space and recreation facilities. The CDC does not, however, include requirements that new development provide for transit facilities or provide pedestrian access to existing and planned transit stops.

In **Chapter 17.136 Land Division – Subdivision**, approval criteria for land divisions require that the proposed preliminary plat complies with the city's comprehensive plan and that proposed streets continue the pattern approved for the streets on adjoining property (17.136.060). Final plat approval criteria for subdivisions require that roads for private use shown on the preliminary plat be approved by the city and that roads for public use be dedicated to the city (17.136.150). Approval criteria in **Chapter 17.148 Planned Development**, require that subdivision standards are met, as well as the standards in Chapter 17.84, Access, Egress, and Circulation (see below).

Chapter 17.152 Street and Utility Improvement Standards regulates a number of transportation facilities and related topics. It establishes block design and size requirements and includes standards for sidewalks (17.152.060) and bikeways (17.152.110). Sidewalk regulations include requiring they be constructed on both sides of streets (except for industrial uses, where only one side is required) but sidewalk width is not specified. Developments adjoining proposed bikeways identified on the adopted pedestrian/bikeway plan must dedicate easements or rights-of-way; permits for planned unit developments, conditional use permits, subdivisions, and "other developments which will principally benefit from such bikeways" will be conditioned to include the cost or construction of bikeway improvements. Bikeway widths are required to be at least five feet per bicycle travel lane; bikeways separated from the road must be at least eight feet wide.

Section 17.152.030 contains the city's street standards. Minimum right-of-way and street widths are established for minor arterials, collectors, local streets (residential and business/industrial), residential access roads (through streets and cul-de-sacs), and alleys (residential and business/industrial). The table in Figure 9 presents the minimum widths for right-of-way and roadway (pavement), as well as the number of lanes, according to functional classification. Cross-section diagrams are not included in the CDC. Consistent with the Transportation Planning Rule and the goal to minimize pavement width (660-12-0045(7), the CDC allows for reduced pavement and right-of-way widths for local residential streets that carry less than 500 ADT.[9]

For street alignment and connections, all local and collector streets that abut a development site must be extended within the site; proposed street or street extensions must be located to provide direct access to existing or planned transit stops and other neighborhood activity centers, such as schools, shopping areas and parks; and all developments should provide an internal network of connecting streets that minimizes travel distances (17.152.030(6)). Proposed street or street extensions must be located to provide direct access to existing or planned transit stops (17.152.030.7.c).

The CDC does not contain a requirement for providing a transportation impact analysis or study as part of a development proposal or comprehensive plan or zone change request. The CDC also does not currently include language addressing TPR Section -0060 [10]

St. Helens Water, Wastewater, Stormwater, Transportation, and Parks System Development Charge Study Final Report (2008)

The Water, Wastewater, Stormwater, Transportation, and Parks System Development Charge Study Final Report ("SDC Study") was the culmination of a process to update the system development charges (SDCs) for these city services to ensure that charges were equitable, adequate, and defensible and that they would generate adequate funding to meet the infrastructure needs of growth "without unduly burdening existing residents and business owners."

The transportation SDC analysis begins on page 14 of the SDC Study. The city's existing transportation SDCs are based on projected trip generation by land use and the SDC Study. The SDC Study estimates the number of adjusted average daily trips (ADTs) to be generated by growth through 2025 and explains the methodology employed. The recommended transportation SDC is $402 per average daily trip; SDCs for a comprehensive list of land uses are provided in a table on page 16 of the SDC Study. Ultimately, transportation SDC fees will likely need to be adjusted to reflect the TSP update and new transportation-related capital improvement projects recommended as part of this process.

[9] Requirements are 40 – 46′ for right of way width and 24 – 28′ for roadway width.
[10] Section -0060 was amended in March 2005 and includes provisions for local jurisdictions on how to make a determination whether or not an amendment to the City's adopted plans or land use regulations has a significant affect on a transportation facility.

TPR Requirement (OAR Section 660-12-0020)
(1) A TSP shall establish a coordinated network of transportation facilities adequate to serve state, regional and local transportation needs. (2) The TSP shall include the following elements:
(a) A determination of transportation needs as provided in OAR 660-012-0030;
(b) A road plan for a system of arterials and collectors and standards for the layout of local streets and other important non-collector street connections. Functional classifications of roads in regional and local TSPs shall be consistent with functional classifications of roads in state and regional TSPs and shall provide for continuity between adjacent jurisdictions. The standards for the layout of local streets shall provide for safe and convenient bike and pedestrian circulation necessary to carry out OAR 660-012-0045(3)(b). New connections to arterials and state highways shall be consistent with designated access management categories. The intent of this requirement is to provide guidance on the spacing of future extensions and connections along existing and future streets which are needed to provide reasonably direct routes for bicycle and pedestrian travel. The standards for the layout of local streets shall address: (A) Extensions of existing streets; (B) Connections to existing or planned streets, including arterials and collectors; and (C) Connections to neighborhood destinations.
(c) A public transportation plan which: (A) Describes public transportation services for the transportation disadvantaged and identifies service inadequacies; (B) Describes intercity bus and passenger rail service and identifies the location of terminals; (C) For areas within an urban growth boundary which have public transit service, identifies existing and planned transit trunk routes, exclusive transit ways, terminals and major transfer stations, major transit stops, and park-and-ride stations. Designation of stop or station locations may allow for minor adjustments in the location of stops to provide for efficient transit or traffic operation or to provide convenient pedestrian access to adjacent or nearby uses. (D) For areas within an urban area containing a population greater than 25,000 persons, not currently served by transit, evaluates the feasibility of developing a public transit system at buildout. Where a transit system is determined to be feasible, the plan shall meet the requirements of paragraph (2)(c)(C) of this rule.
(d) A bicycle and pedestrian plan for a network of bicycle and pedestrian routes throughout the planning area. The network and list of facility improvements shall be consistent with the requirements of ORS 366.514;
(e) An air, rail, water and pipeline transportation plan which identifies where public use airports, mainline and branchline railroads and railroad facilities, port facilities, and major regional pipelines and terminals are located or planned within the planning area. For airports, the planning area shall include all areas within airport imaginary surfaces and other areas covered by state or federal regulations;

TPR Requirement (OAR Section 660-12-0020)
(f) For areas within an urban area containing a population greater than 25,000 persons a plan for transportation system management and demand management;
(g) A parking plan in MPO areas as provided in OAR 660-012-0045(5)(c);
(h) Policies and land use regulations for implementing the TSP as provided in OAR 660-012-0045;
(i) For areas within an urban growth boundary containing a population greater than 2,500 persons, a transportation financing program as provided in OAR 660-012-0040.
(3) Each element identified in subsections (2)(b)–(d) of this rule shall contain: (a) An inventory and general assessment of existing and committed transportation facilities and services by function, type, capacity and condition:
(A) The transportation capacity analysis shall include information on: (i) The capacities of existing and committed facilities; (ii) The degree to which those capacities have been reached or surpassed on existing facilities; and (iii) The assumptions upon which these capacities are based. (B) For state and regional facilities, the transportation capacity analysis shall be consistent with standards of facility performance considered acceptable by the affected state or regional transportation agency; (C) The transportation facility condition analysis shall describe the general physical and operational condition of each transportation facility (e.g., very good, good, fair, poor, very poor).
(b) A system of planned transportation facilities, services and major improvements. The system shall include a description of the type or functional classification of planned facilities and services and their planned capacities and levels of service;
(c) A description of the location of planned facilities, services and major improvements, establishing the general corridor within which the facilities, services or improvements may be sited. This shall include a map showing the general location of proposed transportation improvements, a description of facility parameters such as minimum and maximum road right-of-way width and the number and size of lanes, and any other additional description that is appropriate;
(d) Identification of the provider of each transportation facility or service.

Appendix 2B Technical Memorandum #2: Existing Traffic Conditions

TECHNICAL MEMORANDUM

City of St. Helens Transportation System Plan Update

Date: January 25, 2011

To: Jacob Graichen, City of St. Helens
Seth Brumley, ODOT

From: Chris Brehmer, P.E., Kittelson & Associates, Inc.
Matt Bell, Kittelson & Associates, Inc.

Project: St. Helens Transportation System Plan Update

Subject: Final Chapter 3: Existing Conditions

Cc: Technical Advisory Committee and Citizens Advisory Committee

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Introduction

During the past fifteen years, the city of St. Helens has experienced a population growth of more than 50 percent. At the same time, the demand for through traffic on Columbia River Highway (US 30) and freight rail traffic along the Portland and Western rail line has risen steadily. As a result, the demand for multimodal transportation facilities within St. Helens has increased.

The long-term vision for the city's transportation system is currently reflected in the 1997 Transportation System Plan (TSP - Reference 1). The TSP was adopted in 1997 and reflects an existing conditions analysis consistent with year 1995 travel demands and patterns. With the growth experienced, it is now time to update the 1997 TSP to ensure that the multimodal system can meet the needs of the city and the surrounding communities for the next twenty years. As such, this memorandum documents the existing conditions analysis for the TSP Update. Major topics presented include:

- Transportation System Inventory
    - Street system
    - Pedestrian system
    - Bicycle system
    - Public transportation system
    - Rail system
    - Air, pipeline, and water service
- Key Intersection Operations
    - Mobility standards
    - Intersection performance
- Safety Analysis

  - US 30 Corridor
  - Study intersections
- Financing Plan

In addition to identifying and assessing the available transportation infrastructure, existing system deficiencies are highlighted. Future TSP Update tasks will identify potential transportation options.

STUDY AREA

Figure 3-1 shows a street map of St. Helens, with the city limits and urban growth boundary (UGB) indicated. The study area for the TSP Update consists of the area within the UGB. Based on the requirements of the Transportation Planning Rule (TPR), the focus of the existing conditions analysis is on significant roadways (arterials and collectors) and intersections of these streets as well as pedestrian and bicycle facilities, public transportation, and other transport facilities and services, including rail service, air service, pipelines and water service.

Transportation System Inventory

This section describes the current performance and operational deficiencies of the city's transportation system, covering the automobile, pedestrian, bicycle, public transportation, freight, air, marine, and pipeline/transmission transportation modes.

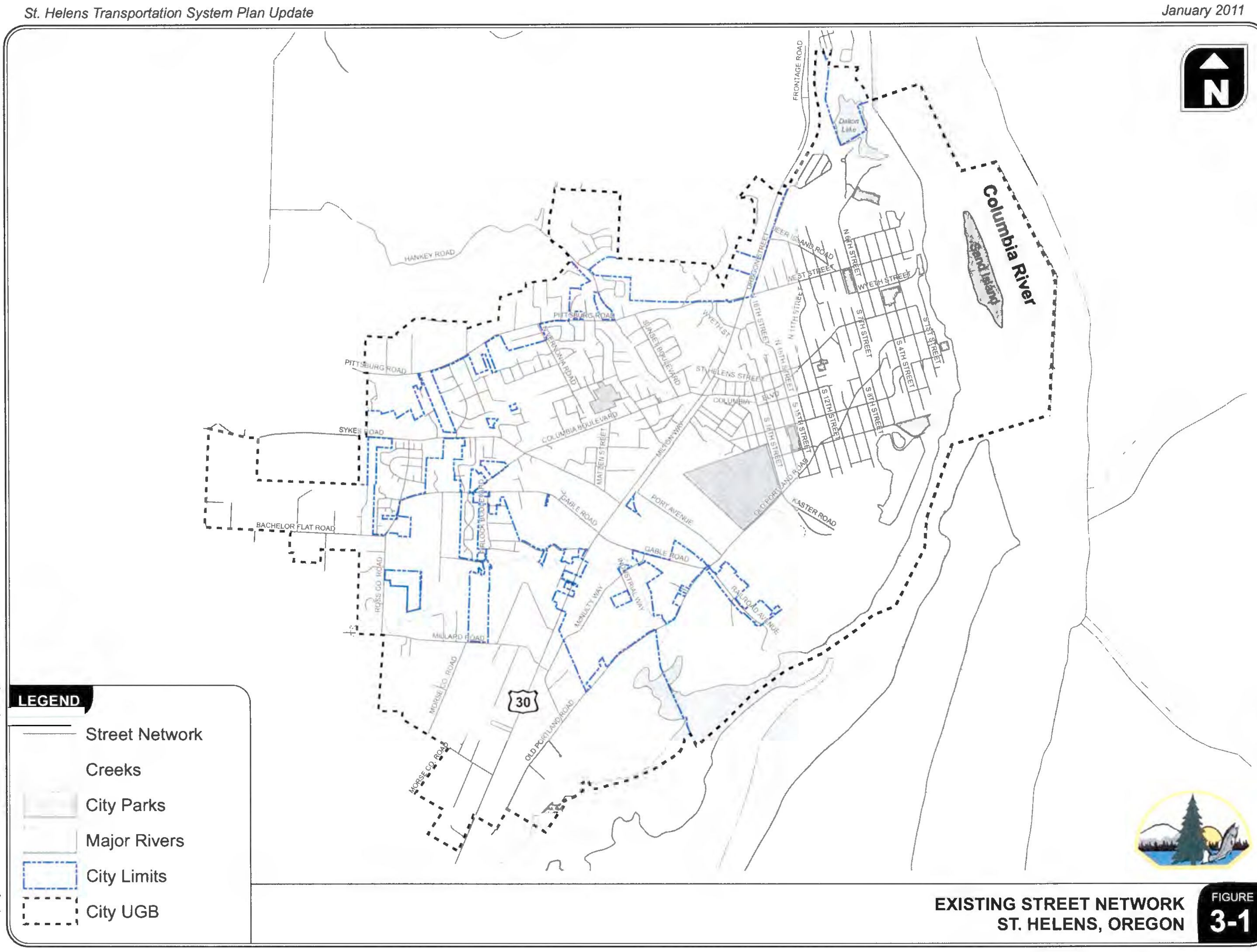
STREET SYSTEM

Highways and streets are the primary means of mobility for St. Helens' citizens, serving the majority of trips over multiple modes. Pedestrians, bicyclists, public transportation, and motorists all utilize public roads for the majority of their trips.

Jurisdiction

Public roads within the study area are operated and maintained by three separate jurisdictions: the City of St. Helens, Columbia County, and the Oregon Department of Transportation (ODOT). Each jurisdiction is responsible for the following:

- Determining the road's functional classification;
- Defining the roadway's major design and multimodal features;
- Maintenance; and,
- Approving construction and access permits.



EXISTING STREET NETWORK
ST. HELENS, OREGON
FIGURE 3-1

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Coordination is required among the three jurisdictions to ensure that the transportation system is planned, operated, maintained, and improved to safely meet public needs. Figure 3-2 illustrates the existing street system and which agency is responsible for each street within the UGB.

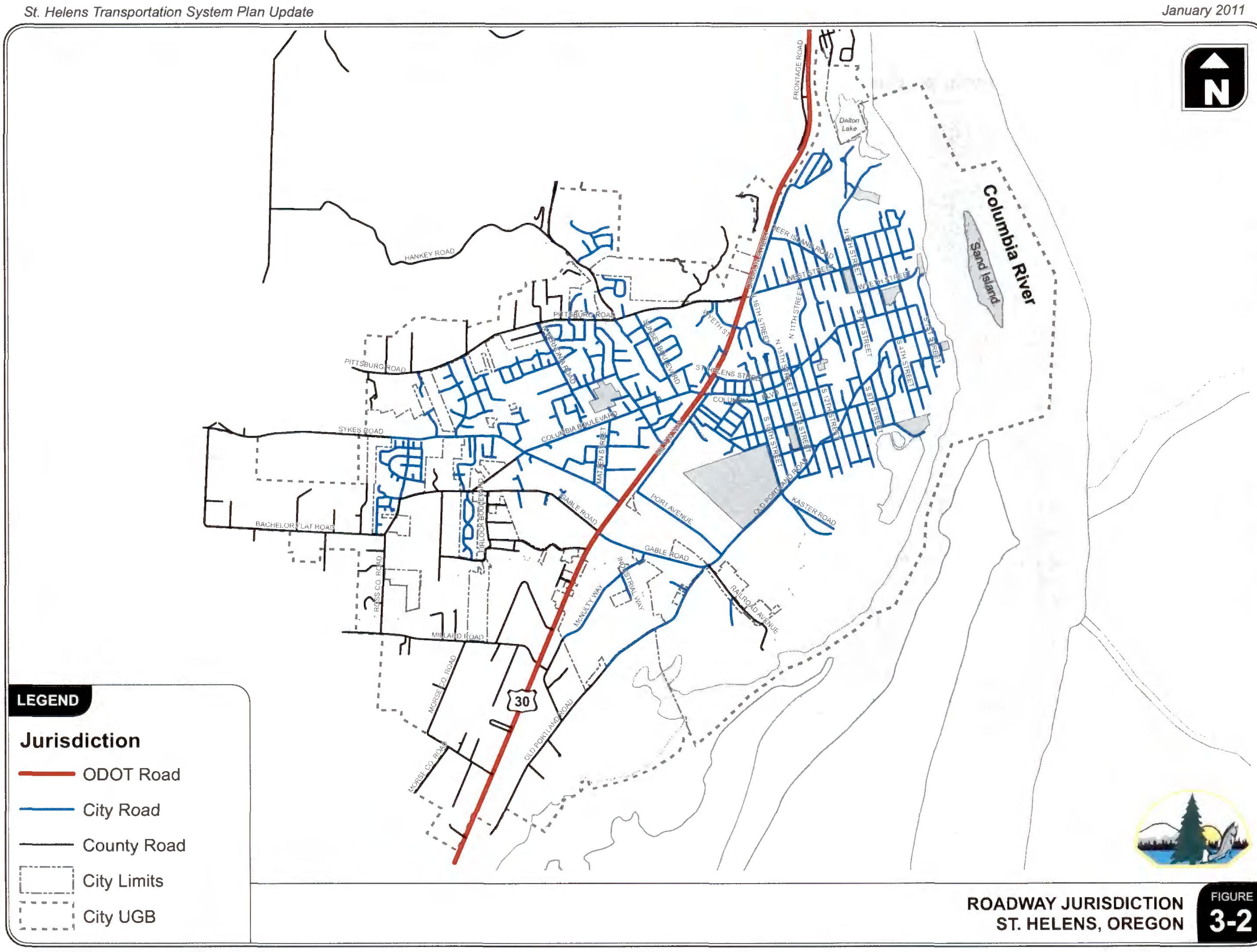
Functional Classification

A street's *functional classification* reflects its role in the transportation system and defines desired operational and design characteristics such as pavement width, right-of-way requirements, driveway (access) spacing requirements, and pedestrian and bicycle features. The City's 1997 TSP defines the following functional classification hierarchy:

> *Major Arterials:* These facilities carry the highest volumes of through traffic and primarily function to provide mobility and not access. Major arterials provide continuity for intercity traffic through the urban area and are usually multi-lane highway facilities. The only major arterial in St. Helens is the Lower Columbia River Highway (US 30).
>
> *Minor Arterials:* These facilities interconnect and augment the major arterial system and accommodate trips of somewhat shorter length. Such facilities interconnect residential, shopping, employment, and recreational activities within the community.
>
> *Collector:* These streets provide both land access and movement within residential, commercial, and industrial uses. These streets gather traffic from local streets and serve as connectors to arterials.
>
> *Local Streets:* These streets provide land access to residential and other properties within neighborhoods and generally do not intersect any arterial routes.

Figure 3-3 illustrates the current functional classification of the study area roadways per the 1997 TSP. As shown, many of the roadways designated as minor arterials on the west side of US 30 have direct access from local streets. Further review indicates that many also have direct access from residential driveways and are posted with comparatively low travel speeds. Also shown in the figure, there are relatively few north-south roadways designated as collectors or minor arterials. The functional classification of the existing roadways will be further evaluated in the transportation options analysis.

ODOT has a separate classification system for its highways, which guide the planning, management, and investment for state highways. The *Oregon Highway Plan* (OHP – Reference 2), designates US 30 as a *Statewide Freight Route* in the study area. This designation reflects the roadway's function, providing the primary route linking communities such as Astoria, Clatskanie, Rainer, Prescott, and Columbia City to the north with St. Helens, Scappoose, and the greater Portland metropolitan area to the south.



ROADWAY JURISDICTION
ST. HELENS, OREGON

FIGURE 3-2

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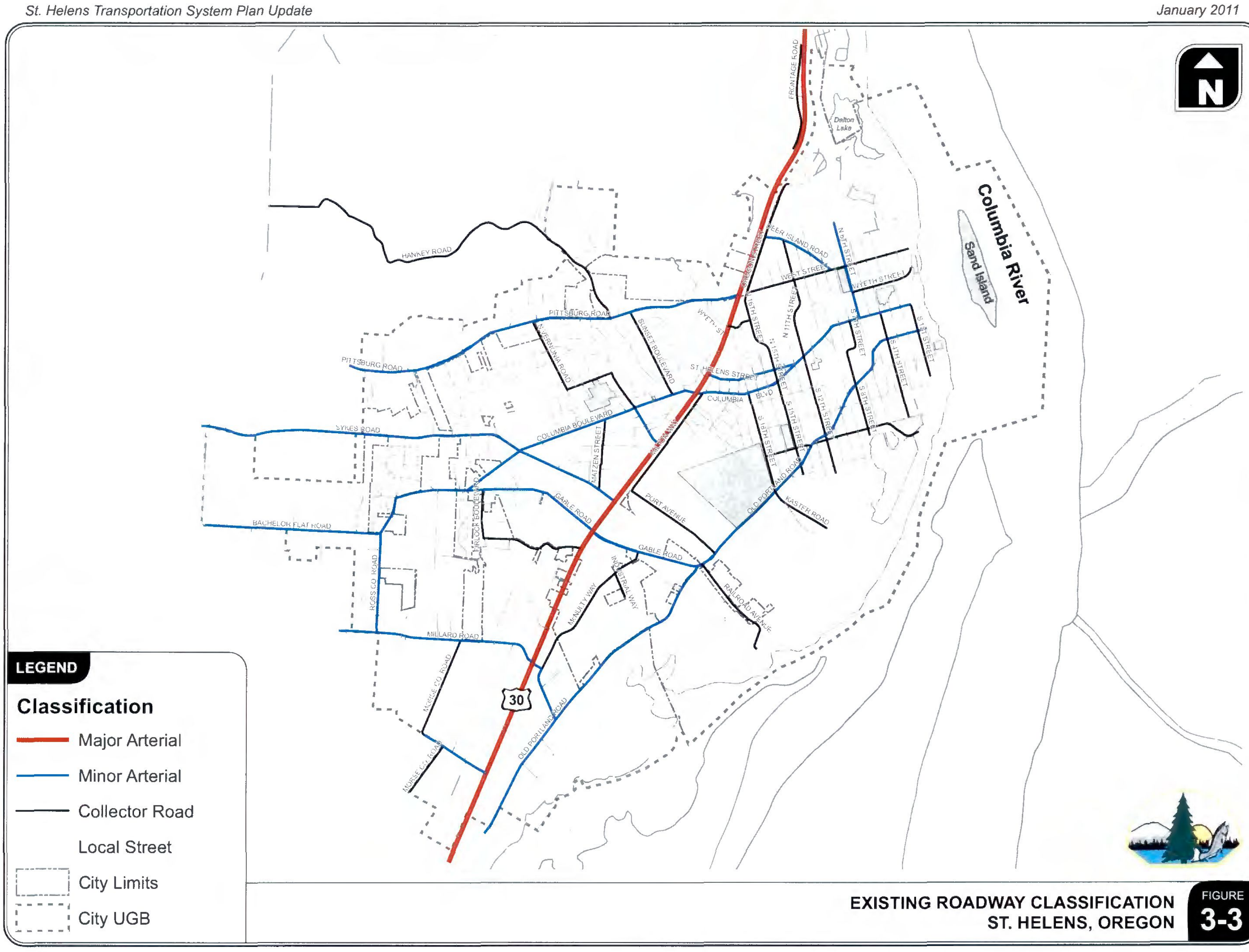

EXISTING ROADWAY CLASSIFICATION
ST. HELENS, OREGON

FIGURE 3-3

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Truck Routes

The existing designated truck routes were established to limit heavy truck traffic on local streets while connecting the industrial areas within St. Helens to US 30. Figure 3-4 illustrates the existing designated truck routes through St. Helens.

Each of the truck routes were qualitatively evaluated to determine if there is sufficient width along the roadways and at intersections to accommodate wide turning movements associated with large trucks. East of US 30, relatively few of the truck routes have curbs or sidewalks provided at the intersections, therefore, large trucks can utilize the extra shoulder space to turn. Where curbs do exist, such as at the Old Portland Road/Kaster Road intersection, the turning radii is sufficient to accommodate the wide turning movements. Old Portland Road and Kaster Road currently have incomplete pedestrian facilities. Old Portland Road has designated bicycle lanes and is a designated bicycle route; however, updates to the functional classification plan should consider whether designating the roadway as both a bicycle and freight route introduces unintended conflicts.

West of US 30, both Sykes Road and Pittsburg Road are relatively narrow streets through predominantly residential areas; however, the routes are relatively straight and do not require significant turning movements. McBride Elementary School is in the northwest corner of the Sykes Road/Columbia Boulevard intersection.

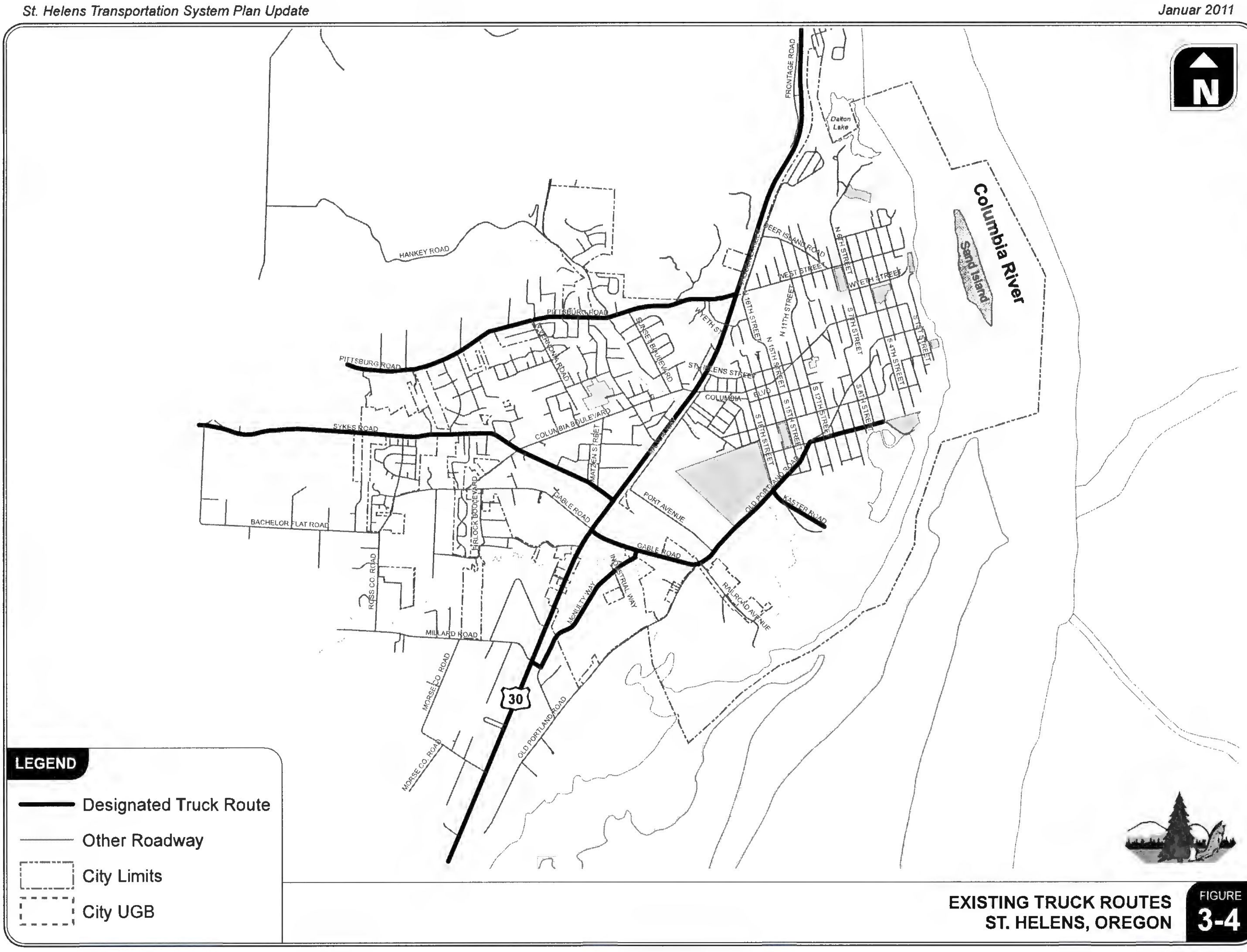
Street Section Standards

The 1997 TSP provided standard street cross sections for each of the functional classifications within the city. Per the TSP, these cross sections were intended to be implemented with some flexibility recognizing unique and special situations as appropriate. The cross section design standards from the 1997 TSP are summarized in Table 3-1 and illustrated in Figure 3-5.

Table 3-1 Existing Street Section Standards

Functional Classification	Sidewalk	Land-scaping	Bicycle Lanes	On-Street Parking	Travel Lanes	Right-of-Way (feet)
Major Arterial	6'	5'	5'	None	(5) 12'-14'	102'
Minor Arterial	6'	None	8' Parking *or* Bicycle Lanes		(2) 14'	60'
Collector Street	5'	None	None	8'	(2) 11'	60'
Local Street	5'	None	None	7'	(1) 12'-13'	50'

While individual local streets are not reviewed as part of the TSP update, the Oregon TPR requires that local governments offer "skinny street" standards for local streets in order to minimize pavement width and right-of-way. The Department of Land Conservation and Development's *Neighborhood Street Design Guidelines* (DLCD - Reference 3), indicates a street with a paved section wider than 28 feet is by definition not a "narrow street." The DLCD guidelines



EXISTING TRUCK ROUTES
ST. HELENS, OREGON
FIGURE 3-4

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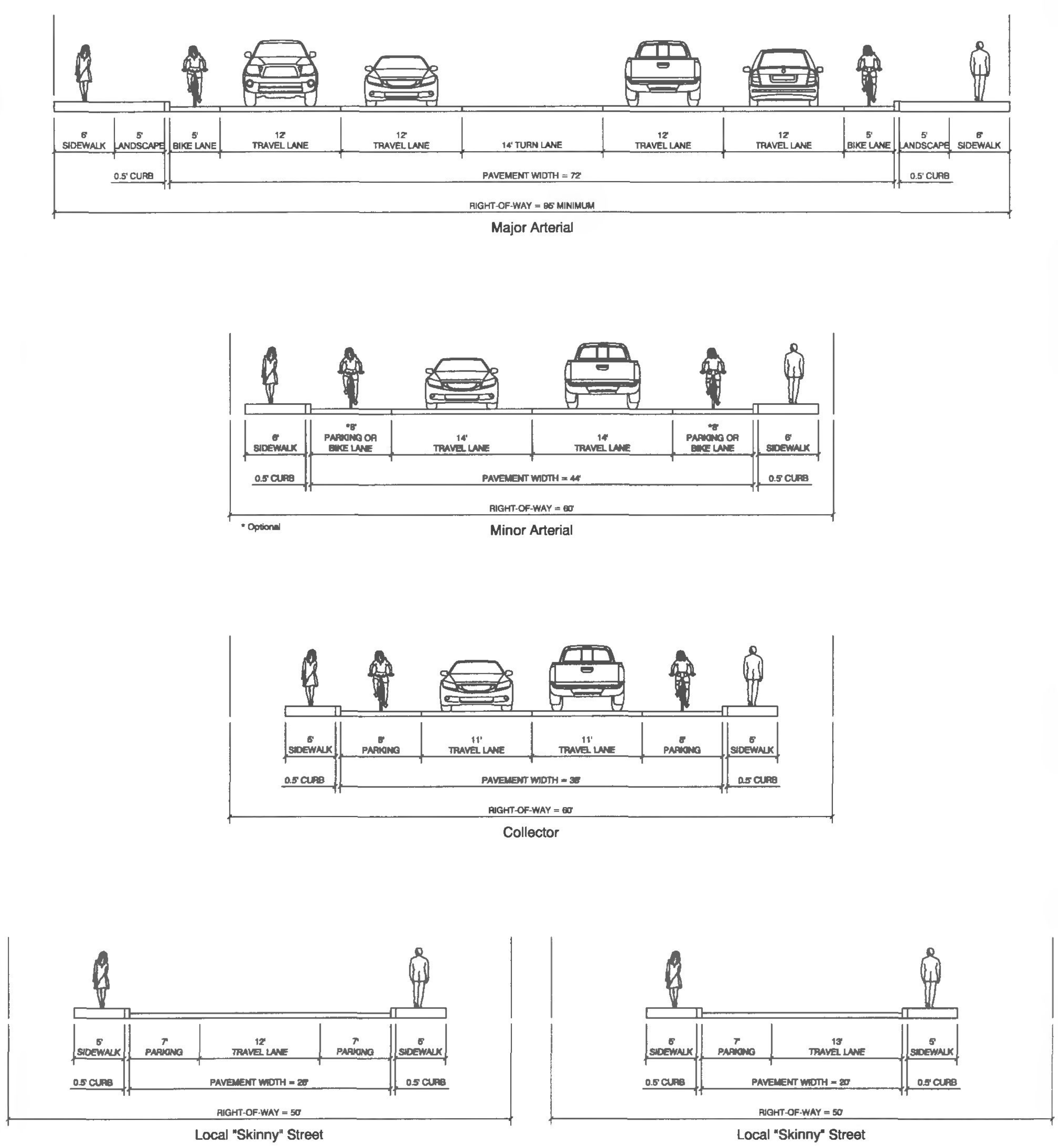


EXISTING TSP ROADWAY CROSS SECTIONS
ST. HELENS, OREGON

FIGURE 3-5

cite benefits of streets with reduced pavement widths including improved livability, improved safety, slower vehicle speeds, and reduced environmental impacts. The guidelines further indicate that narrow streets must meet the operational needs including pedestrian and bicycle circulation and emergency vehicle access.

As shown in Figure 3-5, the cross sections provided in the TSP currently include two options that comply with the "skinny street" standard, showing the narrowest paved cross-section to be 20 feet wide[1]. While the curb-to-curb road section is relatively narrow, the 50-foot right-of-way shown for the two skinny streets is relatively wide; this should be re-evaluated as part of the TSP update.

In addition to the TSP, the City also published roadway standards in the City's Community Development Code. City staff indicate the Development Code standards have been used to guide transportation improvements constructed in conjunction with new developments, not the TSP. Table 3-2 displays the Road Standards shown in the City's Community Development Code.

Table 3-2 Development Code Required Minimum Right-of-Way and Street Widths

Type of Street	Right-of-way Width	Roadway Width	Moving Lanes	Bicycle Lanes
Minor Arterial	60'	36-48'	2-4	2-6'
Collector	60'	24-40'	2-3	2-5'
Local – Commercial, Industrial	50'	34'	2	2-4'
Local – Residential	50'	34'	2	2-4'
Residential Access – through street with less than 500 ADT	40-46'	24-28'	1-2	0
Residential Access – cul-de-sac dead-ends (not more than 400 feet long and serving more than 20 dwelling units)	36-44'	24-28'	1-2	0
Turnarounds for dead-ends in industrial and commercial zones only	50' radius	42' radius		0
Turnarounds for cul-de-sac dead-ends in residential zones only	42' radius	35' radius		0
Alley Residential Business or Industrial	 16' 20'	 16' 20'		0

Source: City of St. Helens Community Development Code, Section 17.152.030 Street

When comparing Figure 3-5 and Table 3-2, it quickly becomes apparent that the cross sections provided in the current TSP are not consistent with the cross section standards shown in the city's Community Development Code. The development of standard cross sections will be an important part of the TSP update process.

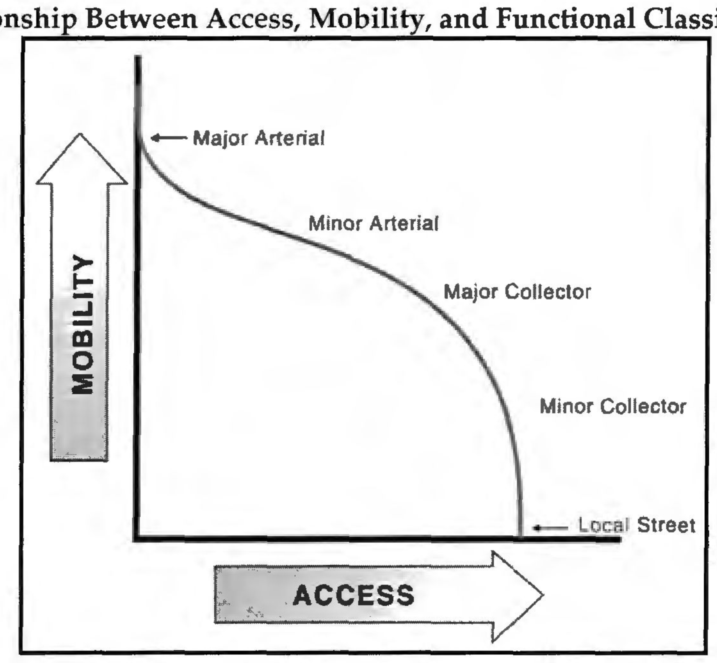
[1] Sidewalks are not considered part of the paved section.

Access Management

Spacing requirements for public roadways and private driveways can have a profound impact on transportation system operations as well as land development. Access management strategies and implementation require careful consideration to balance the needs for access to developed land with the need to ensure movement of traffic in a safe and efficient manner.

Access management generally becomes more stringent as the functional classification level of roadways increases and the corresponding importance of mobility increases. Exhibit 3-1 illustrates the general relationship between access and mobility.

Exhibit 3-1
Relationship Between Access, Mobility, and Functional Classification



ODOT Access Spacing Standards

Access spacing requirements for US 30 are implemented by Oregon Administrative Rule (OAR) 734, Division 51[2] and relate directly to the functional classification of US 30 as both a *Statewide Highway* and *Freight Route*. Table 3-3 illustrates the access spacing standards for public and private approaches along US 30 within St. Helens.

[2] Oregon Revised Statute (OAR) 734, Division 51, was amended in September 2005 to be consistent with August 2005 OHP revisions to Policy 1B. Specifically, the spacing standards in OAR 734-051 were amended to be consistent with the OHP tables in Appendix C, Access Management Standards.

Table 3-3 US 30 Access Spacing Standards for Private and Public Approaches[2]

Posted Speed (miles per hour)	Minimum Space Required * (feet)
≤ 25	520
30 and 35	720
40 and 45	990
50	1,100
≥ 55	1,320

[1] These access management spacing standards do not apply to approaches in existence prior to April 1, 2000 except as provided in OAR 734-051-0115(1)(c) and 734-051-0125(1)(c).

* Measurement of the approach road spacing is from center to center on the same side of the roadway.

For signalized intersections on statewide highways such as US 30, OAR 734-020-470 identifies a desired minimum spacing of ½ mile (2,640 feet) be maintained between signalized intersections.

US 30 has access points serving small commercial properties throughout the downtown area that do not meet ODOT's access spacing standards for new construction. As private properties redevelop in the future, ODOT will review driveway spacing with respect to US 30 access spacing requirements and may determine that changes in land use require the consolidation or reconfiguration of existing accesses. In the interim, many of the existing driveways that do not conform with the access spacing standards will continue to operate safely due to: 1) the relatively slow travel speeds, 2) the separation of left and right-turn movements at many of the major intersections, and 3) the presence of a two-way left-turn lane (TWLTL) along US 30.

Curb and Gutter

St. Helens requires curb and gutter be constructed along its street network in conjunction with adjacent development. Streets constructed in recent development areas provide curb, gutter, and sidewalks; however, many older roadways have not been improved with curb and gutter, which can limit the functionality of the roadway, particularly for pedestrians and bicycles. The curb and gutter deficiencies identified in St. Helens are addressed along with the pedestrian and bicycle facilities.

Other Street System Deficiencies

The following deficiencies were identified through review of the transportation network as well as through feedback from agency staff and the general public:

- Substandard pavement conditions were identified along a number of city roadways, including segments of Bachelor Flat Road, Ross Road, and Millard Road;

- Existing City and County roadways within the city limits are generally not constructed to current City roadway standards;
- The flashing beacon at the westbound approach to the Williams/Columbia Boulevard intersection is burned out.
- The traffic signal at the 18th Street/Old Portland Road intersection does not meet current Manual on Uniform Traffic Control Devices (MUTCD-Reference 4) standards. To correct existing deficiencies, the City should consider either of the following:
  - augment the existing intersection signal displays with a second signal head on each approach (this could be post-mounted in each quadrant) and consider adding pedestrian signal displays or,
  - Complete a traffic study per the requirements of the MUTCD and, based on the study findings, operate the intersection as either a two-way or all-way stop as appropriate, including provision of MUTCD-compliant signing and striping. If two-way or all-way stop control is implemented, then the existing signal should either be turned off and removed or operated as a supplemental warning beacon in support of the new stop control per the engineering study recommendations.
- Significant queuing occurs during the morning and afternoon school peaks near the main entrance to Lewis and Clark Elementary School located near the 9th Street/Columbia Boulevard and 11th Street/Columbia Boulevard intersections.
  - Although morning and afternoon peak hour operations are not analyzed in the TSP Update, the City should consider how schools can be better served by the future transportation system.
- Turn lane vehicle storage deficiencies were identified by ODOT at the following intersections along US 30:
  - The southbound left-turn lane at Deer Island Road does not have enough left turn lane striping to meet minimum storage requirements.
  - The southbound right-turn lanes at Dear Island Road, Pittsburg Road, Wyeth Street, and Achilles Road are substandard in length based on ODOT's current minimum storage and deceleration design requirements.
- Abandoned railroad spurs are located near the southbound approach to the Oregon Street/Deer Island Road intersection
  - These will be removed as part of the redevelopment of the site located in the Southwest corner of the intersection for the future Columbia County Rider Transit Center.

PEDESTRIAN SYSTEM

Pedestrian facilities serve a variety of needs, including:

- Relatively short trips (generally considered to be under a mile) to major pedestrian attractors, such as schools, parks, and public facilities;

- Recreational trips (e.g., jogging or hiking) and circulation within parks;
- Access to transit (generally trips under 1/2-mile to bus stops); and,
- Commute trips, where mixed-use development is provided and/or people have chosen to live near where they work.

Pedestrian facilities should be integrated with transit stops and effectively separate pedestrians from conflicts with vehicular traffic. Furthermore, pedestrian facilities should provide continuous connections among neighborhoods, employment areas, and nearby pedestrian attractors. Pedestrian facilities usually refer to sidewalks or paths, but also include pedestrian crossing treatments for high volume roadways.

The existing pedestrian network serving St. Helens is shown in Figure 3-6 along with major pedestrian attractors such as public schools and transit stop locations. As shown in Figure 3-6, relatively few of the arterial and collector roadways in St. Helens currently provide sidewalks on both sides of the street.

The following roadway segments have been identified as improvement priorities by the City:

- Sykes Road between Columbia Boulevard and Summit View Drive;
- Gable/Bachelor Flat Road between US 30 and Summit View Drive, and;
- Columbia Boulevard between Sykes Road and Gable/Bachelor Flat Road.

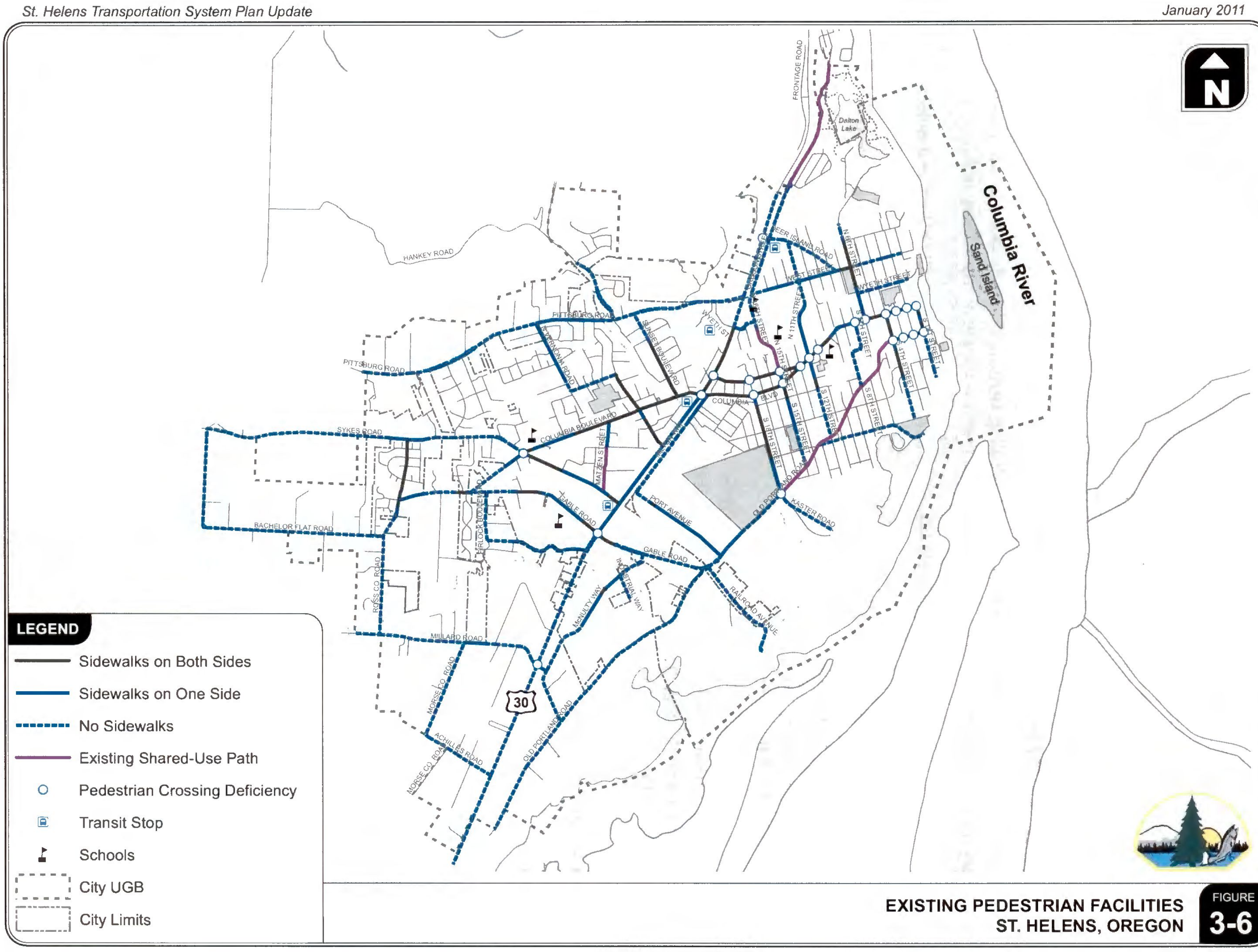
Each of these three streets serves as a major connector between the residential areas east of US 30 and the St. Helens High School, McBride Elementary, and retail uses along US 30. Despite their prominent function, each street has incomplete sidewalks, bike lanes, curbs, and gutters as well as constrained right-of-way.

Pedestrian Crossings at Intersections

All unsignalized intersections in Oregon are considered legal cross walks and motor vehicles are required to yield the right of way to allow pedestrians to cross. However, compliance is not consistent statewide and pedestrians may have difficulty crossing high volume roadways. The City of St. Helens has several marked and unmarked crosswalks at unsignalized intersections along key roadway facilities such as Columbia Boulevard and St. Helens Street that rely on drivers to yield the right-of-way. These and other locations throughout the downtown area tend to have wide roadway cross sections that require pedestrians to cross not only the travel lanes, but also on-street parking lanes provided on one or both sides of a given roadway. The pedestrian environment at these locations could be enhanced and will be further reviewed in the transportation options analysis.

The City of St. Helens converted the intersection of West Street and N. 6th Street to all-way stop control and added a curb extension in June of 2010 in part to facilitate safe pedestrian movements at the intersection.

All of the signalized intersections on US 30 in St. Helens have protected pedestrian crossings.



EXISTING PEDESTRIAN FACILITIES
ST. HELENS, OREGON

FIGURE 3-6

Figure 3-6 also illustrates the location of known pedestrian crossings deficiencies based on input from City staff and the general public through the interactive Safe Routes to School map. Improvements at each of these intersections will be addressed in the transportation options analysis. The Safe Routes to School map will be discussed later in this report.

BICYCLE SYSTEM

Similar to pedestrian facilities, bicycle facilities (including dedicated bicycle lanes in the paved roadway, multi-use paths shared with pedestrians, etc.) serve a variety of trips. These include:

- Trips to major attractors, such as schools, parks and open spaces, retail centers, and public facilities;
- Commute trips, where changing and showering facilities are provided at the workplace;
- Recreational trips; and
- Access to transit, where bicycle storage facilities are available at the stop, or where space is available on bus-mounted bicycle racks.

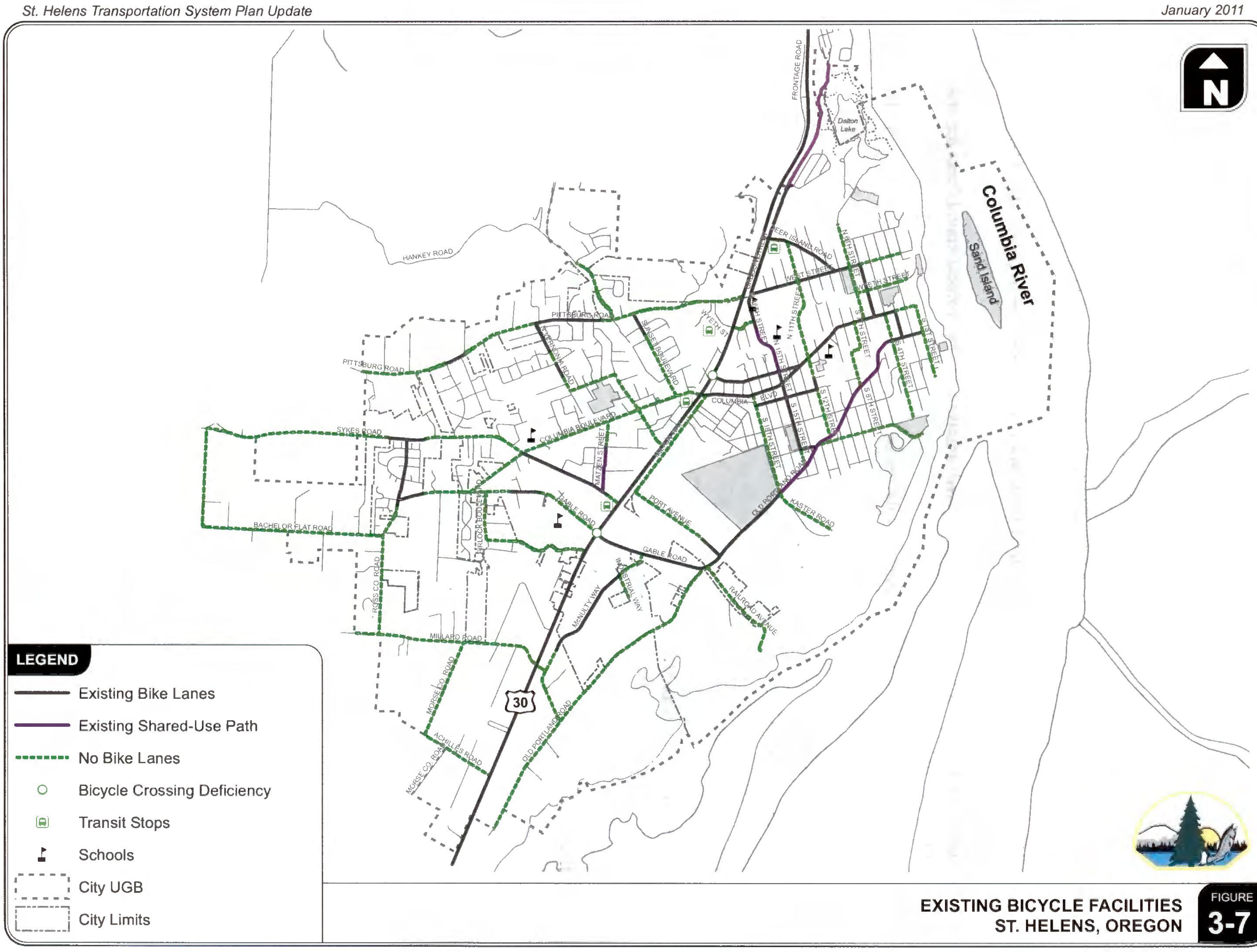
Figure 3-7 summarizes the existing bicycle facilities in St. Helens. As shown, several roadways east of US 30 currently have complete bicycle facilities, while west of US 30 the only completed bicycle facilities are located on Sykes Road between US 30 and Columbia Boulevard. Similar to the previously identified pedestrian issues, improvements are needed along Gable/Bachelor Flat Road and Columbia Boulevard to provide better access to schools and retail areas.

Figure 3-7 also shows the location of known bicycle crossing deficiencies based on input received from City Staff and the St. Helens Pedestrian and Bicycle Committee. Improvements at each of these intersections will be addressed in the transportation options analysis.

Oregon Bicycle and Pedestrian Plan

The following general guidelines were derived from the *Oregon Bicycle and Pedestrian Plan* (Reference 5).

- Dedicated bicycle facilities should be provided along major streets where automobile traffic speeds are significantly higher than bicycle speeds.
- Bicycle facilities should connect residential neighborhoods to schools, retail centers, and employment areas.
- Allowing bicycle traffic to mix with automobile traffic in shared lanes is acceptable where the average daily traffic (ADT) on a roadway is less than 3,000 vehicles per day.
- Lower volume roadways should be considered for bike shoulders or lanes if anticipated to be used by children as part of a Safe Routes to School program.
- In areas where no street connection currently exists or where substantial out-of-direction travel would otherwise be required, a multi-use path may be appropriate to provide adequate facilities for bicyclists.



EXISTING BICYCLE FACILITIES
ST. HELENS, OREGON

FIGURE 3-7

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ODOT categorizes roadway bicycle facilities into the following four major classifications:

- Shared roadway – As implied by the name, no special treatments are available for bicycles and both bicycles and vehicles share the same roadway area under this classification. The shared roadway facility is best used where there is minimal vehicle traffic to conflict with bicycle traffic.
- Shoulder bikeways – This bicycle facility consists of roadways with paved shoulders that can accommodate bicycle traffic.
- Bike lanes – A separate lane is designated adjacent to the vehicle travel lane for the exclusive use of bicyclists.
- Bike paths – These bicycle facilities are exclusive bicycle ways separated from the roadway.

Bicycle Facilities

The 1997 TSP implemented the 1988 *St. Helens Bikeway Master Plan* (Reference 6) that was designed to provide a safe and convenient system of bicycle paths through the City and within the UGB. The plan identified several facilities that were complete as of 1988, including US 30, Sykes Road between Columbia Boulevard and Matzen Street, Oregon Street north of West Street, West Street east of Oregon Street, 16th to 15th Street, and parts of 6th Street, 4th Street, and Old Portland Road. The plan also identified several proposed facilities, including along Pittsburg Road east of Vernonia Road, Vernonia Road, Columbia Boulevard, Gable Road, a connection between Millard Road and Old Portland Road, and others. As of today, the following facilities identified as needed in the 1988 plan have been completed:

- Columbia Boulevard east of US 30
- Gable Road east of US 30
- Old Portland Road north of Gable Road

PUBLIC TRAIL SYSTEM

Figure 3-8 illustrates the public trail system located within the city, including the trails within the Dalton Lake Recreational Area which consists of several paved and unpaved paths, trails, and trailheads that surround Dalton Lake. The Draft Conceptual Dalton Lake Recreational Plan, developed in July 2010, identifies several opportunities and constraints associated with each trail within the system, including the potential development of observation and picnic areas. In addition to several side trials and footpaths, the following major trails are located within the Dalton Lake Recreational Area:

- Rutherford Parkway: an existing 8-foot wide paved multi-use path that extends north of Oregon Street connecting the City of St. Helens with Columbia City to the north.
- Dalton Lake West Path: a dirt road along existing electricity lines that connects Rutherford Parkway to the trail system within the Dalton Lake recreational area.

- Dalton Lake East Path: a gated gravel road path that extends east of Rutherford Parkway and south along the edge of the Columbia River.
- Madrona Court Trail: a narrow trail that extends north from the Crestwood Mobile Home Court to Dalton Lake West Path.

SAFE ROUTES TO SCHOOL

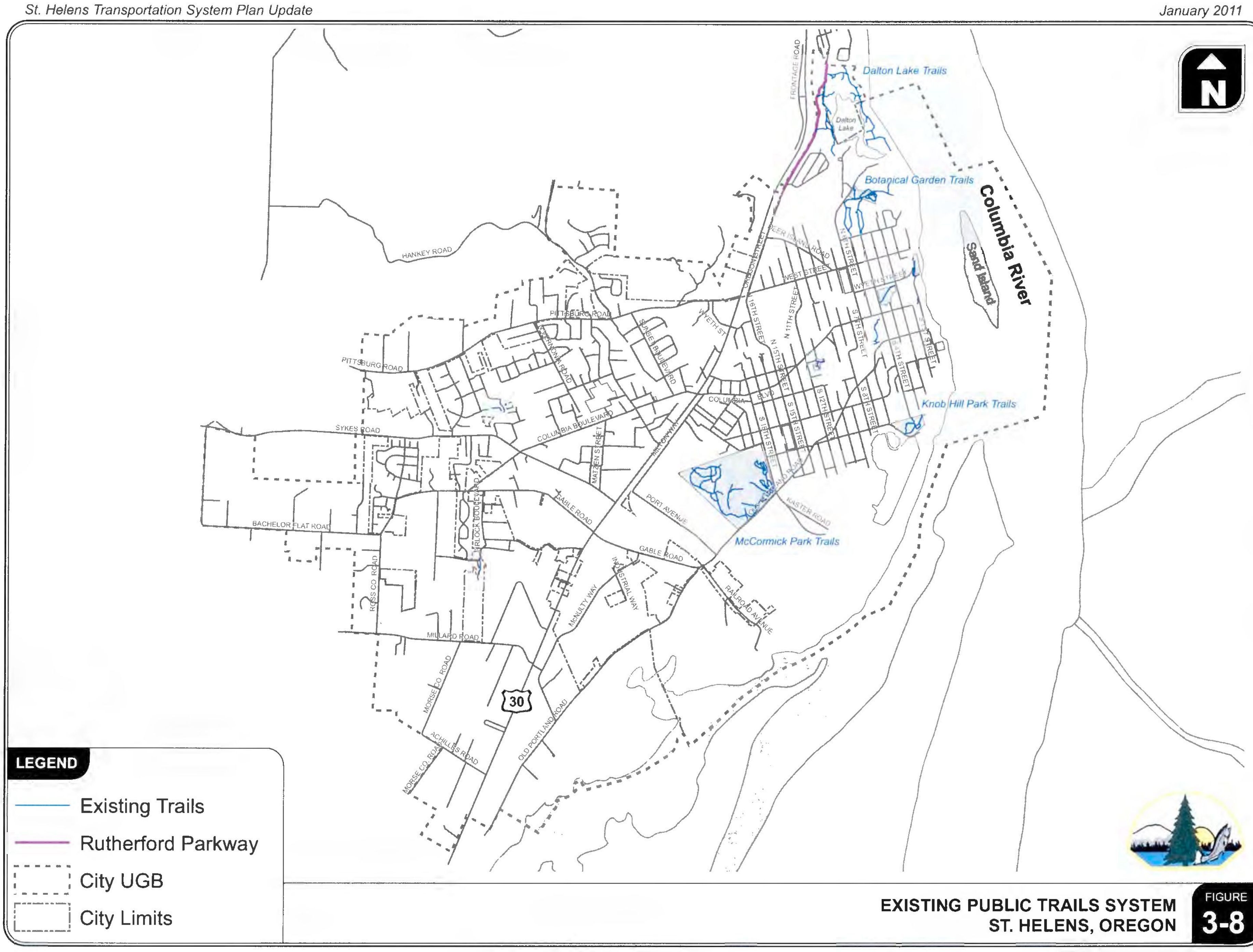
Safe Routes to School (SRTS) programs encourage school children to walk and bike to school safely. In Oregon, elementary-age children living within a mile of school and middle school-age children living within 1.5 miles of school typically are not eligible to receive bus service (pedestrian routes that require crossing railroad tracks, such as the Portland & Western Railroad through St. Helens, require bus service).

SRTS program efforts are typically administered by the local school district directed to these students and are built around 5'E's: Education, Encouragement, Enforcement, Engineering, and Evaluation. The goals of the Oregon SRTS program are to increase the ability and opportunity for children to walk and bicycle to school; promote walking and bicycling to school and encourage a healthy and active lifestyle at an early age; and facilitate the planning, development and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption and air pollution within two miles of the school (Reference 7).

The St. Helens School District does not currently have a formal SRTS Program. While development of a SRTS program is beyond the scope of the TSP Update, identification of deficiencies within the pedestrian and bicycle network near the four major public schools in St. Helens was considered. In addition, a web-based reporting mechanism was developed to solicit specific information from students and the general public regarding inadequacies along key travel routes between neighborhoods and schools. Though not a comprehensive inventory, the following deficiencies were derived from the information collected to date and could be used in part for a future SRTS program.

- There are virtually no sidewalks and no transit pullouts or shelters to serve several residential neighborhoods along Pittsburg Road.
- There are incomplete sidewalks along Gable Road from Columbia Boulevard to the High School.
- There are no sidewalks or bike lanes in the Firlock Park development that feeds the High School and serves as a transfer location for other schools in St. Helens.
- There are also no sidewalks or bike lanes in the Sherwood Estates area that feeds both the High School and McBride Elementary.

Additional information related to other transportation deficiencies is provided in Appendix "A". *Appendix "A" contains all of the safe routes to school information collected for the TSP Update.*



EXISTING PUBLIC TRAILS SYSTEM
ST. HELENS, OREGON

FIGURE **3-8**

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PUBLIC TRANSPORTATION SYSTEM

Public transportation within Columbia County include fixed-route, flex-route, and dial-a-ride services provided by the Columbia County Transit Division. In addition, limited specialized dial-a-ride services are offered by various providers for special-needs populations, such as senior citizens. Each of these services is described below.

Columbia County Rider

The Columbia County Transit Division is the largest transit service provider in Columbia County, operating under the name Columbia County Rider (CCR). The types of services offered by CCR consist of the following:

- *Fixed routes* that operate on a fixed schedule along a specified route and stopping only in designated locations;
- A *flex route* that operates on a fixed schedule and stops at certain designated locations on each trip, but is also allowed to make a limited number of deviations off-route each trip to pick up and drop off passengers at other locations; and
- *Dial-a-ride* service throughout the County that operates on an advance-reservation basis, picking up and dropping off passengers at locations of their choosing. Rides can be scheduled up to one week in advance, and depending on space availability, riders may be able to reserve on the day of their desired trip.

CCR provides fixed-route service through the county along US 30 and within the cities of St. Helens and Scappoose, as well as Dial-A-Ride service throughout the entire County.

Fixed-Route Service

CCR currently operates two fixed routes with the city of St. Helens:

- *St. Helens – Portland*; and
- *St. Helens – PCC Rock Creek and Willow Creek Transit Center*

The *St. Helens – Portland* route currently operates 10 times per weekday, with five morning and five afternoon departures. The first trip of the day leaves St. Helens Medical Mall at 5:50 a.m. and is scheduled to arrive in downtown Portland at 7:00 a.m., with intermediate stops in Warren and Scappoose. The last trip departs St. Helens Medical Mall at 5:00 p.m., arrives in downtown Portland at 6:00 p.m., and returns to St. Helens between approximately 7:00 and 7:10 p.m. Adult fares are currently $3.30 one-way for local trips between St. Helens and Scappoose and $4.80 one-way for trips between Columbia County and Portland. Reduced fares of $2.05 and $3.80, respectively are available for riders under 10 years old, students, riders 55 and over, and persons with disabilities. Monthly passes are available for $106.80 (adult) and $91.80 (reduced fare) and are valid on all Columbia County fixed-route services.

The *St. Helens – Portland Community College (PCC) Rock Creek* operates six times per weekday, with three morning and three afternoon departures. The routing is the same as the St. Helens – Portland route while in Columbia County; however, this route travels via Cornelius Pass Road to PCC Rock Creek, Tanasbourne Shopping Center, and TriMet's Willow Creek Transit Center in Washington County. The scheduled travel time for this route is approximately 80-90 minutes end-to-end. Departures are scheduled every two hours from St. Helens, between 6:30 a.m. and 4:30 p.m. Return trips from Willow Creek operate between 7:25 a.m. and 5:25 p.m., with departures from PCC occurring approximately 11 minutes later on each trip. Connections are available to several TriMet bus lines and the MAX Blue line, providing Columbia County residents the ability to reach other destinations in Washington County and beyond. Fares are the same as the downtown Portland route. *Appendix "B" contains the current Columbia County Rider route map and schedule for St. Helens to Portland.*

Flex-Route Service

Columbia County recently started Flex-Route service between St. Helens and Scappoose to help reduce the number of dial-a-ride trips between the two cities. The route operates with 90-minute headways. Its first run begins at 9:00 a.m. and the last run begins at 4:30 p.m., for a total of 9 hours of service. The Flex-Route operates differently than the fixed routes in that it will make a certain number of deviations from its standard route, upon request. Deviations are limited to a maximum of 10 minutes per trip. Flag-down stops are also allowed where safe within St. Helens (but not on US 30). The fare is $1.50 for all trips and riders.

Because the Flex-Route can deviate off-route to pick up passengers who are not able to travel to one of the standard stop locations, ADA "complementary paratransit" service is not required for this route.

Dial-A-Ride Service

Dial-A-Ride service is available to all Columbia County residents. The service can operate from 6:30 a.m. to 6:30 p.m. Monday through Friday; the contractor is required to provide 8 hours of service each weekday during this time period. Passengers may call ahead or submit an online request form to schedule a ride, from one day up to one week in advance. This service will then transport the individual from the requested pick-up location to the requested drop-off location. Fares for travelers vary by distance, ranging from $1.80 for trips within the same city, up to $25.00 for the longest trips currently programmed.

RAIL SERVICE

Passenger Rail

The City of St. Helens has no passenger rail service.

Freight Rail

Freight rail service is provided through and within the City of St. Helens by the Portland & Western Railroad. The "Portland-Astoria Line" connects the cities of Astoria, Clatskanie, Rainier, Columbia City, St. Helens, and Scappoose with Portland & Western's facilities and the Burlington Northern Santa Fe Railroad (BNSF) in Portland.

Two rail studies have been recently completed that considered freight rail needs in St. Helens; the *Lower Columbia River Rail Corridor Study/US 30 Intersection Study* and the *Lower Columbia River Rail Corridor/Rail Safety Study* (References 8 and 9). The *Lower Columbia River Rail Corridor/Rail Safety Study* reports between four and six trains per day currently travel through St. Helens.

Track Conditions

The Portland & Western Railroad, working with the ODOT Rail Division, recently completed an upgrade of its track between the junction with BNSF in Portland and Port Westward (north of St. Helens). All but five miles of the 54-mile connection to Port Westward have been upgraded with heavy rail to allow for safe and efficient movement of heavy-haul unit trains along the corridor. The maximum authorized speed for freight trains in St Helens is 25 miles per hour, reflecting over a designation as Class 2 track under Federal Rail Administration rating criteria.

Rail Yard

The Portland & Western Railroad operates a rail yard in St. Helens east of US 30 that is generally situated north of Gable Road and south of Columbia Boulevard. The rail yard supports local customers served by the railroad, offering a location to stage and switch rail equipment. Trespassing is prohibited, though the yard area is not currently fenced.

Improvement needs

The two rail studies examined existing and future rail needs and impacts to the US 30 corridor. Key existing conditions needs identified through the study included:

- Fencing the St. Helens rail yard, particularly along US 30;
- Alternative roadway travel routes parallel to US 30;
- Removal of abandoned tracks near the former Stimson Lumber mill site adjacent to Deer Island Road[3];
- Lack of pedestrian attention to the rail crossing at Gable Road – related to some school children walking to St. Helens High School and unaware of approaching trains; and

[3] Note: the abandoned railroad tracks will be removed in conjunction with a planned transit center at the former mill site.

- Lack of eastbound storage for vehicles leaving US 30 and queued awaiting passage of a train – this was noted as a particular concern for southbound left-turns from US 30 who can be stopped by passing trains and trapped in their turn maneuver.

AIR SERVICE

There are three airports within relatively close proximity to the City of St. Helens, including:

- The Portland International Airport, located approximately 35 miles south of St. Helens, is a public airport that provides worldwide passenger and freight service.
- Scappoose Industrial Airpark, located approximately 7 miles south of St. Helens, is a public airport owned and operated by the Port of St. Helens that provides general aviation services to the St. Helens area.
- The Southwest Washington Regional Airport, located approximately 18 miles north of St. Helens in Kelso, Washington, is a public airport that provides general aviation services to the southwest Washington and the St. Helens area.

PIPELINE SERVICE

A high pressure gas transmission line, owned and operated by Northwest Natural Gas, runs along the Rutherford Parkway at the northern end of the City, US 30, and along Old Portland Road.

SURFACE WATER TRANSPORTATION

The Columbia River provides an opportunity for surface water transportation for the City of St. Helens. The City currently has one public and five private marinas and boat docks. The Port of St. Helens is a deep draft port with rail and highway connections.

Study Intersection Operations Assessment

This section of the existing conditions assessment documents the current performance of 15 key study area intersections. Those study intersections are summarized below.

ODOT operated and maintained intersections:

- US 30/Deer Island Road
- US 30/Pittsburg Road
- US 30/Wyeth Street
- US 30/St. Helens Street
- US 30/S. Vernonia Road
- US 30/Gable Road
- US 30/Millard Road
- US 30/Columbia Boulevard

City of St. Helens operated and maintained intersections:

- Columbia Boulevard/N.-S. 6th Street
- Columbia Boulevard/10th Street
- Columbia Boulevard/N.-S.Vernonia Road
- Columbia Boulevard/Sykes Road
- Columbia Boulevard/Gable Road
- Deer Island Road/West Street
- West Street/N. 6th Street

ANALYSIS METHODOLOGY AND PERFORMANCE STANDARDS

All operational analyses described in this report were performed in accordance with the procedures stated in the 2000 *Highway Capacity Manual* (Reference 10).

Per the July 2010 methodology memo and the ODOT *Analysis Procedures Manual* (APM – Reference 11), all intersection operational evaluations were conducted based on the peak 15-minute flow rate observed during the weekday p.m. peak hour. Using the peak 15-minute flow rate ensures that this analysis is based on a reasonable worst-case scenario. For this reason, the analysis reflects conditions that are only likely to occur for 15 minutes out of each average peak hour. The transportation system will likely operate under conditions better than those described in this report during other typical time periods.

The operational analysis results were compared with mobility standards used by the local agencies to assess performance and potential areas for improvement.

City Intersections

Traffic operations at City intersections are generally described using a measure known as "level of service" (LOS). Level of service represents ranges in the average amount of delay that motorists experience when passing through the intersection. LOS is measured on an "A" (best) to "F" (worst) scale.

- At signalized and all-way stop-controlled intersections, LOS is based on the average delay experienced by all vehicles entering the intersection.
- At two-way stop-controlled intersections, LOS is based on the average delay experienced by the critical movement at the intersection, typically a left-turn from a stop-controlled street.

The City of St. Helens has not adopted level-of-service (LOS) or volume-to-capacity (V/C) ratio standards for signalized or unsignalized intersections. Therefore, the following minimum operating standards were applied to City intersections:

- LOS "D" is considered acceptable at signalized and all-way stop controlled intersections if the V/C ratio is not higher than 1.0 for the sum of critical movements.
- LOS "E" is considered acceptable for the poorest operating approach at two-way stop intersections. LOS "F" is allowed in situations where a traffic signal is not warranted.

A summary of the recommended performance standards at each of the study intersections under City jurisdiction is included in Table 3-4.

Table 3-4 Recommended Performance Standards for City Intersections

Intersection	Traffic Control[1]	Posted Speed Limit (mph)	Performance Standard
Columbia Boulevard/ N.-S. 6th Street	TWSC	25	LOS "E"
Columbia Boulevard/ N.-S. 12th Street	TWSC	25	LOS "E"
Columbia Boulevard/ N.-S. Vernonia Road	AWSC	25	LOS "D"
Columbia Boulevard/ Sykes Road	AWSC	25	LOS "D"
Columbia Boulevard/ Gable Road	TWSC	25	LOS "E"
Deer Island Road/ West Street	TWSC	25	LOS "E"
West Street/ N. 6th Street	AWSC	25	LOS "D"

[1]TWSC: Two-way stop-controlled (unsignalized); AWSC = All-way stop-controlled

ODOT Intersections

ODOT uses volume-to-capacity ratio standards to assess intersections operations. Table 6 of the *Oregon Highway Plan* (OHP) provides maximum volume-to-capacity ratios for all signalized and unsignalized intersections outside the Portland Metro area. The ODOT controlled intersections within the study area are located along US 30, which is a designated freight route on a Statewide Highway, and inside the urban growth boundary of a non-metropolitan planning organization

(MPO). The minimum required performance standards are shown in Table 3-5 and reflect the posted speed limit and traffic control at the intersection.

In reviewing Table 3-5, it should be noted that two-way stop-controlled (TWSC) intersections operated and maintained by ODOT are evaluated using two performance standards; one for the highway approaches and one for the minor street approaches. The major street volume-to-capacity (V/C) ratios shown in Table 3-5 reflect the mobility standards for US 30. The stop controlled approaches at Pittsburg Road and Wyeth Street are allowed to operate with a V/C of 0.75 and the stop controlled approach at South Vernonia Road is allowed to operate with a V/C of .90.

Table 3-5 Summary of ODOT Intersection Performance Standards

Intersection	Traffic Control[1]	Posted Speed Limit (mph)	OHP Mobility Standard	ODOT HDM Mobility Standard[2]
US 30/ Deer Island Road	Signal	50	V/C ≤ 0.70	V/C ≤ 0.70
US 30/ Pittsburg Road	TWSC	40	V/C ≤ 0.75	V/C ≤ 0.70
US 30/ Wyeth Street	TWSC	40	V/C ≤ 0.75	V/C ≤ 0.70
US 30/ St. Helens Street	Signal	35	V/C ≤ 0.80	V/C ≤ 0.70
US 30/ Columbia Boulevard	Signal	35	V/C ≤ 0.80	V/C ≤ 0.70
US 30/ South Vernonia Road	TWSC	35	V/C ≤ 0.80	V/C ≤ 0.70
US 30/ Gable Road	Signal	35	V/C ≤ 0.80	V/C ≤ 0.70
US 30/ Millard Road	TWSC	45	V/C ≤ 0.80	V/C ≤ 0.70

[1]TWSC: Two-way stop-controlled (unsignalized)
[2]ODOT Highway Design Manual

Figure 3-9 illustrates the existing lane configurations and traffic control devices at each of the study intersections.

EXISTING LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES
ST. HELENS, OREGON

FIGURE 3-9

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TRAFFIC VOLUMES

Manual turning-movement counts were obtained at most of the study intersections in May 2010[4]. All of the traffic counts were conducted on a typical mid-week day during the evening (4:00 to 6:00 p.m.) peak time period and include vehicle turning movements, pedestrian movements, bicycle movements, and heavy vehicle percentages. Figures 3-10, 3-11, and 3-12 summarize the pedestrian volumes, bicycle volumes, and heavy vehicle volumes at each of the study intersections. The peak hour of intersections along the US 30 corridor was found to occur between 4:20 and 5:20 p.m., while the individual peak hours of the remaining study intersections were found to occur at different times throughout the p.m. peak period. *Appendix "C" contains the traffic count worksheets used in this study.*

[4] Traffic counts and analysis prepared for the *Lower Columbia River Rail Corridor Study* were used to represent the existing conditions analysis at the intersections of: US 30/Millard Road, US 30/Gable Road, US 30/Columbia Boulevard, US 30/St. Helens Street, and US 30/Deer Island Road. The 2008 data was judged to remain reflective of current peak seasonal conditions to the economic downturn that has occurred since 2008.

PEDESTRIAN VOLUMES - WEEKDAY PM PEAK HOUR
ST. HELENS, OREGON

FIGURE 3-10

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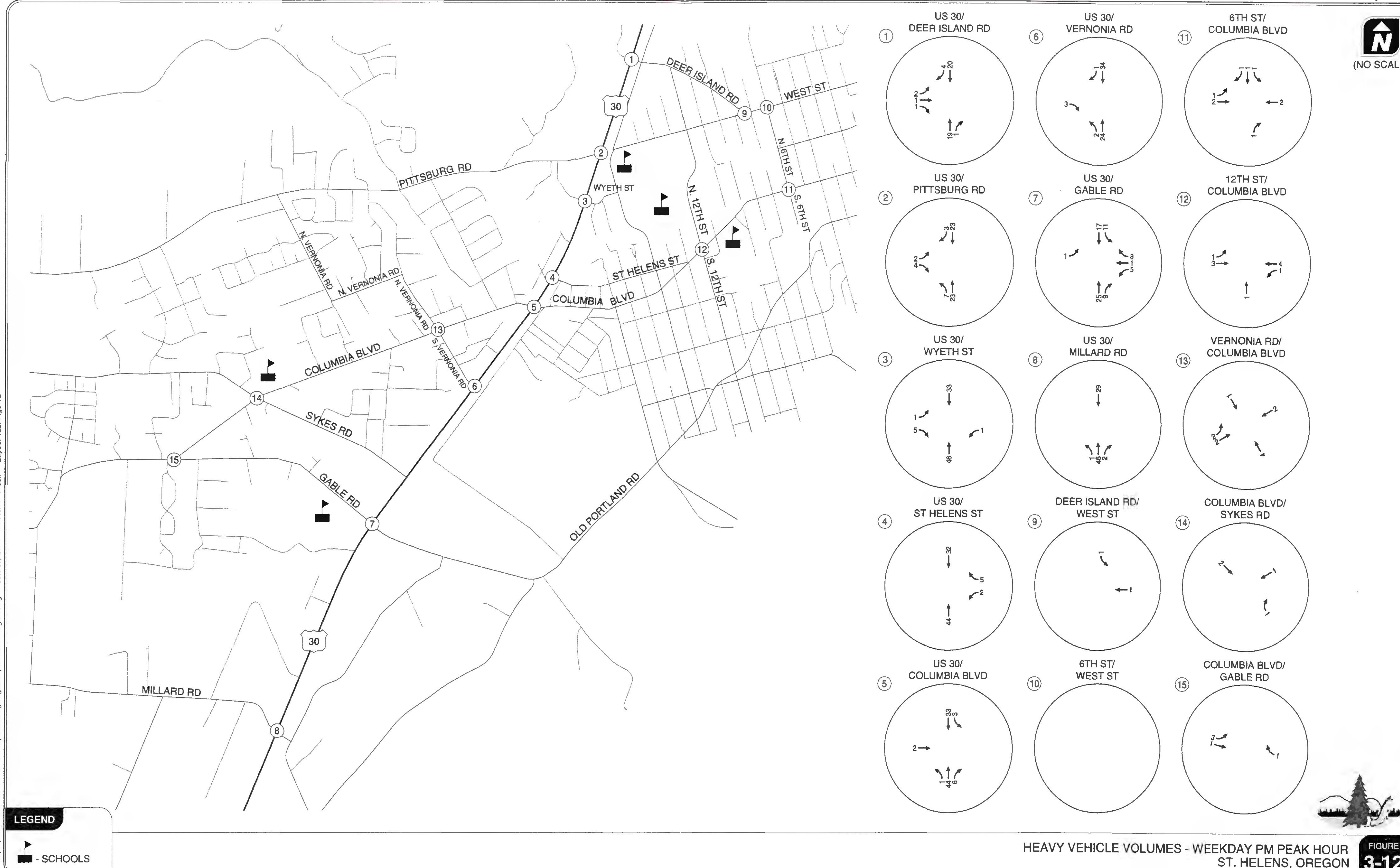
BICYCLE VOLUMES - WEEKDAY PM PEAK HOUR
ST. HELENS, OREGON

FIGURE 3-11



HEAVY VEHICLE VOLUMES - WEEKDAY PM PEAK HOUR
ST. HELENS, OREGON

FIGURE 3-12

Seasonal Adjustment Factor

Traffic volumes along US 30 tend to fluctuate by time of year due to seasonal factors such as tourist travel to coastal destinations, farming harvest activities, school traffic, etc. Typically, transportation facilities are not designed for the highest volume of traffic experience in an hour, but instead, are designed for the 30th highest hourly demand. If demand on a given transportation facility were measured every hour in the year, and the demands were ranked from highest to lowest, the 30th highest hourly demand represents the condition for which the system is typically designed (i.e. it is considered the "design hour"). The concept of the 30th highest hourly demand for providing transportation or parking capacity recognizes that it is not economically sound to have a roadway congestion-free throughout every hour of the year. By designing the system to satisfy the 30th highest hourly demand, typical weekday peaks will operate acceptably.

The 30th highest hour volumes (30 HV) for US 30 were derived from the manual turning movements counts collected in May 2010 in accordance with the methodology described in the APM for locations *without* an Automatic Traffic Recorder (ATR) near the project site. The Seasonal Trend Method uses average values from the ODOT ATR Characteristic Table for each seasonal traffic trend. For St. Helens, an average of the Commuter and Summer seasonal traffic trend values were used to derive 30 HV volumes. Table 3-6 summarizes the average values for the Commuter and Summer seasonal traffic trends during the count month (May) and the peak period as provided in the ODOT Seasonal Trend Table.

Table 3-6 Seasonal Trend Table

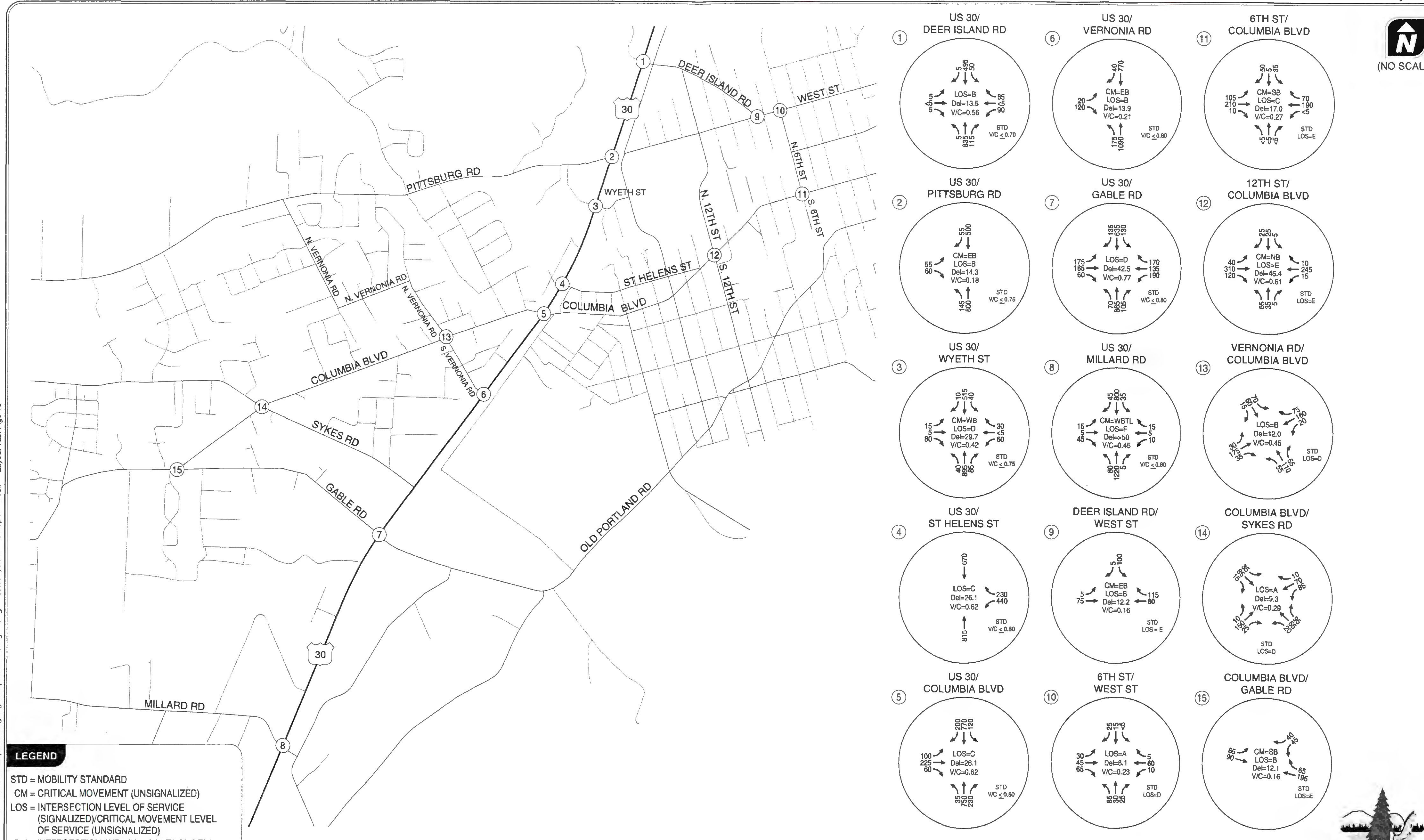
Trend	1-May	15-May	May Average	ODOT Peak Period Seasonal Factor
Commuter	0.92	0.92	0.92	0.90
Summer	0.98	0.94	0.96	0.83
		Average Seasonal Trend	***0.94***	***0.87***

Based on the data in Table 3-6, the 30 HV volumes were determined as follows:

- Seasonal adjustment: 0.94 / 0.87 = 1.08

Per ODOT requirements, traffic volumes from the May 2010 counts were increased by a factor of 1.08 to develop the 30 HV volumes used in the existing conditions analysis. Figure 3-13 provides a summary of the seasonally adjusted year 2010 turning-movement counts, which are rounded to the nearest five vehicles per hour for the weekday p.m. peak hour.

Figure 3-13 also reflects the existing operations at the intersections. As shown all study intersections currently meet the applicable mobility and level-of-service standards during the weekday p.m. peak hour. *Appendix "D" includes the level-of-service analysis worksheets.*



LEGEND

STD = MOBILITY STANDARD
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

EXISTING TRAFFIC OPERATIONS - WEEKDAY PM PEAK HOUR
ST. HELENS, OREGON

FIGURE 3-13

Turn Lane Needs

All of the study intersections along US 30 currently have separate left- and right-turn lanes provided where northbound and southbound turn movements are allowed.

Queuing Analysis

Unsignalized and signalized intersection queuing analyses were prepared for the study intersections along US 30 to identify existing storage deficiencies. In reviewing the queuing information, it should be noted that the results presented reflect conditions when none of the highway-railroad grade crossings along the corridor are closed to accommodate a passing or stopped train. Queues will be longer than those presented in the event that a train is passing through town or switching the St. Helens rail yard and causing temporary crossing closures.

Queuing at Unsignalized Intersections

Unsignalized intersection queues were analyzed according to guidelines set forth in ODOT's APM. Left-turn movements from state facilities and minor streets were analyzed using the Two-Minute Rule[5] methodology for 95th percentile queues. Each vehicle was assumed to occupy 25 feet, given the low proportion of heavy vehicles making these movements.

Table 3-7 summarizes the queuing analysis for the major and minor street left-turn movements at the unsignalized study intersections. US 30 currently has a continuous two-way left-turn lane with dedicated left-turn lanes striped at each of the study intersections. Given this arrangement, Table 3-7 reports the storage lengths for travel lanes on US 30 as the length of the striped turn lanes; additional storage is available in the two-way left-turn lane. The minor street storage length shown in Table 3-7 reflects the length of the striped turn lanes, or the distance between US 30 and the first adjacent driveway or roadway on the minor street.

[5] The Two-Minute Rule is a planning level methodology that estimates queue lengths for major street left turns and minor street movements by estimating the queue that would result from a two-minute stoppage of the turning demand volume. This method does not consider the magnitudes and impacts of the conflicting flows on the size of the queue.

Table 3-7 Summary of Queues at Unsignalized Intersections

Location	Approach/ Movement	95th Percentile Queue	Striped Storage Available	Adequate Storage?
US 30/ Pittsburg Road	NB L	225	100	Yes[1]
	EB LR	100	245	Yes
US 30/ Wyeth Street	NB L	75	90	Yes
	SB L	75	90	Yes
	EB LTR	150	125	**Yes[2]**
	WB LTR	150	160	Yes
US 30/ South Vernonia Road	NB L	300	90	Yes[1]
	EB L	50	200	Yes
US 30/ Millard Road	NB L	125	110	Yes[1]
	SB L	75	130	Yes
	EB TL	50	700	Yes
	WB TL	25	210	Yes

*The following abbreviations are used in this table:
NB: Northbound; SB: Southbound; L: Left; LTR: Shared left/through/right lane; LT: Shared left/through lane

[1] Additional storage is available in the two-way left-turn lane on US 30.
[2] Additional storage is available in the travel lane although the queue is estimated to extend beyond an adjacent driveway or public street.

As shown in Table 3-7, there is currently adequate storage to accommodate the 95th percentile queues at each of the study intersections. In areas where the 95th percentile queue is estimated to extend beyond the striped storage, additional storage is available in either the two-way left-turn lane on US 30 or the existing travel lane on the side street.

It should be noted that, while 95th percentile queues are accommodated, current ODOT design standards require a minimum 100 foot storage length for left-turn lanes and 50 feet of storage for right turn lanes on US 30. Some intersection turn lanes do not fully meet the current design standards when factoring in required deceleration length. Locations not meeting current design standards may need to be extended or restriped in the future. Among the study intersections, these locations include Deer Island Road, Pittsburg Road, and Wyeth Street.

Queuing at Signalized Intersections

The queuing analysis for the signalized study intersections is summarized in Table 3-8. All queue lengths have been rounded up to the nearest 25 feet. The available storage has been identified as the striped turn lane on US 30 and along the minor streets as either the length of the striped turn lanes, or as the distance between US 30 and the first adjacent driveway or roadway on the minor street. *Queuing analysis worksheets can be found in Appendix "E".*

Table 3-8 Summary of Queues at Signalized Intersections

Location	Approach/ Movement	95th-Percentile Queue	Striped Storage Available	Adequate Storage?
US 30/ Deer Island Road	NB L	25	110	Yes
	NB R	50	300	Yes
	SB L	75	110	Yes
	SB R	75	100	Yes
	WB LTR	150	115	**Yes[2]**
	EB LTR	25	N/A	N/A
US 30/ St. Helens Street	WB R	100	90	**Yes[2]**
	WB L	175	180	Yes
US 30/ Columbia Boulevard	NB L	50	110	Yes
	NB R	50	370	Yes
	SB L	125	110	Yes[1]
	SB R	50	155	Yes
	EB TL	400	180	**Yes[2]**
	EB R	50	100	Yes
US 30/ Gable Road	NBL	100	130	Yes
	NB R	50	310	Yes
	SB L	150	130	Yes[1]
	SB R	50	140	Yes
	WB L	225	190	**No**
	WB TR	375	380	Yes
	EB L	200	130	**No**
	EB TR	275	350	Yes

*The following abbreviations are used in this table:
NB: Northbound; SB: Southbound; L: Left; R: Right; LTR: Shared left/through/right lane; LT: Shared left/through lane

[1] Additional storage is available in the two-way left-turn lane on US 30.
[2] Additional storage is available in the travel lane although the queue is estimated to extend beyond an adjacent driveway or public street.

As shown in Table 3-8, there is currently adequate storage to accommodate the 95th percentile queues at each of the signalized intersections with the exception of the US 30/Gable Road intersection where the 95th percentile queues are estimated to extend beyond the available storage and into the adjacent travel lanes in the east and westbound directions. ODOT has identified potential safety mitigation measures at this intersection that include the addition of dual left-turn lanes from US 30 onto Gable Road (discussed later in this report). Installation of the turn lanes could reduce queuing but is unfunded at this time.

Safety Analysis

This section provides analysis of roadway safety information in St. Helens. Two sources of crash data were considered: the ODOT Safety Priority Index System and review of crash data provided by ODOT. The ODOT crash data includes all reported crashes that occurred at the study intersections for the three-year period from January 1, 2006 to December 31, 2008.

Statewide Priority Index System

The Statewide Priority Index System (SPIS) is a method developed by ODOT for identifying hazardous locations on state highways through consideration of crash frequency, crash rate, and crash severity. As described in ODOT's SPIS description, a roadway segment is designated as a SPIS site if a location experiences three or more crashes or one or more fatal crashes over a three-year period. Under this method, all state highways are analyzed in 0.10 mile segments to identify SPIS sites. Statewide, there are approximately 6,000 SPIS sites. SPIS sites are typically intersections, but can also be roadway segments.

Within St. Helens, two intersections have been identified to be in the top ten percent of ODOT's SPIS ranking program for 2008[6], including:

- US 30/Sykes Road.
- US 30/Gable Road

A description of the crash experience and potential mitigation measures identified by the SPIS program is presented below. *Appendix "F" contains the Columbia County 5-15% SPIS Locations 2008, PDF.*

US 30/Sykes Road

Sykes Road is a signalized T-intersection at a location where US 30 has a posted speed limit of 35 mph and a number of nearby accesses. A total of 11 crashes were reported at the intersection during the four-year period, of which 64 percent resulted in an injury and 36 percent resulted in property damage only. Of the 11 crashes, 64 percent were rear-end crashes 27, percent were turning crashes and 9 percent were sideswipe crashes. The SPIS program identifies a potential safety improvement involving installation of a traffic separator, median islands, and access management that would cost on the order of $1,250,000.

US 30/Gable Road

Gable Road intersects US 30 as a four-way intersection at a location where the posted speed limit is 35 mph on the highway. It is the first signalized intersection drivers reach traveling north on US 30 as they enter the City of St. Helens. Separate northbound and southbound right turn lanes

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[6] It is important to note that the SPIS data reported for 2008 is based on 2005-2007 crash data whereas all other crash data analysis presented reflects the reporting period from January 2006 to December 2008.

are provided at the intersection. A total of 24 crashes were reported at the intersection during the four-year period, of which 40 percent resulted in an injury and 60 percent resulted in property damage only. Of the 24 crashes 50 percent were rear-end crashes, 25 percent were turning crashes. The SPIS program identified a potential safety improvement through provision of a dual left-turn lane from US 30 onto Gable Road in conjunction with installation of raised median and lane realignment treatments. The estimated cost of the improvements is $5,400,000.

Crash Data Analysis

ODOT provided detailed crash data covering all crashes that occurred in the City of St. Helens for the three-year period from January 1, 2006 to December 31, 2008. These data were analyzed to determine crash rates for the study intersections and roadway segments.

Segment Crash Data Analysis

Segment crash data was obtained and reviewed for US 30 between Bennett and Deer Island Road. The crash data was divided into three segments, including south of Gable Road, Gable Road to St. Helens Street, and north of St. Helens Street due to the different traffic and land use characteristics on these segments. For each segment, the three-year crash rate, expressed in crashes per million vehicle miles traveled (crashes per MVMT) was identified and compared to statewide average crash rates for highway of the similar classifications. The segment crash rate analysis is summarized in Table 3-9.

Table 3-9 Segment Crash History (January 1, 2003-December 31, 2007)

Highway	Segment (Milepoints)	Total Crashes	Crash Rate[1]	ODOT Classification	Statewide Average[2]
US 30 (South of Gable Road)	25.81 to 27.66	17	0.50	Principal Arterial	1.18
US 30 (Gable to St. Helens Street)	27.67 to 28.67	55	3.23	Principal Arterial	1.18
US 30 (North of St. Helens Street)	28.68 to 29.41	7	1.05	Principal Arterial	1.18

[1] Crash Rate = Average crashes per Million Vehicle Miles Traveled
[2] For Rural Cities, Other Principal Arterials, 2008 Rate

As Table 3-9 shows, the segment crash rates for the section of Gable Road to St. Helens Street exceeds the statewide average for similar facilities. Close inspection of the crash data revealed that a majority of the crashes occurred at intersections, which is to be expected given the frequent and relatively closely spaced access points and street intersections along US 30.

Intersection Crash Data Analysis

Intersection crash data was obtained and reviewed for each of the study intersections. The critical rate method was used in the analysis (refer to Appendix G for details of the critical rate calculations). Under this methodology, a critical crash rate is developed for each intersection based on comparison with similar intersections. The intersections were divided into three groups: signalized intersections, four-way stop-controlled intersections, and two-way stop-controlled intersections. If the crash rate at a specific intersection was found to be higher than the critical crash rate for the intersection type, further safety analysis was conducted (Reference 12).

Crash rates for intersections were calculated in crashes per million entering vehicles (MEV). The crash data are summarized in Table 3-10, including types and severity of crashes as well as the observed crash rate and critical crash rate for each intersection. As shown in Table 3-10, the US 30/Gable Road crash rate exceeded the critical rate.

No fatalities were reported at the study intersections during the study period. The highest incidence of crashes occurred at the US 30/Gable Road intersection, with nineteen total reported crashes in the three-year period. Crash records for this intersection were reviewed in greater detail, as discussed below.

Table 3-10 Intersection Crash History (January 1, 2006-December 31, 2008)

Intersection	Collision Type				Severity			Total	OR[2]	CR[3]
	Rear-End	Turning	Angle	Other	PDO[1]	Injury	Fatal			
Signalized Intersections										
US 30/ Deer Island Road	2	-	-	-	2	-	-	2	0.11	0.44
US 30/ St. Helens Street	-	3	-	-	3	-	-	3	0.13	0.42
US 30/ Columbia Boulevard	2	-	1	1	1	3	-	4	0.15	0.41
US 30/ Gable Road	6	8	4	1	12	7	-	19	**0.61**	**0.40**
Four-Way Stop-Controlled Intersections										
N. 6th Street/ West Street	-	1	-	-	1	-	-	1	0.25	0.69
N.-S. Vernonia Road/ Columbia Boulevard	-	-	1	-	1	-	-	1	0.12	0.56
Columbia Boulevard/ Sykes Road	-	1	2	-	1	2	-	3	0.44	0.59
Two-Way Stop-Controlled Intersections										
US 30/ Pittsburg Road	-	1	-	-	1	-	-	1	0.06	0.25
US 30/ Wyeth Road	-	3	1	-	3	1	-	4	0.22	0.24
US 30/ S. Vernonia Road	1	2	-	-	-	3	-	3	0.13	0.22
US 30/ Millard Road	-	-	-	-	-	-	-	0	0.00	0.22
Deer Island Road/ West Street	-	-	-	-	-	-	-	0	0.00	0.39
N.-S. 6th Street/ Columbia Boulevard	-	-	-	1	1	-	-	1	0.15	0.32
N.-S. 12th Street/ Columbia Boulevard	1	-	-	-	1	-	-	1	0.11	0.29
Columbia Boulevard/ Gable Road	-	1	-	-	1	-	-	1	0.19	0.35

[1] PDO – Property Damage Only
[2] OR - Observed Rate (Crashes per million entering vehicles)
[3] CR - Critical Rate

US 30/Gable Road

The annual crash records for the US 30/Gable Road intersection are summarized in Table 3-11. As shown, rear-end crashes accounted for approximately 30 percent of crashes at this intersection (6 of 19 over the three-year period). Other noteworthy items include:

- Four of the rear-end crashes occurred at the southwest approach, two occurred at the southeast approach, and one occurred at the northwest approach to the intersection.
- Turning movement crashes accounted for approximately 40 percent of crashes at the intersection (8 or 19 over the three-year period). Further review shows that these crashes were predominantly due to drivers turning in front of on-coming traffic and failing to yield right-of-way to other vehicles.
- Angle crashes accounted for approximately 20 percent of at the intersection (4 of 19 over the three-year period). Further review shows that these crashes were predominantly due to drivers disregarding the traffic signal.

Table 3-11 US 30/Gable Road Annual Reported Crashes

Year	Collision Type				Severity		Total
	Rear-End	Turning	Angle	Other	PDO[1]	Injury	
2006	5	3	0	0	3	5	8
2007	1	1	4	0	4	2	6
2008	0	4	0	1	5	0	5

[1] Property Damage Only

As shown in Table 3-11, the frequency of crashes declined over the three-year reporting period. Given that no improvements have been made to the intersection during this period, the apparent reduction change in annual crash frequency likely reflects random fluctuations in the crash occurrences. Based on an analysis of the detailed crash patterns, the improvements identified in the SPIS list for the intersection should improve intersection safety *Appendix "H" contains the crash data obtained from ODOT.*

Transportation Funding

The following section identifies key funding sources that have contributed to transportation projects within the City of St. Helens over the past five years.

Transportation System Development Charges

A transportation system development charge (SDC) is a one-time fee imposed on new development (and some types of re-development) at the time of development. The fee is intended to recover a fair share of the costs of existing and planned facilities that provide capacity to serve new growth. The City's existing transportation SDCs are based on projected trip generation by land use. More specifically, new development is charged by adjusted daily trip ends (daily trip-ends adjusted for diverted linked trips) at a rate of $402 per trip. Existing residential transportation SDCs are provided below: (Commercial charges vary by land use type).

Table 3-12 Existing Transportation SDC

ITE Code	Customer Type	Average Daily Trips	Pass-By Trip Factor	Total SDC
210	Single Family	9.57	1	$3,847
220	Apartment	6.72	1	$2,701

St. Helens has collected nearly one million dollars in SDC revenue over the last five years. Revenue generated from SDCs is required to be spent on qualified projects identified in the City's Capital Improvement Plan, which relies heavily on the implementation plan outlined in the City's Transportation System Plan. While the total costs associated with some projects qualify for SDC revenue, others are only partially covered by the program. The remainder of those project costs are financed with other revenue sources.

Statewide Transportation Improvement Program

The Oregon *Statewide Transportation Improvement Program* (STIP - Reference 13) is the state's four-year transportation improvement program for state and regional transportation systems, including federal land and Indian reservation road systems, interstate, state, and regional highways, bridges, and public transportation. It covers all state and federally-funded system improvements for which funding is approved and that are expected to be undertaken during a four-year period.

The current STIP includes projects funded during the 2008-2011 period throughout the state of Oregon. While there are many projects identified in Columbia County, there are no projects identified within the City of St. Helens. The draft 2010-2013 STIP includes one project in St. Helens. The project would provide improvements to Columbia Boulevard between US 30 and N.-S. 1st Street including grinding and resurfacing the roadway, removal and reconstruction of sidewalks, and installation of new curb and gutter. The STIP identifies a $204,000 construction cost and commencement in 2010.

Other Revenue Sources

Table 3-13 displays the total revenue by source used to fund transportation projects within the City of St. Helens over the past five years.

Table 3-13 Revenue Source History

Revenue Source	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Motor Vehicle Tax	$559,998	$555,714	$525,203	$470,914	$510,410
State Grants	$47,436	$0	0	$537,670	$105,882
System Development Charges	$459,724	$163,328	$229,924	$55,527	$87,962
Other[1]	$14,374	$53,986	$11,232	$4,052	$14,207
Total Revenue	***$667,532***	***$773,028***	***$766,359***	***$1,068,163***	***$718,461***

[1] Other revenue sources generally include miscellaneous revenue, donations, and interest.

As shown in Table 3-13, the largest revenue sources for the city have been the motor vehicle tax and SDCs. The SDC assessment will likely increase again following the economic recovery and will continue to be a viable source for city revenue.

Expenditure History

Table 3-14 displays the total expenditures on transportation related projects within St. Helens over the last five years.

Table 3-14 Expenditure History

Expenditures	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Road Paving	$243,976	0	$592,273	$491,543	$5,725
Sidewalk Projects	0	0	0	0	$163,652
Bicycle Path Construction	0	0	$16,333	$155,379	$193,665
Administrative[1]	$484,427	$474,223	$1,026,556	$544,194	$687,138
Total Expenditures	$728,403	$474,223	$1,635,162	$1,191,116	$1,050,180

[1] Administrative expenditures include general labor costs, equipment costs, general maintenance and overhead.

FINDINGS

The following summarizes the findings of the existing conditions analysis, including issues and deficiencies that will be addressed in the transportation options analysis:

Street System

- The functional classification plan should re-evaluated based on current and anticipated future development patterns, particularly for the roadways west of US 30.
- Existing truck routes west of US 30 should be also be re-evaluated based the location of existing residential areas and schools.

- Standard roadway cross sections should be developed consistent with the city's Community Development Code.
- Access spacing standards along US 30 should be re-evaluated based on input from ODOT and City staff.
- Each of the "Other Street System Deficiencies" identified in this memorandum should be addressed.

Pedestrian and Bicycle Systems

- Significant gaps in the pedestrian and bicycle systems were identified throughout the city along with several unsafe, or deficient, crossing locations.
    - Priority areas have been identified by City staff, the St. Helens Pedestrian and Bicycle Committee and the general public through the interactive Safe Routes to School map.

Rail, Air, Pipeline, and Water Systems

- Several improvements to the rail system were identified in the LCRRC study, including:
    - Fencing the St. Helens rail yard, removal of abandoned tracks on Deer Island Road, and pedestrian safety at the Gable Road rail crossing.

Intersection Operations Analysis

- All study intersections currently meet the applicable mobility and level-of-service standards during the weekday p.m. peak hour.
- All study intersections along US 30 currently have separate left- and right-turn lanes provided where northbound and southbound turn movements are allowed.
- There is currently adequate storage to accommodate the 95th percentile queues at each of the study intersections with the exception of the US 30/Gable Road intersection.

Safety Analysis

- Two intersections along US 30 were identified as being in the top ten percent of ODOT's SPIS ranking program for 2008, including those at Gable Road and Sykes Roads.
    - Potential mitigation measures have been identified by ODOT at each location but are currently unfunded.
- The segment crash rates for the section of Gable Road to St. Helens Street exceeds the statewide average for similar facilities, primarily due to crashes at Sykes Road and Gable Road.
- No additional mitigation measures were identified at the study intersections.

Transportation Funding

- The City's primary funding sources for transportation improvements include motor vehicle taxes and System Development Charges.

REFERENCES

1. City of St. Helens. *Transportation System Plan*. 1997.
2. The Oregon Department of Transportation. *Oregon Highway Plan*. 1999.
3. Department of Land Conservation and Development (DLCD). *Neighborhood Street Design Guidelines*.
4. Federal Highway Administration. *Manual on Uniform Traffic Control Devices*. 2003.
5. The Oregon Department of Transportation. *Oregon Bicycle and Pedestrian Plan*. 1995.
6. City of St. Helens. *St. Helens Bikeway Master Plan*. 1988.
7. http://www.oregon.gov/ODOT/TS/saferoutes.shtml#Safe_Routes_to_School_Matters
8. Kittelson & Associates, *Lower Columbia River Rail Corridor Study/US 30 Intersection Study*. 2008.
9. HDR Engineering. Inc. *Lower Columbia River Rail Corridor/Rail Safety Study*. 2009.
10. Transportation Research Board. *Highway Capacity Manual*. 2000.
11. The Oregon Department of Transportation. *Analysis Procedures Manual*. 2006.
12. PIARC Technical Committee on Road Safety. *Road Safety Manual*. 2003, World Road Association.
13. The Oregon Department of Transportation. *Statewide Transportation Improvement Program*. 2008.

APPENDIX

A. Safe Routes to School Public Comments (July, 2010)
B. Columbia County Rider Route Map
C. Traffic Count Data
D. Existing Conditions Traffic Operations Worksheets
E. Queuing Analysis Worksheets
F. ODOT SPIS List for Columbia County, 2008.
G. Critical Crash Rate Tables
H. Crash Data

Appendix A

Safe Routes to School
Public Comments

St. Helens Transportation System Plan

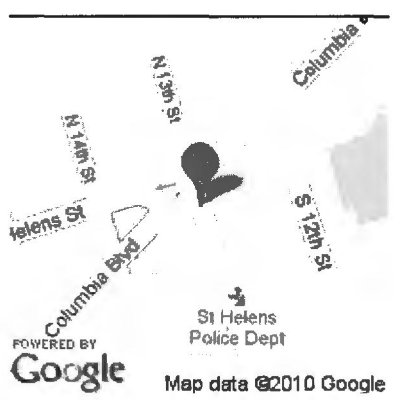
Safe Routes to School

Comments submitted as of 8:00 p.m. on September 1, 2010

There are lots of residential neighborhoods off of Pittsburg road. Virtually non-existent side walks, and no Transit pullouts and shelters.

Gable Road from Summit View Dr. to Highway 30 must have continuous connectivity via both sidewalk and bike path. Bachelor Flat from Sykes to Gable is next. The intersection of Ross and Bachelor Flat needs to be re-constructed and made into a full 3-way stop.

I have recently completed a two phase grant request with Chad for sidewalks along Juniper, Ponderosa and Douglas to the McBride school. The second part of this grant is for sidewalk and bike paths along N. Vernonia Rd from Frantz Street east to a point opposite Mayfair Drive. Then southerly through Cambell park to McMichael and then to Vernonia rd at Sherlock grocery.



The recent addition of what appears to be a "mock" Volcano/Fountain at the convergence of St. Helens Street, Columbia Blvd. and 13th Street has created vision obstruction to traffic of all types from all angles. Not only was it a poor choice to locate a vision obstruction at what will always be a busy multi-use intersection but a hideous artwork as well. In this case good money should be thrown after bad and the project torn down and used for fill wherever fill is needed within the city.

If money was actually available to enhance the intersection there was a number of ways that lighting and signage could have better improved what was long known as a kamikaze corner. Shame on the city brain trust for wasting such badly needed funding on a large scale science project such as the volcano. If it was not bad enough by itself it was then punctuated by a poorly placed switch box that looks like a RV rental space pedestal...Less is more in a situation like this and the only cure is to remove it before it causes a fatality.

Do not even begin to think that there should be a change in traffic flow that would alleviate the circus turn at this intersection. Doing a protracted u-turn here is a historic act by drivers here since before motorized vehicles were introduced in St. Helens. Knowing how to circle/brake and go here is a right of passage for all young drivers in the community. Leave it be.

The traffic patterns in this strip mall became a nightmare built out one business at a time. There is very little that is good about it when all locations are rented and busy. It needs a study all it's own with an outcome that takes both traffic flow and parking spot location size and type all into consideration. Since there is an ability to add two additional businesses to the West of the current jumble. The stage can be set to require smart solutions for those that are far ahead of the build out and planning process.

To the High School- There are no sidewalks along Gable Road from Columbia Blvd to the school -on both sides of the street. There are no sidewalks or bike lanes in the entire Firlock developement that feeds the High School and is a transfer for other Schools in the district. The Sherwood estates area-off N.Vernonia Rd has no sidewalks nor bike paths. This area feeds into McBride School and the High School.

The area of reference is on Gable Rd between Safeway and Avamere at St Helens. This particular area is hazardous for two diverse vulnerable populations. #1 Our senior residents who often will walk independently/walk with a walker/use their power scooter. #2 High School students. This particular area has a very narrow shoulder with an abundance of loose gravel which makes navigating along this stretch dangerous. We would love to set up a meeting and discuss how this area can be improved. We feel this is a high priority given the pedestrian and vehicle traffic. Thank you so much for this opportunity to discuss future plans for road improvement and the great interactive site.

I always see a lot of walkers along Old Portland Road. Some places have an asphalt paved path that takes the place of sidewalks and other places you have to walk on the street. You are probably going to discuss ADA access somewhere in your plan and it should be noted that there does need to be improved ADA access in many places in St. Helens. Specific spots for public transit access would also be a good idea for the major arterials going from highway 30 to the old town/courthouse area.

A lot of work should be done around the park area so that people would be safe and be encouraged to walk to and from the park. Side walks, pedestrian amenities would make it easier to see people walking here.

I am so glad to see the changes happening at the intersection of 6th street and West by the ball field. Installing a 4 way stop has been a huge safety factor. When riding bikes, kids never seem to stop at this intersection and the fact that motorists did not have to stop when coming from Columbia Blvd, heading towards West, concerned me about biking safety. But the installation of the 4 way stop makes motorists slow down and watch for bikers.

I live off of N Vernonia Rd and am often seeing pedestrian traffic walking in the road with limited driveways to step off on besides the drainage ditch on the west side of the road making it unsafe for to step off the road for safety. The only sidewalks available on N Vernonia between Pittsburg Rd and Frantz are from brand new developments. I see quite a bit of traffic from Pittsburg Road towards Yankton utilizing this road and some don't slow down.

Need more sidewalks on Sykes Rd from Summit View Dr down and then on Bachelor Flat Rd/Gable Rd from Summit View Dr down. More crosswalks across Old Portland Rd, so the kids can cross to walk to school.

I live in the Parkwood Crossing Neighborhood. It is full of kids and babies that will be going to school in the years to come. It is close to the high school and McBride. Kids could walk if we had sidewalks leaving both sides of the neighborhood. Maple Street is particularly dangerous as it curves and has no shoulder. The track team and others run up it and then through Parkwood which already has sidewalks so Maple is a problem. We should also have sidewalks from Parkwood to McBride a simple solution to bussing all those kids too. Please connect the Parkwood Neighborhood to the schools with sidewalks. Thank You.

The Highschool needs sidewalks on all sides not just Gable. Gable is the most important but I would also like to see sidewalks on Firlock Park Street, Firlock Park Blvd and Maple to Parkwood Dr. This would surround the Highschool with sidewalks which should be done. Many people in the south section of the Parkwood Neighborhood walk from Maple to Firlock to get to the High School.

The high school kids use Firlock Park Blvd a lot both for going to and from school and as a training route for their cross country track training.

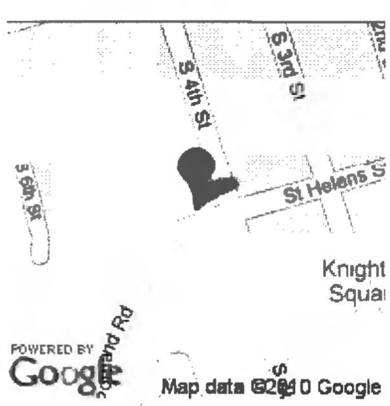
Maple st and Firlock Park Blvd are in great need of side walks. Please just drive through there when people and High Schoolers are out and about. Please install them now, Please.

We have several residents who live at Avamere that ride their scooters, wheelchairs and walk to Safeway and other stores in the area. They would travel Gable Rd. more frequently if there was a sidewalk all along Gable Rd. This is for their safety and well-being to have this side walk and it would show the residents and the community that we truly do care about them.

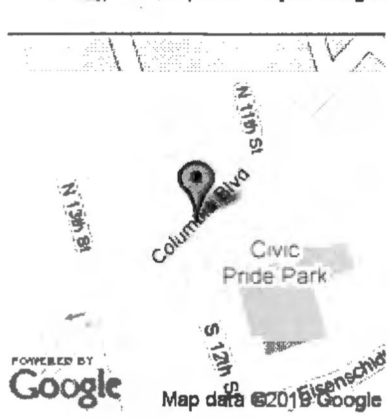
I would love to see sidewalks going all the way to the High School both from Maple and Firlock Park and on Gable also going from Gable to McBride. It is such a short distance from the neighborhood to these schools but it is very unsafe for the kids to walk - the roads are very well traveled.

The city needs to develop a street scape development plan from Highway 30 all the way to the end of Old Town including Columbia Blvd. St. Helens Street, 1st street and the Strand. This plan should include Street Trees, Landscaping, Streetscape (including appropriate lighting, seating, planters). Dollars should be set aside in the city budget for this starting with street trees.St Helens just instituted major reparis to the streets in the Houlton area and they did not include those appurtenances that normally go into major street upgrades in cities (large and small) around the country.
If St Helens would follow through with this type of plan they would draw people from Highway 30 and Houlton down to the Old Town. The city wouldn't have to put up "directional signage" [sic.].

Traffic cannot cross 12th and Columbia in the mornings when Columbia Blvd. is blocked with traffic going to the grade school and people are heading to work down town. Students are also walking and biking in this area which makes it very dangerous.



We would love to see a 4 way stop put here at the intersection of S.4th and Old Portland/St. Helens St. Although there have not been numerous accidents reported, there have been MANY near misses with cars, bikes and pedestrians. People are driving way too fast down the hill and don't seem to be concerned that there is a crosswalk coming up, or people trying to make a left hand turn off of 4th onto Old Portland. We believe that with a "stop ahead" sign placed on Old Portland and a 4 way stop would make this intersection much safer for everyone.



would be nice if a barrier or curb of some sorts could keep traffic from crossing over 12th Street to enter Red Apple. have entrance only at other end

I feel the traffic light at this location has become burden on the community and a waste of resources. With the slow down of industrial activity served by this traffic control device there is no longer enough traffic to warrant it's usage as a stop light. Much of the public's time is wasted sitting at a stop light with no cross traffic. It should not be removed because, in the future, industrial traffic may pick up. However, currently, the public would be far better served by a flashing caution light.

This is by far the worst eyesore I have seen created with public funds. What an embarrassing waste of resources.

This stretch of Gable Rd. should be widened and rebuilt. Currently it is too dangerous for pedestrian and bicycle usage and they should be disallowed until such improvements are made.

You can certainly tell the adjacent commercial property owners totally controlled the current redesign of this intersection and stretch of Gable Rd. The City accepted a 50' right of way for all of this commercial use!?! No where else in town would this have been allowed. What a travesty!! Who controls this stuff?

The flashing caution light for the rock wall dividing the intersection of Willamette and Col. Blvd has been burned out for two years now. When it is dark and you are going West on Col. Blvd, there is a chance to not notice the impediment. When someone smack into it head-on and suffers severe injury or damage, is the City going to be liable for not maintaining this warning device??

Ditto the other comment at this location!!!! It is a historical feature.

Dumb change.
It "was" your responsibility as a driver to watch out for pedestrians, bicyclers, kids, traffic and other obstructions. Thank goodness Government is protecting us from our selves. Now I can just pull up here, stop and go. If something or someone is in the way, too bad. Yep, the changes will protect everyone.

Until 7pm at night, this light is very long, resulting in people having to wait in order to turn left. There are significant gaps in oncoming traffic, and a blinking yellow left-turn signal would make this intersection much easier. Currently, it is very frustrating, resulting in many folks either driving through Rite-Aid/bowling alley, or through the Burgerville parking lot.

Appendix B
Columbia County Rider
Route Map

St. Helens

Medical Mall/Columbia Commons

Rite Aid

Warren Baptist Church

Scappoose

1st Street & Columbia Blvd

Chinook Plaza

Portland

S.W. Salmon, between

6th & Broadway

Dial-a-Ride Transportation

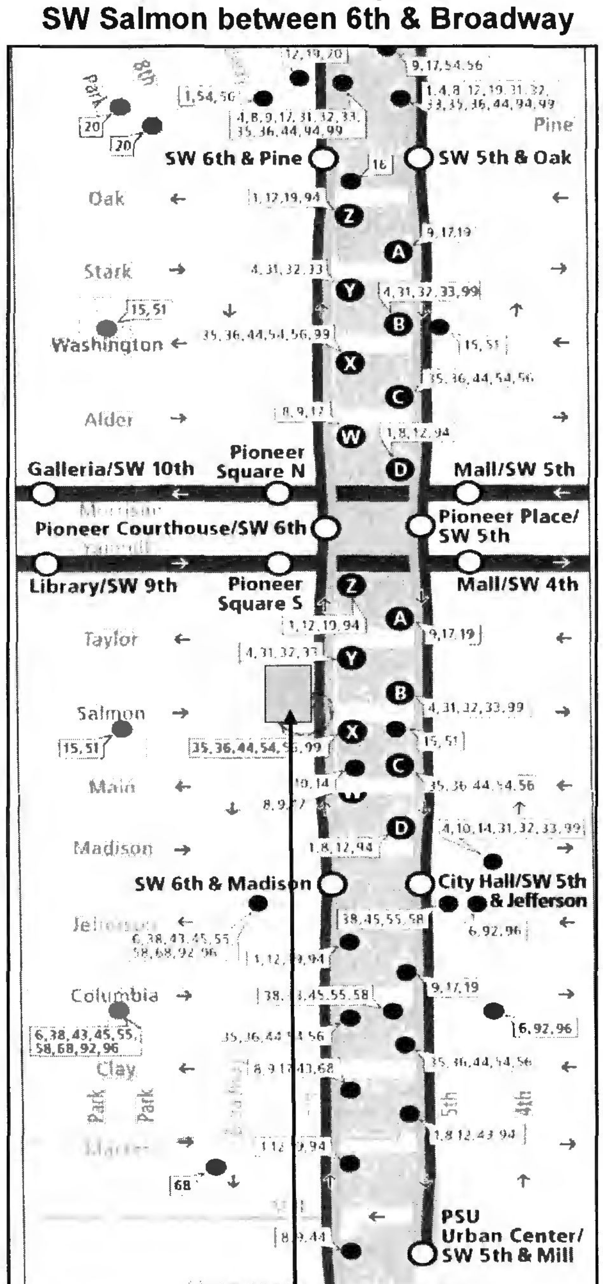
Available Monday through Friday from 6:30a.m. to 6:30 p.m. Our friendly staff will pick you up at the curbside and deliver you to your destination as close as possible to the front door. Simply dial our dispatch center up to one week in advance at:

503.366.0159

We gladly accept Title XIX Non-Emergency Medical Transportation requests coordinated through Northwest Ride Center. Contact them at 1.866.811.1001.

Don't drive....
TAKE THE BUS!

Map of our Bus Stop location
SW Salmon between 6th & Broadway



Columbia County Rider Bus Stop
In Bus Zone Near Starbucks

CC Rider

St. Helens–Scappoose

Downtown Portland (TriMet Transit Mall)

Vehicles are Wheel Chair Accessible

503.366.0159

"Public Transportation for All"

www.columbiacountyrider.com

Revised 1/14/2010

St. Helens to Scappoose
One Way

General Public	**$3.30**
Senior/Disabled/Students/Children	**$2.05**

To Portland
One Way

General Public	**$4.80**
Senior/Disabled/Students/Children	**$3.80**

Monthly Passes

General Public	**$106.80**
Senior/Disabled/Students/Children	**$91.80**

Seniors 60 and over• Children under age 10
(*Correct Change Only*)

Tickets and monthly passes can be purchased through transit personnel or by calling:

503.366.0159

Check or cash only

	Schedule St Helens and Scappoose To Portland (SW Salmon, Between 6th & Broadway)	**Yellow Indicates AM Departures** "Saturday Service"			↓		**Orange Indicates PM Departures** "Saturday Service" ↓			↓	
1	St Helens Medical Mall	5:50	6:20	6:50	8:30	10:30	12:30	2:30	4:00	4:30	5:00
2	Rite Aid Pharmacy/St Helens	5:55	6:25	6:55	8:35	10:35	12:35	2:35	4:05	4:35	5:05
3	Warren Baptist Church	6:00	6:30	7:00	8:40	10:40	12:40	2:40	4:10	4:40	5:10
4	1st Street and Columbia Ave Scappoose	6:15	6:45	7:15	8:45	10:45	12:45	2:45	4:15	4:45	5:15
5	Chinook Plaza/Scappoose	6:20	6:50	7:20	8:50	10:50	12:50	2:50	4:20	4:50	5:20
	Portland (SW Salmon, Between 6th & Broadway) **To Scappoose & St Helens**										
6	SW Salmon Between 6th & Broadway	7:00	7:30	8:00	9:30	11:30	1:30	3:30	5:00	5:30	6:00
7	Chinook Plaza/Scappoose	7:30	8:00	8:30	10:00	12:00	2:00	4:00	5:30	6:00	6:30
8	1st Street and Columbia Ave Scappoose	7:35	8:05	8:35	10:05	12:05	2:05	4:05	5:35	6:05	6:35
9	Warren Baptist Church								5:40	6:10	6:40

Beginning January 30th, 2010 CC Rider begins Saturday Service to SW Salmon.
Saturday Trips are indicated above in green.

All Times listed above are departure times.
CC Rider provides full daily service Monday through Friday.

Don't drive....
TAKE THE BUS!

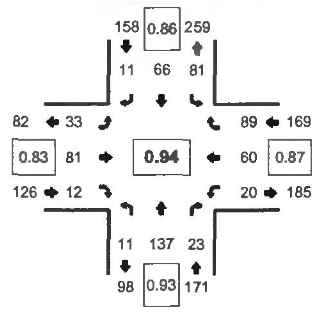
230 Strand Street
St. Helens, OR 97051
Phone: 503.366.0159

Appendix C
Traffic Count Data

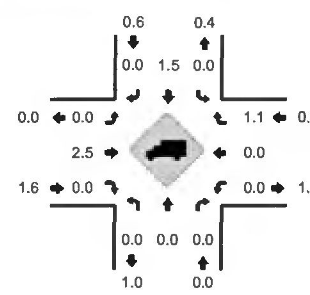
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

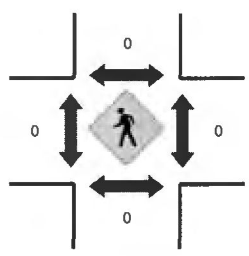
LOCATION: Columbia Blvd -- Sykes Rd — **QC JOB #:** 10517609

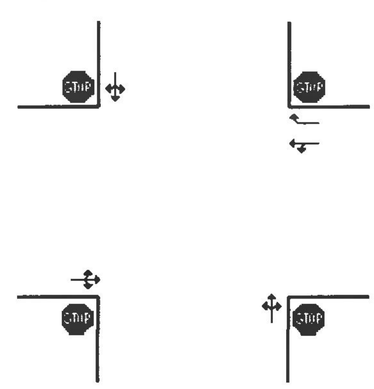
CITY/STATE: St Helens, OR — **DATE:** 5/4/2010

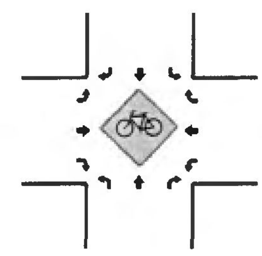


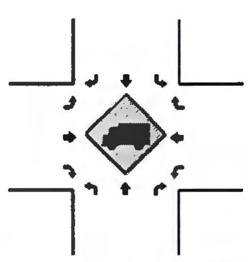
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

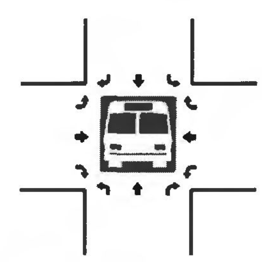












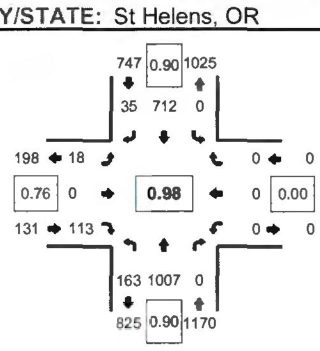
5-Min Count Period Beginning At	Columbia Blvd (Northbound) Left	Thru	Right	U	Columbia Blvd (Southbound) Left	Thru	Right	U	Sykes Rd (Eastbound) Left	Thru	Right	U	Sykes Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	7	2	0	2	5	0	0	1	5	0	0	2	4	5	0	33	
4:05 PM	2	9	1	0	4	4	2	0	2	1	0	0	2	8	7	0	42	
4:10 PM	1	11	3	0	1	3	0	0	2	8	3	0	2	4	2	0	40	
4:15 PM	0	7	1	0	8	3	1	0	2	4	0	0	1	6	7	0	40	
4:20 PM	1	9	2	0	5	5	2	0	3	9	0	0	0	4	2	0	42	
4:25 PM	0	5	1	0	4	5	0	0	1	8	1	0	2	2	7	0	36	
4:30 PM	1	4	2	0	6	9	0	0	4	12	1	0	0	5	1	0	45	
4:35 PM	0	5	2	0	5	4	1	0	2	9	0	0	1	6	6	0	41	
4:40 PM	1	6	1	0	6	1	0	0	2	10	0	0	2	4	8	0	41	
4:45 PM	0	11	2	0	5	2	1	0	2	6	0	0	1	4	7	0	41	
4:50 PM	0	12	3	0	6	7	2	0	0	8	0	0	2	6	3	0	49	
4:55 PM	2	12	0	0	10	6	2	0	1	3	0	0	1	5	6	0	48	498
5:00 PM	0	17	1	0	10	5	0	0	1	2	0	0	0	3	8	0	47	512
5:05 PM	1	11	0	0	7	3	0	0	2	6	0	0	2	8	10	0	50	520
5:10 PM	2	10	3	0	8	8	1	0	2	6	1	0	1	8	5	0	55	535
5:15 PM	4	12	4	0	9	3	1	0	3	10	0	0	2	4	9	0	61	556
5:20 PM	0	7	2	0	6	7	1	0	4	9	0	0	0	3	10	0	49	563
5:25 PM	1	11	4	0	4	5	4	0	5	5	2	0	3	6	5	0	55	582
5:30 PM	0	11	3	0	4	3	1	0	2	10	0	0	4	3	10	0	51	588
5:35 PM	0	14	1	0	6	4	0	0	1	8	3	0	3	9	3	0	52	599
5:40 PM	0	11	1	0	8	7	0	0	6	7	1	0	2	1	14	0	58	616
5:45 PM	0	14	1	0	10	6	1	0	1	5	1	0	1	6	1	0	47	622
5:50 PM	2	7	1	0	4	7	1	0	2	5	1	0	1	5	8	0	44	617
5:55 PM	1	12	2	0	5	8	1	0	4	8	3	0	1	4	6	0	55	624

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	28	132	28	0	96	56	8	0	28	88	4	0	20	80	96	0	664
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	4		4
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

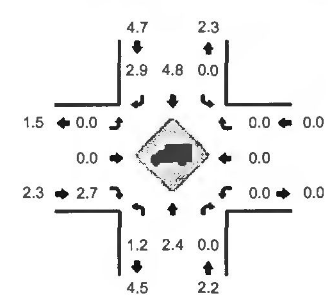
Comments:

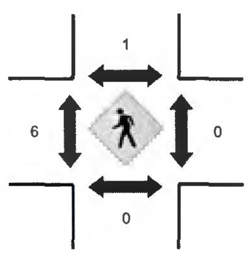
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

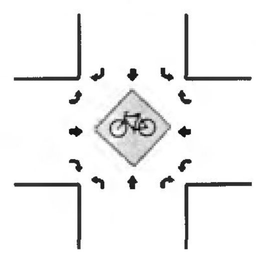
LOCATION: US 30 – Vernonia Rd | **QC JOB #:** 10517608
CITY/STATE: St Helens, OR | **DATE:** 5/4/2010

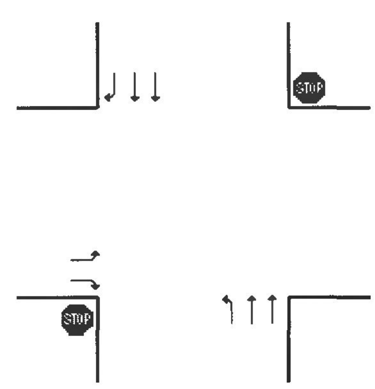


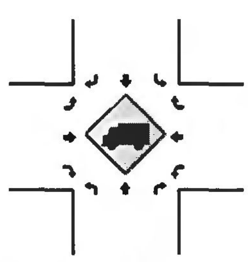
Peak-Hour: 4:20 PM -- 5:20 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

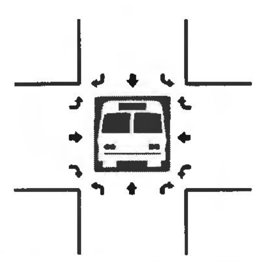












5-Min Count Period Beginning At	US 30 (Northbound) Left	Thru	Right	U	US 30 (Southbound) Left	Thru	Right	U	Vernonia Rd (Eastbound) Left	Thru	Right	U	Vernonia Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	9	69	0	0	0	61	1	0	1	0	11	0	0	0	0	0	152	
4:05 PM	10	79	0	0	0	50	4	0	4	0	9	0	0	0	0	0	156	
4:10 PM	12	61	0	0	0	67	1	0	1	0	6	0	0	0	0	0	148	
4:15 PM	13	79	0	0	0	50	2	0	4	0	18	0	0	0	0	0	166	
4:20 PM	18	90	0	0	0	67	2	0	1	0	8	0	0	0	0	0	186	
4:25 PM	14	77	0	0	0	56	0	0	2	0	13	0	0	0	0	0	162	
4:30 PM	15	79	0	0	0	64	2	0	1	0	9	0	0	0	0	0	170	
4:35 PM	8	86	0	0	0	51	4	0	3	0	7	0	0	0	0	0	159	
4:40 PM	12	81	0	0	0	55	6	0	2	0	7	0	0	0	0	0	163	
4:45 PM	14	96	0	0	0	56	2	0	0	0	11	0	0	0	0	0	179	
4:50 PM	15	98	0	0	0	44	2	0	3	0	7	0	0	0	0	0	169	
4:55 PM	18	84	0	0	0	59	3	0	1	0	6	0	0	0	0	0	171	1981
5:00 PM	15	73	0	0	0	62	5	0	1	0	8	0	0	0	0	0	164	1993
5:05 PM	12	76	0	0	0	70	1	0	2	0	12	0	0	0	0	0	173	2010
5:10 PM	15	82	0	0	0	57	2	0	0	0	14	0	0	0	0	0	170	2032
5:15 PM	7	85	0	0	0	71	6	0	2	0	11	0	0	0	0	0	182	2048
5:20 PM	21	64	0	0	0	63	3	0	2	0	13	0	0	0	0	0	166	2028
5:25 PM	18	80	0	0	0	59	1	0	2	0	6	0	0	0	0	0	166	2032
5:30 PM	14	82	0	0	0	57	7	0	2	0	5	0	0	0	0	0	167	2029
5:35 PM	18	65	0	0	0	46	2	0	2	0	8	0	0	0	0	0	141	2011
5:40 PM	13	57	0	0	0	48	2	0	4	0	6	0	0	0	0	0	130	1978
5:45 PM	17	63	0	0	0	40	1	0	2	0	7	0	0	0	0	0	130	1929
5:50 PM	17	64	0	0	0	48	1	0	1	0	6	0	0	0	0	0	137	1897
5:55 PM	14	65	0	0	0	39	2	0	3	0	7	0	0	0	0	0	130	1856

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	136	972	0	0	0	792	36	0	16	0	148	0	0	0	0	0	2100
Heavy Trucks	0	20	0		0	24	0		0	0	4		0	0	0		48
Pedestrians		0				0				8				0			8
Bicycles																	
Railroad																	
Stopped Buses																	

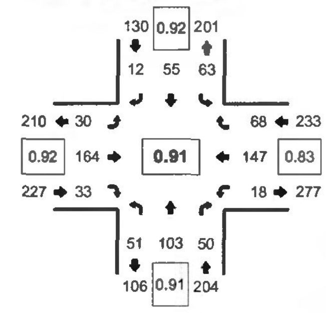
Comments:

Report generated on 7/6/2010 5:19 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

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

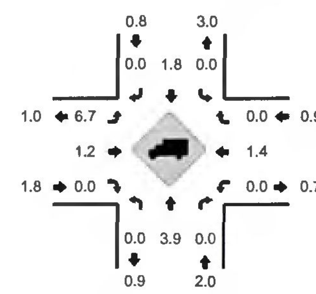
LOCATION: Vernonia Rd -- Columbia Blvd | **QC JOB #:** 10517607

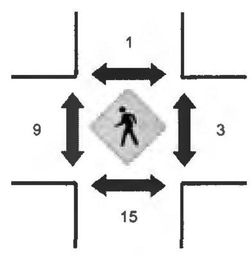
CITY/STATE: St Helens, OR | **DATE:** 5/4/2010

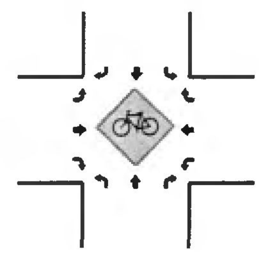


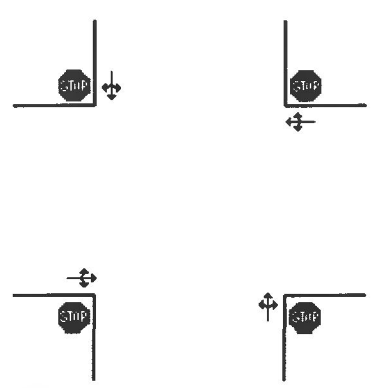
Peak-Hour: 4:45 PM -- 5:45 PM

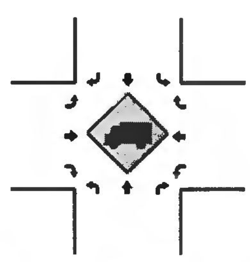
Peak 15-Min: 5:00 PM -- 5:15 PM

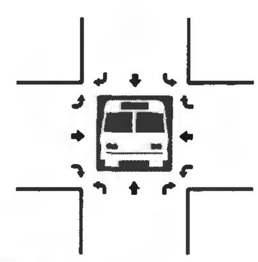












5-Min Count Period Beginning At	Vernonia Rd (Northbound)				Vernonia Rd (Southbound)				Columbia Blvd (Eastbound)				Columbia Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	3	4	4	0	3	7	1	0	1	6	3	0	2	11	7	0	52	
4:05 PM	1	7	3	0	6	3	5	0	3	10	2	0	4	11	4	0	59	
4:10 PM	0	11	1	0	3	3	3	0	0	16	1	0	1	9	3	0	51	
4:15 PM	6	5	5	0	6	13	0	0	2	11	0	0	3	9	4	0	64	
4:20 PM	1	11	2	0	5	6	1	0	2	9	6	0	1	10	0	0	54	
4:25 PM	4	9	7	0	3	4	1	0	3	16	1	0	0	7	4	0	59	
4:30 PM	1	6	9	0	4	9	0	0	4	12	3	0	1	7	7	0	63	
4:35 PM	0	3	5	0	4	5	1	0	2	13	2	0	2	8	4	0	49	
4:40 PM	4	7	4	0	2	5	3	0	1	21	2	0	1	12	1	0	63	
4:45 PM	3	9	3	0	8	3	1	0	2	11	2	0	3	11	8	0	64	
4:50 PM	3	6	4	0	7	3	2	0	2	13	4	0	4	7	5	0	60	
4:55 PM	3	9	2	0	5	2	1	0	5	15	2	0	0	12	5	0	61	699
5:00 PM	6	13	9	0	6	7	0	0	4	12	0	0	0	18	7	0	82	729
5:05 PM	5	7	4	0	9	3	0	0	4	12	2	0	0	17	8	0	71	741
5:10 PM	3	5	3	0	6	6	2	0	0	15	6	0	1	11	8	0	66	756
5:15 PM	2	11	4	0	1	6	1	0	3	19	2	0	2	12	7	0	70	762
5:20 PM	6	11	5	0	6	8	0	0	1	9	3	0	1	13	4	0	67	775
5:25 PM	5	8	4	0	5	5	0	0	4	11	3	0	1	13	4	0	63	779
5:30 PM	7	3	7	0	4	5	3	0	3	15	2	0	2	10	3	0	64	780
5:35 PM	4	10	2	0	2	3	2	0	0	14	4	0	1	9	7	0	58	789
5:40 PM	4	11	3	0	4	4	0	0	2	18	3	0	3	14	2	0	68	794
5:45 PM	4	10	3	0	7	3	1	0	1	11	0	0	3	7	5	0	55	785
5:50 PM	3	5	10	0	7	4	0	0	2	13	2	0	0	15	4	0	65	790
5:55 PM	3	5	4	0	6	3	1	0	1	12	4	0	2	9	5	0	55	784

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	56	100	64	0	84	64	8	0	32	156	32	0	4	184	92	0	876
Heavy Trucks	0	0	0		0	4	0		0	0	0		0	4	0		8
Pedestrians		12				0				12				4			28
Bicycles																	
Railroad																	
Stopped Buses																	

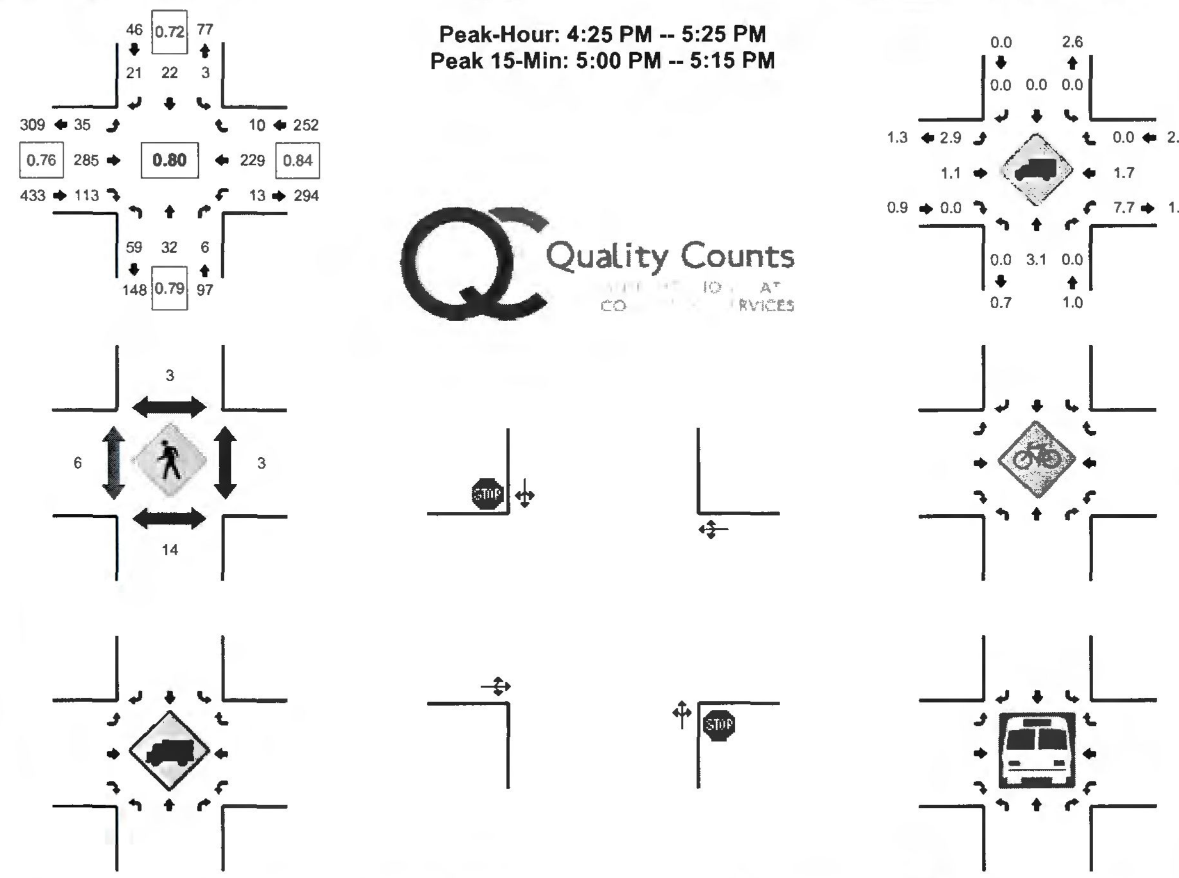
Comments:

Report generated on 7/6/2010 5:19 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

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

LOCATION: 12th -- Columbia Blvd — QC JOB #: 10517606
CITY/STATE: St Helens, OR — DATE: 5/4/2010

Peak-Hour: 4:25 PM -- 5:25 PM
Peak 15-Min: 5:00 PM -- 5:15 PM



5-Min Count Period Beginning At	12th (Northbound)				12th (Southbound)				Columbia Blvd (Eastbound)				Columbia Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	5	0	1	0	0	0	0	0	3	17	7	0	2	14	1	0	50	
4:05 PM	6	2	0	0	2	1	1	0	3	30	6	0	0	21	0	0	72	
4:10 PM	2	2	0	0	1	2	2	0	3	19	6	0	1	23	0	0	61	
4:15 PM	2	2	0	0	0	3	1	0	4	14	6	0	2	11	2	0	47	
4:20 PM	4	0	3	0	0	0	2	0	1	15	7	0	1	11	2	0	46	
4:25 PM	4	1	0	0	0	0	1	0	4	26	3	0	1	21	0	0	61	
4:30 PM	5	1	2	0	1	1	1	0	2	19	8	0	1	14	1	0	56	
4:35 PM	4	3	0	0	0	4	3	0	1	20	13	0	2	15	2	0	67	
4:40 PM	3	2	1	0	0	3	0	0	3	13	10	0	2	20	0	0	57	
4:45 PM	6	2	0	0	0	1	4	0	4	21	8	0	0	19	1	0	66	
4:50 PM	1	6	0	0	0	3	3	0	2	23	12	0	1	20	0	0	71	
4:55 PM	4	4	0	0	1	3	2	0	3	30	2	0	1	17	2	0	69	723
5:00 PM	5	2	1	0	1	2	3	0	4	25	14	0	1	23	2	0	83	756
5:05 PM	8	0	0	0	0	1	1	0	3	31	18	0	0	28	0	0	90	774
5:10 PM	9	4	0	0	0	3	1	0	6	32	9	0	0	20	1	0	85	798
5:15 PM	4	4	1	0	0	0	1	0	3	27	8	0	3	21	0	0	72	823
5:20 PM	6	3	1	0	0	1	1	0	0	18	8	0	1	11	1	0	51	828
5:25 PM	3	2	1	0	0	1	2	0	2	23	5	0	0	13	0	0	52	819
5:30 PM	1	3	1	0	0	3	0	0	0	18	6	0	1	14	2	0	49	812
5:35 PM	3	2	1	0	1	3	0	0	2	12	9	0	1	14	1	0	49	794
5:40 PM	7	2	1	0	0	2	1	0	2	19	5	0	0	11	1	0	51	788
5:45 PM	5	1	3	0	0	1	3	0	7	21	6	0	4	17	1	0	69	791
5:50 PM	6	0	1	0	1	2	4	0	2	11	5	0	1	20	2	0	55	775
5:55 PM	6	2	2	0	0	2	1	0	1	14	6	0	1	28	2	0	65	771

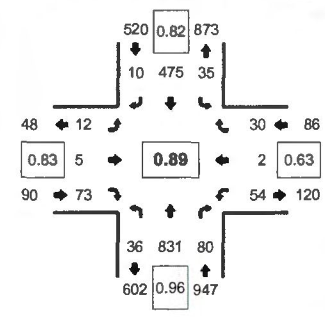
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	88	24	4	0	4	24	20	0	52	352	164	0	4	284	12	0	1032
Heavy Trucks	0	0	0		0	0	0		0	4	0		0	4	0		8
Pedestrians		20				0				12				12			44
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

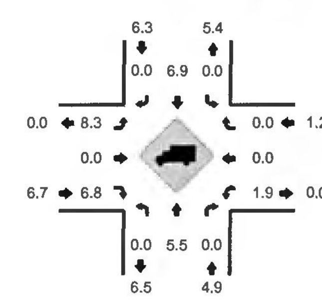
Report generated on 7/6/2010 5:19 PM — SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

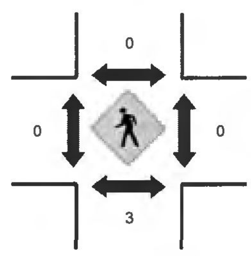
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

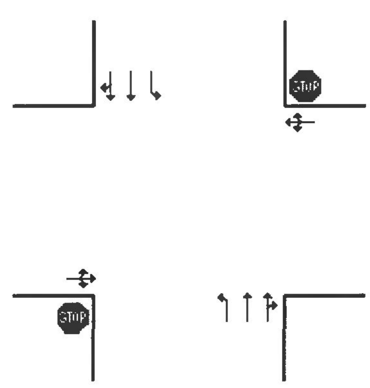
LOCATION: US 30 -- Wyeth St — **QC JOB #:** 10517605
CITY/STATE: St Helens, OR — **DATE:** 5/6/2010

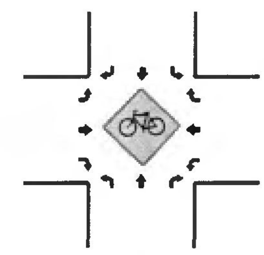


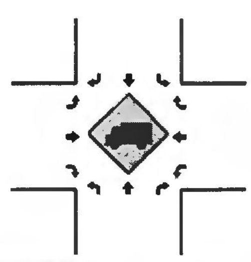
Peak-Hour: 4:20 PM -- 5:20 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

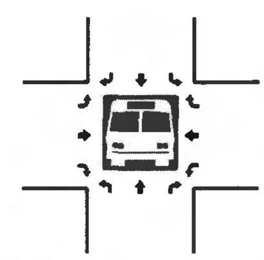












5-Min Count Period Beginning At	US 30 (Northbound) Left	Thru	Right	U	US 30 (Southbound) Left	Thru	Right	U	Wyeth St (Eastbound) Left	Thru	Right	U	Wyeth St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	4	52	3	0	8	53	2	0	1	0	7	0	5	0	2	0	137	
4:05 PM	7	54	5	0	1	25	0	0	0	0	5	0	1	0	1	0	99	
4:10 PM	7	48	5	0	2	39	1	0	1	0	6	0	1	0	1	0	111	
4:15 PM	2	50	3	0	6	34	2	0	0	0	4	0	4	0	3	0	108	
4:20 PM	1	67	5	0	3	41	0	0	0	0	8	0	3	0	1	0	129	
4:25 PM	2	58	5	0	3	35	0	0	0	1	7	0	2	0	3	0	116	
4:30 PM	6	76	4	0	1	45	2	0	2	0	4	0	10	0	4	0	154	
4:35 PM	5	68	5	0	3	57	0	0	1	1	6	0	9	0	6	0	161	
4:40 PM	0	76	5	0	2	49	4	0	2	0	6	0	4	0	0	0	148	
4:45 PM	3	69	7	0	4	30	2	0	1	0	8	0	2	0	0	0	126	
4:50 PM	3	75	8	0	2	35	0	0	0	1	6	0	4	0	3	0	137	
4:55 PM	4	62	10	0	5	40	1	0	0	1	3	0	4	0	1	0	131	1557
5:00 PM	3	71	10	0	3	36	0	0	1	1	9	0	2	0	4	0	140	1560
5:05 PM	1	68	7	0	1	36	0	0	2	0	7	0	6	0	4	0	132	1593
5:10 PM	5	74	7	0	4	37	0	0	1	0	6	0	5	0	2	0	141	1623
5:15 PM	3	67	7	0	4	34	1	0	2	0	3	0	3	2	2	0	128	1643
5:20 PM	1	60	7	0	4	42	2	0	2	2	2	0	1	0	1	0	124	1638
5:25 PM	4	57	3	0	3	31	0	0	2	0	6	0	3	0	0	0	109	1631
5:30 PM	1	62	4	0	2	48	0	0	3	0	3	0	3	1	1	0	128	1605
5:35 PM	3	70	5	0	6	37	1	0	1	0	4	0	1	0	0	0	128	1572
5:40 PM	1	54	5	0	3	37	0	0	0	1	0	0	2	1	1	0	105	1529
5:45 PM	1	75	5	0	4	41	1	0	1	0	3	0	4	0	1	0	136	1539
5:50 PM	2	62	8	0	8	39	1	0	0	0	4	0	3	0	1	0	128	1530
5:55 PM	1	53	6	0	7	49	1	0	0	1	1	0	1	1	3	0	124	1523

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	880	56	0	24	604	24	0	20	4	64	0	92	0	40	0	1852
Heavy Trucks	0	52	0		0	48	0		4	0	4		4	0	0		112
Pedestrians		12				0				0				0			12
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/6/2010 5:19 PM — SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

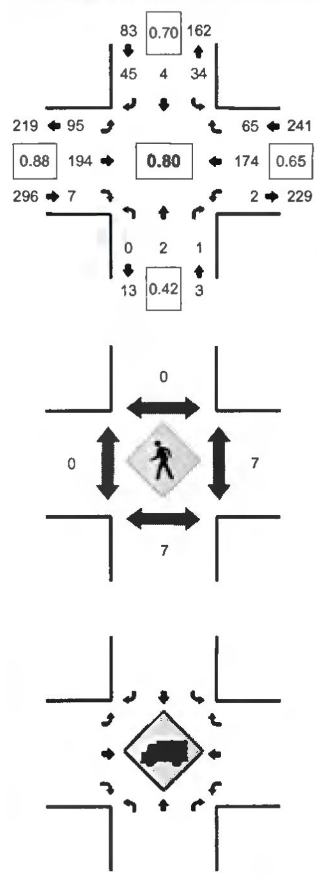
LOCATION: 6th -- Columbia Blvd

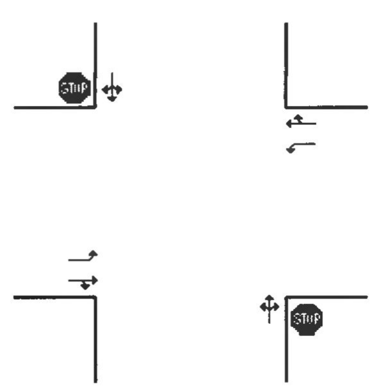
CITY/STATE: St Helens, OR

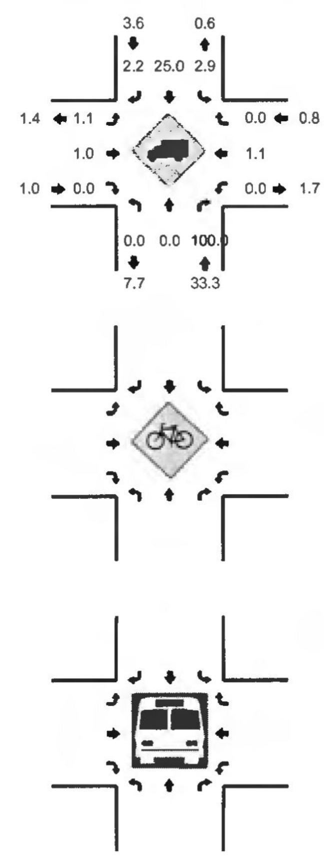
QC JOB #: 10517604

DATE: 5/4/2010

Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:00 PM -- 5:15 PM







5-Min Count Period Beginning At	6th (Northbound)				6th (Southbound)				Columbia Blvd (Eastbound)				Columbia Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	1	0	2	0	2	0	3	14	1	0	0	14	6	0	43	
4:05 PM	1	0	0	0	2	0	3	0	9	18	1	0	0	20	6	0	60	
4:10 PM	0	1	0	0	5	0	8	0	7	15	0	0	0	13	2	0	51	
4:15 PM	0	0	0	0	4	0	4	0	6	13	1	0	0	9	3	0	40	
4:20 PM	0	0	0	0	3	0	3	0	12	13	0	0	0	9	2	0	42	
4:25 PM	1	0	0	0	1	0	7	0	9	16	0	0	0	10	1	0	45	
4:30 PM	0	0	0	0	5	0	7	0	8	10	0	0	1	10	10	0	51	
4:35 PM	0	0	0	0	5	0	7	0	8	21	0	0	0	14	5	0	60	
4:40 PM	0	1	0	0	1	0	3	0	7	8	1	0	0	15	1	0	37	
4:45 PM	0	0	0	0	4	0	5	0	1	20	1	0	0	11	3	0	45	
4:50 PM	0	0	0	0	2	0	1	0	4	16	0	0	0	19	3	0	45	
4:55 PM	0	0	0	0	2	0	2	0	8	24	0	0	0	14	4	0	54	573
5:00 PM	0	0	0	0	2	0	2	0	3	20	1	0	0	21	10	0	59	589
5:05 PM	0	0	0	0	4	1	2	0	10	16	0	0	0	25	12	0	70	599
5:10 PM	0	1	1	0	0	1	4	0	12	19	2	0	0	20	6	0	66	614
5:15 PM	0	0	0	0	2	0	3	0	7	20	0	0	0	10	5	0	47	621
5:20 PM	0	0	0	0	4	0	5	0	13	7	1	0	1	8	2	0	41	620
5:25 PM	0	0	0	0	3	2	4	0	14	13	1	0	0	7	4	0	48	623
5:30 PM	0	0	0	0	3	0	4	0	6	17	0	0	0	16	2	0	48	620
5:35 PM	0	0	1	0	6	0	6	0	8	7	0	0	0	13	5	0	46	606
5:40 PM	0	0	0	0	3	0	8	0	6	9	0	0	0	9	2	0	37	606
5:45 PM	0	0	0	0	0	0	5	0	13	10	0	0	0	12	4	0	44	605
5:50 PM	1	0	0	0	2	1	3	0	7	7	0	0	0	22	4	0	47	607
5:55 PM	0	1	0	0	1	0	4	0	4	15	0	0	0	22	3	0	50	603

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	4	4	0	24	8	32	0	100	220	12	0	0	264	112	0	780
Heavy Trucks	0	0	4		0	4	0		0	4	0		0	4	0		16
Pedestrians		8				0				0				12			20
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/6/2010 5:19 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: Intersection Peak

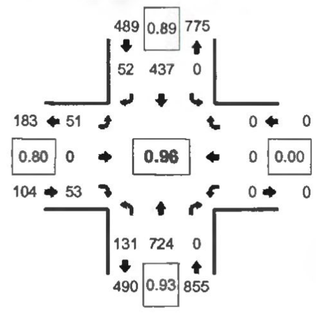
Method for determining peak hour: Total Entering Volume

LOCATION: US 30 -- Pittsburg Rd

CITY/STATE: St Helens, OR

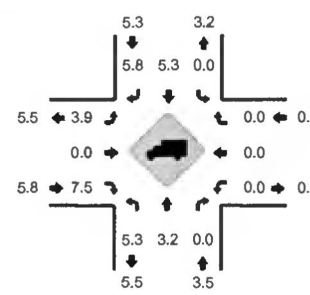
QC JOB #: 10517603

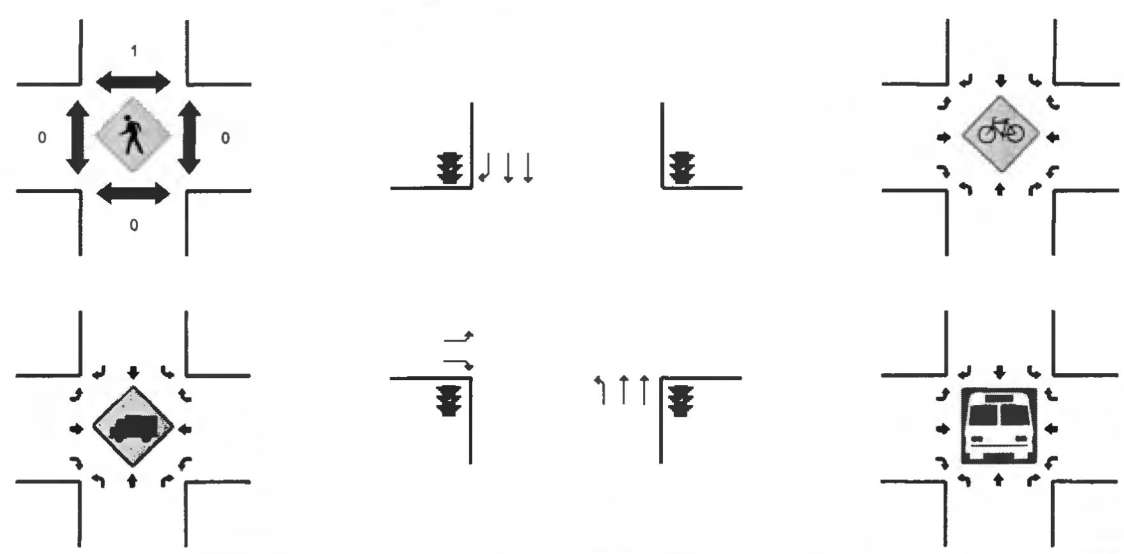
DATE: 5/4/2010



Peak-Hour: 4:20 PM -- 5:20 PM

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





5-Min Count Period Beginning At	US 30 (Northbound) Left	Thru	Right	U	US 30 (Southbound) Left	Thru	Right	U	Pittsburg Rd (Eastbound) Left	Thru	Right	U	Pittsburg Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	6	54	0	0	0	41	8	0	3	0	3	0	0	0	0	0	115	
4:05 PM	7	54	0	0	0	33	4	0	4	0	3	0	0	0	0	0	105	
4:10 PM	7	40	0	0	0	41	5	0	3	0	3	0	0	0	0	0	99	
4:15 PM	4	69	0	0	0	29	5	0	8	0	9	0	0	0	0	0	124	
4:20 PM	7	60	0	0	0	41	7	0	4	0	4	0	0	0	0	0	123	
4:25 PM	7	38	0	0	0	43	9	0	7	0	7	0	0	0	0	0	111	
4:30 PM	14	79	0	0	0	36	4	0	3	0	4	0	0	0	0	0	140	
4:35 PM	14	64	0	0	0	39	4	0	1	0	1	0	0	0	0	0	123	
4:40 PM	6	51	0	0	0	46	4	0	4	0	3	0	0	0	0	0	114	
4:45 PM	4	59	0	0	0	30	1	0	1	0	1	0	0	0	0	0	96	
4:50 PM	8	78	0	0	0	32	1	0	7	0	7	0	0	0	0	0	133	
4:55 PM	16	57	0	0	0	31	6	0	1	0	1	0	0	0	0	0	112	1395
5:00 PM	11	61	0	0	0	28	2	0	8	0	9	0	0	0	0	0	119	1399
5:05 PM	15	51	0	0	0	34	6	0	4	0	5	0	0	0	0	0	115	1409
5:10 PM	12	53	0	0	0	45	3	0	3	0	3	0	0	0	0	0	119	1429
5:15 PM	17	73	0	0	0	32	5	0	8	0	8	0	0	0	0	0	143	1448
5:20 PM	8	40	0	0	0	47	5	0	7	0	7	0	0	0	0	0	114	1439
5:25 PM	6	60	0	0	0	36	10	0	3	0	3	0	0	0	0	0	118	1446
5:30 PM	4	57	0	0	0	34	6	0	5	0	4	0	0	0	0	0	110	1416
5:35 PM	6	50	0	0	0	37	7	0	3	0	3	0	0	0	0	0	106	1399
5:40 PM	7	50	0	0	0	19	7	0	1	0	1	0	0	0	0	0	85	1370
5:45 PM	3	51	0	0	0	38	5	0	5	0	5	0	0	0	0	0	107	1381
5:50 PM	5	60	0	0	0	27	4	0	5	0	5	0	0	0	0	0	106	1354
5:55 PM	5	60	0	0	0	31	5	0	5	0	5	0	0	0	0	0	111	1353

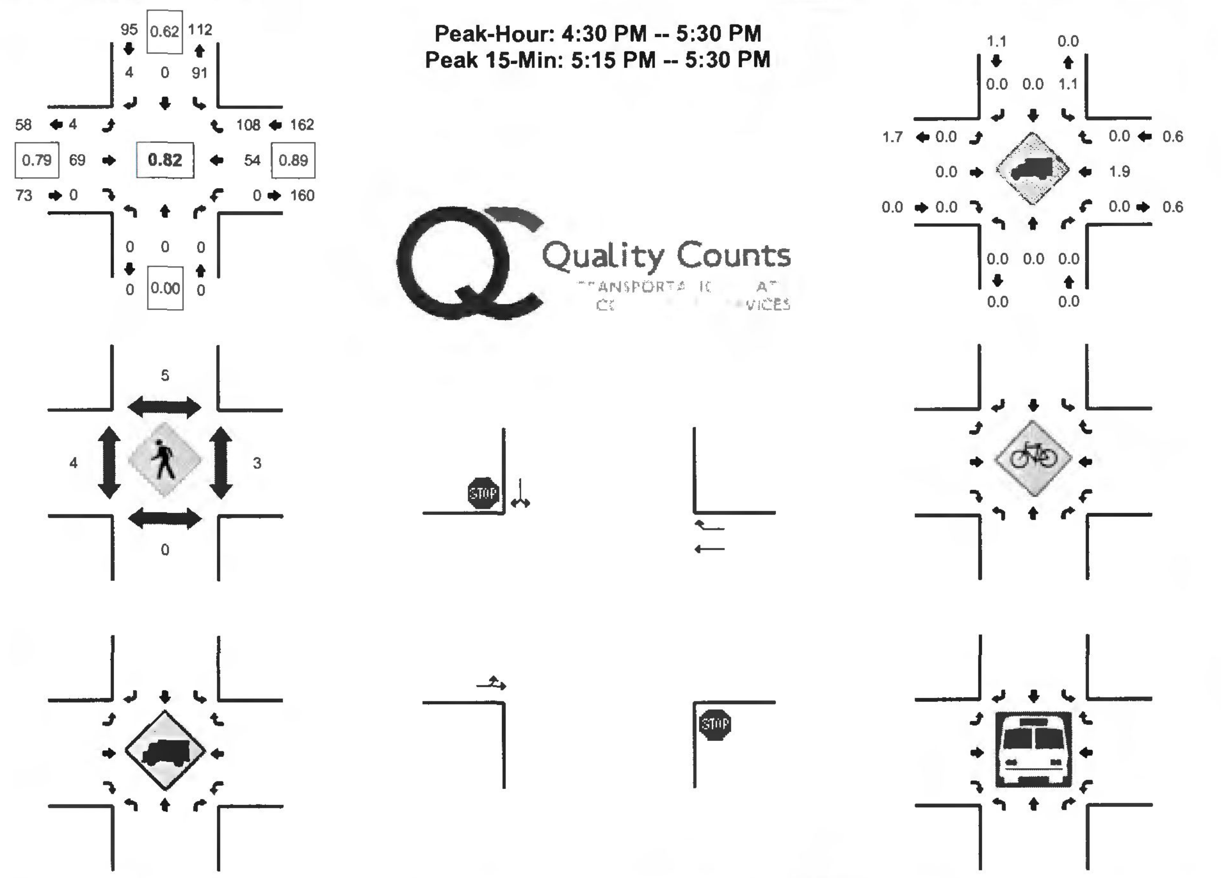
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	136	776	0	0	0	484	48	0	32	0	32	0	0	0	0	0	1508
Heavy Trucks	12	24	0		0	36	4		4	0	4		0	0	0		84
Pedestrians		0				4				0				0			4
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

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

LOCATION: Deer Island -- West — **QC JOB #:** 10517602
CITY/STATE: St Helens, OR — **DATE:** 5/4/2010

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



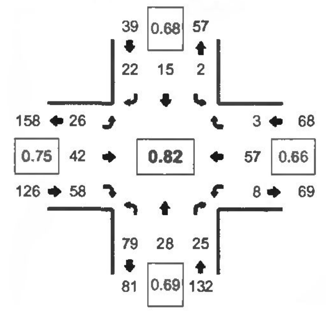
5-Min Count Period Beginning At	Deer Island (Northbound)				Deer Island (Southbound)				West (Eastbound)				West (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	7	0	0	0	0	7	0	0	0	2	11	0	27	
4:05 PM	0	0	0	0	7	0	0	0	1	7	0	0	0	4	2	0	21	
4:10 PM	0	0	0	0	7	0	0	0	0	3	0	0	0	4	9	0	23	
4:15 PM	0	0	0	0	6	0	0	0	0	5	0	0	0	4	6	0	21	
4:20 PM	0	0	0	0	3	0	0	0	1	6	0	0	0	3	9	0	22	
4:25 PM	0	0	0	0	4	0	0	0	1	0	0	0	0	4	4	0	13	
4:30 PM	0	0	0	0	10	0	0	0	0	11	0	0	0	5	7	0	33	
4:35 PM	0	0	0	0	8	0	2	0	0	4	0	0	0	5	12	0	31	
4:40 PM	0	0	0	0	3	0	0	0	2	6	0	0	0	4	8	0	23	
4:45 PM	0	0	0	0	5	0	0	0	1	6	0	0	0	3	4	0	19	
4:50 PM	0	0	0	0	5	0	0	0	0	6	0	0	0	7	4	0	22	
4:55 PM	0	0	0	0	3	0	0	0	0	3	0	0	0	5	8	0	19	274
5:00 PM	0	0	0	0	5	0	0	0	0	7	0	0	0	3	13	0	28	275
5:05 PM	0	0	0	0	6	0	1	0	0	5	0	0	0	5	13	0	30	284
5:10 PM	0	0	0	0	8	0	1	0	0	3	0	0	0	5	7	0	24	285
5:15 PM	0	0	0	0	8	0	0	0	1	4	0	0	0	6	8	0	27	291
5:20 PM	0	0	0	0	15	0	0	0	0	7	0	0	0	3	11	0	36	305
5:25 PM	0	0	0	0	15	0	0	0	0	7	0	0	0	3	13	0	38	330
5:30 PM	0	0	0	0	13	0	0	0	0	4	0	0	0	5	10	0	32	329
5:35 PM	0	0	0	0	11	0	2	0	0	4	0	0	0	1	11	0	29	327
5:40 PM	0	0	0	0	5	0	0	0	0	2	0	0	0	8	9	0	24	328
5:45 PM	0	0	0	0	6	0	0	0	0	3	0	0	0	2	7	0	18	327
5:50 PM	0	0	0	0	5	0	0	0	0	1	0	0	0	3	6	0	15	320
5:55 PM	0	0	0	0	5	0	0	0	0	2	0	0	0	2	11	0	20	321

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	152	0	0	0	4	72	0	0	0	48	128	0	404
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				4				0				0			4
Bicycles																	
Railroad																	
Stopped Buses																	

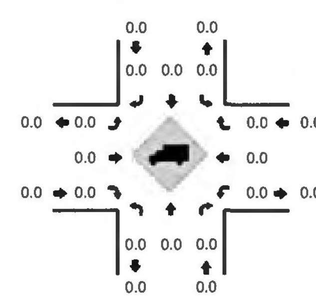
Comments:

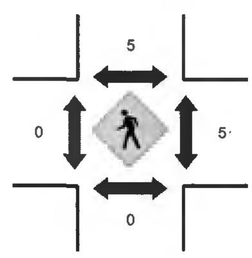
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

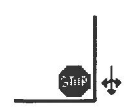
LOCATION: North 6th -- West | **QC JOB #:** 10517601
CITY/STATE: St Helens, OR | **DATE:** 5/4/2010

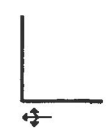


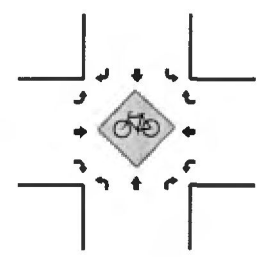
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

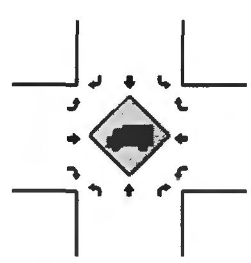


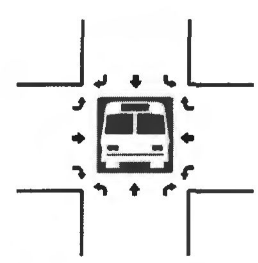












5-Min Count Period Beginning At	North 6th (Northbound)				North 6th (Southbound)				West (Eastbound)				West (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	6	2	1	0	0	0	2	0	3	4	3	0	2	3	0	0	26	
4:05 PM	5	3	1	0	0	2	0	0	3	5	10	0	0	1	0	0	30	
4:10 PM	8	1	5	0	0	4	1	0	1	2	8	0	1	6	0	0	37	
4:15 PM	5	1	1	0	0	1	2	0	2	4	2	0	0	2	0	0	20	
4:20 PM	5	6	2	0	0	2	2	0	0	6	3	0	1	4	0	0	31	
4:25 PM	2	2	2	0	0	0	0	0	0	3	2	0	4	4	0	0	19	
4:30 PM	8	5	0	0	0	2	1	0	6	4	7	0	1	5	0	0	39	
4:35 PM	9	1	0	0	0	2	0	0	1	5	6	0	0	6	0	0	30	
4:40 PM	7	4	1	0	1	0	2	0	3	1	3	0	0	4	0	0	26	
4:45 PM	0	2	1	0	0	0	1	0	1	6	3	0	1	4	0	0	19	
4:50 PM	5	2	0	0	0	1	0	0	1	5	2	0	0	4	1	0	21	
4:55 PM	3	1	3	0	0	3	3	0	0	2	1	0	0	6	0	0	22	320
5:00 PM	9	1	2	0	0	0	3	0	2	1	5	0	0	3	0	0	26	320
5:05 PM	16	2	4	0	0	1	1	0	2	4	6	0	0	3	0	0	39	329
5:10 PM	5	5	2	0	0	1	1	0	2	4	3	0	0	6	0	0	29	321
5:15 PM	7	5	2	0	0	0	1	0	1	3	2	0	2	6	0	0	29	330
5:20 PM	3	5	2	0	0	5	5	0	4	6	8	0	0	2	0	0	40	339
5:25 PM	5	0	2	0	0	1	2	0	3	7	9	0	2	10	1	0	42	362
5:30 PM	6	2	1	0	0	0	2	0	2	3	8	0	0	4	1	0	29	352
5:35 PM	5	2	1	0	0	3	1	0	3	6	6	0	1	7	0	0	35	357
5:40 PM	9	0	2	0	1	1	3	0	2	2	3	0	2	3	0	0	28	359
5:45 PM	4	2	3	0	0	0	1	0	1	3	2	0	0	3	0	0	19	359
5:50 PM	5	4	3	0	0	2	0	0	2	1	4	0	1	4	0	0	26	364
5:55 PM	5	0	1	0	1	1	2	0	2	2	2	0	0	6	1	0	23	365

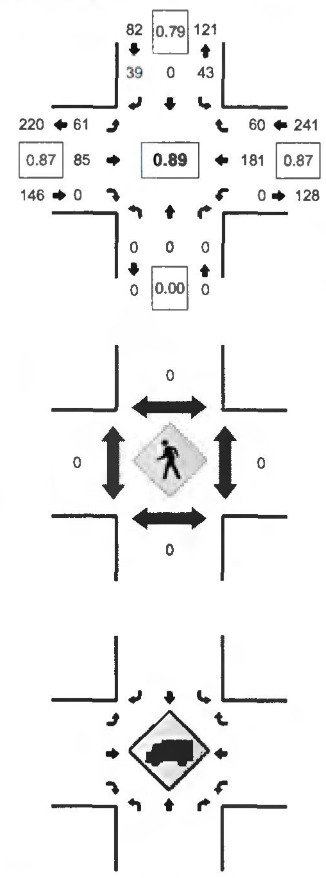
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	60	40	24	0	0	24	32	0	32	64	76	0	16	72	4	0	444
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				12				0				12			24
Bicycles																	
Railroad																	
Stopped Buses																	

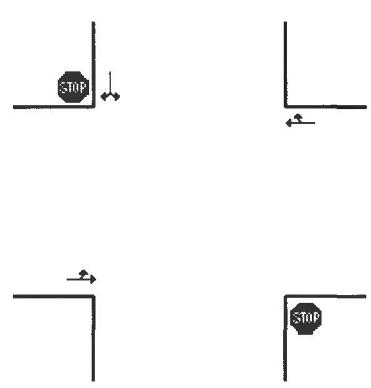
Comments:

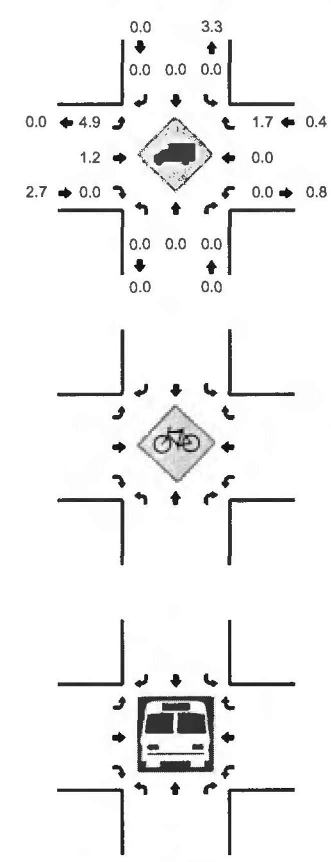
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

LOCATION: Columbia Blvd -- Gable Rd | **QC JOB #:** 10517610
CITY/STATE: St Helens, OR | **DATE:** 5/4/2010

Peak-Hour: 4:40 PM -- 5:40 PM
Peak 15-Min: 5:15 PM -- 5:30 PM







5-Min Count Period Beginning At	Columbia Blvd (Northbound) Left	Thru	Right	U	Columbia Blvd (Southbound) Left	Thru	Right	U	Gable Rd (Eastbound) Left	Thru	Right	U	Gable Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	0	0	0	3	0	2	0	4	8	0	0	0	7	2	0	26	
4:05 PM	0	0	0	0	4	0	7	0	4	4	0	0	0	14	1	0	34	
4:10 PM	0	0	0	0	1	0	5	0	7	5	0	0	0	9	6	0	33	
4:15 PM	0	0	0	0	4	0	4	0	1	5	0	0	0	8	5	0	27	
4:20 PM	0	0	0	0	5	0	2	0	5	5	0	0	0	8	7	0	32	
4:25 PM	0	0	0	0	1	0	2	0	7	6	0	0	0	11	7	0	34	
4:30 PM	0	0	0	0	0	0	6	0	5	4	0	0	0	7	7	0	29	
4:35 PM	0	0	0	0	3	0	4	0	6	4	0	0	0	7	5	0	29	
4:40 PM	0	0	0	0	2	0	2	0	7	5	0	0	0	18	7	0	41	
4:45 PM	0	0	0	0	6	0	1	0	3	9	0	0	0	14	7	0	40	
4:50 PM	0	0	0	0	2	0	4	0	5	6	0	0	0	14	3	0	34	
4:55 PM	0	0	0	0	5	0	2	0	3	5	0	0	0	14	1	0	30	389
5:00 PM	0	0	0	0	3	0	2	0	1	12	0	0	0	15	2	0	35	398
5:05 PM	0	0	0	0	2	0	6	0	7	6	0	0	0	15	2	0	38	402
5:10 PM	0	0	0	0	3	0	3	0	4	10	0	0	0	16	6	0	42	411
5:15 PM	0	0	0	0	3	0	7	0	6	7	0	0	0	13	6	0	42	426
5:20 PM	0	0	0	0	2	0	2	0	8	8	0	0	0	15	6	0	41	435
5:25 PM	0	0	0	0	9	0	3	0	3	5	0	0	0	19	10	0	49	450
5:30 PM	0	0	0	0	2	0	3	0	9	6	0	0	0	12	5	0	37	458
5:35 PM	0	0	0	0	4	0	4	0	5	6	0	0	0	16	5	0	40	469
5:40 PM	0	0	0	0	3	0	1	0	5	8	0	0	0	9	6	0	32	460
5:45 PM	0	0	0	0	3	0	3	0	2	9	0	0	0	10	4	0	31	451
5:50 PM	0	0	0	0	3	0	3	0	3	11	0	0	0	15	6	0	41	458
5:55 PM	0	0	0	0	3	0	4	0	2	5	0	0	0	13	10	0	37	465

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	0	0	0	56	0	48	0	68	80	0	0	0	188	88	0	528
Heavy Trucks	0	0	0		0	0	0		4	0	0		0	0	0		4
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/6/2010 5:19 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Appendix D
Existing Conditions Traffic
Operations Worksheets

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	1	1	1	1	1	1	1	1	1	1	1	1
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	110		300	110		110
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.955			0.955				0.850			0.850
Flt Protected		0.984			0.984		0.950			0.950		
Satd. Flow (prot)	0	1612	0	0	1612	0	1676	3353	1458	1630	3353	1500
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1638	0	0	1638	0	1676	3353	1458	1630	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			1				1			1
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		225			179			1625			999	
Travel Time (s)		5.1			4.1			22.2			13.6	
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
Adj. Flow (vph)	1	1	1	1	1	1	1	1	1	1	1	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	3	0	0	3	0	1	1	1	1	1	1
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0		20.0	20.0		8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	34.0	34.0	0.0	34.0	34.0	0.0	22.0	34.0	34.0	22.0	34.0	34.0
Total Split (%)	37.8%	37.8%	0.0%	37.8%	37.8%	0.0%	24.4%	37.8%	37.8%	24.4%	37.8%	37.8%
Maximum Green (s)	30.0	30.0		30.0	30.0		18.0	30.0	30.0	18.0	30.0	30.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max	Max	None	Max	Max
Walk Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0			11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0			0	0		0	0
v/c Ratio		0.02			0.02		0.01	0.00	0.00	0.01	0.00	0.00
Control Delay		23.0			23.0		25.0	3.0	2.0	25.0	3.0	2.0
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		23.0			23.0		25.0	3.0	2.0	25.0	3.0	2.0
Queue Length 50th (ft)		1			1		0	0	0	0	0	0
Queue Length 95th (ft)		8			8		5	1	1	5	1	1
Internal Link Dist (ft)		145			99			1545			919	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)							110		300	110		110
Base Capacity (vph)		945			945		580	3120	1357	564	3120	1396
Starvation Cap Reductn		0			0		0	0	0	0	0	0
Spillback Cap Reductn		0			0		0	0	0	0	0	0
Storage Cap Reductn		0			0		0	0	0	0	0	0
Reduced v/c Ratio		0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 53
Natural Cycle: 50
Control Type: Semi Act-Uncoord

Splits and Phases: 1: Deer Island Rd & US 30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	1	1	1	1	1	1	1	1	1	1	1	1
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.95			0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1612			1612		1676	3353	1458	1630	3353	1500
Flt Permitted		1.00			1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1638			1638		1676	3353	1458	1630	3353	1500
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1	1	1	1	1	1	1	1	1	1	1
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2	0	0	2	0	1	1	1	1	1	1
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)		0.9			0.9		0.9	45.8	45.8	0.9	45.8	45.8
Effective Green, g (s)		0.9			0.9		0.9	45.8	45.8	0.9	45.8	45.8
Actuated g/C Ratio		0.02			0.02		0.02	0.77	0.77	0.02	0.77	0.77
Clearance Time (s)		4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		25			25		25	2577	1120	25	2577	1153
v/s Ratio Prot							0.00	0.00		c0.00	0.00	
v/s Ratio Perm		c0.00			0.00				c0.00			0.00
v/c Ratio		0.08			0.08		0.04	0.00	0.00	0.04	0.00	0.00
Uniform Delay, d1		28.9			28.9		28.9	1.6	1.6	28.9	1.6	1.6
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.4			1.4		0.7	0.0	0.0	0.7	0.0	0.0
Delay (s)		30.3			30.3		29.6	1.6	1.6	29.6	1.6	1.6
Level of Service		C			C		C	A	A	C	A	A
Approach Delay (s)		30.3			30.3			10.9			10.9	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	59.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

	↗	↘	↖	↑	↓	↙
Lane Configurations						
Volume (vph)	55	60	145	798	501	56
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	25	100			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1599	1377	1629	3320	3257	1443
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1599	1377	1629	3320	3257	1443
Link Speed (mph)	35			40	40	
Link Distance (ft)	567			871	1625	
Travel Time (s)	11.0			14.8	27.7	
Confl. Peds. (#/hr)	1					
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	4%	8%	5%	3%	5%	6%
Adj. Flow (vph)	57	63	151	831	522	58
Shared Lane Traffic (%)						
Lane Group Flow (vph)	57	62	151	831	522	58
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	55	60	145	798	501	56
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	57	62	151	831	522	58
Pedestrians					1	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)		1				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1241	261	522			
vC1, stage 1 conf vol	522					
vC2, stage 2 conf vol	719					
vCu, unblocked vol	1241	261	522			
tC, single (s)	6.9	7.1	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.4	2.2			
p0 queue free %	82	91	85			
cM capacity (veh/h)	326	720	1020			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	120	151	416	416	261	261	58
Volume Left	57	151	0	0	0	0	0
Volume Right	62	0	0	0	0	0	58
cSH	682	1020	1700	1700	1700	1700	1700
Volume to Capacity	0.18	0.15	0.24	0.24	0.15	0.15	0.03
Queue Length 95th (ft)	16	13	0	0	0	0	0
Control Delay (s)	14.3	9.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	14.3	1.4			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	13	5	79	58	2	32	39	897	86	38	513	11
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	85		250	85		25
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor												
Frt		0.891			0.953				0.850			0.850
Flt Protected		0.993			0.969		0.950			0.950		
Satd. Flow (prot)	0	1450	0	0	1596	0	1710	3226	1488	1662	3196	1530
Flt Permitted		0.993			0.969		0.950			0.950		
Satd. Flow (perm)	0	1450	0	0	1596	0	1710	3226	1488	1662	3196	1530
Link Speed (mph)		25			25			40			40	
Link Distance (ft)		275			614			1403			871	
Travel Time (s)		7.5			16.7			23.9			14.8	
Confl. Peds. (#/hr)			3	3								
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	8%	0%	7%	2%	0%	0%	0%	6%	0%	0%	7%	0%
Adj. Flow (vph)	15	6	89	65	2	36	44	1008	97	43	576	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	110	0	0	103	0	44	1008	97	43	576	12
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	13	5	79	58	2	32	39	897	86	38	513	11
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	15	6	89	65	2	36	44	1008	97	43	576	12
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1290	1854	291	1564	1770	504	589			1104		
vC1, stage 1 conf vol	662	662		1096	1096							
vC2, stage 2 conf vol	629	1192		468	674							
vCu, unblocked vol	1290	1854	291	1564	1770	504	589			1104		
tC, single (s)	7.7	6.5	7.0	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.7	5.5		6.5	5.5							
tF (s)	3.6	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	97	87	66	99	93	96			93		
cM capacity (veh/h)	260	190	689	192	231	519	996			640		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	109	103	44	504	504	97	43	288	288	12
Volume Left	15	65	44	0	0	0	43	0	0	0
Volume Right	89	36	0	0	0	97	0	0	0	12
cSH	508	247	996	1700	1700	1700	640	1700	1700	1700
Volume to Capacity	0.21	0.42	0.04	0.30	0.30	0.06	0.07	0.17	0.17	0.01
Queue Length 95th (ft)	20	49	3	0	0	0	5	0	0	0
Control Delay (s)	14.0	29.7	8.8	0.0	0.0	0.0	11.0	0.0	0.0	0.0
Lane LOS	B	D	A				B			
Approach Delay (s)	14.0	29.7	0.3				0.7			
Approach LOS	B	D								

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

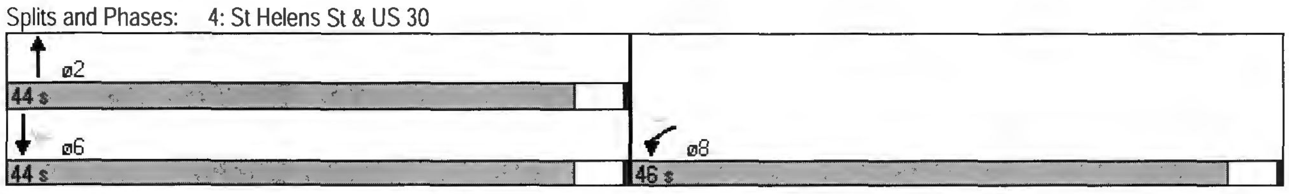
Lane Configurations	↰↰	↱	↑↑			↑↑
Volume (vph)	1	1	1	1	1	1
Ideal Flow (vphpl)	1750	1750	1800	1800	1750	1800
Lane Util. Factor	0.97	1.00	0.95	0.95	0.95	0.95
Frt		0.850	0.925			
Flt Protected	0.950					0.976
Satd. Flow (prot)	3162	1458	3101	0	0	3272
Flt Permitted	0.950					0.939
Satd. Flow (perm)	3162	1458	3101	0	0	3148
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		1	1091			
Link Speed (mph)	25		35			35
Link Distance (ft)	349		598			1403
Travel Time (s)	9.5		11.6			27.3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1	1	1	1	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1	1	2	0	0	2
Turn Type		Perm			Perm	
Protected Phases	8		2			6
Permitted Phases		8			6	
Detector Phase	8	8	2		6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	20.0	20.0	20.0		20.0	20.0
Total Split (s)	46.0	46.0	44.0	0.0	44.0	44.0
Total Split (%)	51.1%	51.1%	48.9%	0.0%	48.9%	48.9%
Maximum Green (s)	42.0	42.0	40.0		40.0	40.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Max		Max	Max
Walk Time (s)	5.0	5.0	5.0		5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0	0		0	0
v/c Ratio	0.00	0.01	0.00			0.00
Control Delay	27.0	22.0	0.0			1.0
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	27.0	22.0	0.0			1.0
Queue Length 50th (ft)	0	0	0			0
Queue Length 95th (ft)	2	4	0			1
Internal Link Dist (ft)	269		518			1323
Turn Bay Length (ft)						
Base Capacity (vph)	2187	1008	3020			3022
Starvation Cap Reductn	0	0	0			0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.00	0.00	0.00			0.00

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 61
Natural Cycle: 40
Control Type: Semi Act-Uncoord

Splits and Phases: 4: St Helens St & US 30



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	1	1	1	1	1	1
Ideal Flow (vphpl)	1750	1750	1800	1800	1750	1800
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.95			0.95
Frt	1.00	0.85	0.93			1.00
Flt Protected	0.95	1.00	1.00			0.98
Satd. Flow (prot)	3162	1458	3101			3271
Flt Permitted	0.95	1.00	1.00			0.94
Satd. Flow (perm)	3162	1458	3101			3148
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1	1	1	1	1
RTOR Reduction (vph)	0	1	0	0	0	0
Lane Group Flow (vph)	1	0	2	0	0	2
Turn Type		Perm			Perm	
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	1.0	1.0	55.2			55.2
Effective Green, g (s)	1.0	1.0	55.2			55.2
Actuated g/C Ratio	0.02	0.02	0.86			0.86
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	49	23	2666			2707
v/s Ratio Prot	c0.00		0.00			
v/s Ratio Perm		0.00				c0.00
v/c Ratio	0.02	0.00	0.00			0.00
Uniform Delay, d1	31.1	31.1	0.6			0.6
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	0.2	0.0	0.0			0.0
Delay (s)	31.3	31.1	0.6			0.6
Level of Service	C	C	A			A
Approach Delay (s)	31.2		0.6			0.6
Approach LOS	C		A			A

Intersection Summary			
HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	64.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

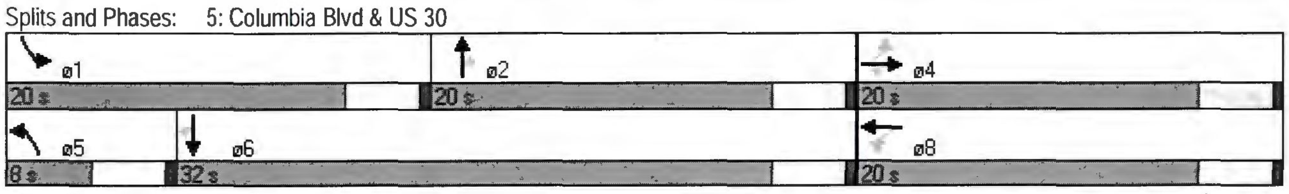
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱				↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	1	1	1	1	1	1	1	1	1	1	1	1
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	80		80	0		0	120		430	120		155
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.950				0.850			0.850
Flt Protected		0.976			0.984		0.950			0.950		
Satd. Flow (prot)	0	3245	1488	0	0	0	1710	3420	1488	1662	3420	1530
Flt Permitted		0.917			0.965		0.950			0.950		
Satd. Flow (perm)	0	3049	1488	0	0	0	1710	3420	1488	1662	3420	1530
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			1						1			1
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1699			1325			1662			598	
Travel Time (s)		46.3			36.1			32.4			11.6	
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
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	1	1	1	1	1	1	1	1	1	1	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2	1	0	3	0	1	1	1	1	1	1
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8					2			6
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0		8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	20.0	20.0	0.0	8.0	20.0	20.0	20.0	32.0	32.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%	0.0%	13.3%	33.3%	33.3%	33.3%	53.3%	53.3%
Maximum Green (s)	16.0	16.0	16.0	16.0	16.0		4.0	16.0	16.0	16.0	28.0	28.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Walk Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0			11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
v/c Ratio		0.00	0.00		no cap		0.01	0.00	0.00	0.00	0.00	0.00
Control Delay		16.0	13.0				26.0	16.0	13.0	16.0	9.0	7.0
Queue Delay		0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		16.0	13.0		Error		26.0	16.0	13.0	16.0	9.0	7.0
Queue Length 50th (ft)		0	0		0		0	0	0	0	0	0
Queue Length 95th (ft)		2	3		0		5	1	3	4	1	2
Internal Link Dist (ft)		1619			1245			1582			518	
Turn Bay Length (ft)			80				120		430	120		155
Base Capacity (vph)		813	398		1		114	912	398	443	1596	715
Starvation Cap Reductn		0	0		0		0	0	0	0	0	0
Spillback Cap Reductn		0	0		0		0	0	0	0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Storage Cap Reductn		0	0		0		0	0	0	0	0	0
Reduced v/c Ratio		0.00	0.00		3.00		0.01	0.00	0.00	0.00	0.00	0.00

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBT, Start of Green
Natural Cycle: 60
Control Type: Pretimed

Splits and Phases: 5: Columbia Blvd & US 30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱				↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	1	1	1	1	1	1	1	1	1	1	1	1
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3244	1488		0		1710	3420	1488	1662	3420	1530
Flt Permitted		0.92	1.00		0.96		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3048	1488		0		1710	3420	1488	1662	3420	1530
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1	1	1	1	1	1	1	1	1	1	1
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	1	0	0	1
Lane Group Flow (vph)	0	2	0	0	3	0	1	1	0	1	1	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8					2			6
Actuated Green, G (s)		16.0	16.0		16.0		4.0	16.0	16.0	16.0	28.0	28.0
Effective Green, g (s)		16.0	16.0		16.0		4.0	16.0	16.0	16.0	28.0	28.0
Actuated g/C Ratio		0.27	0.27		0.27		0.07	0.27	0.27	0.27	0.47	0.47
Clearance Time (s)		4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)		813	397		0		114	912	397	443	1596	714
v/s Ratio Prot							c0.00	c0.00		c0.00	0.00	
v/s Ratio Perm		c0.00	0.00						0.00			0.00
v/c Ratio		0.00	0.00		no cap		0.01	0.00	0.00	0.00	0.00	0.00
Uniform Delay, d1		16.1	16.1		Error		26.1	16.1	16.1	16.1	8.5	8.5
Progression Factor		1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0	0.0		Error		0.1	0.0	0.0	0.0	0.0	0.0
Delay (s)		16.1	16.1		Error		26.3	16.1	16.1	16.2	8.5	8.5
Level of Service		B	B		F		C	B	B	B	A	A
Approach Delay (s)		16.1			Error			19.5			11.1	
Approach LOS		B			F			B			B	

Intersection Summary

HCM Average Control Delay	Error	HCM Level of Service	F
HCM Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	19	122	176	1088	769	38
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	50	85			25
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1662	1444	1693	3353	3257	1485
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1662	1444	1693	3353	3257	1485
Link Speed (mph)	25			35	35	
Link Distance (ft)	1136			1937	1662	
Travel Time (s)	31.0			37.7	32.4	
Confl. Peds. (#/hr)	1		6			6
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	0%	3%	1%	2%	5%	3%
Adj. Flow (vph)	19	124	180	1110	785	39
Shared Lane Traffic (%)						
Lane Group Flow (vph)	19	124	180	1110	785	39
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	19	122	176	1088	769	38
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)	19	124	180	1110	785	39
Pedestrians	6				1	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	1				0	
Right turn flare (veh)		2				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1706	398	829			
vC1, stage 1 conf vol	791					
vC2, stage 2 conf vol	915					
vCu, unblocked vol	1706	398	829			
tC, single (s)	6.8	7.0	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	79	78			
cM capacity (veh/h)	230	595	800			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	144	180	555	555	392	392	39
Volume Left	19	180	0	0	0	0	0
Volume Right	124	0	0	0	0	0	39
cSH	688	800	1700	1700	1700	1700	1700
Volume to Capacity	0.21	0.22	0.33	0.33	0.23	0.23	0.02
Queue Length 95th (ft)	20	21	0	0	0	0	0
Control Delay (s)	13.9	10.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	B					
Approach Delay (s)	13.9	1.5			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

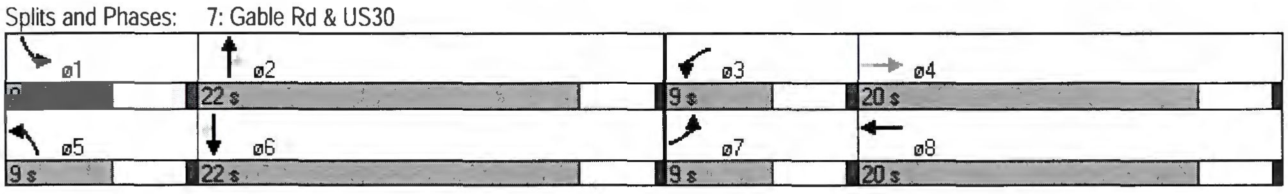
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	1	1	1	1	1	1	1	1	1	1	1
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	130		0	215		0	130		310	130		140
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.925			0.925				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1587	0	1630	1587	0	1676	3353	1458	1630	3353	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1630	1587	0	1630	1587	0	1676	3353	1458	1630	3353	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			1				1			1
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		1390			1323			3867			969	
Travel Time (s)		31.6			30.1			75.3			18.9	
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
Adj. Flow (vph)	1	1	1	1	1	1	1	1	1	1	1	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1	2	0	1	2	0	1	1	1	1	1	1
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7			3	8		5	2		1	6	
Permitted Phases		4							2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0		8.0	20.0		8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	9.0	20.0	0.0	9.0	20.0	0.0	9.0	22.0	22.0	9.0	22.0	22.0
Total Split (%)	15.0%	33.3%	0.0%	15.0%	33.3%	0.0%	15.0%	36.7%	36.7%	15.0%	36.7%	36.7%
Maximum Green (s)	5.0	16.0		5.0	16.0		5.0	18.0	18.0	5.0	18.0	18.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max	Max	None	None	None
Walk Time (s)		5.0			5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)		11.0			11.0			11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)		0			0			0	0		0	0
v/c Ratio	0.00	0.01		0.00	0.01		0.00	0.00	0.00	0.00	0.00	0.00
Control Delay	22.0	19.0		22.0	19.0		22.0	5.0	5.0	22.0	5.0	5.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	19.0		22.0	19.0		22.0	5.0	5.0	22.0	5.0	5.0
Queue Length 50th (ft)	0	0		0	0		0	0	0	0	0	0
Queue Length 95th (ft)	4	6		4	6		4	1	2	4	1	2
Internal Link Dist (ft)		1310			1243			3787			889	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	130			215			130		310	130		140
Base Capacity (vph)	202	630		202	630		207	3013	1310	202	3013	1348
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 42.2
Natural Cycle: 60
Control Type: Semi Act-Uncoord

Splits and Phases: 7: Gable Rd & US30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	1	1	1	1	1	1	1	1	1	1	1	1
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.93		1.00	0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1630	1587		1630	1587		1676	3353	1458	1630	3353	1500
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1630	1587		1630	1587		1676	3353	1458	1630	3353	1500
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1	1	1	1	1	1	1	1	1	1	1
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	0	0	0	0
Lane Group Flow (vph)	1	1	0	1	1	0	1	1	1	1	1	1
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7			3	8		5	2		1	6	
Permitted Phases		4							2			6
Actuated Green, G (s)	0.7	0.8		0.7	0.8		0.7	34.3	34.3	0.7	34.3	34.3
Effective Green, g (s)	0.7	0.8		0.7	0.8		0.7	34.3	34.3	0.7	34.3	34.3
Actuated g/C Ratio	0.01	0.02		0.01	0.02		0.01	0.65	0.65	0.01	0.65	0.65
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	22	24		22	24		22	2191	953	22	2191	980
v/s Ratio Prot	c0.00			0.00	0.00		0.00	0.00		c0.00	0.00	
v/s Ratio Perm		c0.00							c0.00			0.00
v/c Ratio	0.05	0.04		0.05	0.04		0.05	0.00	0.00	0.05	0.00	0.00
Uniform Delay, d1	25.6	25.5		25.6	25.5		25.6	3.2	3.2	25.6	3.2	3.2
Progression Factor	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	0.7		0.9	0.7		0.9	0.0	0.0	0.9	0.0	0.0
Delay (s)	26.4	26.2		26.4	26.2		26.4	3.2	3.2	26.4	3.2	3.2
Level of Service	C	C		C	C		C	A	A	C	A	A
Approach Delay (s)		26.3			26.3			10.9			10.9	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	52.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	3	45	10	3	17	81	1152	1	1	1	1
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		250	0		110	110		150	150		200
Storage Lanes	0		1	0		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.960			0.962		0.950			0.950		
Satd. Flow (prot)	0	1647	1458	0	1650	1458	1676	3353	1458	1630	3353	1500
Flt Permitted		0.960			0.962		0.950			0.950		
Satd. Flow (perm)	0	1647	1458	0	1650	1458	1676	3353	1458	1630	3353	1500
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		737			300			1086			3867	
Travel Time (s)		12.6			5.1			16.5			58.6	
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
Adj. Flow (vph)	15	3	49	11	3	18	88	1252	1	1	1	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	18	49	0	14	18	88	1252	1	1	1	1
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	14	3	45	10	3	17	81	1152	1	1	1	1
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)	15	3	49	11	3	18	88	1252	1	1	1	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			10			4						
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	807	1433	1	1457	1432	626	1			1253		
vC1, stage 1 conf vol	3	3		1428	1428							
vC2, stage 2 conf vol	804	1429		29	3							
vCu, unblocked vol	807	1433	1	1457	1432	626	1			1253		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	98	95	92	98	96	95			100		
cM capacity (veh/h)	296	182	1083	131	183	427	1620			551		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	67	33	88	626	626	1	1	1	1	1
Volume Left	15	11	88	0	0	0	1	0	0	0
Volume Right	49	18	0	0	0	1	0	0	0	1
cSH	1007	329	1620	1700	1700	1700	551	1700	1700	1700
Volume to Capacity	0.07	0.10	0.05	0.37	0.37	0.00	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	5	8	4	0	0	0	0	0	0	0
Control Delay (s)	11.4	22.1	7.3	0.0	0.0	0.0	11.5	0.0	0.0	0.0
Lane LOS	B	C	A				B			
Approach Delay (s)	11.4	22.1	0.5				3.8			
Approach LOS	B	C								

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	4	75	58	117	98	4
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0			100	0	0
Storage Lanes	0			1	1	0
Taper Length (ft)	25			25	25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850	0.995	
Flt Protected		0.997			0.954	
Satd. Flow (prot)	0	1745	1716	1488	1645	0
Flt Permitted		0.997			0.954	
Satd. Flow (perm)	0	1745	1716	1488	1645	0
Link Speed (mph)		25	25		25	
Link Distance (ft)		2305	403		1964	
Travel Time (s)		62.9	11.0		53.6	
Confl. Peds. (#/hr)	5			5	3	4
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	0%	0%	2%	0%	1%	0%
Adj. Flow (vph)	5	91	71	143	120	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	96	71	143	125	0
Sign Control		Stop	Stop		Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	4	75	58	117	98	4
Sign Control		Stop	Stop		Free	
Grade		0%	0%		0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	5	91	71	143	120	5
Pedestrians		4	3		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)				4		
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	286	248	251	8	3	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	286	248	251	8	3	
tC, single (s)	7.1	6.5	6.5	6.2	4.1	
tC, 2 stage (s)						
tF (s)	3.5	4.0	4.0	3.3	2.2	
p0 queue free %	99	85	88	87	93	
cM capacity (veh/h)	494	606	601	1073	1622	

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	96	213	124
Volume Left	5	0	120
Volume Right	0	143	5
cSH	599	1605	1622
Volume to Capacity	0.16	0.13	0.07
Queue Length 95th (ft)	14	11	6
Control Delay (s)	12.2	9.8	7.1
Lane LOS	B	A	A
Approach Delay (s)	12.2	9.8	7.1
Approach LOS	B	A	

Intersection Summary			
Average Delay	9.6		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	28	45	63	9	62	3	85	30	27	2	16	24
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.994			0.974			0.923	
Flt Protected		0.981			0.994			0.971			0.998	
Satd. Flow (prot)	0	1717	1488	0	1729	0	0	1655	0	0	1612	0
Flt Permitted		0.981			0.994			0.971			0.998	
Satd. Flow (perm)	0	1717	1488	0	1729	0	0	1655	0	0	1612	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		403			853			1453			709	
Travel Time (s)		11.0			23.3			39.6			19.3	
Confl. Peds. (#/hr)	5					5			5	5		
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
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	34	55	77	11	76	4	104	37	33	2	20	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	89	77	0	91	0	0	174	0	0	51	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	28	45	63	9	62	3	85	30	27	2	16	24
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)	34	55	77	11	76	4	104	37	33	2	20	29

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	89	77	90	173	51
Volume Left (vph)	34	0	11	104	2
Volume Right (vph)	0	77	4	33	29
Hadj (s)	0.19	-0.70	0.00	0.01	-0.33
Departure Headway (s)	5.3	4.4	4.7	4.6	4.4
Degree Utilization, x	0.13	0.09	0.12	0.22	0.06
Capacity (veh/h)	640	770	712	748	757
Control Delay (s)	7.9	6.7	8.4	8.9	7.7
Approach Delay (s)	7.3		8.4	8.9	7.7
Approach LOS	A		A	A	A

Intersection Summary			
Delay	8.1		
HCM Level of Service	A		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✣			✣			✣	
Volume (vph)	103	210	8	2	188	70	0	2	1	37	4	49
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			-1%			1%	
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.994			0.963			0.955			0.926	
Flt Protected	0.950										0.980	
Satd. Flow (prot)	1646	1723	0	0	1673	0	0	1260	0	0	1528	0
Flt Permitted	0.950										0.980	
Satd. Flow (perm)	1646	1723	0	0	1673	0	0	1260	0	0	1528	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		559			839			582			1453	
Travel Time (s)		15.2			22.9			15.9			39.6	
Confl. Peds. (#/hr)			7	7					7	7		
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	1%	1%	0%	0%	1%	0%	0%	0%	100%	3%	25%	2%
Adj. Flow (vph)	129	263	10	3	235	88	0	3	1	46	5	61
Shared Lane Traffic (%)												
Lane Group Flow (vph)	129	272	0	0	325	0	0	3	0	0	112	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✢			✢			✢	
Volume (veh/h)	103	210	8	2	188	70	0	2	1	37	4	49
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-1%			1%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	129	262	10	2	235	88	0	2	1	46	5	61
Pedestrians					7			7				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					4.0			4.0				
Percent Blockage					1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	322			280			880	860	282	813	821	279
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	322			280			880	860	282	813	821	279
tC, single (s)	4.1			4.1			7.1	6.5	7.2	7.1	6.8	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	4.2	3.5	4.2	3.3
p0 queue free %	90			100			100	99	100	83	98	92
cM capacity (veh/h)	1243			1287			223	263	566	267	253	760

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	129	272	325	4	112
Volume Left	129	0	2	0	46
Volume Right	0	10	88	1	61
cSH	1243	1700	1287	321	411
Volume to Capacity	0.10	0.16	0.00	0.01	0.27
Queue Length 95th (ft)	9	0	0	1	27
Control Delay (s)	8.2	0.0	0.1	16.4	17.0
Lane LOS	A		A	C	C
Approach Delay (s)	2.6		0.1	16.4	17.0
Approach LOS				C	C

Intersection Summary				
Average Delay	3.6			
Intersection Capacity Utilization	50.6%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (vph)	38	308	122	14	247	11	64	35	6	3	24	23
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			0%			2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.965			0.994			0.992			0.938	
Flt Protected		0.996			0.997			0.971			0.997	
Satd. Flow (prot)	0	1667	0	0	1696	0	0	1669	0	0	1620	0
Flt Permitted		0.996			0.997			0.971			0.997	
Satd. Flow (perm)	0	1667	0	0	1696	0	0	1669	0	0	1620	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		643			960			563			720	
Travel Time (s)		17.5			26.2			15.4			19.6	
Confl. Peds. (#/hr)	3		14	14		3	6		3	3		6
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	3%	1%	0%	8%	2%	0%	0%	3%	0%	0%	0%	0%
Adj. Flow (vph)	48	385	153	18	309	14	80	44	8	4	30	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	585	0	0	341	0	0	132	0	0	63	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	38	308	122	14	247	11	64	35	6	3	24	23
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			2%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	48	385	152	18	309	14	80	44	8	4	30	29
Pedestrians		6			3			14			3	
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		1			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	326			552			971	931	478	942	1000	325
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	326			552			971	931	478	942	1000	325
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			98			58	82	99	98	87	96
cM capacity (veh/h)	1225			977			189	247	583	197	228	716

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	585	340	131	62
Volume Left	48	18	80	4
Volume Right	152	14	8	29
cSH	1225	977	214	327
Volume to Capacity	0.04	0.02	0.61	0.19
Queue Length 95th (ft)	3	1	89	17
Control Delay (s)	1.1	0.6	45.4	18.6
Lane LOS	A	A	E	C
Approach Delay (s)	1.1	0.6	45.4	18.6
Approach LOS			E	C

Intersection Summary			
Average Delay	7.1		
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	177	36	19	159	73	55	111	54	68	59	13
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.980			0.961			0.967			0.988	
Flt Protected		0.994			0.996			0.988			0.976	
Satd. Flow (prot)	0	1677	0	0	1664	0	0	1639	0	0	1673	0
Flt Permitted		0.994			0.996			0.988			0.976	
Satd. Flow (perm)	0	1677	0	0	1664	0	0	1639	0	0	1673	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		3269			1699			1136			924	
Travel Time (s)		89.2			46.3			31.0			25.2	
Confl. Peds. (#/hr)	1		15	15		1	9		3	3		9
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
Heavy Vehicles (%)	7%	1%	0%	0%	1%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	35	195	40	21	175	80	60	122	59	75	65	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	270	0	0	276	0	0	241	0	0	154	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	32	177	36	19	159	73	55	111	54	68	59	13
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)	35	195	40	21	175	80	60	122	59	75	65	14

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	269	276	242	154
Volume Left (vph)	35	21	60	75
Volume Right (vph)	40	80	59	14
Hadj (s)	-0.03	-0.15	-0.06	0.06
Departure Headway (s)	5.5	5.4	5.6	5.9
Degree Utilization, x	0.41	0.41	0.38	0.25
Capacity (veh/h)	604	618	578	534
Control Delay (s)	12.3	12.1	12.1	10.9
Approach Delay (s)	12.3	12.1	12.1	10.9
Approach LOS	B	B	B	B

Intersection Summary			
Delay	12.0		
HCM Level of Service	B		
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	87	13	22	65	96	12	148	25	87	71	12
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		0	0		25	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987				0.850		0.981			0.990	
Flt Protected		0.987			0.988			0.997			0.975	
Satd. Flow (prot)	0	1683	0	0	1729	1473	0	1712	0	0	1675	0
Flt Permitted		0.987			0.988			0.997			0.975	
Satd. Flow (perm)	0	1683	0	0	1729	1473	0	1712	0	0	1675	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		679			2026			1723			3269	
Travel Time (s)		18.5			55.3			47.0			89.2	
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
Heavy Vehicles (%)	0%	2%	0%	0%	0%	1%	0%	0%	0%	0%	2%	0%
Adj. Flow (vph)	38	93	14	23	69	102	13	157	27	93	76	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	145	0	0	92	102	0	197	0	0	182	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			↰	↱		✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	36	87	13	22	65	96	12	148	25	87	71	12
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)	38	93	14	23	69	102	13	157	27	93	76	13

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	145	93	102	197	181
Volume Left (vph)	38	23	0	13	93
Volume Right (vph)	14	0	102	27	13
Hadj (s)	0.02	0.13	-0.68	-0.07	0.07
Departure Headway (s)	5.3	5.8	5.0	5.0	5.1
Degree Utilization, x	0.21	0.15	0.14	0.27	0.26
Capacity (veh/h)	623	576	666	675	650
Control Delay (s)	9.7	8.6	7.6	9.8	9.9
Approach Delay (s)	9.7	8.1		9.8	9.9
Approach LOS	A	A		A	A

Intersection Summary			
Delay	9.3		
HCM Level of Service	A		
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	66	92	195	65	46	42
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Grade (%)		0%	0%		2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.966		0.936	
Flt Protected		0.980			0.974	
Satd. Flow (prot)	0	1670	1682	0	1579	0
Flt Permitted		0.980			0.974	
Satd. Flow (perm)	0	1670	1682	0	1579	0
Link Speed (mph)		30	30		35	
Link Distance (ft)		819	1665		1723	
Travel Time (s)		18.6	37.8		33.6	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	5%	1%	0%	2%	0%	0%
Adj. Flow (vph)	74	103	219	73	52	47
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	177	292	0	99	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	66	92	195	65	46	42
Sign Control		Free	Free		Stop	
Grade		0%	0%		2%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	74	103	219	73	52	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	292				507	256
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	292				507	256
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				90	94
cM capacity (veh/h)	1253				497	788

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	178	292	99
Volume Left	74	0	52
Volume Right	0	73	47
cSH	1253	1700	603
Volume to Capacity	0.06	0.17	0.16
Queue Length 95th (ft)	5	0	15
Control Delay (s)	3.7	0.0	12.1
Lane LOS	A		B
Approach Delay (s)	3.7	0.0	12.1
Approach LOS			B

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E
Queuing Analysis Worksheets

Lane Group	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	3	3	1	1	1	1	1	1
v/c Ratio	0.02	0.02	0.01	0.00	0.00	0.01	0.00	0.00
Control Delay	23.0	23.0	25.0	3.0	2.0	25.0	3.0	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.0	23.0	25.0	3.0	2.0	25.0	3.0	2.0
Queue Length 50th (ft)	1	1	0	0	0	0	0	0
Queue Length 95th (ft)	8	8	5	1	1	5	1	1
Internal Link Dist (ft)	145	99		1545			919	
Turn Bay Length (ft)			110		300	110		110
Base Capacity (vph)	945	945	580	3120	1357	564	3120	1396
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Intersection Summary

Lane Group	WBL	WBR	NBT	SBT
Lane Group Flow (vph)	1	1	2	2
v/c Ratio	0.00	0.01	0.00	0.00
Control Delay	27.0	22.0	0.0	1.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	27.0	22.0	0.0	1.0
Queue Length 50th (ft)	0	0	0	0
Queue Length 95th (ft)	2	4	0	1
Internal Link Dist (ft)	269		518	1323
Turn Bay Length (ft)				
Base Capacity (vph)	2187	1008	3020	3022
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.00	0.00	0.00	0.00

Intersection Summary

Lane Group	EBT	EBR	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	2	1	3	1	1	1	1	1	1
v/c Ratio	0.00	0.00	no cap	0.01	0.00	0.00	0.00	0.00	0.00
Control Delay	16.0	13.0		26.0	16.0	13.0	16.0	9.0	7.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.0	13.0	Error	26.0	16.0	13.0	16.0	9.0	7.0
Queue Length 50th (ft)	0	0	0	0	0	0	0	0	0
Queue Length 95th (ft)	2	3	0	5	1	3	4	1	2
Internal Link Dist (ft)	1619		1245		1582			518	
Turn Bay Length (ft)		80		120		430	120		155
Base Capacity (vph)	813	398	1	114	912	398	443	1596	715
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.00	3.00	0.01	0.00	0.00	0.00	0.00	0.00

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1	2	1	2	1	1	1	1	1	1
v/c Ratio	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Control Delay	22.0	19.0	22.0	19.0	22.0	5.0	5.0	22.0	5.0	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	19.0	22.0	19.0	22.0	5.0	5.0	22.0	5.0	5.0
Queue Length 50th (ft)	0	0	0	0	0	0	0	0	0	0
Queue Length 95th (ft)	4	6	4	6	4	1	2	4	1	2
Internal Link Dist (ft)		1310		1243		3787			889	
Turn Bay Length (ft)	130		215		130		310	130		140
Base Capacity (vph)	202	630	202	630	207	3013	1310	202	3013	1348
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Intersection Summary

Appendix F

ODOT SPIS List for
Columbia County, 2008

COLUMBIA COUNTY 5-15% SPIS LOCATIONS 2008

Map	Highway Crashes	Milepoint SPIS #	ADT Rank	Problem Location Solution (Based on 2005-2007 data)
1	NEHALEM 3	57.04 37.9	1,400 15% Site	OR-47 at Scappoose Vernonia Rd. Just north of Vernonia on a 2-lane rural highway with no shoulders. Low volume, high speed area - curve is signed at 40 mph. (2005-2007) Total 3 crashes, 1 Inj A NEW With only 3 crashes in 3 years, we would try Chevrons first near the curve. ($15,000)
2	LOWER COLUMBIA RIVER 11	27.78 59.1	23,000 5% Site	Sykes Road (signal) / On US-30 / A signalized T-intersection in a small suburban high growth area, with a number of accesses nearby. This is a reduced speed zone. (2003-2007) 21 crashes, peak year 2004, NEW Access management, install traffic separator, median islands ($1,250,000)
3	LOWER COLUMBIA RIVER 24	27.62 44.3	24,100 10% Site	Gable Road (signal) / 4 lane urban hwy, signalized intersection, bike lane, shopping center, 35 MPH NEW Install a double left from US-30 south to Gable west. Align lanes, upgrade intersection with raised medians ($5,400,000)
4	LOWER COLUMBIA RIVER 12	25.71 67.3	23,900 5% Site	Bennett Road at US-30 / 5 lane rural highway with a right turn eastbound and railroad to the east. Moving east there is a speed zone change. (2003-2007) 19 crashes, peak year 2006 & 2007, NEW Close Bennett Rd connection to Old Portland Rd. Move Old Portland Rd access to Achilles Rd or to Bayport Marina Lane (further separating the intersections) ($5,500,000)
5	LOWER COLUMBIA RIVER 3	25.43 41.7	23,900 15% Site	Church Rd / 4 lane rural highway intersecting angled road in town of Warren; left and right turn lanes provided (2005-2007) Total 3 crashes, 2 Inj A A recent preservation project (Key 11938, 2004, $2.5 million) improved the roadway with new grading, paving, delineation, signs and safety improvements. ($2,547000)
6	LOWER COLUMBIA RIVER 15	21.18 51.5	25,700 10% Site	Scappoose Vernonia Rd & Crown Z Rd (signal) / 4 lane rural hwy signalized, increases from 35MPH to 55MPH, misaligned. (2003-2007) 22 crashes, peak year 2005, 1 fatal (fixed, 2007, curb, overturned), NEW Realign the west approach properly (must replace the small bridge to the west) ($3,200,000)
7	LOWER COLUMBIA RIVER 13	20.44 47.0	25,000 10% Site	SW Em Watts Rd (signal) / 4 lane urban hwy, signal, bike lanes, 35MPH, school located at corner of intersection. NEW Upgrade delineation and signing; minor access management at Chinook Plaza. ($34,000)

ADT	Average Daily Traffic
SPIS #	100.0 would be the "worst" possible location for crashes and injuries
Rank	How the site compares with other sites state wide
5%	This location is in the top 5% ("worst") locations state wide.

Appendix G
Critical Crash Rate Tables

INTERSECTION CRASH RATES CALCULATOR

INT	Peak Hour	Daily Vol.	3-Year TEV	3-Year MEV	Crash Total	Crash/Year	ntersection Typ	Crash Rate	Critical Rate	Over Critical
US 30/Dear Island	1,692	16920	18527400	18.5	2	0.7	1	0.11	0.44	0
US 30/Pittsburg	1.448	14480	15855600	15.9	1	0.3	3	0.06	0.25	0
US 30/Wyeth	1,643	16430	17990850	18.0	4	1.3	3	0.22	0.24	0
US 30/St Helens	2,155	21550	23597250	23.6	3	1.0	1	0.13	0.42	0
US 30/Columbia	2,490	24900	27265500	27.3	4	1.3	1	0.15	0.41	0
US 30/Vernonia	2,048	20480	22425600	22.4	3	1.0	3	0.13	0.22	0
US 30/Gable	2,835	28350	31043250	31.0	19	6.3	1	0.61	0.40	1
US 30/Milliard	2,280	22800	24966000	25.0	0	0.0	3	0.00	0.22	0
Deer Island/West	330	3300	3613500	3.6	0	0.0	3	0.00	0.39	0
6th/West	365	3650	3996750	4.0	1	0.3	2	0.25	0.69	0
6th/Columbia	623	6230	6821850	6.8	1	0.3	3	0.15	0.32	0
12th/Columbia	828	8280	9066600	9.1	1	0.3	3	0.11	0.29	0
Vernonia/Columbia	794	7940	8694300	8.7	1	0.3	2	0.12	0.56	0
Columbia/Sykes	624	6240	6832800	6.8	3	1.0	2	0.44	0.59	0
Columbia/Gable	469	4690	5135550	5.1	1	0.3	3	0.19	0.35	0

NOTES:
Anything that is not colored is an entered value (from data/research). Colored cells have formulas to perform calculations.
Calculations:

Daily Volumes: Peak Hour x 1.10
3-Year TEV: Daily Volume x 365 x 3
3-Year MEV: 3-Year Volume x 1,000,000
Crash/Year: Crash Total / 3
Crash Rate: Crash Total / 3-Year MEV
Critical Rate: Average Crash Rate Per Intersection Type x (1.645 x (Average Crash Rate Per Intersection Type x 1,000,000 / 3-Year TEV)^.05) + (1 / 2 x 3-Year TEV)

Signalized	1	0.25
Four-way stop	2	0.27
Two-way stop	3	0.11

SEG	Peak Hour	Daily Vol.	Yearly Volume	Begin MP	End MP	Length	VMT	MVMT	Crash Total	Crash/Year	Avg. Crash Rate
US 30 (S of Gable	1760	17600	6424000	25.83	27.60	1.77	11370480.00	11.37	17	5.67	0.50
US 30 (Gable to St He	1556	15560	5679400	27.67	28.67	1.00	5679400.00	5.68	55	18.33	3.23
US 30 (N of St Helens	1321	13205	4819825	28.94	29.40	0.46	2217119.50	2.22	7	2.33	1.05

Average Volume For Segments

1		2		3	
Milliard	2020	Gable	1500	St Helens	1485
Gable	1500	Vernonia	1719	Wyeth	1306
		Columbia	1520	Pittsburg	1161
		St Helens	1485	Dear Island	1330
AVG	**1760**	**AVG**	**1556**	**AVG**	**1321**

NOTES:
Anything that is not colored is an entered value (from data/research). Colored cells have formulas to perform calculations.
Calculations:

Daily Volumes: Peak Hour x 1.10
Yearly Volumes Daily Volume x 365
Length: End MP - Begin MP
VMT: Yearly Volumes x Length
MVMT: VMT / 1,000,000
Crash/Year: Crash Total / 3
Avg. Crash Rate Crash /Year / MVMT

Appendix H
Crash Data

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

US 30 (Hwy 092) @ Gable Road
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2008														
NON-COLLISION	0	0	1	1	0	0	0	1	0	1	0	1	0	0
TURNING MOVEMENTS	0	0	4	4	0	0	2	2	2	4	0	4	0	0
2008 TOTAL	0	0	5	5	0	0	2	3	2	5	0	5	0	0
YEAR: 2007														
ANGLE	0	2	2	4	0	5	0	2	2	2	2	4	0	0
REAR-END	0	0	1	1	0	0	0	1	0	1	0	1	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	1	0	1	0	0
2007 TOTAL	0	2	4	6	0	5	0	3	3	4	2	6	0	0
YEAR: 2006														
REAR-END	0	4	1	5	0	4	1	4	1	3	2	5	0	0
TURNING MOVEMENTS	0	1	2	3	0	1	0	1	2	1	2	3	0	0
2006 TOTAL	0	5	3	8	0	5	1	5	3	4	4	8	0	0
FINAL TOTAL	0	7	12	19	0	10	3	11	8	13	6	19	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

092 LOWER COLUMBIA RIVER

US 30 (Hwy 092) @ Gable Road
January 1, 2006 through December 31, 2008

SER# / INVEST	S P E E A L D U C C S G H S L R W O K	DATE / DAY / TIME	COUNTY / CITY / URBAN AREA	RD# FC / COMPNT / MLG TYP / MILEPNT	CONN # / FIRST STREET / SECOND STREET	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL / TRAF- CNTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE TRLR QTY / OWNER / VEH TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00248	N N N	08/19/2006	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											27
NONE		Sat	ST. HELENS	0 0	LOWER COL RIVER HY	N		TRF SIGNAL	N	DRY	REAR		PRVTE	NE SW									000		00
		3P	ST HELEN UA	27.69	GABLE RD	06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	39	M	OR-Y		016,026	088		27
																				OR<25					
												02	NONE 0	STOP											
													PRVTE	NE SW									012		00
													PSNGR CAR		01	DRVR	INJC	85	M	OR-Y		000	000		00
																				OR<25					
00189	Y Y N	06/26/2006	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	S-STRGHT	01	NONE 0	STRGHT											10,01
CITY		Mon	ST. HELENS	0 0	LOWER COL RIVER HY	SW		TRF SIGNAL	N	DRY	REAR		PRVTE	SW NE									000		00
		11P	ST HELEN UA	27.69	GABLE RD	06	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	52	M	OR-Y		047,042	088		10,01
																				OR<25					
												02	NONE 0	STRGHT											
													PRVTE	SW NE									006		00
													PSNGR CAR		01	DRVR	INJC	40	F	OR-Y		000	000		00
																				OR<25					
00404	N N N	12/07/2006	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NO RPT		Thu	ST. HELENS	0 0	LOWER COL RIVER HY	SW		TRF SIGNAL	N	DRY	REAR		PRVTE	SW NE									000		00
		8A	ST HELEN UA	27.69	GABLE RD	06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	29	F	OR-Y		026	000		07
																				OR<25					
												02	NONE 0	STOP											
													PRVTE	SW NE									011		00
													PSNGR CAR		01	DRVR	INJC	17	M	OR-Y		000	000		00
																				OR<25					
00133	N N N	04/05/2007	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											27
NO RPT		Thu	ST. HELENS	0 0	LOWER COL RIVER HY	SW		TRF SIGNAL	N	DRY	REAR		PRVTE	SW NE									000		00
		10A	ST HELEN UA	27.69	GABLE RD	06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	31	F	OR-Y		016,026	038		27
																				OR<25					
												02	NONE 0	STOP											
													PRVTE	SW NE									011		00
													PSNGR CAR		01	DRVR	NONE	56	F	OR-Y		000	000		00
																				OR<25					
00158	N N N	04/24/2008	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	NON-COLL	01	NONE 0	STRGHT										025	10
NO RPT		Thu	ST. HELENS	0 0	LOWER COL RIVER HY	SW		TRF SIGNAL	N	DRY	NCCL		PRVTE	SW NE									000	025	00
		7A	ST HELEN UA	27.69	GABLE RD	06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	16	M	OR-Y		017	000		10
																				OR<25					
00024	Y N N	01/16/2007	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-R											08,01
NONE		Tue	ST. HELENS	0 0	LOWER COL RIVER HY	NW		TRF SIGNAL	N	ICE	TURN		UNKN	NE NW									088		00
		3P	ST HELEN UA	27.69	GABLE RD	06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	M	UNK		001,047,080	000		08,01
																				UNK					
												02	NONE 0	STOP											
													PRVTE	NW SE									012		00
													PSNGR CAR		01	DRVR	NONE	33	F	OR-Y		000	000		00
																				OR<25					

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

092 LOWER COLUMBIA RIVER

US 30 (Hwy 092) @ Gable Road
January 1, 2006 through December 31, 2008

SER# INVEST	S D P R S W E A U C O E L G H R D C S L K	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# FC COMPNT MLG TYP MILEPNT	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00040	N N N	01/28/2006	COLUMBIA	1 14		INTER	CROSS	N	N	CLD	O-1TURN	01	NONE 0	STRGHT											04,02
CITY		Sat	ST. HELENS	0 0	LOWER COL RIVER HY	CN		L-GRN-SIG	N	WET	TURN		PRVTE	NE SW									000		00
		3P	ST HELEN UA	27.69	GABLE RD	01	0		N	DAY	PDC		PSNGR CAR		01	DRVR	NONE	65	M	OR-Y		000	000		00
																				OR<25					
												02	NONE 0	TURN-L											
													PRVTE	SW NW									000		00
													PSNGR CAR		01	DRVR	NONE	51	F	OR-Y		020,004,028	088		04,02
																				OR<25					
00308	N N N	09/16/2006	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	O-1TURN	01	NONE 0	STRGHT											27,04,02
CITY		Sat	ST. HELENS	0 0	LOWER COL RIVER HY	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	NE SW									000		00
		8P	ST HELEN UA	27.69	GABLE RD	01	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	25	M	OR-Y		020,028,016	038		27,04,02
																				OR<25					
															02	PSNG	INJC	17	F			000	000		00
												02	NONE 0	TURN-L											
													PRVTE	SW NW									000		00
													PSNGR CAR		01	DRVR	NONE	75	M	OR-Y		000	000		00
																				OR<25					
00226	N N N	06/29/2007	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										082	02
NO RPT		Fri	ST. HELENS	0 0	LOWER COL RIVER HY	CN		TRF SIGNAL	N	DRY	ANGL		PRVTE	NE SW									000		00
		6P	ST HELEN UA	27.69	GABLE RD	01	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	21	F	OR-Y		028	000	082	02
																				OR<25					
												02	POLCE 0	STRGHT											
													PUBLC	SE NW									088		00
													PSNGR CAR		01	DRVR	NONE	44	M	OR-Y		000	000		00
																				OR<25					
00416	N N N	11/10/2008	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	O-1TURN	01	NONE 0	STRGHT											04
NO RPT		Mon	ST. HELENS	0 0	LOWER COL RIVER HY	CN		THR-GN-SIG	N	DRY	TURN		PRVTE	NE SW									000		00
		3P	ST HELEN UA	27.69	GABLE RD	01	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	21	F	OR-Y		000	000		00
																				OR<25					
												02	NONE 0	TURN-L											
													PRVTE	SW NW									088		00
													PSNGR CAR		01	DRVR	NONE	50	F	OR-Y		004,020	000		04
																				OR<25					
00485	N N N	12/29/2007	COLUMBIA	1 14		INTER	CROSS	N	N	RAIN	ANGL-OTH	01	NONE 0	STRGHT											04
NO RPT		Sat	ST. HELENS	0 0	LOWER COL RIVER HY	CN		TRF SIGNAL	N	WET	ANGL		PRVTE	SW NE									000		00
		3P	ST HELEN UA	27.69	GABLE RD	02	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	36	M	OR-Y		020	000		04
																				OR<25					
												02	NONE 0	STRGHT											
													PRVTE	SE NW									000		00
													PSNGR CAR		01	DRVR	NONE	68	M	OR-Y		000	000		00
																				N-RES					
															02	PSNG	INJB	00	F			000	000		00

092 LOWER COLUMBIA RIVER

US 30 (Hwy 092) @ Gable Rcad
January 1, 2006 through December 31, 2008

SER# / INVEST	SPEED / ALC / DRUGS / SCHL / WORK	DATE / DAY / TIME	COUNTY / CITY / URBAN AREA	RD# FC / COMPNT / MLG TYP / MILEPNT	CONN # / FIRST STREET / SECOND STREET	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL / TRAF- / CNTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / VEH TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00118	N N N	03/14/2008	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	S-CTHER	01	NONE 0	TURN-R											08,02
NO RPT		Fri	ST. HELENS	0 0	LOWER COL RIVER HY	CN		TRF SIGNAL	N	WET	TURN		UNKN	SE NE									000		00
		10A	ST HELEN UA	27.69	GABLE RD	02	0		N	DAY	PDC		UNKNOWN		01	DRVR	NONE	00	U	UNK		006,028	000		08,02
																				UNK					
												02	NONE 0	TURN-R											
													PRVTE	SE NE									000		00
													PSNGR CAR		01	DRVR	NONE	82	M	OR-Y		000	000		00
																				OR<25					
00455	N N N	12/30/2006	COLUMBIA	1 14		INTER	CROSS	N	N	CLD	S-OTHER	01	NONE 0	STRGHT										004	07
NONE		Sat	ST. HELENS	0 0	LOWER COL RIVER HY	CN		TRF SIGNAL	N	WET	TURN		PRVTE	NW SE									000		00
		5P	ST HELEN UA	27.69	GABLE RD	03	0		N	DLIT	PDC		PSNGR CAR		01	DRVR	NONE	00	M	OR-Y		026	000		07
																				OR<25					
												02	NONE 0	TURN-R											
													PRVTE	NW SW									013	004	00
													PSNGR CAR		01	DRVR	NONE	44	F	OR-Y		000	000		00
																				OR<25					
00411	N N N	10/29/2007	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											04,10
CITY		Mon	ST. HELENS	0 0	LOWER COL RIVER HY	CN		TRF SIGNAL	N	DRY	ANGL		PUBLC	NW SE									000		00
		8P	ST HELEN UA	27.69	GABLE RD	03	0		N	DARK	PDO		PSNGR CAR		01	DRVR	NONE	60	M	OR-Y		020	000		04
																				OR<25					
												02	NONE 0	STRGHT											
													PRVTE	NE SW									000		00
													PSNGR CAR		01	DRVR	NONE	49	M	OR-Y		023	000		10
																				OR<25					
												03	NONE 0	STOP											
													PRVTE	SW NE									011		00
													PSNGR CAR		01	DRVR	NONE	18	F	OR-Y		000	000		00
																				OR<25					
00207	N N N	06/12/2008	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	S-OTHER	01	LOG 1	TURN-R											08,02
NO RPT		Thu	ST. HELENS	0 0	LOWER COL RIVER HY	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	NW SW									000		00
		2P	ST HELEN UA	27.69	GABLE RD	03	0		N	DAY	PDO		SEMI TOW		01	DRVR	NONE	52	M	OR-Y		000	000		00
																				OR>25					
												02	NONE 0	TURN-R											
													PRVTE	NW SW									031		00
													PSNGR CAR		01	DRVR	NONE	67	F	OR-Y		031,044,028	000		08,02
																				OR<25					
00390	N Y N N N	10/12/2007	COLUMBIA	1 14		INTER	CROSS	N	N	RAIN	ANGL-OTH	01	NONE 0	STRGHT											04
CITY		Fri	ST. HELENS	0 0	LOWER COL RIVER HY	CN		TRF SIGNAL	N	WET	ANGL		PRVTE	SW NE									000		00
		9P	ST HELEN UA	27.69	GABLE RD	04	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	INJB	39	F	OR-Y		000	000		00
																				OR<25					
															02	PSNG	INJB	36	M			000	000		00

092 LOWER COLUMBIA RIVER

US 30 (Hwy 092) @ Gable Rcad
January 1, 2006 through December 31, 2008

SER# INVEST	S D P R S W E A U C O E L G H R D C S L K	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# FC COMPNT MLG TYP MILEPNT	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACTN EVENT	CAUSE
												02	NONE 0	STRGHT										
													PRVTE	NW SE									000	00
													PSNGR CAR		01	DRVR	NONE	20	F	OR-Y		020	000	04
																				OR<25				
															02	PSNG	INJC	16	F			000	000	00
															03	PSNG	INJC	16	F			000	000	00
00480	N N N	12/27/2008	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	S-1TURN	01	NONE 0	TURN-R										08,02
NONE		Sat	ST. HELENS	0 0	LOWER COL RIVER HY	CN		TRF SIGNAL	N	SNO	TURN		PRVTE	SW SE									000	00
		9A	ST HELEN UA	27.69	GABLE RD	04	0		N	DAY	PDC		TRUCK		01	DRVR	NONE	00	M	OTH-Y		006,028	000	08,02
																				UNK				
												02	NONE 0	STRGHT										
													PRVTE	SW NE									000	00
													PSNGR CAR		01	DRVR	NONE	51	M	OR-Y		000	000	00
																				OR<25				

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF ST. HELENS, COLUMBIA COUNTY

US 30 (Hwy 092) @ Gable Road
January 1, 2006 through December 31, 2008

SER# / INVEST	S P E E	A L C	D R U G	S C H L	W O R K	DATE / DAY / TIME	CLASS / DIST / FROM	CITY STREET / FIRST STREET / SECOND STREET	RD CHAR / DIRECT / LOCTN	INT-TYP / (MEDIAN) LEGS / (#LANES)	INT-REL / TRAF- CCNTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / VEH TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS / RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00371	N	N	N			11/03/2006	17	LOWER COL RIVER HY	INTER	CROSS	N	N	RAIN	S-1STOP	01	NONE 0	STRGHT										124,092	07
CITY						Fri	0	GABLE RD	SE		TRF SIGNAL	N	WET	REAR		PRVTE	SE NW									000	124	00
						5P			06	0		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	18	M	OR-Y		043,026	000		07
																							OR<25					
															02	NONE 0	STOP											
																PRVTE	SE SW									013	092	00
																PSNGR CAR		01	DRVR	NONE	54	F	OR-Y		000	000		00
																							OR<25					
00451	N	N	N			12/27/2006	17	LOWER COL RIVER HY	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NONE						Wed	0	GABLE RD	SE		TRF SIGNAL	N	DRY	REAR		PRVTE	SE NW									000		00
						1P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	51	F	OR-Y		026	000		07
																							OR<25					
															02	NONE 9	STOP											
																UNKN	SE NW									011		00
																SEMI TOW		01	DRVR	NONE	00	U	UNK		000	000		00
																							UNK					

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

US 30 (Hwy 092) @ Millard Road
January 1, 2006 through December 31, 2008

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

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

US 30 (Hwy 092) @ Pittsburg Road
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2006														
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	0	1	1	0	0
2006 TOTAL	0	0	1	1	0	0	0	0	1	0	1	1	0	0
FINAL TOTAL	0	0	1	1	0	0	0	0	1	0	1	1	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF ST. HELENS, COLUMBIA COUNTY

US 30 (Hwy 092) @ Pittsburg Road
January 1, 2006 through December 31, 2008

SER# INVEST	SPEE	ALC	DRUG	SCHL	WORK	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CCNTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00398	Y	N	N			11/27/2006	16	LOWER COL RIVER HY	INTER	CROSS	N	N	UNK	ANGL-OTH	01	NONE 0	TURN-R										124	01
NO RPT						Mon	0	PITTSBURG RD	SW		STOP SIGN	N	ICE	TURN		PRVTE	NW SW									022	124	00
						7A			06	0		N	DAWN	PDO		PSNGR CAR		01	DRVR	NONE	32	M	OTH-Y		047,080	017		01
																							OR<25					
															02	NONE 0	STOP											
																PRVTE	SW NE									011		00
																PSNGR CAR		01	DRVR	NONE	38	F	OR-Y		000	000		00
																							OR<25					
															03	NONE 0	TURN-R											
																PRVTE	NW SW									000	124	00
																PSNGR CAR		01	DRVR	NONE	37	F	OR-Y		047	000		01
																							OR<25					
																		02	PSNG	NO<5	01	M			000	000		00
																		03	PSNG	NO<5	02	M			000	000		00

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

US 30 (Hwy 092) @ St. Helens Street
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2007														
TURNING MOVEMENTS	0	0	2	2	0	0	0	2	0	2	0	2	0	0
2007 TOTAL	0	0	2	2	0	0	0	2	0	2	0	2	0	0
YEAR: 2006														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2006 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	0	3	3	0	0	0	3	0	3	0	3	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CONTINUOUS SYSTEM CRASH LISTING

092 LOWER COLUMBIA RIVER

US 30 (Hwy 092) @ St. Helens Street

January 1, 2006 through December 31, 2008

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

00297  N N N      08/10/2007  COLUMBIA           1   14                        INTER     3-LEG   N            N CLR  ANGL-OTH  01 NONE    0 STRGHT                                                    02
NO RPT            Fri         ST. HELENS          0 0    LOWER COL RIVER HY    CN                UNKNOWN      N DRY  TURN         PRVTE      SW NE                                          000          00
                  4P          ST HELEN UA       28.67    ST HELENS ST          02          0                  N DAY  PDO         PSNGR CAR           01 DRVR NONE  16 M OR-Y      000        000          00
                                                                                                                                                                    OR<25

                                                                                                                                 02 NONE    0 TURN-L
                                                                                                                                    PRVTE      SE SW                                          000          00
                                                                                                                                   PSNGR CAR           01 DRVR NONE  72 F OR-Y      028        000          02
                                                                                                                                                                    OR<25

00348  N N N      10/26/2006  COLUMBIA           1   14                        INTER     3-LEG   N            N CLR  ANGL-OTH  01 NONE    0 STRGHT                                                    02
NO RPT            Thu         ST. HELENS          0 0    LOWER COL RIVER HY    CN                TRF SIGNAL   N DRY  TURN         PRVTE      NE SW                                          000          00
                  4P          ST HELEN UA       28.67    ST HELENS ST          03          0                  N DAY  PDO         PSNGR CAR           01 DRVR NONE  00 M OR-Y      020,028    088          02
                                                                                                                                                                    OR>25

                                                                                                                                 02 NONE    0 TURN-L
                                                                                                                                    PRVTE      E  SW                                          088          00
                                                                                                                                   PSNGR CAR           01 DRVR NONE  59 F OR-Y      000        000          00
                                                                                                                                                                    OR<25

00113  N N N      03/29/2007  COLUMBIA           1   14                        INTER     3-LEG   N            N CLR  ANGL-OTH  01 NONE    0 STRGHT                                                    04,02
NO RPT            Thu         ST. HELENS          0 0    LOWER COL RIVER HY    CN                TRF SIGNAL   N DRY  TURN         PRVTE      SW NE                                          000          00
                  3P          ST HELEN UA       28.67    ST HELENS ST          04          0                  N DAY  PDO         PSNGR CAR           01 DRVR NONE  44 F OR-Y      020,028    000          04,02
                                                                                                                                                                    OR<25

                                                                                                                                 02 NONE    0 TURN-L
                                                                                                                                    PRVTE      SE SW                                          088          00
                                                                                                                                   PSNGR CAR           01 DRVR NONE  59 F OR-Y      000        000          00
                                                                                                                                                                    OR<25
```

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

US 30 (Hwy 092) @ Vernonia Road
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2007														
TURNING MOVEMENTS	0	1	0	1	0	1	0	0	1	1	0	1	0	0
2007 TOTAL	0	1	0	1	0	1	0	0	1	1	0	1	0	0
YEAR: 2006														
REAR-END	0	1	0	1	0	1	0	1	0	1	0	1	0	0
TURNING MOVEMENTS	0	1	0	1	0	2	0	1	0	1	0	1	0	0
2006 TOTAL	0	2	0	2	0	3	0	2	0	2	0	2	0	0
FINAL TOTAL	0	3	0	3	0	4	0	2	1	3	0	3	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

092 LOWER COLUMBIA RIVER

US 30 (Hwy 092) @ Vernonia Road
January 1, 2006 through December 31, 2008

SER# INVEST	S P E E D	A L C	D R U G S	R S C H L	W O R K	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# FC COMPNT MLG TYP MILEPNT	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00274 NO RPT	N	N	N			08/23/2006 Wed 3P	COLUMBIA ST. HELENS ST HELEN UA	1 14 0 0 28.25	 LOWER COL RIVER HY VERNONIA RD	INTER CN 04	3-LEG 0	N STOP SIGN	N N N	CLR DRY DAY	ANGL-OTH TURN INJ	01	NONE 0 PRVTE PSNGR CAR	TURN-L NW NE	01	DRVR	INJC	75	M	OR-Y OR<25		028	 015 000		02 00 02
																02	NONE 0 PRVTE PSNGR CAR	TURN-L SW NW	01	DRVR	INJB	44	M	OR-Y OR<25		000	 000 000		 00 00
00461 NO RPT	N	N	N			12/15/2007 Sat 8A	COLUMBIA ST. HELENS ST HELEN UA	1 14 0 0 28.25	 LOWER COL RIVER HY VERNONIA RD	INTER CN 04	3-LEG 0	N STOP SIGN	N N N	FOG WET DAY	ANGL-OTH TURN INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT SW NE	01	DRVR	INJC	20	M	OR-Y OR<25		000	 000 000		02 00 00
																02	NONE 0 PRVTE PSNGR CAR	TURN-R SE NE	01	DRVR	NONE	27	M	OR-Y OR<25		028	 015 000		 00 02

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF ST. HELENS, COLUMBIA COUNTY

US 30 (Hwy 092) @ Vernonia Road
January 1, 2006 through December 31, 2008

SER# INVEST	SPEE	ALC	DRUG	SCHL	WORK	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CCNTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00048	N	N	N			02/21/2006	17	LOWER COL RIVER HY	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NO RPT						Tue	0	VERNONIA RD	NW		STOP SIGN	N	DRY	REAR		PRVTE	NW SE									000		00
						9A			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	20	F	OR-Y		026	088		07
																							OR<25					
															02	NONE 0	STOP											
																PRVTE	NW SE									011		00
																PSNGR CAR		01	DRVR	INJC	26	F	OR-Y		000	000		00
																							OR<25					

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

US 30 (Hwy 092) @ Wyeth Street

January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2008														
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	0	1	1	0	0
2008 TOTAL	0	0	1	1	0	0	0	0	1	0	1	1	0	0
YEAR: 2007														
TURNING MOVEMENTS	0	0	2	2	0	0	0	1	1	2	0	2	0	0
2007 TOTAL	0	0	2	2	0	0	0	1	1	2	0	2	0	0
YEAR: 2006														
ANGLE	0	1	0	1	0	1	0	1	0	1	0	1	0	0
2006 TOTAL	0	1	0	1	0	1	0	1	0	1	0	1	0	0
FINAL TOTAL	0	1	3	4	0	1	0	2	2	3	1	4	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

092 LOWER COLUMBIA RIVER

US 30 (Hwy 092) @ Wyeth Street
January 1, 2006 through December 31, 2008

SER# / INVEST	S P E E D / A L C / D R U G S / R S C H L / W O R K	DATE / DAY / TIME	COUNTY / CITY / URBAN AREA	RD# FC / COMPNT / MLG TYP / MILEPNT	CONN # / FIRST STREET / SECOND STREET	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL / TRAF- CNTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / VEH TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN EVENT	CAUSE
00437	N N N	12/17/2006	COLUMBIA	1 14		INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										02
NO RPT		Sun	ST. HELENS	0 0	LOWER COL RIVER HY	CN		STOP SIGN	N	DRY	ANGL		PRVTE	NE SW									000	00
		2P	ST HELEN UA	28.94	WYETH ST	03	0		Y	DAY	INJ		PSNGR CAR		01	DRVR	INJC	49	M	OR-Y		000	000	00
																				OR<25				
												02	NONE 0	STRGHT										
													PRVTE	NW SE									018	00
													PSNGR CAR		01	DRVR	NONE	31	M	OR-Y		028	000	02
																				OR<25				
00467	N N N N N	12/31/2008	COLUMBIA	1 14		INTER	CROSS	N	N	CLD	O-1TURN	01	NONE 0	TURN-L										02
CITY		Wed	ST. HELENS	0 0	LOWER COL RIVER HY	CN		STOP SIGN	N	WET	TURN		PRVTE	W NE									015	00
		3P	ST HELEN UA	28.94	WYETH ST	03	0		N	DUSK	PDO		PSNGR CAR		01	DRVR	NONE	67	M	OR-Y		028	000	02
																				OR>25				
												02	NONE 0	TURN-L										
													PRVTE	E SW									015	00
													PSNGR CAR		01	DRVR	NONE	53	M	OR-Y		000	000	00
																				OR<25				
00092	N N N	03/07/2007	COLUMBIA	1 14		INTER	3-LEG	N	N	RAIN	O-1TURN	01	NONE 0	TURN-L										02
NONE		Wed	ST. HELENS	0 0	LOWER COL RIVER HY	CN		STOP SIGN	N	WET	TURN		PRVTE	NE SE									088	00
		8A	ST HELEN UA	28.94	WYETH ST	04	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	16	F	OR-Y		028	000	02
																				OR<25				
												02	NONE 0	STRGHT										
													PRVTE	SW NE									000	00
													PSNGR CAR		01	DRVR	NONE	37	F	OR-Y		000	000	00
																				OR<25				
00198	N N N	06/02/2007	COLUMBIA	1 14		INTER	3-LEG	N	N	CLR	O-1TURN	01	NONE 0	STRGHT										02
NO RPT		Sat	ST. HELENS	0 0	LOWER COL RIVER HY	CN		STOP SIGN	N	DRY	TURN		PRVTE	SW NE									000	00
		5P	ST HELEN UA	28.94	WYETH ST	04	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	18	M	OR-Y		000	000	00
																				OR<25				
												02	NONE 0	TURN-L										
													PRVTE	NE SE									088	00
													PSNGR CAR		01	DRVR	NONE	83	M	OR-Y		004,028	000	02
																				OR<25				

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

West Street @ 6th Street
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2007														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	0	1	1	0	0
2007 TOTAL	0	0	1	1	0	0	0	1	0	0	1	1	0	0
FINAL TOTAL	0	0	1	1	0	0	0	1	0	0	1	1	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF ST. HELENS, COLUMBIA COUNTY

West Street @ 6th Street
January 1, 2006 through December 31, 2008

SER# INVEST	SPEE	ALC	DRUG	SCHL	WORK	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CCNTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00443	N	N	N			11/26/2007	17	WEST ST	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-R											08
CITY						Mon	0	6TH ST	NE		STOP SIGN	N	DRY	TURN		PRVTE	SE NE									000		00
						9P			06	0		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	52	F	OR-Y		007	000		08
																							OR<25					
															02	NONE 0	STOP											
																PRVTE	NE SW									012		00
																PSNGR CAR		01	DRVR	NONE	46	F	OR-Y		000	000		00
																							N-RES					

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Columbia Boulevard @ 12th Street
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2008														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2008 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF ST. HELENS, COLUMBIA COUNTY

Columbia Boulevard @ 12th Street
January 1, 2006 through December 31, 2008

SER# INVEST	SPEC E	ALC E	DRUG	SCHL	WORK	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CCNTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00131	N	N	N			01/23/2008	16	COLUMBIA BLVD	INTER	CROSS	N	N	CLR	O-1TURN	01	NONE 0	TURN-L											02
NONE						Wed	0	12TH ST	CN		STOP SIGN	N	DRY	TURN		PRVTE	SE SW									015		00
						2P			01	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	M	UNK		028	000		02
																							UNK					
															02	NONE 0	STRGHT											
																PRVTE	NW SE									015		00
																PSNGR CAR		01	DRVR	NONE	49	F	OR-Y		000	000		00
																							OR<25					

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Columbia Boulevard @ 6th Street
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2006														
PARKING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2006 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

URBAN NON-SYSTEM CRASH LISTING

CITY OF ST. HELENS, COLUMBIA COUNTY

Columbia Boulevard @ 6th Street

January 1, 2006 through December 31, 2008

SER# INVEST	SPEE	ALC	DRUG	SCHL	WORK	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CCNTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00294	N	N	N			09/01/2006	16	COLUMBIA BLVD	INTER	CROSS	N	N	CLR	S-STRGHT	01	NONE 0	PARKNG											02
NONE						Fri	0	6TH ST	NE		UNKNOWN	N	DRY	PARK		PRVTE	NE SW									008		00
						4P			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	F	UNK		028	000		02
																							OR<25					
															02	NONE 0	STRGHT											
																PRVTE	NE SW									006		00
																PSNGR CAR		01	DRVR	NONE	40	F	OR-Y		000	000		00
																							OR<25					

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Columbia Boulevard @ Sykes Road
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2008														
ANGLE	0	1	0	1	0	1	0	1	0	0	1	1	0	0
TURNING MOVEMENTS	0	1	0	1	0	1	0	0	1	0	1	1	0	0
2008 TOTAL	0	2	0	2	0	2	0	1	1	0	2	2	0	0
YEAR: 2007														
ANGLE	0	0	1	1	0	0	0	0	1	0	1	1	0	0
2007 TOTAL	0	0	1	1	0	0	0	0	1	0	1	1	0	0
FINAL TOTAL	0	2	1	3	0	2	0	1	2	0	3	3	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

CDS380 6/24/2010

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF ST. HELENS, COLUMBIA COUNTY

Columbia Boulevard @ Sykes Road
January 1, 2006 through December 31, 2008

SER# INVEST	S P E E / A L C / D R U G / S C H L / W O R K	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CCNTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN EVENT	CAUSE
00447	N N N	11/28/2007	16	00404	INTER	CROSS	N	N	RAIN	ANGL-OTH	01	NONE 0	STRGHT										02
NONE		Wed	0	SYKES RD	CN		STOP SIGN	N	WET	ANGL		PRVTE	NE SW									000	00
		6P			03	0		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	53	M	OR-Y		028	000	02
																			OR<25				
											02	NONE 0	STRGHT										
												PRVTE	NW SE									000	00
												PSNGR CAR		01	DRVR	NONE	00	F	OR-Y		000	000	00
																			OR<25				
00454	N N N N N	12/05/2008	16	COLUMBIA BLVD	INTER	4-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										02
CITY		Fri	0	SYKES RD	CN		STOP SIGN	N	WET	TURN		PRVTE	SE NW									015	00
		6P			03	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	22	M	OR-Y		028	000	02
																			OR<25				
											02	NONE 0	STRGHT										
												PRVTE	SW NE									015	00
												PSNGR CAR		01	DRVR	INJC	32	M	OR-Y		000	000	00
																			OR<25				
00084	N N N	02/26/2008	16	COLUMBIA BLVD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										02
NONE		Tue	0	SYKES RD	CN		STOP SIGN	N	DRY	ANGL		PRVTE	SE NW									015	00
		6P			04	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	INJC	41	M	OR-Y		028	000	02
																			OR<25				
											02	NONE 0	STRGHT										
												PRVTE	SW NE									015	00
												PSNGR CAR		01	DRVR	NONE	63	F	OR-Y		000	000	00
																			OR<25				

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Columbia Boulevard @ Vernonia Road
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2008														
ANGLE	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2008 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

URBAN NON-SYSTEM CRASH LISTING

CITY OF ST. HELENS, COLUMBIA COUNTY

Columbia Boulevard @ Vernonia Road

January 1, 2006 through December 31, 2008

SER# INVEST	S P E E	E A L C	D R U G	S C H L	W O R K	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CCNTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00344	N	N	N			09/14/2008	16	COLUMBIA BLVD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											02
NO RPT						Sun	0	VERNONIA RD	CN		STOP SIGN	N	DRY	ANGL		PRVTE	SW NE									015		00
						10A			03	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	67	F	OR-Y		000	000		00
																							OR<25					
															02	NONE 0	STRGHT											
																PRVTE	NW SE									015		00
																PSNGR CAR		01	DRVR	NONE	25	M	OR-Y		028	000		02
																							OR<25					

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Columbia Boulevard/ Bachelor Flat Road @ Gable Road
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2008														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2008 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

COLUMBIA COUNTY

Columbia Boulevard/ Bachelor Flat Road @ Gable Road
January 1, 2006 through December 31, 2008

SER# INVEST	S P E E	A L C	D R U G	S C H L	W O R K	DATE DAY TIME	MILEPNT DIST FROM INTERSECT	COUNTY ROADS FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFF-RD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00226	N	N	N	N	N	7/6/2008	1.28	GABLE RD	INTER	3-LEG	N	N	CLD	O-1TURN	01	NONE 0	STRGHT											02
CITY						Sun			CN		STOP SIGN	N	DRY	TURN		PRVTE	E W									000		00
						12P			02	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	21	F	OR-Y		000	000		00
																							OR<25					
															02	NONE 0	TURN-L											
																PRVTE	W N									006		00
																PSNGR CAR		01	DRVR	NCNE	19	M	OR-Y		004,028	000		02
																							OR<25					

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Deer Island Road @ West Street
January 1, 2006 through December 31, 2008

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

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

US 30 (Hwy 092) @ Columbia Boulevard
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2008														
ANGLE	0	1	0	1	0	1	0	0	1	0	1	1	0	0
PEDESTRIAN	0	1	0	1	0	1	0	0	1	0	1	1	0	0
2008 TOTAL	0	2	0	2	0	2	0	0	2	0	2	2	0	0
YEAR: 2006														
REAR-END	0	1	1	2	0	1	0	1	1	1	1	2	0	0
2006 TOTAL	0	1	1	2	0	1	0	1	1	1	1	2	0	0
FINAL TOTAL	0	3	1	4	0	3	0	1	3	1	3	4	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

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

092 LOWER COLUMBIA RIVER

US 30 (Hwy 092) @ Columbia Boulevard
January 1, 2006 through December 31, 2008

SER# INVEST	S P E E D	A L C	D R U G S	S C H L	W O R K	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# FC COMPNT MLG TYP MILEPNT	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACTN EVENT	CAUSE
00409	N	N	N			11/07/2008	COLUMBIA	1 14		INTER	CROSS	N	N	CLD	PED	01	NONE 0	TURN-R										02
CITY						Fri	ST. HELENS	0 0	COLUMBIA BLVD	E		TRF SIGNAL	N	WET	PED		PRVTE	SW E									088	00
						5P	ST HELEN UA	28.56	LOWER COL RIVER HY	05	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	40	M	OR-Y		029	000	02
																								OR<25				
																		STRGHT	01	PED	INJC	16	F		01	000	035	00
																		SW NE										
00427	N	N	N	N	N	12/09/2006	COLUMBIA	1 14		INTER	CROSS	N	N	FOG	S-1STOP	01	NONE 0	STRGHT										27
CITY						Sat	ST. HELENS	0 0	COLUMBIA BLVD	SW		TRF SIGNAL	N	WET	REAR		PRVTE	SW NE									000	00
						8P	ST HELEN UA	28.56	LOWER COL RIVER HY	06	1		N	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	43	M	OR-Y		016,026	038	27
																								OR<25				
																02	NONE 0	STOP										
																	PRVTE	SW NE									011	00
																	PSNGR CAR		01	DRVR	INJC	45	F	OR-Y		000	000	00
																								OR<25				
00230	N	N	N			07/23/2006	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										27
NONE						Sun	ST. HELENS	0 0	COLUMBIA BLVD	NW		YIELD	N	DRY	REAR		PRVTE	NW SE									000	00
						11A	ST HELEN UA	28.56	LOWER COL RIVER HY	06	1		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	M	OR-Y		016,026	038	27
																								OR<25				
																02	NONE 0	STOP										
																	PRVTE	NW SE									011	00
																	PSNGR CAR		01	DRVR	NONE	64	F	OR-Y		000	000	00
																								OR<25				
00430	N	N	N			11/30/2008	COLUMBIA	1 14		INTER	CROSS	N	N	RAIN	ANGL-OTH	01	NONE 0	STRGHT										04
CITY						Sun	ST. HELENS	0 0	COLUMBIA BLVD	CN		TRF SIGNAL	N	WET	ANGL		PRVTE	NE SW									000	00
						9P	ST HELEN UA	28.56	LOWER COL RIVER HY	02	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	INJB	54	F	OTH-Y		000	000	00
																								N-RES				
																02	NONE 0	STRGHT										
																	PRVTE	W E									000	00
																	PSNGR CAR		01	DRVR	NONE	21	M	OR-Y		020	000	04
																								OR<25				

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

US 30 (Hwy 092) @ Deer Island Road
January 1, 2006 through December 31, 2008

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2008														
REAR-END	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2008 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
YEAR: 2007														
REAR-END	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2007 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	0	2	2	0	0	0	2	0	2	0	2	0	0

Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

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

092 LOWER COLUMBIA RIVER

US 30 (Hwy 092) @ Deer Island Road
January 1, 2006 through December 31, 2008

SER# INVEST	SPEED	ALC	DRUGS	SCHL	WORK	DATE DAY TIME	COUNTY CITY URBAN AREA	RD# FC COMPNT MLG TYP MILEPNT	CONN # FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYP (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CNTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH TYP COLL TYP SVRTY	V#	SPCL USE TRLR QTY OWNER VEH TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN EVENT	CAUSE
00277	N	N	N	N	N	07/31/2007	COLUMBIA	1 14		INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										10
STATE						Tue		0 0		W		TRF SIGNAL	N	DRY	REAR		PRVTE	W E									000	00
						11A	ST HELEN UA	29.42		06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	20	F	OR-Y		026	000	10
																								OR<25				
																02	NONE 0	STOP										
																	PRVTE	W E									011	00
																	PSNGR CAR		01	DRVR	NONE	35	F	OR-Y		000	000	00
																								OR<25				
00210	N	N	N			06/20/2008	COLUMBIA	1 14		INTER	CROSS	N	N	CLR	S-STRGHT	01	NONE 0	STRGHT										07
NONE						Fri		0 0		CN		TRF SIGNAL	N	DRY	REAR		UNKN	E W									000	00
						3P	ST HELEN UA	29.42		02	0		N	DAY	PDO		UNKNOWN		01	DRVR	NONE	00	F	UNK		042	000	07
																								OR<25				
																02	NONE 0	STRGHT										
																	PRVTE	E W									006	00
																	PSNGR CAR		01	DRVR	NONE	47	M	OR-Y		000	000	00
																								OR<25				

ACTION CODE TRANSLATION LIST

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

CAUSE CODE TRANSLATION LIST

CAUSE CODE	SHORT DESCRIPTION	LONG DESCRIPTION
00	NO CODE	NO CAUSE ASSOCIATED AT THIS LEVEL
01	TOO-FAST	TOO FAST FOR CONDITIONS (NOT EXCEED POSTED SPEED
02	NO-YIELD	DID NOT YIELD RIGHT-OF-WAY
03	PAS-STOP	PASSED STOP SIGN OR RED FLASHER
04	DIS--RAG	DISREGARDED R-A-G TRAFFIC SIGNAL.
05	LEFT-CTR	DROVE LEFT OF CENTER ON TWO-WAY ROAD
06	IMP-OVER	IMPROPER OVERTAKING
07	TOO-CLOS	FOLLOWED TOO CLOSELY
08	IMP-TURN	MADE IMPROPER TURN
09	DRINKING	ALCOHOL OR DRUG INVOLVED
10	OTHR-IMP	OTHER IMPROPER DRIVING
11	MECH-DEF	MECHANICAL DEFECT
12	OTHER	OTHER (NOT IMPROPER DRIVING)
13	IMP LN C	IMPROPER CHANGE OF TRAFFIC LANES
14	DIS TCD	DISREGARDED OTHER TRAFFIC CONTROL DEVICE
15	WRNG WAY	WRONG WAY ON ONE-WAY ROADWAY
16	FATIGUE	DRIVER DROWSY/FATIGUED/SLEEPY
18	IN RDWY	NON-MOTORIST ILLEGALLY IN ROADWAY
19	NT VISBL	NON-MOTORIST CLOTHING NOT VISIBLE
20	IMP PKNG	VEHICLE IMPROPERLY PARKED
21	DEF STER	DEFECTIVE STEERING MECHANISM
22	DEF BRKE	INADEQUATE OR NO BRAKES
24	LOADSHFT	VEHICLE LOST LOAD OR LOAD SHIFTED
25	TIREFAIL	TIRE FAILURE
26	PHANTOM	PHANTOM / NON-CONTACT VEHICLE
27	INATTENT	INATTENTION
30	SPEED	DRIVING IN EXCESS OF POSTED SPEED
31	RACING	SPEED RACING (PER PAR)
32	CARELESS	CARELESS DRIVING (CITATION ISSUED)
33	RECKLESS	RECKLESS DRIVING (CITATION ISSUED)
34	AGGRESV	AGGRESSIVE DRIVING (PER PAR)
35	RD RAGE	ROAD RAGE (PER PAR)

COLLISION TYPE CODE TRANSLATION LIST

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

CRASH TYPE CODE TRANSLATION LIST

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

DRIVER LICENSE CODE TRANSLATION LIST

LIC CODE	SHORT DESC	LONG DESCRIPTION
0	NONE	NOT LICENSED (HAD NEVER BEEN LICENSED)
1	OR-Y	VALID OREGON LICENSE
2	OTH-Y	VALID LICENSE, OTHER STATE OR COUNTRY
3	SUSP	SUSPENDED/REVOKED

DRIVER RESIDENCE CODE TRANSLATION LIST

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

ERROR CODE TRANSLATION LIST

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

ERROR CODE TRANSLATION LIST

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

EVENT CODE TRANSLATION LIST

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

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
060	MARKER	DELINEATOR OR MARKER (REFLECTOR POSTS)
061	MAILBOX	MAILBOX
062	TREE	TREE, STUMP OR SHRUBS
063	VEG OHED	TREE BRANCH OR OTHER VEGETATION OVERHEAD, ETC.
064	WIRE/CBL	WIRE OR CABLE ACROSS OR OVER THE ROAD
065	TEMP SGN	TEMPORARY SIGN OR BARRICADE IN ROAD, ETC.
066	PERM SGN	PERMANENT SIGN OR BARRICADE IN/OFF ROAD
067	SLIDE	SLIDES, ROCKS OFF OR ON ROAD, FALLING ROCKS
068	FRGN OBJ	FOREIGN OBSTRUCTION/DEBRIS IN ROAD (NOT GRAVEL)
069	EQP WORK	EQUIPMENT WORKING IN/OFF ROAD
070	OTH EQP	OTHER EQUIPMENT IN OR OFF ROAD (INCLUDES PARKED TRAILER, BOAT)
071	MAIN EQP	WRECKER, STREET SWEEPER, SNOW PLOW OR SANDING EQUIPMENT
072	OTHER WALL	ROCK, BRICK OR OTHER SOLID WALL
073	IRRGL PVMT	SPEED BUMP, OTHER BUMP, POTHOLE OR PAVEMENT IRREGULARITY (PER PAR)
075	CAVE IN	BRIDGE OR ROAD CAVE IN
076	HI WATER	HIGH WATER
077	SNO BANK	SNOW BANK
078	HOLE	CHUCKHOLE IN ROAD, LOW OR HIGH SHOULDER AT PAVEMENT EDGE
079	DITCH	CUT SLOPE OR DITCH EMBANKMENT
080	OBJ F MV	STRUCK BY ROCK OR OTHER OBJECT SET IN MOTION BY OTHER VEHICLE (INCL. LOST LOADS)
081	FLY-OBJ	STRUCK BY OTHER MOVING OR FLYING OBJECT
082	VEH HID	VEHICLE OBSCURED VIEW
083	VEG HID	VEGETATION OBSCURED VIEW
084	BLDG HID	VIEW OBSCURED BY FENCE, SIGN, PHONE BOOTH, ETC.
085	WIND GUST	WIND GUST
086	IMMERSED	VEHICLE IMMERSED IN BODY OF WATER
087	FIRE/EXP	FIRE OR EXPLOSION
088	FENC/BLD	FENCE OR BUILDING, ETC.
089	OTH ACDT	ACCIDENT RELATED TO ANOTHER SEPARATE ACCIDENT
090	TO 1 SIDE	TWO-WAY TRAFFIC ON DIVIDED ROADWAY ALL ROUTED TO ONE SIDE
092	PHANTOM	OTHER (PHANTOM) NON-CONTACT VEHICLE (ON PAR OR REPORT)
093	CELL-POL	CELL PHONE (ON PAR OR DRIVER IN USE)
094	VIOL GDL	TEENAGE DRIVER IN VIOLATION OF GRADUATED LICENSE PGM
095	GUY WIRE	GUY WIRE
096	BERM	BERM (EARTHEN OR GRAVEL MOUND)
097	GRAVEL	GRAVEL IN ROADWAY
098	ABR EDGE	ABRUPT EDGE
099	CELL-WTN	CELL PHONE USE WITNESSED BY OTHER PARTICIPANT
100	UNK FIXD	UNKNOWN TYPE OF FIXED OBJECT
101	OTHER OBJ	OTHER OR UNKNOWN OBJECT, NOT FIXED
104	OUTSIDE V	PASSENGER RIDING ON VEHICLE EXTERIOR
105	PEDAL PSGR	PASSENGER RIDING ON PEDALCYCLE
106	MAN WHLCHR	PEDESTRIAN IN NON-MOTORIZED WHEELCHAIR
107	MTR WHLCHR	PEDESTRIAN IN MOTORIZED WHEELCHAIR
110	N-MTR	NON-MOTORIST STRUCK VEHICLE
111	S CAR VS V	STREET CAR/TROLLEY (ON RAILS AND/OR OVERHEAD WIRE SYSTEM) STRUCK VEHICLE
112	V VS S CAR	VEHICLE STRUCK STREET CAR/TROLLEY (ON RAILS AND/OR OVERHEAD WIRE SYSTEM)
113	S CAR ROW	AT OR ON STREET CAR/TROLLEY RIGHT-OF-WAY
114	RR EQUIP	VEHICLE STRUCK RAILROAD EQUIPMENT (NOT TRAIN) ON TRACKS
120	WIRE BAR	WIRE OR CABLE MEDIAN BARRIER
124	SLIPPERY	SLIDING OR SWERVING DUE TO WET, ICY, SLIPPERY OR LOOSE SURFACE
125	SHLDR	SHOULDER GAVE WAY

FUNCTIONAL CLASSIFICATION TRANSLATION LIST

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

HIGHWAY COMPONENT TRANSLATION LIST

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

INJURY SEVERITY CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
1	KILL	FATAL INJURY
2	INJA	INCAPACITATING INJURY - BLEEDING, BROKEN BONES
3	INJB	NON-INCAPACITATING INJURY
4	INJC	POSSIBLE INJURY - COMPLAINT OF PAIN
5	PRI	DIED PRIOR TO CRASH
7	NO<5	NO INJURY - 0 TO 4 YEARS OF AGE

LIGHT CONDITION CODE TRANSLATION LIST

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

MEDIAN TYPE CODE TRANSLATION LIST

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

MILEAGE TYPE CODE TRANSLATION LIST

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

MOVEMENT TYPE CODE TRANSLATION LIST

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

PEDESTRIAN LOCATION CODE TRANSLATION LIST

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

ROAD CHARACTER CODE TRANSLATION LIST

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

PARTICIPANT TYPE CODE TRANSLATION LIST

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

TRAFFIC CONTROL DEVICE CODE TRANSLATION LIST

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

095	BUS STPSGN	BUS STOP SIGN AND RED LIGHTS
099	UNKNOWN	UNKNOWN OR NOT DEFINITE

VEHICLE TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
01	PSNGR CAR	PASSENGER CAR, PICKUP, ETC.
02	BOBTAIL	TRUCK TRACTOR WITH NO TRAILERS (BOBTAIL)
03	FARM TRCTR	FARM TRACTOR OR SELF-PROPELLED FARM EQUIPMENT
04	SEMI TOW	TRUCK TRACTOR WITH TRAILER/MOBILE HOME IN TOW
05	TRUCK	TRUCK WITH NON-DETACHABLE BED, PANEL, ETC.
06	MOPED	MOPED, MINIBIKE, MOTOR SCOOTER, OR MOTOR BICYCLE
07	SCHL BUS	SCHOOL BUS (INCLUDES VAN)
08	OTH BUS	OTHER BUS
09	MTRCYCLE	MOTORCYCLE
10	OTHER	OTHER: FORKLIFT, BACKHOE, ETC.
11	MOTRHOME	MOTORHOME
12	TROLLEY	MOTORIZED STREET CAR/TROLLEY (NO RAILS/WIRES)
13	ATV	ATV
14	MTRSCTR	MOTORIZED SCOOTER
15	SNOWMOBILE	SNOWMOBILE
99	UNKNOWN	UNKNOWN VEHICLE TYPE

WEATHER CONDITION CODE TRANSLATION LIST

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

Appendix 2C Technical Memorandum #3: Future Traffic Conditions

MEMORANDUM

Date:	January 25, 2011	Project #: 10639
To:	Jacob Graichen, City of St. Helens Seth Brumley, ODOT	
From:	Chris Brehmer, P.E. and Matt Bell	
Project:	St. Helens Transportation System Plan Update	
Subject:	Final TSP Chapter 4: Future Needs Analysis	

INTRODUCTION

This chapter presents the year 2031 forecast transportation conditions for the St. Helens Area. Included in this chapter is a summary of the future "no-build" traffic conditions analysis conducted for St. Helens to identify transportation system deficiencies that may exist by the year 2031 if no additional improvements to the system are made in the next 20 years. This analysis was used to inform the identification and evaluation of transportation system options as identified in the following chapter.

The future no-build traffic conditions analysis includes an evaluation of how the 15 study intersections will operate in the year 2031 assuming growth and development occurs without any improvements made to the transportation system. The remainder of this chapter includes a description of the methodology used to develop forecast traffic volumes at the study intersections and presents the results of the future no-build traffic conditions analysis.

BACKGROUND

The information provided in the following documents was used to develop the future no-build traffic conditions identified in this report:

- Chapter 3 identified the existing physical, geometrical, and operational conditions of the study area roadways and intersections. The information provided in Chapter 3 was used as basis to compare future traffic conditions.
- The August 6, 2010 Land Use Inventory memorandum provided the basis for identifying how potential changes in housing and jobs over the next twenty years may change the traffic volumes and patterns within the city.

2031 TRAFFIC VOLUME FORECAST

Oregon's Transportation Planning Rule (TPR) requires communities to develop a 20-year plan to support the transportation system needs. St. Helens anticipates completing and adopting the TSP update in 2011, thus the year 2031 is an appropriate forecast horizon year.

The year 2031 traffic volumes were developed according to the Cumulative Analysis methodology described in the ODOT *Analysis Procedures Manual* (APM – Reference 1). This type of analysis combines growth in regional traffic volumes along US 30 with growth in local traffic volumes associated with the projected development of available land within the city[1]. A summary of the traffic volume projection process is presented below.

CUMULATIVE ANALYSIS

The cumulative analysis process accounts for the following four categories of vehicle trips.

- Through trips: vehicles that travel through St. Helens on US 30 but do stop in the city or leave the highway. An example of a through trip is someone traveling from Scappoose to Astoria along US 30.
- Inbound trips: vehicles that come from outside of St. Helens to a destination within the city limits. An example of an inbound trip is someone who works in Portland but returns home to St. Helens during the weekday p.m. peak hour.
- Outbound trips: vehicles that start in St. Helens and travel to a destination outside the city limits. An example of an outbound trip is someone who works in St. Helens but returns home to Rainier during the p.m. peak hour.
- Local trips: vehicles that travel from one point in St. Helens to another without leaving the city limits. An example of a local trip is someone who travels from their home to the grocery store without leaving the city.

Appendix "A" illustrates the distribution of the trips at the study intersections.

There are several steps required to prepare a cumulative analysis, including:

- Developing a growth rate projection for highway traffic volumes;
- Identifying where household and employment growth is likely to occur in the community;
- Developing estimates of the number of vehicle trips associated with household and employment growth, and;
- Allocating those trips across the city to various growth areas.

An overview of each of these steps is presented below.

Regional Traffic Growth

An increase of 41 percent in through traffic was projected along US 30 over the 20-year planning period based on information provided in ODOT's Future Volume Tables. This growth rate was applied to existing traffic volumes along US 30 to represent growth in regional traffic.

[1] A detailed technical explanation of this methodology and additional information on the forecasts are contained the methodology memorandum included in Appendix "A".

Household and Employment Growth

Anticipated household and employment growth in the St. Helens area also contributes to future growth in traffic volumes. Growth estimates were developed based on the coordinated population projection from Columbia County as well as a review of existing land use, zoning, and allowable density as documented in the August 6, 2010 Land Use Inventory memorandum. *The August 6, 2010 Land Use Inventory memorandum is included in Appendix "B".*

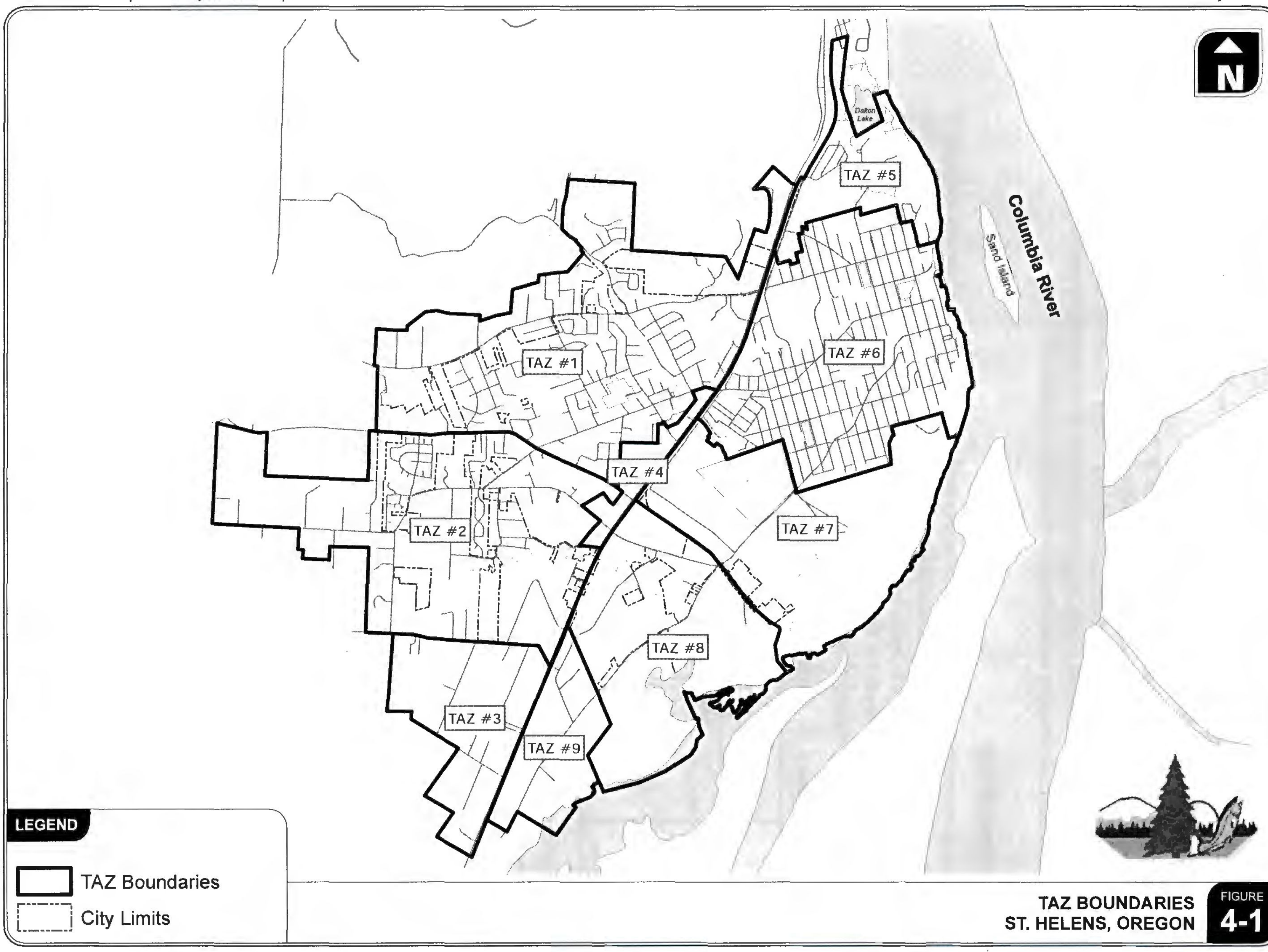
Traffic Analysis Zones

Projected employment and housing growth was allocated to different areas of the city aggregated into Traffic Analysis Zones (TAZs) established for the project. The TAZ boundaries aggregate areas that have common access to major transportation facilities and similar land uses. Figure 4-1 illustrates the TAZs established for the TSP Update. The Employment and Household Growth forecasts for each TAZ are summarized in Table 1.

Table 1 2031 Population and Employment Growth by TAZ

	TAZ									
	1	2	3	4	5	6	7	8	9	
	West of US 30				East of US 30					
Growth Sector	North	Central	South	Highway Commercial	North	Downtown	North Industrial	South Industrial	South	Total
Housing Units										
Single Family	720	160	130	0	420	90	0	0	20	***1,540***
Multifamily	0	140	0	0	0	100	0	0	0	***240***
Total	***720***	***300***	***130***	***0***	***420***	***190***	***0***	***0***	***20***	***1,780***
Percent Increase	***52%***	***46%***	***60%***	***0%***	***105%***	***9%***	***0%***	***0%***	***27%***	***34%***
Employment Buildings (1,000 Square Feet)										
Commercial	27	9	3	6	3	17	199	107	0	***371***
Industrial	0	0	0	0	8	2	474	211	0	***695***
Institutional	160	190	37	0	124	33	8	4	20	***576***
Retail	140	49	19	32	0	24	0	28	0	***292***
Total	***327***	***248***	***59***	***38***	***135***	***76***	***681***	***350***	***20***	***1,934***
Percent Increase	***71%***	***47%***	***80%***	***11%***	***126%***	***8%***	***100%***	***48%***	***94%***	***50%***

Source: August 6, 2010 Task 2.4 Land Use Inventory memorandum



TAZ BOUNDARIES
ST. HELENS, OREGON

FIGURE 4-1

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Reviewing Table 1, several trends reflecting zoning and vacant lands are apparent:

- Anticipated housing growth tends to be focused in the north and central portions of the City both to the east and west of US 30. Modest housing growth is also anticipated in the downtown area.
- Commercial (office) development is expected in nearly all areas but will be largely focused east of US 30 and south of the downtown core.
- As would be expected, industrial growth is concentrated east of US 30, primarily in the areas south of downtown.
- Institutional uses (churches, schools, government offices, parks, etc.) are spread throughout the City and are particularly focused in the north and central areas on both sides of US 30. In total, 695,000 square feet of new institutional uses could be developed in the city during the next twenty years.
- Retail growth is largely anticipated to follow the residential growth areas, with the majority of the growth west of US 30. The amount of new retail building space within the core retail area along the west side of US 30 and in the downtown area is smaller than that anticipated in the northwestern portion of the City.

Trip Generation

The increases in household and employment can be equated to increases in traffic volumes by calculating the "trip generation" of the future uses. Trip generation estimates were prepared that reflect the projected growth shown in Table 1 based on data published in the standard reference manual, *Trip Generation, 8th Edition,* published by the Institute of Transportation Engineers (ITE - Reference 2). Table C-1 in Appendix "C" summarizes the total trips by TAZ rounded to the nearest 5. The values shown in the table represent the number of vehicle trips generated by various land uses and do not account for integration among the land uses (for example, trips from employment to housing) and so must be further adjusted. As shown, the total number of net new trips is 4,055 City wide.

2031 Forecast Traffic Volumes

The 2031 forecast traffic volumes were developed by adding the through, inbound, outbound, and local trips derived by the cumulative analysis process to the seasonally adjusted existing traffic volumes (shown in Figure 3-12 of the existing conditions analysis). The 2031 forecast traffic volumes are shown in Figure 4-2. Figure 4-2 also shows the results of an operations analysis performed at each of the study intersections. Additional information related to the operations analysis is provided below.

2031 Forecast Operations Analysis

Table 2 summarizes the operational information provided in Figure 4-2 and compares the results to the individual performance standard for ODOT and City intersections. *Appendix "D" contains the year 2031 forecast traffic operations worksheets used in the analysis.*

LEGEND

STD = MOBILITY STANDARD
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

YEAR 2031 FORECAST FUTURE TRAFFIC CONDITIONS WITHOUT MITIGATION
ST. HELENS, OREGON

FIGURE 4-2

Table 2
Intersection Operations Analysis, 2031 No Build, Weekday PM Peak Hour

Intersection	Existing Traffic Control[1]	Performance Standard	Forecast Intersection Operations	Meets Standard?
		ODOT Intersections		
US 30/Dear Island Road	Signal	V/C ≤ 0.70	0.88	**No**
US 30/ Pittsburg Road	TWSC	V/C ≤ 0.85	>1.00	**No**
US 30/ Wyeth Street	TWSC	V/C ≤ 0.85	>1.00	**No**
US 30/ St Helens Road	Signal	V/C ≤ 0.80	0.75	Yes
US 30/ Columbia Boulevard	Signal	V/C ≤ 0.80	0.80	Yes
US 30/Vernonia Road	TWSC	V/C ≤ 0.90	0.51	Yes
US 30/ Gable Road	Signal	V/C ≤ 0.80	1.35	**No**
US 30/ Millard Road	TWSC	V/C ≤ 0.80	>1.00	**No**
		City Intersections		
Dear Island Road/ West Street	TWSC	LOS "E"	LOS "C"	Yes
West Street/ 6th Street	AWSC	LOS "D"	LOS "B"	Yes
Columbia Boulevard/ 6th Street	TWSC	LOS "E"	LOS "C"	Yes
Columbia Boulevard/ 12th Street	TWSC	LOS "E"	LOS "F"	**No**
Columbia Boulevard/ Vernonia Road	AWSC	LOS "D"	LOS "D"	Yes
Columbia Boulevard/ Sykes Road	TWSC	LOS "E"	LOS "C"	Yes
Columbia Boulevard/ Gable Road	TWSC	LOS "E"	LOS "E"	Yes

[1]TWSC: Two-way stop-controlled (unsignalized); AWSC: All-way stop-controlled

As shown in Table 2, six of the study intersections are projected to not meet ODOT or City performance standards under 2031 no-build traffic conditions. This is primarily due to growth in local and regional traffic volumes, but also reflects a general lack of connectivity within the city and a heavy reliance on US 30 for making local trips.

The following Chapter, Transportation Alternatives Analysis must consider the relationship/interaction between the study intersections and explore opportunities to provide greater connectivity through alternative routes to each of the areas served by these intersections.

Additional issues identified through the future conditions analysis include:

- Limited connectivity between major roadways along US 30;
- Limited connectivity between areas east and west of US 30 and the Portland & Western Rail Line. As a result each of the major intersections along US 30, such as Deer Island, Gable and Millard Road are overloaded under future conditions (as indicated above);
- A lack of north-south collector or arterial level routes on city streets parallel to US 30. As a result, local circulation (internal trips) tends to rely on US 30. For example, to get from the area east of US 30 and north of downtown (TAZ 5) to any area west of US 30, motorists must use US 30 or travel a significant distance out of the way on local streets;
- A lack of spacing between US 30 and parallel roads that do exist east of US 30. For example, the distance between US 30 and Oregon Street along Deer Island Road and between US 30 and Milton Way along Columbia Boulevard can make use of the parallel facility difficult.

Appendix "E" provides the 2030 no-build traffic conditions operational analysis worksheets for each study intersection.

CONCLUSIONS

The results of the future "no-build" traffic conditions analysis indicate that without significant improvements to the transportation system, many of the ODOT controlled intersections along US 30 will fail to meet minimum performance standards by 2031.

It is unlikely the city and ODOT would allow development to occur without incremental improvements. Readers should understand the results shown in Figure 4-2 are an illustration of what would happen if growth occurred without corresponding improvements. This analysis offers insights as to probable "hot spots" where planning now can help avoid future congestion and capacity failures.

NEXT STEPS

The Transportation Alternatives Analysis presented in the following chapter will develop and evaluate multi-modal options to address the capacity needs identified in this chapter as well as the existing deficiencies identified previously. The Transportation Alternatives Analysis will also consider the feasibility of proposed transportation projects and provide recommendations for improvement projects and strategies to address the needs. A menu of different improvements options developed for the TSP update will be presented and intersection capacity improvements and non-vehicular options will be explored to develop a "toolbox" of options.

REFERENCES

1. Oregon Department of Transportation, *Analysis Procedures Manual.* 2006
2. Institute of Transportation Engineers, *Trip Generation Manual.* 2009

APPENDIX

A. Trip Distribution Figures
B. Methodology Memorandum
C. Trip Generation Table
D. Year 2031 Forecast Traffic Conditions Worksheets

Appendix A:
Trip Distribution Figures

ESTIMATED EXTERNAL-EXTERNAL TRIPS
ST. HELENS, OREGON

FIGURE A-1

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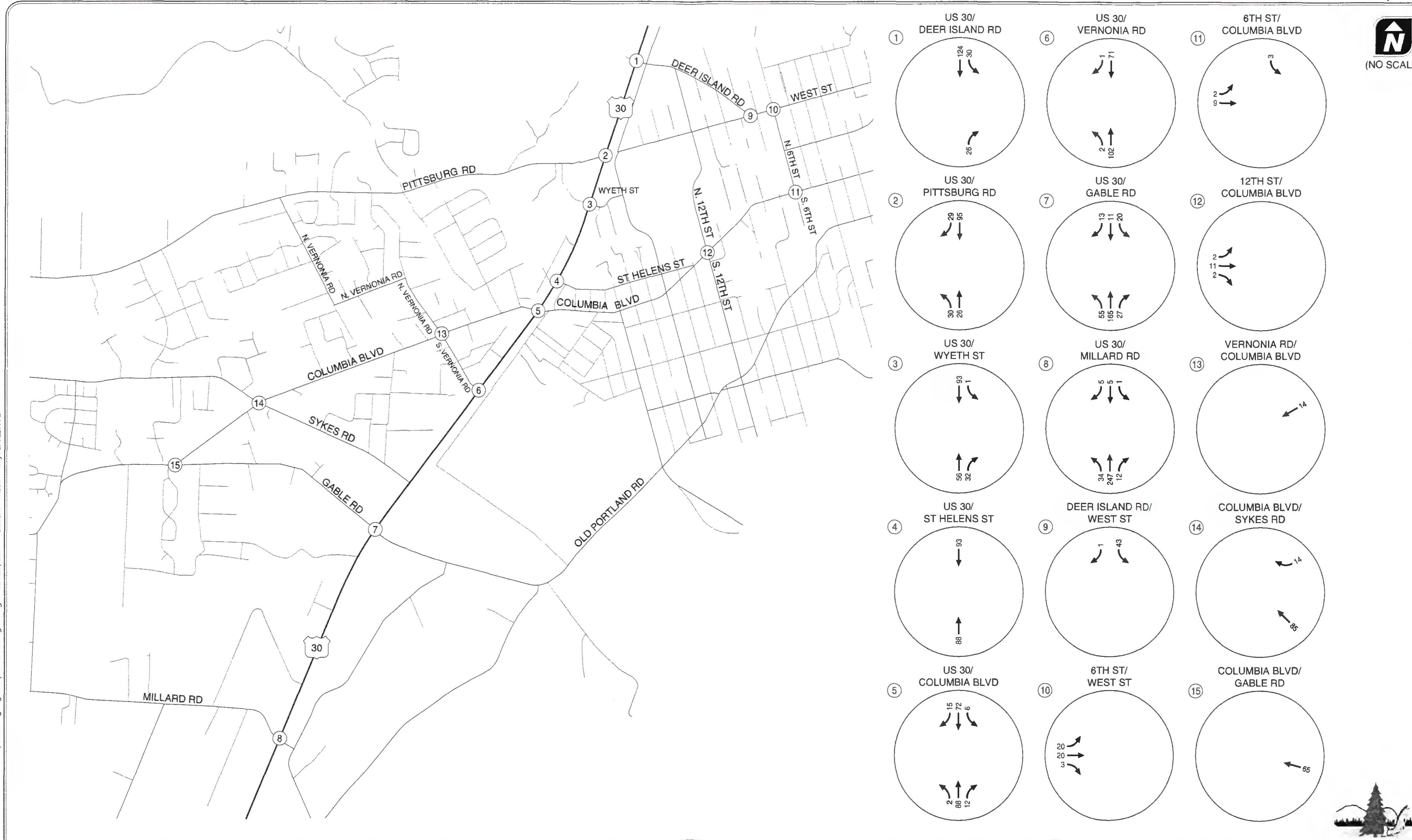

ESTIMATED EXTERNAL-INTERNAL TRIPS
ST. HELENS, OREGON

FIGURE A-2

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ESTIMATED INTERNAL-EXTERNAL TRIPS
ST. HELENS, OREGON

FIGURE A-3

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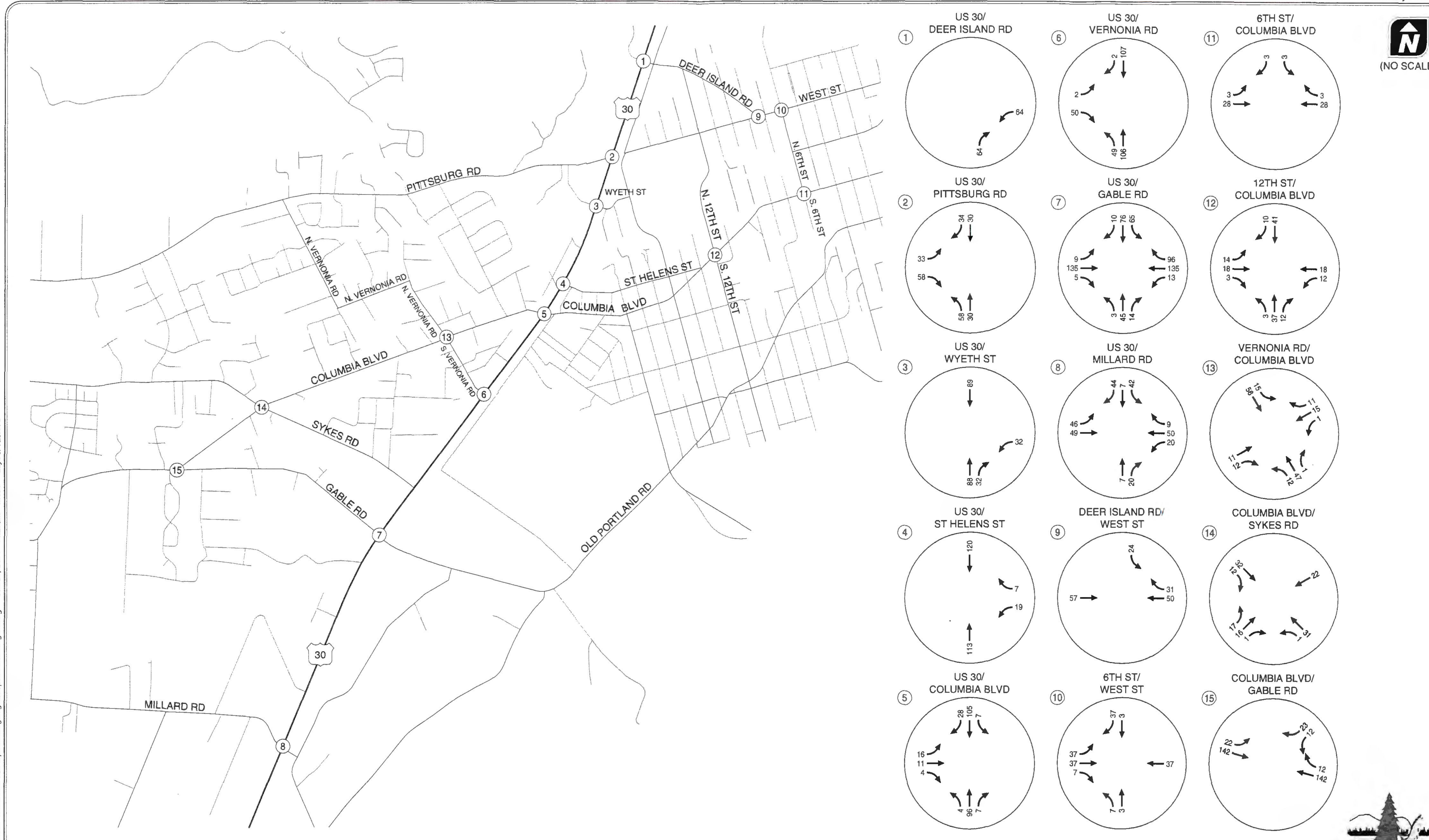
ESTIMATED INTERNAL-INTERNAL TRIP ATTRACTIONS
ST. HELENS, OREGON

FIGURE A-4



ESTIMATED INTERNAL-INTERNAL TRIP PRODUCTIONS
ST. HELENS, OREGON

FIGURE A-5

TOTAL NEW TRIPS
ST. HELENS, OREGON

FIGURE
A-6

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Appendix B:
Methodology Memorandum

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING
610 SW Alder Street, Suite 700, Portland, OR 97205 503.228.5230 503.273.8169

MEMORANDUM

Date:	August 31, 2010	Project #: 10639
To:	Doug Baumgartner, ODOT Region 1	
Cc:	Jacob Graichen, City of St. Helens Seth Brumley, ODOT Region 1	
From:	Chris Brehmer, P.E. and Matthew Bell, Kittelson & Associates, Inc.	
Project:	City of St. Helens Transportation System Plan Update	
Subject:	Technical Memorandum #2: Future Forecasting	

This memorandum provides an overview of the trip forecasting methodology proposed for use in developing year 2031 traffic volume projections for the Transportation System Plan (TSP) update. Pending ODOT and City review comments, the growth projections identified herein will be used to prepare an analysis of the study intersection operations under future 2031 conditions.

Forecasting Traffic Volumes

Various methods of estimating future traffic growth have been developed for planning purposes. The Cumulative Analysis method was selected to estimate future traffic volumes in St. Helens. The ODOT *Analysis Procedures Manual* (APM – Reference 1) identifies the Cumulative Analysis method as appropriate for "small urban areas that are growing at a fairly uniform rate or for areas where only minor changes are expected to take place." Two distinct components comprise the cumulative method:

- Background growth reflecting anticipated increases in through traffic
- Household and employment growth within the city that results in new land development

The derivation of trips associated with each of these components is described below.

BACKGROUND GROWTH RATE

As outlined in the APM, a background growth rate was developed for the St. Helens Urban Growth Boundary based on ODOT's Future Volume Tables. Six data points were identified along US 30 between Millard Road and Deer Island Road. The 20-year growth factor for each data point is listed in Table 1, along with the existing (2006) and forecast (2026) Average Annual Daily Traffic (AADT). A correlation coefficient (R^2 Value) is also provided that indicates how well the historical traffic volume corresponds with the year. The APM states that R^2 values over 0.75 are preferred.

Table 1
Background Growth Rate Calculations in St. Helens

Highway Mile Point	Location	AADT		R^2 Value	20-Year Growth Factor
		2006	2026		
US 30 – 26.96	0.01 mile north of Millard Road	24,100	33,600	0.92	1.39
US 30 – 27.59	South City Limits of St. Helens	24,300	38,000	0.92	1.56
US 30 – 27.68	0.01 mile south of Gable Road	23,500	32,900	0.92	1.40
US 30 – 27.70	0.01 mile north of Gable Road	24,900	31,700	0.84	1.27
US 30 – 28.57	0.01 mile north of Columbia Boulevard	21,000	25,200	0.75	1.20
US 30 – 29.42	0.01 mile north of Deer Island Road	15,300	22,800	0.90	1.49
				20-Year Average Growth Factor	***1.39***

Based on the information provided in Table 1, the 20-year growth factor for the St. Helens area is 1.39 and the average annual growth factor is two percent[1]. Year 2031 volumes on US 30 will be derived by increasing the year 2010 traffic volumes by 41 percent to represent 21 years of regional growth[2].

HOUSEHOLD AND EMPLOYMENT GROWTH

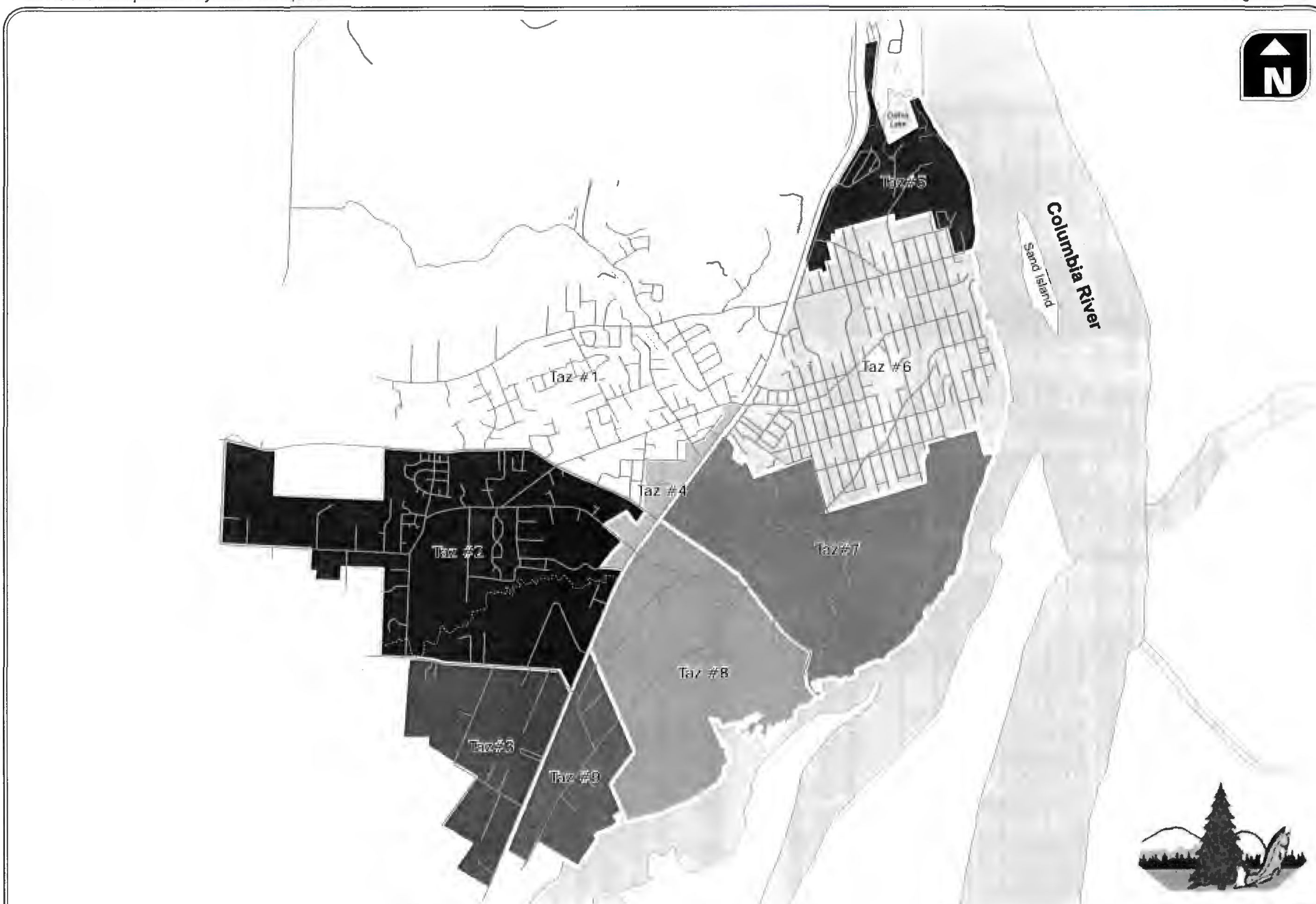
The 2031 traffic volume forecast also needs to reflect anticipated employment and household growth in St. Helens. Growth estimates were developed based on the coordinated population projection from Columbia County as well as a review of existing land use, zoning, and allowable density documented in the August 5, 2010 Task 2.4 Land Use Inventory memorandum (see Attachment "A"). The August 5 memorandum includes a forecast for household and employment growth for the 2031 plan year.

Traffic Analysis Zones

Projected employment and housing growth will be assigned to the traffic network according to Traffic Analysis Zones (TAZs) established for the project to evaluate the anticipated growth in the City. The TAZ boundaries aggregate areas that have common access to major transportation facilities and similar land use patterns. Figure 1 illustrates the TAZs established for the TSP update. The Employment and Household Growth forecasts for each TAZ are summarized in Table 2.

[1] Annual growth factor = 20-year growth factor divided by 20 years = (1.39-1.0)/20 = 0.02

[2] 21-years of growth is equivalent to a factor of 1.39 + 0.02



TAZ BOUNDARIES
ST. HELENS, OREGON

FIGURE
2-1

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Table 2
2031 Population and Employment Growth by TAZ

Growth Sector	TAZ								
	1	2	3	4	5	6	7	8	9
	West of US 30				East of US 30				
	North	Central	South	Retail Strip	North	Downtown	North Industrial	South Industrial	South
Housing (Units)									
Single Family	722	163	131	1	424	90	0	0	17
Multifamily	4	143	0	0	0	95	0	0	0
Total	***726***	***306***	***131***	***1***	***424***	***185***	***0***	***0***	***17***
Employment (Square Feet)									
Commercial	27,173	8,626	3,277	5,636	3,346	17,480	198,671	106,731	0
Industrial	381	0	0	0	7,988	1,555	474,306	210,782	0
Institutional	160,392	190,384	36,809	182	124,459	32,846	8,389	3,916	19,607
Retail	140,063	48,885	18,572	31,940	0	23,845	0	28,139	0
Total	***328,009***	***247,895***	***56,658***	***37,758***	***135,793***	***75,726***	***681,366***	***349,568***	***19,607***

Source: August 5, 2010 Task 2.4 Land Use Inventory memorandum

Reviewing Table 2, several trends reflecting zoning and vacant lands are apparent:

- Anticipated housing growth tends to be focused in the north and central portions of the City west of US 30. A large amount of residential growth is anticipated in the northern area of the City east of US 30 along with some additional growth in the greater downtown area.
- Commercial (office) development is expected in nearly all areas but will be largely focused east of US 30 and south of the downtown core.
- As would be expected, industrial growth is concentrated east of US 30, primarily in the areas south of downtown.
- Institutional uses (churches, schools, government offices, parks, etc.) are spread throughout the City and are particularly focused in the north and central areas on both sides of US 30.
- Retail growth is largely anticipated to follow the residential growth areas, with the majority of the growth west of US 30. The amount of new retail building space within the core retail area along the west side of US 30 and in the downtown area is smaller than that anticipated in the northwestern portion of the City.

Trip Generation

Trip generation estimates reflecting the anticipated growth shown in Table 2 were prepared based on data published in the standard reference manual, *Trip Generation, 8th Edition*, published by the Institute of Transportation Engineers (ITE) and are shown in Table 3. The values shown in Table 3 were rounded to the nearest 5.

Table 3
2031 Growth Trip Generation Estimate, Weekday PM Peak Hour

TAZ	Housing			Employment			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
1	460	270	730	210	275	485	675	550	1,225
2	160	90	250	110	160	270	270	250	520
3	80	50	130	30	75	105	115	120	235
4	0	0	0	40	45	85	40	50	90
5	270	160	430	30	60	90	300	220	520
6	95	55	150	40	95	135	140	145	285
7	0	0	0	140	580	720	140	580	720
8	0	0	0	100	315	415	100	315	415
9	10	5	15	5	25	30	15	30	45
Area-wide	***1,075***	***630***	***1,705***	***705***	***1,630***	***2,335***	***1,795***	***2,260***	***4,055***

CUMULATIVE ANALYSIS

The cumulative method combines historical growth trends with information about existing and planned land uses to predict total future traffic volumes. Similar to a travel demand model, the cumulative process accounts for four categories of trips.

- Through trips (External-External): those vehicles that travel through St. Helens on US 30 but don't leave the highway
- Inbound trips (External-Internal): vehicles that come from outside of St. Helens to a destination within the city
- Outbound trips (Internal-External): vehicles that leave St. Helens and travel to a destination outside the city
- Local trips (Internal-Internal): vehicles that travel from one point in St. Helens to another without leaving the city

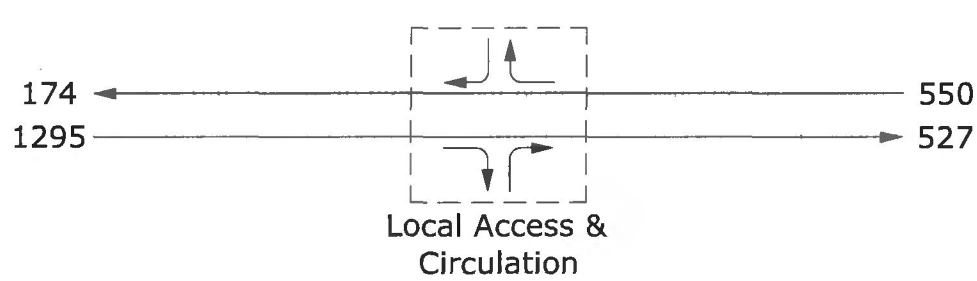
Through Trips

Ideally, through trips would be measured by completing a survey of users on US 30. This type of data collection can be a time and resource intensive endeavor. A more simple method of approximating through traffic can be applied through evaluation of existing turning movements on US 30.

The APM method of assessing through trips assumes that all turning movement volumes off the highway originate outside of the city limits. When applied to St. Helens, this method results in unreasonable results (i.e., 10 percent through trips in the northbound direction and a negative value in the southbound direction along US 30) and doesn't account for the use of the highway for local travel. Based on the existing highway network operations and observed traffic patterns, through movements are expected to represent a more significant portion of highway trips within St. Helens that is not reflected in the outcome when the APM method is applied directly.

A modified version of the APM method was developed to estimate the through trips assuming a portion of the turning movement volumes at each study intersection will originate within the city limits. Rather than subtracting the entire turning movement volume from the highway volume, a portion of the turning movement volume that accounts for trips that enter and exit the highway within the city limits was used. An illustration of the through trip calculation is provided in Attachment "B".

The existing through trip calculations were used to develop both future 2031 through trips and future 2031 inbound and outbound trips in the St. Helens area. Exhibit 1 illustrates the through trip patterns in each direction at the US 30/Millard Road and US 30/Deer Island Road intersections. The derivation of Exhibit 1 is shown in Attachment B.

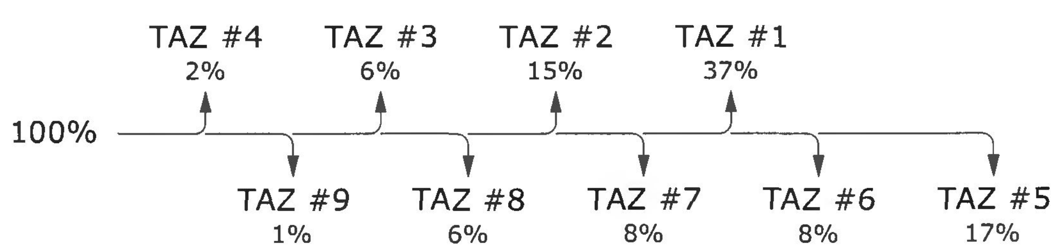


Inbound, Outbound Trips

In addition to through trips, it is necessary to understand the pattern of trips with one trip-end inside St. Helens and one trip-end outside St. Helens. After removing the through trips, the housing and employment trips identified in Table 4 were allocated to inbound and outbound trips for each TAZ. The trips were assigned to the TAZs based on the relative density of future trip making among TAZs.

For example, the northern area west of US 30 represented by TAZ 1 has a large number of the total housing and employment trips (1,225 of the 4,055 total area-wide trips). As a result, TAZ 1 would be expected to be the destination for a comparatively higher percentage of the inbound and outbound trips.

Exhibit 2 below illustrates the distribution of inbound trips among the TAZs. The spreadsheets shown in Attachment C include detailed documentation of the inbound and outbound trip derivation consistent with the APM procedures.



Local Trips

After accounting for through, inbound and outbound trips, the remaining trips are assumed to occur between locations within the City. These localized trips occur between uses such as housing and retail, housing and employment, and other uses within the City.

The spreadsheets shown in Attachment C documentation the assignment of local trips between TAZs consistent with the APM procedures.

Next Steps

Please review the methodology and analysis described in this memorandum and advise us of any questions, concerns, or suggestions. Once the methodology and projections are confirmed, the net new through, inbound, outbound, and local trips will be assigned to the study intersections. Future 2031 traffic operations will then be analyzed at the study intersections.

If you have any questions as you review this material, please call us at (503) 228-5230.

ATTACHMENTS

A. Land Use Inventory – August 2010

B. External-External Trip Calculation

C. Trip Calculations

Attachment A:
Land Use Inventory

Memorandum

Date: **August 6, 2010** (Revised)

To: Technical Advisory Committee and Citizens Advisory Committee

cc: Chris Brehmer, Kittelson & Associates

From: Matt Hastie, Angelo Planning Group (APG)
Shayna Rehberg, APG
Becky Dann, APG

Re: City of St. Helens Transportation System Plan Update - Task 2.4
Land Use Inventory

Introduction

A land use inventory of the City of St. Helens is needed to help assess current and future transportation conditions. Specifically, the existing and future projected number of housing units[1], floor area of employment, and general location of housing units and employment have been estimated in order to model traffic volumes and movements. This data has been aggregated by Transportation Analysis Zones (TAZs) developed by Kittelson & Associates and City staff in consultation with the Oregon Department of Transportation. The TAZs divide land within the City's Urban Growth Boundary (UGB) into nine distinct zones as shown in Appendix A. This memorandum summarizes the distribution of existing and future housing units and employment floor area by TAZ. Additional information on the assumptions relied on for this analysis is included in Appendices B, C, and D.

Housing Units

Existing Housing Units

The number and type of housing units in St. Helens in 2009 ("existing" units) was estimated by:

- Distributing population by TAZ
- Calculating average household size for each TAZ
- Dividing population by household size to estimate households by TAZ
- Estimating the number of single-family and multi-family units in each TAZ based on property tax codes and average densities

In order to arrive at the 2009 total population for the UGB, the 2009 certified population estimate for the City of St. Helens was added to an estimate of the unincorporated population within the UGB. The Population Forecasts for Columbia County Oregon, its Cities & Unincorporated Area: 2010 to 2030 prepared by the Portland State University (PSU) Population Research Center (PRC) estimated an average annual growth rate of 0.5% between 2000 and 2010 for the unincorporated portion of

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[1] Housing units, for these purposes, are assumed to include only occupied housing units. As a result, housing units and households are used interchangeably throughout this memo.

Columbia County. This growth rate was applied to the year 2000 unincorporated population within the UGB (based on Census data) to estimate the 2009 unincorporated UGB population.

This 2009 total population was then allocated to TAZs based on their share of the total UGB population in 2000, which was determined by summing 2000 population by Census Block to the TAZ level.[1] 2009 population by TAZ was then converted to households using average household size estimates by TAZ for 2009.

Table 1. 2009 Population & Households Allocation by TAZ

TAZ	1	2	3	4	5	6	7	8	9	Total
Allocation of Population	3,636	1,887	516	484	1,232	5,831	499	72	146	14,303
Allocation of Households	1,384	662	217	206	402	2,150	184	30	64	5,299

Sources: 2000 Census, PSU PRC

The number of households needs to be divided into single-family and multi-family housing for modeling purposes. The existing distribution of developed single-family and multi-family housing was determined primarily by property coding in Columbia County taxlot data files. County data is coded for single-family and multi-family development or "improvements", and the corresponding number of units registered in the taxlot data was used to estimate the distribution of housing types by TAZ. Assumptions about which property codes represent single- and multi-family development are shown in Appendix B. Where the number of units was not available in taxlot data, single-family developed properties were assumed to have one unit, and the number of multi-family units on each lot was estimated using estimated average multi-family densities for the city. Table 2 shows the estimated distribution of single and multi-family units.

Table 2. Distribution of Existing Housing Units by Housing Type and TAZ

TAZ	1	2	3	4	5	6	7	8	9	Overall
Single-family	90%	91%	100%	77%	100%	89%	100%	100%	100%	91%
Multi-family	10%	9%	0%	23%	0%	11%	0%	0%	0%	9%

Sources: Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning

The results of applying average household size by TAZ and the distribution of single-family and multi-family residential housing types is shown in Table 3.

[1] Census Block geography does not exactly coincide with TAZ boundaries, but the closest approximation was made for the purposes of estimating population and the number of households.

Table 3. Number of Households by Housing Type and by TAZ (2009)

TAZ	1	2	3	4	5	6	7	8	9	Total
Single-family	1,251	604	217	160	402	1,921	184	30	64	4,833
Multi-family	132	58	0	47	0	229	0	0	0	466
Total	1,384	662	217	206	402	2,150	184	30	64	5,299

Sources: Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning

Future Housing Units

The total 2031 population was estimated based on the 2030 population forecast for St. Helens from the Population Forecasts for Columbia County Oregon, its Cities & Unincorporated Area: 2010 to 2030, increased one additional year at the growth rate projected for 2020 to 2030. This population estimate was converted into households by applying the forecasted citywide average household size of 2.55 persons per household from the same document. This represents a decrease relative to the household size estimated for St. Helens in 2010 in the document (2.7 persons per household). This shift reflects a long term trend influenced by an aging population, a declining share of married-couple households, and lower fertility rates.[1]

The capacity for future residential development was used to estimate the distribution of new households to each TAZ. Residential development capacity was estimated based on current zoning on land coded as vacant in the County Tax Assessor data. The density assumptions used are described further in Appendix C. The share of future residential development capacity by TAZ is shown in Table 4a, and the distribution of potential future units between single-family and multi-family units in each TAZ is shown in Table 4b. The allocation among housing types (single-family vs. multi-family) reflects the type and density of housing allowed per zone. (See Appendix C for assumptions about housing types per zone.)

Table 4a. Residential Development Capacity by TAZ

TAZ	1	2	3	4	5	6	7	8	9	Total
% of total potential units	41%	17%	7%	0%	24%	10%	0%	0%	1%	100%

Sources: Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning

Table 4b. Single-family vs. Multi-family Residential Development Capacity by TAZ

TAZ	1	2	3	4	5	6	7	8	9
Single-family	99%	53%	100%	100%	100%	49%	N/A	N/A	100%
Multi-family	1%	47%	0%	0%	0%	51%	N/A	N/A	0%

Sources: Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning

[1] Portland State University Population Research Center, Population Forecasts for Columbia County Oregon, its Cities & Unincorporated Area: 2010 to 2030, February 2008.

Estimated future new single-family and multi-family households by TAZ are shown in Table 5.

Table 5. Future Households (2031) by Housing Type and TAZ

TAZ	1	2	3	4	5	6	7	8	9	Total
Single-family	1,973	767	348	161	826	2,011	184	30	81	6,381
Multi-family	136	201	0	47	0	324	0	0	0	708
Total	2,109	968	348	208	826	2,335	184	30	81	7,089

Sources: Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning, PSU PRC

Employment Floor Area

Gross floor area of employment uses (in square feet) will be used as a traffic modeling input as well. The categories of employment are retail (RET), commercial (COM), institutional (INS), and industrial (IND). Estimated employment area is based on City building footprint data, the County's taxlot data layer for uses and gross lot area, jobs data from the City of St. Helens Economic Opportunities Analysis (EOA) (November 2008), and City and County zoning.[1]

Existing Employment Floor Area

Existing gross area of employment was estimated primarily based on City building footprint data, property coding in the County taxlot data file, and a windshield survey of the City's commercial areas conducted on June 22, 2010.[2] Property codes indicating improved commercial, industrial (including port land), or institutional (school, church, fraternal association, city, or county) property were included. A table showing how each of the property class codes was categorized is included in Appendix B.

Field observations of employment uses were also used to refine categorization of individual properties as commercial (COM), retail (RET), industrial (IND), or institutional (INS). Where field observations were made, the use observed was assumed to be correct if there was a conflict with the taxlot data. Field observations and property code data were combined and linked with City building footprint data in order to calculate an approximate amount of existing floor area in the city by employment type.[3] Estimates of existing employment floor area by type for each TAZ are presented in Table 6.

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[1] The City provided business license data but that data was not in a form that could be readily geocoded and, thus, was not used in preparing these estimates.

[2] The commercial areas that were surveyed included Old Towne St. Helens, the Houlton Business District, and areas along US 30.

[3] Per the City's Planner, the building footprint data is not very complete for development on the west side of St. Helens. However, because this development has been mostly residential, it is considered not to significantly affect estimates being made for employment land.

Table 6. Existing Employment Floor Area (Square Feet) by Use Type and by TAZ

TAZ	1	2	3	4	5	6	7	8	9	Total
COM	119,993	78,790	73,425	166,149	0	268,275	18,191	13,713	8,111	746,647
IND	53,998	0	0	4,971	6,355	142,989	575,642	615,001	0	1,398,956
INS	260,843	408,513	0	8,270	101,185	278,913	90,815	170	12,678	1,161,387
RET	29,007	38,492	0	169,273	0	244,646	0	105,218	0	586,636
Total	463,841	525,795	73,425	348,663	107,540	934,823	684,648	734,102	20,789	3,893,626

Sources: Columbia County taxlot data

Future Employment Floor Area

The 2008 Economic Opportunities Analysis (EOA) prepared for the City of St. Helens forecasts future jobs using a jobs per capita ratio. The current jobs per capita ratio for each employment category can be calculated based on the number of jobs reported in the EOA in 2008 and the 2008 population estimate from PSU PRC. (The categorization of jobs into the 4 employment categories is shown in Appendix D.) The projected number of jobs in 2031 in each employment category is estimated by multiplying the existing jobs per capita ratio for that category by the forecasted 2031 population, as shown in Table 7.

To translate projected jobs into projected employment floor area, the forecast jobs were multiplied by the existing ratio of jobs to developed employment floor area by employment category (existing developed square feet by category is shown in Table 6). The projected 2031 employment floor area is estimated by dividing the number of projected jobs in each category by the jobs per 1,000 square feet ratio for that category. These results are shown in Table 7.

Table 7. Existing and Future Jobs and Floor Area by Use Type

Assigned Employment Use Type	Total Jobs (2008)	Jobs per capita (2008)	Jobs per 1000sf	2031 Projected Jobs	2031 Projected Floor Area
COM	742	0.061	0.994	1,111	1,117,587
IND	1,040	0.086	0.743	1,557	2,093,968
INS	1,217	0.101	1.048	1,822	1,738,371
RET	563	0.047	0.960	843	878,080
Total	3,562			5,332	5,828,005

Sources: City of St. Helens Economic Opportunities Analysis (2008), PSU PRC, Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning

The projected floor area was then allocated to each TAZ by use type based on the percentage of development capacity by TAZ and use type. Estimates of future development capacity for employment uses were based on existing vacant land identified in the County's taxlot data and existing zoning. Land with property codes indicating that the land is vacant were considered developable for future commercial, retail, institutional or industrial employment uses. A table showing how each of the property class codes was categorized is included in Appendix B.

For each zone, a mix of potential uses (each of the 4 employment types and residential) was assumed based on the uses allowed in the zone. Assumptions include some level of employment development in residential and public land zones for institutional uses (e.g. schools, churches, public agency offices). In commercial zones where residential uses are permitted (GC, HBD, MC, MU, OTSH), not all land was assumed to develop with employment uses, and zones intended for more mixed use (HBD, OTSH, MU) have lower levels of assumed employment development than other commercial zones. The full table of assumptions for each zone is provided in Appendix D.

Once future developed uses were assigned, the amount of floor area per employment use category was estimated using the following typical assumptions for lot coverage by use type:

- Commercial, retail, and institutional – 30%
- Industrial – 25%

These percentages take into account land on a lot needed for development requirements such as parking, open space or landscaping, and public facility dedications or easements.

The share of potential future additional employment capacity by TAZ for each category of employment uses is presented in Table 8.

Table 8. Share of Employment Development Capacity by Use Type and TAZ

TAZ	1	2	3	4	5	6	7	8	9	Total
COM	48%	17%	6%	11%	0%	8%	0%	10%	0%	100%
IND	7%	2%	1%	2%	1%	5%	54%	29%	0%	100%
INS	0%	0%	0%	0%	1%	0%	68%	30%	0%	100%
RET	28%	33%	6%	0%	22%	6%	1%	1%	3%	100%

Note: Percentages may not add up to 100% due to rounding.
Sources: Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning

These percentages were applied to the total projected employment area for 2031 shown in Table 7 to allocate employment area by category to the TAZs. The future employment area allocations are shown in Table 9.

Table 9. Future Employment Area Square Feet) by Use Type and TAZ [1]

TAZ	1	2	3	4	5	6	7	8	9	Total
COM	147,166	87,416	76,702	171,785	3,346	285,755	216,862	120,444	8,111	1,117,587
IND	54,379	0	0	4,971	14,343	144,544	1,049,948	825,783	0	2,093,968
INS	421,235	598,897	36,809	8,452	225,644	311,759	99,204	4,086	32,285	1,738,371
RET	169,070	87,377	18,572	201,213	0	268,491	0	133,357	0	878,080
Total (sf)	791,850	773,690	132,083	386,421	243,333	1,010,549	1,366,014	1,083,670	40,396	5,828,006

Sources: City of St. Helens Economic Opportunities Analysis (2008), Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning

Summary of Results/Conclusion

The following tables summarize current and future households and employment floor area by TAZ. These results are also shown graphically on the maps that follow.

Number of Households by Housing Type and by TAZ (2009)

TAZ	1	2	3	4	5	6	7	8	9	Total
Single-family	1,251	604	217	160	402	1,921	184	30	64	4,833
Multi-family	132	58	0	47	0	229	0	0	0	466
Total	1,384	662	217	206	402	2,150	184	30	64	5,299

Sources: Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning

Future Households (2031) by Housing Type and TAZ

TAZ	1	2	3	4	5	6	7	8	9	Total
Single-family	1,973	767	348	161	826	2,011	184	30	81	6,381
Multi-family	136	201	0	47	0	324	0	0	0	708
Total	2,109	968	348	208	826	2,335	184	30	81	7,089

Sources: Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning, PSU PRC

[1] Note: The future projections indicate a change the ratio of jobs (or employment area) to housing. This is related to a combination of assumptions about changing household size and the ratio of jobs to population.

Existing Employment Floor Area (Square Feet) by Use Type and by TAZ

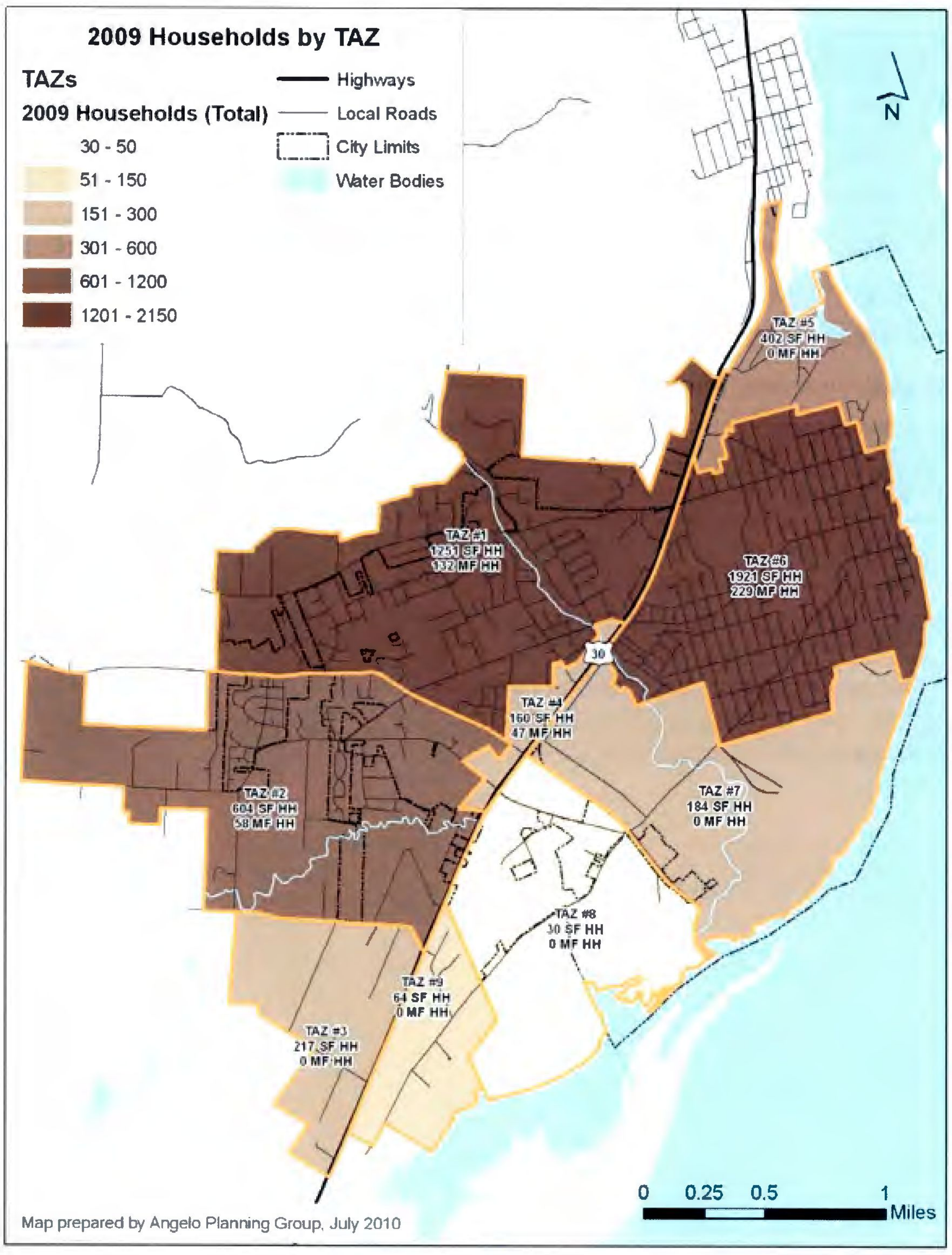
TAZ	1	2	3	4	5	6	7	8	9	Total
COM	119,993	78,790	73,425	166,149	0	268,275	18,191	13,713	8,111	746,647
IND	53,998	0	0	4,971	6,355	142,989	575,642	615,001	0	1,398,956
INS	260,843	408,513	0	8,270	101,185	278,913	90,815	170	12,678	1,161,387
RET	29,007	38,492	0	169,273	0	244,646	0	105,218	0	586,636
Total	463,841	525,795	73,425	348,663	107,540	934,823	684,648	734,102	20,789	3,893,626

Sources: Columbia County taxlot data

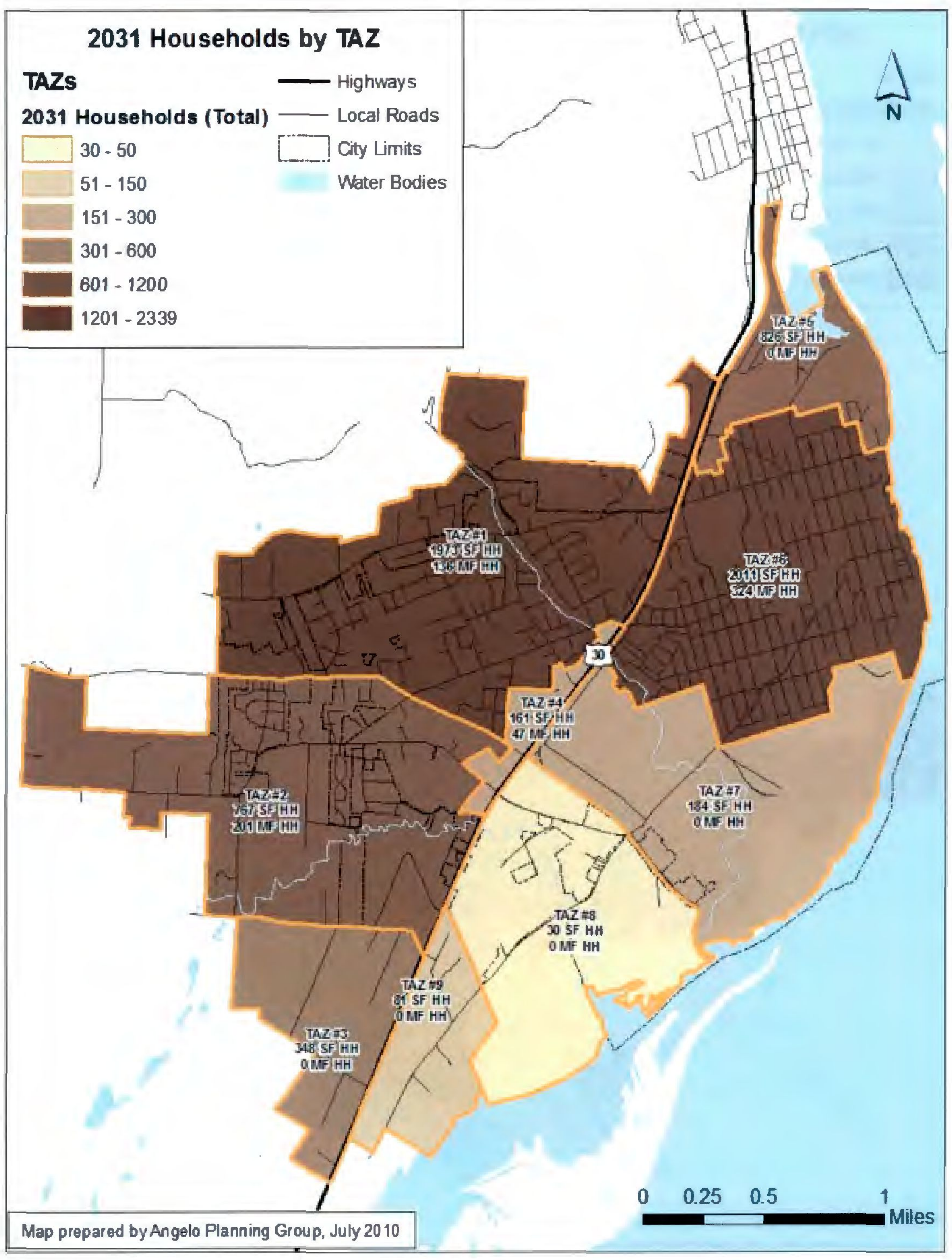
Future Employment Area (Square Feet) by Use Type and TAZ

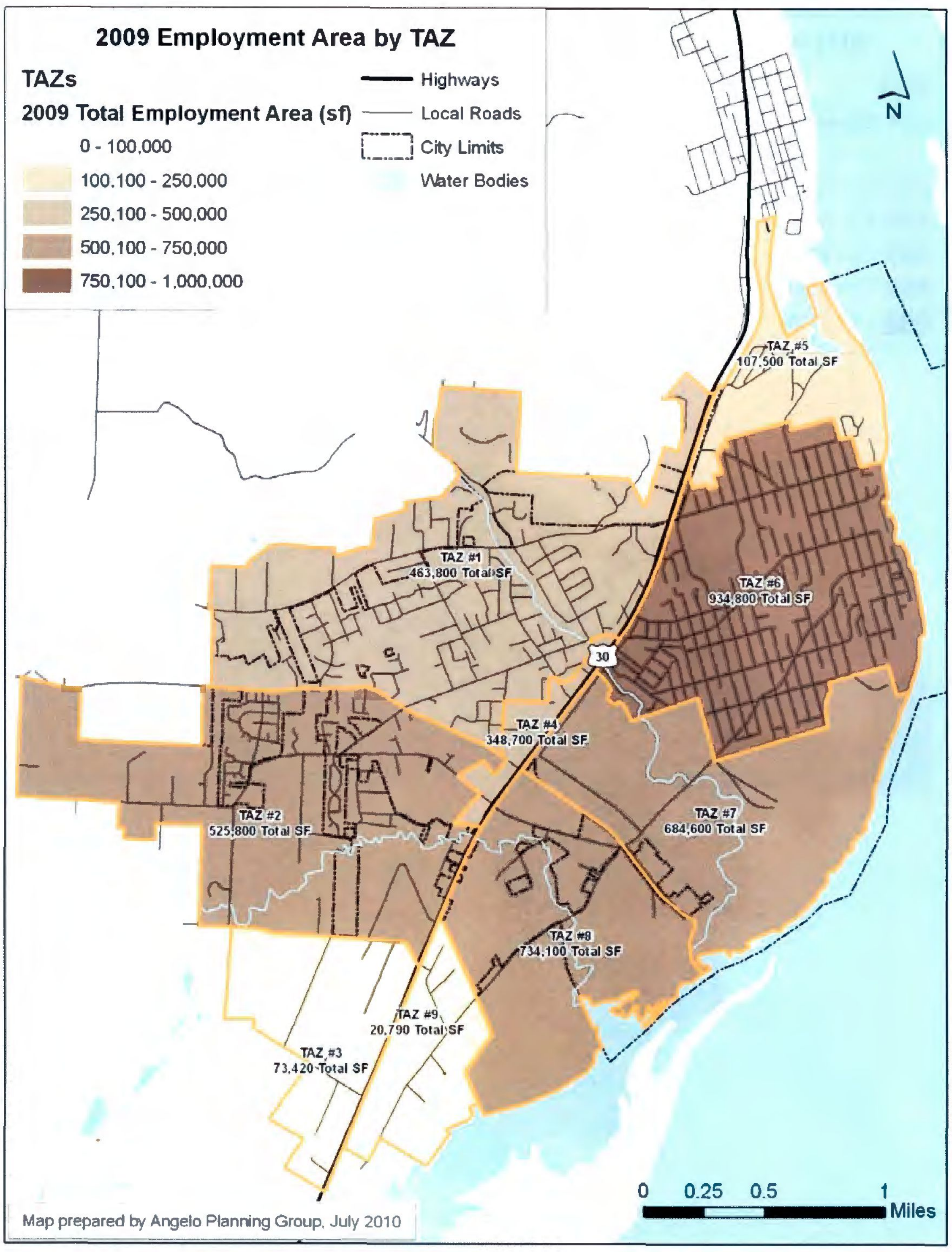
TAZ	1	2	3	4	5	6	7	8	9	Total
COM	147,166	87,416	76,702	171,785	3,346	285,755	216,862	120,444	8,111	1,117,587
IND	54,379	0	0	4,971	14,343	144,544	1,049,948	825,783	0	2,093,968
INS	421,235	598,897	36,809	8,452	225,644	311,759	99,204	4,086	32,285	1,738,371
RET	169,070	87,377	18,572	201,213	0	268,491	0	133,357	0	878,080
Total (sf)	791,850	773,690	132,083	386,421	243,333	1,010,549	1,366,014	1,083,670	40,396	5,828,006

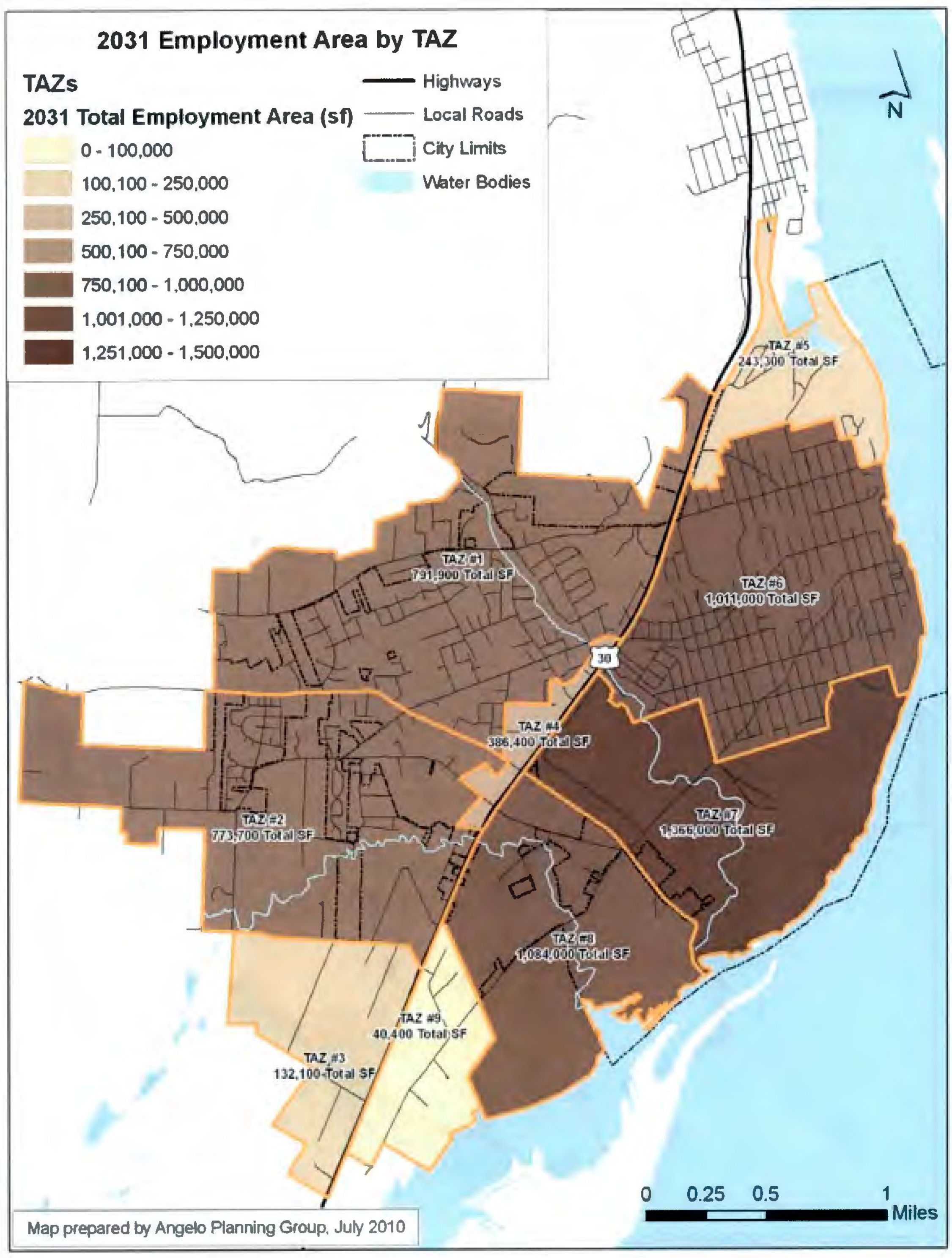
Sources: City of St. Helens Economic Opportunities Analysis (2008), Columbia County taxlot data, City of St. Helens Zoning, Columbia County Zoning



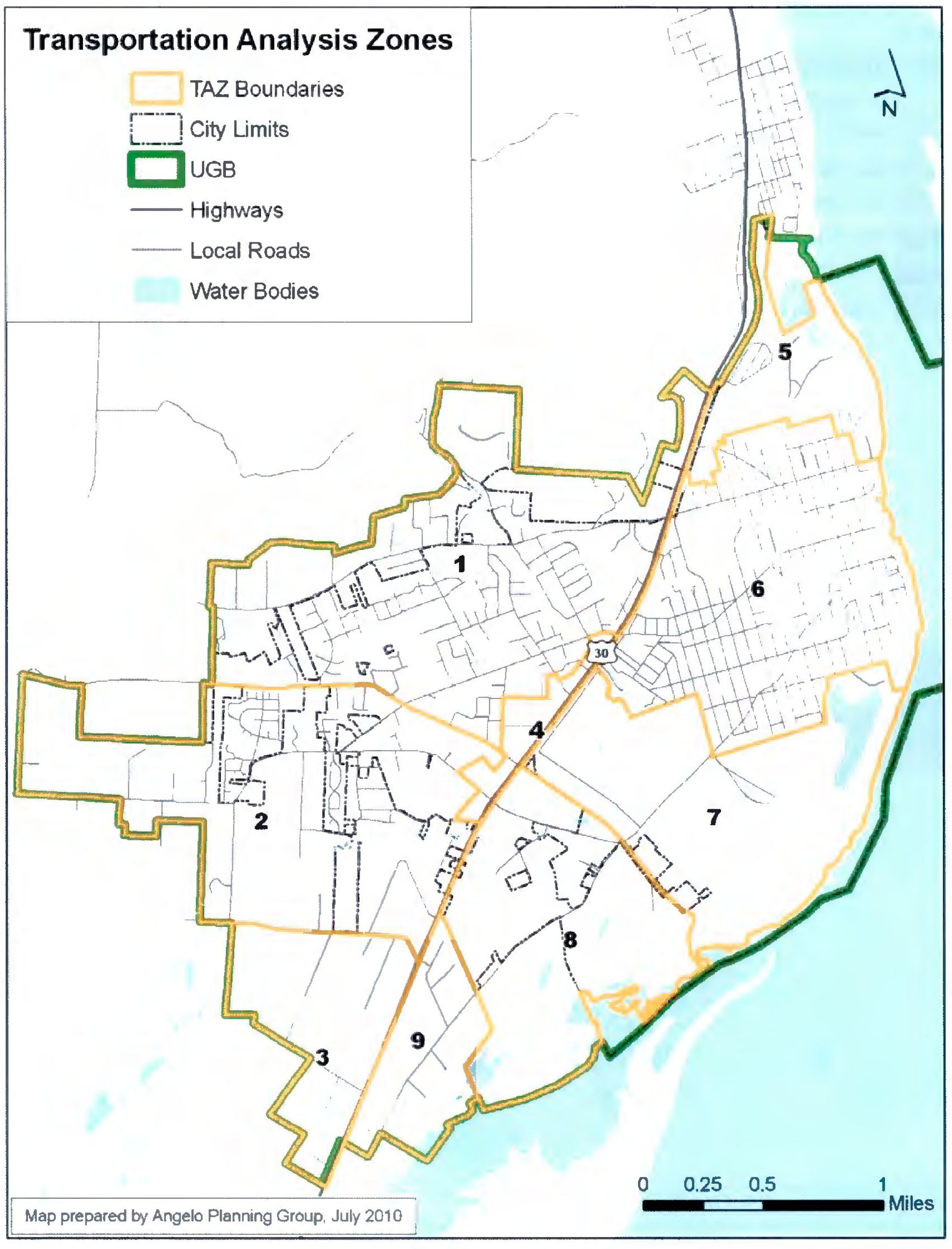
2009 Households by TAZ
TAZs
2009 Households (Total)
30 - 50
51 - 150
151 - 300
301 - 600
601 - 1200
1201 - 2150
Highways
Local Roads
City Limits
Water Bodies
N
TAZ #5
402 SF HH
0 MF HH
TAZ #1
1251 SF HH
132 MF HH
TAZ #6
1921 SF HH
229 MF HH
30
TAZ #4
160 SF HH
47 MF HH
TAZ #2
604 SF HH
58 MF HH
TAZ #7
184 SF HH
0 MF HH
TAZ #8
30 SF HH
0 MF HH
TAZ #9
64 SF HH
0 MF HH
TAZ #3
217 SF HH
0 MF HH
0 0.25 0.5 1
Miles
Map prepared by Angelo Planning Group, July 2010


2031 Households by TAZ
TAZs
2031 Households (Total)
30 - 50
51 - 150
151 - 300
301 - 600
601 - 1200
1201 - 2339
Highways
Local Roads
City Limits
Water Bodies
N
TAZ #1
TAZ #2
767 SF HH
201 MF HH
TAZ #3
348 SF HH
0 MF HH
TAZ #4
161 SF HH
47 MF HH
TAZ #5
826 SF HH
0 MF HH
TAZ #6
2011 SF HH
324 MF HH
TAZ #7
184 SF HH
0 MF HH
TAZ #8
30 SF HH
0 MF HH
TAZ #9
81 SF HH
0 MF HH
30
0 0.25 0.5 1
Miles
Map prepared by Angelo Planning Group, July 2010


2009 Employment Area by TAZ
TAZs
2009 Total Employment Area (sf)
0 - 100,000
100,100 - 250,000
250,100 - 500,000
500,100 - 750,000
750,100 - 1,000,000
Highways
Local Roads
City Limits
Water Bodies
N
TAZ #5
107,500 Total SF
TAZ #1
463,800 Total SF
TAZ #6
934,800 Total SF
30
TAZ #4
348,700 Total SF
TAZ #2
525,800 Total SF
TAZ #7
684,600 Total SF
TAZ #8
734,100 Total SF
TAZ #9
20,790 Total SF
TAZ #3
73,420 Total SF
0 0.25 0.5 1
Miles
Map prepared by Angelo Planning Group, July 2010


2031 Employment Area by TAZ
TAZs
2031 Total Employment Area (sf)
0 - 100,000
100,100 - 250,000
250,100 - 500,000
500,100 - 750,000
750,100 - 1,000,000
1,001,000 - 1,250,000
1,251,000 - 1,500,000
Highways
Local Roads
City Limits
Water Bodies
N
TAZ #1
791,900 Total SF
TAZ #2
773,700 Total SF
TAZ #3
132,100 Total SF
TAZ #4
386,400 Total SF
TAZ #5
243,300 Total SF
TAZ #6
1,011,000 Total SF
TAZ #7
1,356,000 Total SF
TAZ #8
1,084,000 Total SF
TAZ #9
40,400 Total SF
30
0 0.25 0.5 1
Miles
Map prepared by Angelo Planning Group, July 2010

Appendix A: Transportation Analysis Zones (TAZs), City of St. Helens



Appendix B: Columbia County Property Codes and Assigned Uses

Class	Class Description	Assigned Use Category
003	MISCELLANEOUS, CENTRALLY ASSESSED	INS
010	UNBUILDABLE(SIZE,DEQ DENIAL, ETC) ZONED RESIDENTIAL	NA
014		UNK
020	UNBUILDABLE(SIZE, DEQ DENIAL,ETC) ZONED COMMERCIAL	NA
024	IMPROVED COMMERCIAL, HISTORIC ZONED COMMERCIAL	COM
030		UNK
038	ENTERPRISE ZONE, IMPROVED STATE IPR PROCESSED	COM
040	UNBUILDABLE(SIZE, DEQ DENIAL,ETC) ZONING NOT SIGNIFICANT	NA
100	VACANT LAND, ZONED RESIDENTIAL	RES VAC
101	RESIDENTIAL IMPROVED, ZONED RESIDENTIAL	RES SF
102	CONDOMINIUM	RES MF
109	M S IMPROVED, ZONED RESIDENTIAL	RES SF
200	VACANT LAND ZONED COMMERCIAL	COM VAC
201	COMMERCIAL IMPROVED, ZONED COMMERCIAL	COM
206	COMMERCIAL, MARINA/MOORAGE	COM
207	ALL M S PARKS, REGARDLESS OF ZONE	NA
208	COMMERCIAL, RETIRE/CARE FACILITY	INS
300	VACANT LAND, ZONED INDUSTRIAL	IND VAC
301	INDUSTRIAL IMPROVED, ZONED INDUSTRIAL	IND
303	INDUSTRIAL, STATE RESPONSIBLE IPR PROCESSED	IND
308	INDUSTRIAL, COUNTY RESPONSIBLE IPR PROCESSED	IND
330		UNK
331	INDUSTRIAL, AGGREGATE MINE WITH IMPROVMENTS	IND
338	INDUSTRIAL, AGGREGATE MINE COUNTY RESPONSIBLE IPR PROCESSED	IND
400	VACANT H&B USE TRACT LAND, ZONING NOT SIGNIFICANT	VAC
401	IMPROVED H&B USE TRACT, ZONING NOT SIGNIFICANT	RES SF
409	M S H&B USE TRACT, ZONING NOT SIGNIFICANT	RES SF
540	VACANT H&B USE FARM, RECEIVING FARM DEF, ZONED NON-EFU	VAC
541	IMPROVED H&B USE FARM, RCVG FARM DEF, ZONED NON-EFU	RES SF
640	VACANT H&B USE TRACT FOREST/WLO, DESIGNATED, ZONING NOT SIGNIFICANT	VAC
641	IMPRVD H&B USE TRACT FOREST/WLO, DESIGNATED, ZONING NOT SIGNIFICANT	RES SF
649	M S H&B USE TRACT FOREST/WLO,DESIGNATED, ZONING NOT SIGNIFICANT	RES SF
701	IMPROVED 5 OR MORE UNITS, ZONED MULTI-FAMILY AND MS PARK IMPROVED	RES MF
781	MULTIPLE HOUSING, LOW INCOME SPECIAL ASMT	RES MF
910	CHURCH - VACANT	INS VAC
911	CHURCH - IMPROVED	INS
920	SCHOOL - VACANT	INS VAC
921	SCHOOL - IMPROVED	INS
930		UNK
940	CITY - VACANT	INS VAC
941	CITY - IMPROVED	INS
950	COUNTY - VACANT	INS VAC
951	COUNTY - IMPROVED	INS
960	STATE OWNED - VACANT	INS VAC

Class	Class Description	Assigned Use Category
961	STATE OWNED - IMPROVED	INS
980		UNK
981	BENEVOLENT, FRATERNAL OWNERSHIP - IMPROVED	INS
990	PORT PROPERTIES OR OTHER MUNICIPAL PROPERTIES - VACANT	IND VAC
991	PORT PROPERTIES OR OTHER MUNICIPAL PROPERTIES - IMPROVED	IND
995	EXEMPT, GOVERMENT HOUSING AUTHORITIES	RES MF

COM – commercial
IND – industrial
INS – institutional
RES – residential
SF – single-family
MF – multi-family
UNK – unknown
VAC – vacant

Appendix C: Assumptions for Residential Development Capacity

Assumptions about the percentage of available land that could be developed for residential uses and the density and type of projected housing are summarized in Table C-1. They are based on uses and densities allowed by existing City and County zoning.

The percentage of land in a zone that may potentially be developed for residential uses depends on whether residential uses are allowed in that zone and on policy direction provided in the City's zoning code and Comprehensive Plan. The percentage assumptions shown in Table C-1 are consistent with those made for estimating employment area, also presented in this report.

Assumptions about the number of units per acre are derived from minimum lot size requirements specified in the City's zoning code as well as input from City staff. The same assumptions were applied to corresponding County comprehensive plan designations outside the City limits but inside the City's UGB, assuming that over the next 20 years, land will be annexed to meet growth demands and urban zoning will be applied consistent with the existing comprehensive plan designations. Converting minimum lot size requirements to units per acre is straightforward for low- and medium-density residential development. For high-density residential development, lot size requirements allow for an average density of 20 units per acre and higher, depending on lot size. Instead of assuming maximum densities, an efficiency factor of 80% was applied, resulting in an average density of approximately 16 units per acre. In the two downtown mixed use districts where high density is allowed only above commercial uses, a slightly lower density was assumed based on input from City staff, resulting in a density of roughly 12 units per acre.

Last, the zones were designated as supporting primarily single-family or multi-family development based on the primary types of housing allowed in each zone.

Table C-1: Residential Development Capacity Assumptions by Zone

	Zone	Percentage Residential	Units per acre	SF/MF
City				
Apartment Residential	AR	0.95	16	MF
General Commercial	GC	0.1	16	MF
Houlton Business District	HBD	0.2	12	MF
Highway Commercial	HC	0		
Heavy Industrial	HI	0		
Light Industrial	LI	0		
Marine Commercial	MC	0.2	8	SF
Manufactured Home Residential	MHR	0.95	8.71	SF
Mixed Use	MU	0.4	8.71	SF
Olde Towne St. Helens	OTSH	0.2	12	MF
Public Land	PL	0		
Suburban Residential	R10	0.8	4.36	SF

	Zone	Percentage Residential	Units per acre	SF/MF
General Residential	R5	0.8	8.71	SF
Moderate Residential	R7	0.8	6.22	SF
County				
Rural Suburban Unincorporated Residential	RSUR	0.8	1	SF
Unincorporated General Commercial	UGC	0.1	16	MF
Unincorporated General Residential	UGR	0.8	8.71	SF
Unincorporated Highway Commercial	UHC	0		
Unincorporated Heavy Industrial	UHI	0		
Unincorporated Light Industrial	ULI	0		
Unincorporated Multifamily Residential	UMFR	0.95	7.92	MF
Unincorporated Manufactured Home Residential	UMHR	0.95	8.71	SF
Unincorporated Public Land	UPL	0		

Appendix D: Assumptions for Employment Development Potential

Table D-1: Projected Percentages of Land for Employment and Residential Uses by Zone

Zones		**RET**	**COM**	**INS**	**IND**	**RES**
City						
Apartment Residential	AR			0.05		0.95
General Commercial	GC	0.35	0.35	0.1	0.1	0.1
Houlton Business District	HBD	0.3	0.3	0.2		0.2
Highway Commercial	HC	0.8	0.2			
Heavy Industrial	HI		0.2		0.8	
Light Industrial	LI		0.2		0.8	
Marine Commercial	MC	0.6	0.2			0.2
Manufactured Home Residential	MHR			0.05		0.95
Mixed Use	MU	0.25	0.25	0.1		0.4
Olde Towne St. Helens	OTSH	0.3	0.3	0.2		0.2
Public Land	PL			0.3		
Suburban Residential	R10			0.2		0.8
General Residential	R5			0.2		0.8
Moderate Residential	R7			0.2		0.8
County						
Rural Suburban Unincorporated Residential	RSUR			0.2		0.8
Unincorporated General Commercial	UGC	0.35	0.35	0.1	0.1	0.1
Unincorporated General Residential	UGR			0.2		0.8

COM – commercial
RET – retail
IND – industrial
INS – institutional
RES – residential

Table D-2: Lot Coverage Percentages of Land for Employment Uses

	RET	COM	INS	IND
Lot Coverage/Floor Area Ratio	0.3	0.3	0.3	0.25

Table D-3: Existing Employment by Industry and Assigned Category

Employment Sector	Average Annual Employment (2008)	Assigned category
Construction	101	IND
Manufacturing	928	IND
Wholesale Trade / Transportation/Utilities	11	IND
Retail Trade	563	RET
Information	7	COM
Financial Activities	142	COM
Professional/Business Services	63	COM
Private Education/Health Services	412	INS
Leisure/Hospitality	424	COM
Other Services	106	COM
Government	805	INS

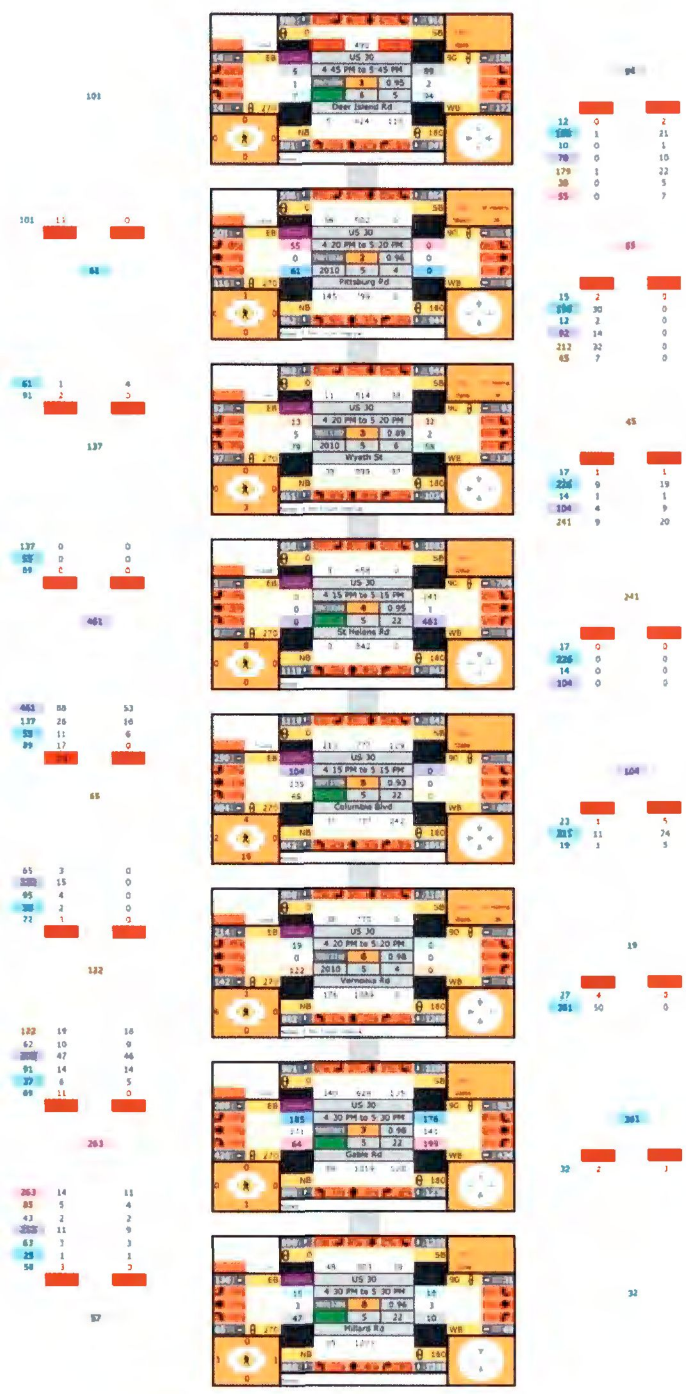
Source: *City of St. Helens Economic Opportunities Analysis (2008)*

Attachment B:
External-External Trip Calculation

EXTERNAL-EXTERNAL TIPS CALCULATION

The northbound through volumes at the US 30/Millard Road intersection and southbound through volumes at the US 30/Deer Island Road intersection were used as a basis to develop the E-E volumes in the northbound and southbound directions, respectively.

In the northbound direction, the 1,295 volumes entering the US 30/Millard Road intersection were first reduced by 85 northbound lefts and 7 northbound rights. The remaining 1,203 northbound through volumes were then reduced by 85 northbound lefts and 125 northbound rights at the Gable Road intersection as opposed to 88 northbound lefts and 128 northbound rights. The lower reduction represents a portion of the 15 eastbound lefts and 18 westbound rights from the US 30/Millard Road intersection that were distributed at the US 30/Gable Road intersection. The same 15 eastbound lefts and 18 westbound rights were further distributed at the remaining study intersections to the north in proportion to the turning volumes at each intersection. Of the 15 lefts and 18 rights, 22 were distributed within the City limits and 11 were assumed to continue north on US 30. The same process was repeated at each intersection for each of the entering volumes in both the north and southbound directions.



Attachment C:
Trip Calculations

TRIP CALCULATIONS

The existing External-External trip calculations were used to develop both future 2031 External-External trips and future 2031 External-Internal and Internal-External trips in the St. Helens area. Table 4 summarizes the estimated growth in External-External, External-Internal, and Internal-External trips that enter and exit the St. Helens area at the US 30/Millard Road and US 30/Deer Island Road intersections.

Table 4
External/External Trip Calculations

External Trip Station	Direction	2010 DHV	Growth Factor[1]	2010 E-E Trips[2]	2031 DHV[3]	E-E Trip Probability[4]	2031 E-E Trip Growth[5]	2031 E-I I-E Trip Growth[6]
US 30/ Millard	Enter	1,295	1.41	527	1,826	0.41	216	315
	Exit	860	1.41	174	1,212	0.20	71	281
US 30/ Deer Island	Enter	550	1.41	174	775	0.32	71	154
	Exit	918	1.41	527	1,294	0.57	216	160

1 – Background growth rate
2 – Total traffic volume carried through to an external gate
3 – 2031 DHV = (2010 DHV)*(Growth Factor=1.41)
4 – E-E Trip Probability = (2010 E-E Trips)/(2010 DHV)
5 – 2031 E-E Trip Growth = (E-E Trip Probability)*((2031 DHV)-(2010 DHV))
6 – 2031 E-I, I-E Trip Growth = (2031 DHV) – (2010 DHV) – (2031 E-E Trip Growth)

External-Internal, Internal-External Trips

The External-Internal and Internal-External trips identified in Table 4 were further distributed by first calculating the production and attraction probabilities for each TAZ (i.e. TAZ 1 attractions divided by total trip attractions). Table 5 contains the trip attractions and productions.

Table 5
External Trip Attractions and Production Probabilities

TAZ	1	2	3	4	5	6	7	8	9	Total
Total New Trips[1]	1,221	521	238	88	520	285	716	415	46	4,050
Trip Attractions[1]	673	272	116	41	300	137	138	100	16	1,793
Attraction Probability[2]	0.37	0.15	0.06	0.02	0.17	0.08	0.08	0.06	0.01	1.00
Trip Productions[1]	548	250	122	48	220	147	578	315	31	2,259
Production Probability[3]	0.24	0.11	0.05	0.02	0.10	0.07	0.26	0.14	0.01	1.00

1 – TAZ new trip volumes calculated in Table 3.
2 – Attraction Probability = (TAZ Trip Attractions) / (Total Trip Attractions)
3 – Production Probability = (TAZ Trip Productions) / (Total Trip Productions)

The trips were then distributed to each external station by multiplying these trips by each zone's attraction probability. Tables 6 and 7 summarize the External-Internal and Internal-External trip distributions.

Table 6
External-Internal Trip Distribution

External Station	New E-I Trips[1]	TAZ 1[2]	TAZ 2	TAZ 3	TAZ 4	TAZ 5	TAZ 6	TAZ 7	TAZ 8	TAZ 9
US 30/Millard	315	118	48	20	7	53	24	24	18	3
US 30/Deer island	154	58	23	10	3	26	12	12	9	1

1 – New External-Internal Trips recorded from "Enter" row of Table 4
2 – TAZ External-Internal Trips = (New E-I Trips) * (TAZ Attraction Probability)

Table 7
Internal-External Trip Distribution

External Station	New E-I Trips[1]	TAZ 1[2]	TAZ 2	TAZ 3	TAZ 4	TAZ 5	TAZ 6	TAZ 7	TAZ 8	TAZ 9
US 30/Millard	281	68	31	15	6	28	18	72	39	4
US30/Deer island	160	39	18	9	3	16	10	41	22	2

1 – New Internal-External Trips recorded from "Exit" row of Table 4
2 – TAZ Internal-External Trips = (New I-E Trips) * (TAZ Attraction Probability)

Internal-Internal Trips

The remaining new trips were then distributed among the zones within St. Helens. Table 8 identifies the internal trip attraction and production probabilities.

Table 8 Internal Trip Attraction and Production Probabilities

TAZ	1	2	3	4	5	6	7	8	9	Total
Total Internal-Internal[1]	938	402	184	68	399	220	567	328	36	3,142
Internal Attractions[2]	497	201	86	30	222	101	102	74	12	1,325
Attraction Probability[3]	0.37	0.15	0.06	0.02	0.17	0.08	0.08	0.06	0.01	1.00
Internal Productions[4]	441	201	98	38	177	119	465	254	25	1,818
Production Probability[5]	0.24	0.11	0.05	0.02	0.10	0.07	0.26	0.14	0.01	1.00

1 – Total Internal-Internal = (Total New Trips) – (Sum of External-Internal Trips + Sum of Internal-External Trips)
2 – Internal Attractions = (TAZ Trip Attractions) – (Sum of External-Internal Trips)
3 – Attraction Probability = (TAZ Internal Attractions) / (Total Internal Attractions)
4 – Internal Productions = (TAZ Trip Productions) – (Sum of Internal-External Trips)
5 – Production Probability = (TAZ Internal Productions) / (Total Internal Productions)

The matrix in Table 9 illustrates the distribution of internal trip attractions between and among the zones, and Table 10 illustrates the distribution for trip productions.

Table 9
Internal Trip Attraction Distribution

Zone	I-I Attraction	TAZ 1	TAZ 2	TAZ 3	TAZ 4	TAZ 5	TAZ 6	TAZ 7	TAZ 8	TAZ 9
1	497	187	75	32	11	83	38	38	28	4
2	201	75	30	13	5	34	15	15	11	2
3	86	32	13	6	2	14	7	7	5	1
4	30	11	5	2	1	5	2	2	2	0
5	222	83	34	14	5	37	17	17	12	2
6	101	38	15	7	2	17	8	8	6	1
7	102	38	15	7	2	17	8	8	6	1
8	74	28	11	5	2	12	6	6	4	1
9	12	4	2	1	0	2	1	1	1	0

Table 10
Internal Trip Production Distribution

Zone	I-I Production	TAZ 1	TAZ 2	TAZ 3	TAZ 4	TAZ 5	TAZ 6	TAZ 7	TAZ 8	TAZ 9
1	441	107	49	24	9	43	29	113	62	6
2	201	49	22	11	4	20	13	51	28	3
3	98	24	11	5	2	10	6	25	14	1
4	38	9	4	2	1	4	3	10	5	1
5	177	43	20	10	4	17	12	45	25	2
6	119	29	13	6	3	12	8	30	17	2
7	465	113	51	25	10	45	30	119	65	6
8	254	62	28	14	5	25	17	65	35	3
9	25	6	3	1	1	2	2	6	3	0

Appendix C:

Trip Generation Table

Table C-1
2031 Growth Trip Generation Estimate, Weekday PM Peak Hour

TAZ	Housing			Employment			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
1	460	270	730	210	275	485	675	550	1,225
2	160	90	250	110	160	270	270	250	520
3	80	50	130	30	75	105	115	120	235
4	0	0	0	40	45	85	40	50	90
5	270	160	430	30	60	90	300	220	520
6	95	55	150	40	95	135	140	145	285
7	0	0	0	140	580	720	140	580	720
8	0	0	0	100	315	415	100	315	415
9	10	5	15	5	25	30	15	30	45
Area-wide	***1,075***	***630***	***1,705***	***705***	***1,630***	***2,335***	***1,795***	***2,260***	***4,055***

Appendix D:
Year 2031 Forecast Traffic Conditions Worksheets

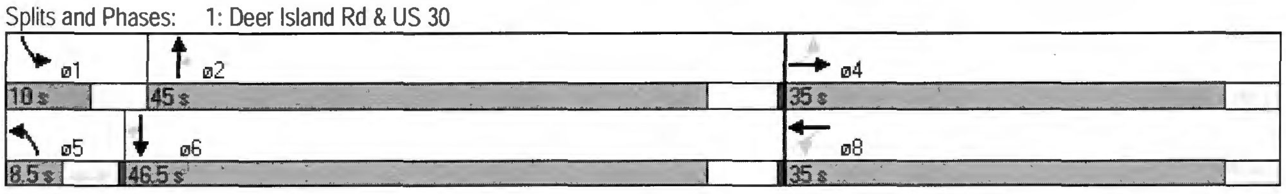
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	5	1	7	298	2	109	5	1185	321	85	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	110		300	110		110
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.927			0.964				0.850			0.850
Flt Protected		0.981			0.965		0.950			0.950		
Satd. Flow (prot)	0	1215	0	0	1628	0	1710	3353	1473	1662	3288	916
Flt Permitted		0.894			0.777		0.950			0.950		
Satd. Flow (perm)	0	1107	0	0	1311	0	1710	3353	1473	1662	3288	916
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			22				338			6
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		225			179			1625			999	
Travel Time (s)		5.1			4.1			22.2			13.6	
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
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Adj. Flow (vph)	5	1	7	314	2	115	5	1247	338	89	723	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	13	0	0	431	0	5	1247	338	89	723	6
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	34.0	34.0		34.0	34.0		8.5	30.5	30.5	9.5	32.5	32.5
Total Split (s)	35.0	35.0	0.0	35.0	35.0	0.0	8.5	45.0	45.0	10.0	46.5	46.5
Total Split (%)	38.9%	38.9%	0.0%	38.9%	38.9%	0.0%	9.4%	50.0%	50.0%	11.1%	51.7%	51.7%
Maximum Green (s)	31.0	31.0		31.0	31.0		4.0	39.5	39.5	6.0	41.0	41.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.5	0.5	0.5	0.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.5	5.5	5.5	4.0	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	5.1	5.1	2.5	5.1	5.1
Minimum Gap (s)	2.0	2.0		2.0	2.0		1.0	3.1	3.1	1.0	3.1	3.1
Time Before Reduce (s)	5.0	5.0		5.0	5.0		8.0	10.0	10.0	8.0	10.0	10.0
Time To Reduce (s)	5.0	5.0		5.0	5.0		3.0	20.0	20.0	3.0	20.0	20.0
Recall Mode	None	None		None	None		None	Max	Max	None	Max	Max
Walk Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)	25.0	25.0		25.0	25.0			20.0	20.0		22.0	22.0
Pedestrian Calls (#/hr)	0	0		0	0			0	0		0	0
v/c Ratio		0.03			0.95		0.06	0.83	0.40	0.79	0.41	0.01
Control Delay		14.6			60.7		43.2	28.3	3.4	85.9	13.8	7.5
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		14.6			60.7		43.2	28.3	3.4	85.9	13.8	7.5
Queue Length 50th (ft)		2			223		3	323	0	51	116	0
Queue Length 95th (ft)		15			#411		14	417	47	#135	195	7
Internal Link Dist (ft)		145			99			1545			919	
Turn Bay Length (ft)							110		300	110		110
Base Capacity (vph)		392			473		77	1494	843	113	1773	497
Starvation Cap Reductn		0			0		0	0	0	0	0	0
Spillback Cap Reductn		0			0		0	0	0	0	0	0
Storage Cap Reductn		0			0		0	0	0	0	0	0
Reduced v/c Ratio		0.03			0.91		0.06	0.83	0.40	0.79	0.41	0.01

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 88.8
Natural Cycle: 90
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Deer Island Rd & US 30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1	7	298	2	109	5	1185	321	85	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Lane Util. Factor		1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.93			0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98			0.96		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1215			1628		1710	3353	1473	1662	3288	916
Flt Permitted		0.89			0.78		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1108			1310		1710	3353	1473	1662	3288	916
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)	5	1	7	314	2	115	5	1247	338	89	723	6
RTOR Reduction (vph)	0	5	0	0	15	0	0	0	180	0	0	3
Lane Group Flow (vph)	0	8	0	0	416	0	5	1247	158	89	723	3
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)		29.7			29.7		0.8	43.2	43.2	6.0	47.9	47.9
Effective Green, g (s)		29.7			29.7		0.8	43.2	43.2	6.0	47.9	47.9
Actuated g/C Ratio		0.32			0.32		0.01	0.47	0.47	0.06	0.52	0.52
Clearance Time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Vehicle Extension (s)		2.5			2.5		2.5	5.1	5.1	2.5	5.1	5.1
Lane Grp Cap (vph)		356			421		15	1568	689	108	1704	475
v/s Ratio Prot							0.00	c0.37		c0.05	0.22	
v/s Ratio Perm		0.01			c0.32				0.11			0.00
v/c Ratio		0.02			0.99		0.33	0.80	0.23	0.82	0.42	0.01
Uniform Delay, d1		21.4			31.2		45.5	20.9	14.7	42.7	13.7	10.8
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0			40.3		9.3	4.3	0.8	37.0	0.8	0.0
Delay (s)		21.5			71.5		54.8	25.1	15.4	79.7	14.5	10.8
Level of Service		C			E		D	C	B	E	B	B
Approach Delay (s)		21.5			71.5			23.2			21.6	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM Average Control Delay	30.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	92.4	Sum of lost time (s)	13.5
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	167	172	270	1258	785	179
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	25	100			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1599	1377	1629	3320	3257	1443
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1599	1377	1629	3320	3257	1443
Link Speed (mph)	35			40	40	
Link Distance (ft)	567			871	1625	
Travel Time (s)	11.0			14.8	27.7	
Confl. Peds. (#/hr)	1					
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	4%	8%	5%	3%	5%	6%
Adj. Flow (vph)	174	179	281	1310	818	186
Shared Lane Traffic (%)						
Lane Group Flow (vph)	174	179	281	1310	818	186
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	167	172	270	1258	785	179
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	174	179	281	1310	818	186
Pedestrians					1	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)		1				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2036	409	818			
vC1, stage 1 conf vol	818					
vC2, stage 2 conf vol	1219					
vCu, unblocked vol	2036	409	818			
tC, single (s)	6.9	7.1	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.4	2.2			
p0 queue free %	0	69	64			
cM capacity (veh/h)	140	575	787			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	353	281	655	655	409	409	186
Volume Left	174	281	0	0	0	0	0
Volume Right	179	0	0	0	0	0	186
cSH	232	787	1700	1700	1700	1700	1700
Volume to Capacity	1.52	0.36	0.39	0.39	0.24	0.24	0.11
Queue Length 95th (ft)	533	41	0	0	0	0	0
Control Delay (s)	293.3	12.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	B					
Approach Delay (s)	293.3	2.1			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay	36.3		
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	13	6	80	146	2	34	40	1482	202	40	907	11
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	85		250	85		25
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor												
Frt		0.891			0.975				0.850			0.850
Flt Protected		0.993			0.961		0.950			0.950		
Satd. Flow (prot)	0	1451	0	0	1614	0	1710	3226	1488	1662	3196	1530
Flt Permitted		0.993			0.961		0.950			0.950		
Satd. Flow (perm)	0	1451	0	0	1614	0	1710	3226	1488	1662	3196	1530
Link Speed (mph)		25			25			40			40	
Link Distance (ft)		275			614			1403			871	
Travel Time (s)		7.5			16.7			23.9			14.8	
Confl. Peds. (#/hr)			3	3								
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
Heavy Vehicles (%)	8%	0%	7%	2%	0%	0%	0%	6%	0%	0%	7%	0%
Adj. Flow (vph)	14	6	84	154	2	36	42	1560	213	42	955	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	104	0	0	192	0	42	1560	213	42	955	12
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	13	6	80	146	2	34	40	1482	202	40	907	11
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)	14	6	84	154	2	36	42	1560	213	42	955	12
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1940	2896	480	2296	2695	780	966			1773		
vC1, stage 1 conf vol	1039	1039		1644	1644							
vC2, stage 2 conf vol	901	1857		652	1051							
vCu, unblocked vol	1940	2896	480	2296	2695	780	966			1773		
tC, single (s)	7.7	6.5	7.0	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.7	5.5		6.5	5.5							
tF (s)	3.6	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	91	84	0	98	90	94			88		
cM capacity (veh/h)	141	71	517	89	121	342	721			356		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	104	192	42	780	780	213	42	477	477	12
Volume Left	14	154	42	0	0	0	42	0	0	0
Volume Right	84	36	0	0	0	213	0	0	0	12
cSH	298	104	721	1700	1700	1700	356	1700	1700	1700
Volume to Capacity	0.35	1.85	0.06	0.46	0.46	0.13	0.12	0.28	0.28	0.01
Queue Length 95th (ft)	38	390	5	0	0	0	10	0	0	0
Control Delay (s)	23.4	486.6	10.3	0.0	0.0	0.0	16.5	0.0	0.0	0.0
Lane LOS	C	F	B				C			
Approach Delay (s)	23.4	486.6	0.2				0.7			
Approach LOS	C	F								

Intersection Summary			
Average Delay	31.0		
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	ᵀᵀ	↱	↑↑			↑↑
Volume (vph)	514	265	1506	0	0	1132
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor		0.98				
Frt		0.850				
Flt Protected	0.950					
Satd. Flow (prot)	3193	1458	3226	0	0	3420
Flt Permitted	0.950					
Satd. Flow (perm)	3193	1436	3226	0	0	3420
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		40				
Link Speed (mph)	25		35			35
Link Distance (ft)	349		598			1403
Travel Time (s)	9.5		11.6			27.3
Confl. Bikes (#/hr)		4				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Adj. Flow (vph)	541	279	1585	0	0	1192
Shared Lane Traffic (%)						
Lane Group Flow (vph)	541	279	1585	0	0	1192
Turn Type		Perm				
Protected Phases	8		2			6
Permitted Phases		8				
Detector Phase	8	8	2			6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0			4.0
Minimum Split (s)	20.0	20.0	20.0			20.0
Total Split (s)	28.0	28.0	62.0	0.0	0.0	62.0
Total Split (%)	31.1%	31.1%	68.9%	0.0%	0.0%	68.9%
Maximum Green (s)	24.0	24.0	58.0			58.0
Yellow Time (s)	3.5	3.5	3.5			3.5
All-Red Time (s)	0.5	0.5	0.5			0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	Max			Max
Walk Time (s)	5.0	5.0	5.0			5.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
v/c Ratio	0.74	0.77	0.73			0.52
Control Delay	37.1	41.4	12.0			8.4
Queue Delay	0.0	0.0	0.5			0.0
Total Delay	37.1	41.4	12.6			8.4
Queue Length 50th (ft)	139	122	257			151
Queue Length 95th (ft)	194	212	386			224
Internal Link Dist (ft)	269		518			1323

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Turn Bay Length (ft)						
Base Capacity (vph)	894	431	2183			2314
Starvation Cap Reductn	0	0	234			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.61	0.65	0.81			0.52

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 85.9
Natural Cycle: 60
Control Type: Semi Act-Uncoord

Splits and Phases: 4: St Helens St & US 30

ø2
62 s
ø6
62 s
ø8
28 s

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	514	265	1506	0	0	1132
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3193	1435	3226			3420
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3193	1435	3226			3420
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	541	279	1585	0	0	1192
RTOR Reduction (vph)	0	31	0	0	0	0
Lane Group Flow (vph)	541	248	1585	0	0	1192
Confl. Bikes (#/hr)		4				
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Turn Type		Perm				
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	19.8	19.8	58.1			58.1
Effective Green, g (s)	19.8	19.8	58.1			58.1
Actuated g/C Ratio	0.23	0.23	0.68			0.68
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	736	331	2182			2313
v/s Ratio Prot	0.17		c0.49			0.35
v/s Ratio Perm		c0.17				
v/c Ratio	0.74	0.75	0.73			0.52
Uniform Delay, d1	30.6	30.7	8.8			6.9
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	3.8	9.0	2.2			0.8
Delay (s)	34.4	39.7	11.0			7.7
Level of Service	C	D	B			A
Approach Delay (s)	36.2		11.0			7.7
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	85.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	261	72	0	0	0	45	1352	271	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	80		80	0		0	120		430	120		155
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			0.850
Flt Protected		0.982					0.950			0.950		
Satd. Flow (prot)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Flt Permitted		0.982					0.950			0.950		
Satd. Flow (perm)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			68						227			317
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1699			1325			1662			598	
Travel Time (s)		46.3			36.1			32.4			11.6	
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
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Adj. Flow (vph)	160	275	76	0	0	0	47	1423	285	160	1255	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	435	76	0	0	0	47	1423	285	160	1255	317
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Detector Phase	4	4	4				5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0				8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	0.0	0.0	0.0	11.0	50.0	50.0	20.0	59.0	59.0
Total Split (%)	22.2%	22.2%	22.2%	0.0%	0.0%	0.0%	12.2%	55.6%	55.6%	22.2%	65.6%	65.6%
Maximum Green (s)	16.0	16.0	16.0				7.0	46.0	46.0	16.0	55.0	55.0
Yellow Time (s)	3.5	3.5	3.5				3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5				0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None				None	Max	Max	None	None	None
Walk Time (s)	5.0	5.0	5.0					5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0					11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0					0	0	0	0	0
v/c Ratio		0.78	0.24				0.37	0.82	0.32	0.66	0.58	0.28
Control Delay		44.9	12.3				47.6	22.6	4.1	48.1	10.6	1.6
Queue Delay		0.0	0.0				0.0	0.0	0.0	0.0	0.1	0.0
Total Delay		44.9	12.3				47.6	22.6	4.1	48.1	10.7	1.6
Queue Length 50th (ft)		121	4				25	334	15	84	216	0
Queue Length 95th (ft)		#182	41				61	460	57	148	281	30

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1619			1245			1582			518	
Turn Bay Length (ft)			80				120		430	120		155
Base Capacity (vph)		606	333				135	1731	880	301	2164	1123
Starvation Cap Reductn		0	0				0	0	0	0	200	0
Spillback Cap Reductn		0	0				0	0	0	0	0	0
Storage Cap Reductn		0	0				0	0	0	0	0	0
Reduced v/c Ratio		0.72	0.23				0.35	0.82	0.32	0.53	0.64	0.28

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 86
Natural Cycle: 80
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Columbia Blvd & US 30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱				↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	152	261	72	0	0	0	45	1352	271	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	1.00				1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85				1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3244	1488				1660	3226	1444	1614	3257	1530
Flt Permitted		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3244	1488				1660	3226	1444	1614	3257	1530
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)	160	275	76	0	0	0	47	1423	285	160	1255	317
RTOR Reduction (vph)	0	0	56	0	0	0	0	0	103	0	0	112
Lane Group Flow (vph)	0	435	20	0	0	0	47	1423	182	160	1255	205
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Actuated Green, G (s)		14.9	14.9				4.0	47.7	47.7	13.0	56.7	56.7
Effective Green, g (s)		14.9	14.9				4.0	47.7	47.7	13.0	56.7	56.7
Actuated g/C Ratio		0.17	0.17				0.05	0.54	0.54	0.15	0.65	0.65
Clearance Time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		552	253				76	1757	786	240	2108	990
v/s Ratio Prot							0.03	c0.44		c0.10	0.39	
v/s Ratio Perm		0.13	0.01						0.13			0.13
v/c Ratio		0.79	0.08				0.62	0.81	0.23	0.67	0.60	0.21
Uniform Delay, d1		34.8	30.6				41.1	16.3	10.4	35.3	8.9	6.3
Progression Factor		1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		7.3	0.1				14.1	4.2	0.7	6.8	0.5	0.1
Delay (s)		42.2	30.7				55.1	20.4	11.1	42.1	9.3	6.4
Level of Service		D	C				E	C	B	D	A	A
Approach Delay (s)		40.5			0.0			19.8			11.8	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	19.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	87.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	25	202	257	1750	1197	44
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	50	85			25
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1662	1444	1693	3353	3257	1485
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1662	1444	1693	3353	3257	1485
Link Speed (mph)	25			35	35	
Link Distance (ft)	1136			1937	1662	
Travel Time (s)	31.0			37.7	32.4	
Confl. Peds. (#/hr)	1		6			6
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	3%	1%	2%	5%	3%
Adj. Flow (vph)	26	213	271	1842	1260	46
Shared Lane Traffic (%)						
Lane Group Flow (vph)	26	213	271	1842	1260	46
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	202	257	1750	1197	44
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	213	271	1842	1260	46
Pedestrians	6				1	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	1				0	
Right turn flare (veh)		2				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2729	636	1312			
vC1, stage 1 conf vol	1266					
vC2, stage 2 conf vol	1463					
vCu, unblocked vol	2729	636	1312			
tC, single (s)	6.8	7.0	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	67	49	49			
cM capacity (veh/h)	80	416	526			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	239	271	921	921	630	630	46
Volume Left	26	271	0	0	0	0	0
Volume Right	213	0	0	0	0	0	46
cSH	468	526	1700	1700	1700	1700	1700
Volume to Capacity	0.51	0.51	0.54	0.54	0.37	0.37	0.03
Queue Length 95th (ft)	71	73	0	0	0	0	0
Control Delay (s)	27.7	18.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	D	C					
Approach Delay (s)	27.7	2.4			0.0		
Approach LOS	D						

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		

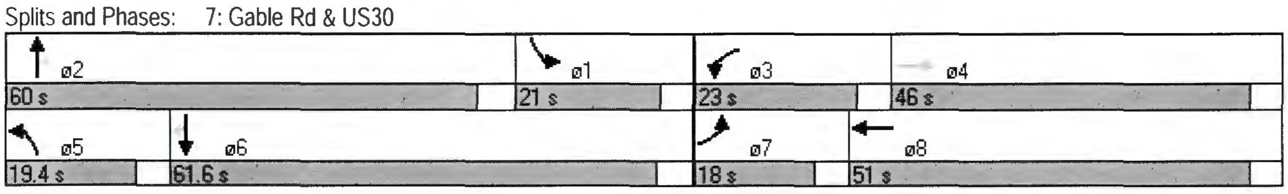
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	219	359	107	279	329	358	151	1539	173	255	948	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	130		0	215		0	130		310	130		140
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor		1.00										0.98
Frt		0.966			0.922				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1646	1686	0	1614	1565	0	1710	3320	1365	1525	3320	1530
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1646	1686	0	1614	1565	0	1710	3320	1365	1525	3320	1498
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			38				109			91
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		1390			1323			3867			969	
Travel Time (s)		31.6			30.1			75.3			18.9	
Confl. Bikes (#/hr)			1									1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Adj. Flow (vph)	223	366	109	285	336	365	154	1570	177	260	967	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	223	475	0	285	701	0	154	1570	177	260	967	182
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7			3	8		5	2		1	6	
Permitted Phases		4							2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	8.5	35.0		8.5	34.0		8.5	24.5	24.5	8.5	24.5	24.5
Total Split (s)	18.0	46.0	0.0	23.0	51.0	0.0	19.4	60.0	60.0	21.0	61.6	61.6
Total Split (%)	12.0%	30.7%	0.0%	15.3%	34.0%	0.0%	12.9%	40.0%	40.0%	14.0%	41.1%	41.1%
Maximum Green (s)	14.0	42.0		19.0	47.0		15.4	55.5	55.5	17.0	57.1	57.1
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.5	4.5	4.0	4.5	4.5
All-Red Time (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.5	4.0	4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	2.3	2.3		2.3	2.3		2.3	4.1	4.1	2.3	4.1	4.1
Minimum Gap (s)	0.5	1.0		0.5	1.0		0.5	2.1	2.1	0.5	2.1	2.1
Time Before Reduce (s)	8.0	8.0		8.0	8.0		8.0	10.0	10.0	8.0	10.0	10.0
Time To Reduce (s)	3.0	3.0		3.0	3.0		3.0	20.0	20.0	3.0	20.0	20.0
Recall Mode	None	None		None	None		None	Max	Max	None	None	None
Walk Time (s)		5.0			5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)		26.0			25.0			15.0	15.0		13.0	13.0
Pedestrian Calls (#/hr)		1			1			1	1		1	1
v/c Ratio	1.45	0.99		1.40	1.36		0.90	1.28	0.31	1.50	0.76	0.29

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	279.2	91.2		251.2	211.1		112.4	170.8	14.5	296.7	45.1	17.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	279.2	91.2		251.2	211.1		112.4	170.8	14.5	296.7	45.1	17.0
Queue Length 50th (ft)	~297	458		~371	~876		151	~1020	44	~352	433	59
Queue Length 95th (ft)	#471	#698		#561	#1127		#286	#1159	106	#537	520	120
Internal Link Dist (ft)		1310			1243			3787			889	
Turn Bay Length (ft)	130			215			130		310	130		140
Base Capacity (vph)	154	479		204	516		176	1228	574	173	1273	631
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	1.45	0.99		1.40	1.36		0.88	1.28	0.31	1.50	0.76	0.29

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Semi Act-Uncoord
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Gable Rd & US30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	219	359	107	279	329	358	151	1539	173	255	948	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.5	4.5	4.0	4.5	4.5
Lane Util. Factor	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		1.00	1.00		1.00	1.00	1.00	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
Frt	1.00	0.97		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1646	1685		1614	1565		1710	3320	1365	1525	3320	1498
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1646	1685		1614	1565		1710	3320	1365	1525	3320	1498
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)	223	366	109	285	336	365	154	1570	177	260	967	182
RTOR Reduction (vph)	0	7	0	0	26	0	0	0	69	0	0	56
Lane Group Flow (vph)	223	468	0	285	675	0	154	1570	108	260	967	126
Confl. Bikes (#/hr)			1									1
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Turn Type	Prot			Prot			Prot		Perm	Prot		Perm
Protected Phases	7			3	8		5	2		1	6	
Permitted Phases		4							2			6
Actuated Green, G (s)	14.0	42.0		19.0	47.0		15.0	55.5	55.5	17.0	57.5	57.5
Effective Green, g (s)	14.0	42.0		19.0	47.0		15.0	55.5	55.5	17.0	57.5	57.5
Actuated g/C Ratio	0.09	0.28		0.13	0.31		0.10	0.37	0.37	0.11	0.38	0.38
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.5	4.5	4.0	4.5	4.5
Vehicle Extension (s)	2.3	2.3		2.3	2.3		2.3	4.1	4.1	2.3	4.1	4.1
Lane Grp Cap (vph)	154	472		204	490		171	1228	505	173	1273	574
v/s Ratio Prot	0.14			c0.18	c0.43		0.09	c0.47		c0.17	0.29	
v/s Ratio Perm		0.28							0.08			0.08
v/c Ratio	1.45	0.99		1.40	1.38		0.90	1.28	0.21	1.50	0.76	0.22
Uniform Delay, d1	68.0	53.8		65.5	51.5		66.8	47.2	32.3	66.5	40.2	31.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	234.2	38.9		205.7	182.3		41.3	131.7	1.0	254.0	2.9	0.3
Delay (s)	302.2	92.8		271.2	233.8		108.0	179.0	33.3	320.5	43.1	31.4
Level of Service	F	F		F	F		F	F	C	F	D	C
Approach Delay (s)		159.7			244.6			159.7			92.8	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	157.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	129.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱	↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	119	71	70	67	70	49	119	1694	45	88	1091	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		250	0		110	110		150	150		200
Storage Lanes	0		1	0		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor												
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.970			0.976		0.950			0.950		
Satd. Flow (prot)	0	1698	1488	0	1708	1488	1693	3288	1153	1662	3288	1530
Flt Permitted		0.970			0.976		0.950			0.950		
Satd. Flow (perm)	0	1698	1488	0	1708	1488	1693	3288	1153	1662	3288	1530
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		737			300			1086			3867	
Travel Time (s)		12.6			5.1			16.5			58.6	
Confl. Peds. (#/hr)	3		3	1		1	3		1	1		3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	4%	29%	0%	4%	0%
Adj. Flow (vph)	124	74	73	70	73	51	124	1765	47	92	1136	159
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	198	73	0	143	51	124	1765	47	92	1136	159
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	119	71	70	67	70	49	119	1694	45	88	1091	153
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	124	74	73	70	73	51	124	1765	47	92	1136	159
Pedestrians		3			1			3			3	
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)			10			4						
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2492	3383	574	2842	3336	886	1139			1812		
vC1, stage 1 conf vol	1323	1323		2014	2014							
vC2, stage 2 conf vol	1170	2060		828	1323							
vCu, unblocked vol	2492	3383	574	2842	3336	886	1139			1812		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	84	0	0	82	80			73		
cM capacity (veh/h)	0	4	464	0	36	290	613			343		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	271	194	124	882	882	47	92	568	568	159
Volume Left	124	70	124	0	0	0	92	0	0	0
Volume Right	73	51	0	0	0	47	0	0	0	159
cSH	0	1	613	1700	1700	1700	343	1700	1700	1700
Volume to Capacity	6500.18	260.22	0.20	0.52	0.52	0.03	0.27	0.33	0.33	0.09
Queue Length 95th (ft)	Err	Err	19	0	0	0	26	0	0	0
Control Delay (s)	Err	Err	12.4	0.0	0.0	0.0	19.3	0.0	0.0	0.0
Lane LOS	F	F	B				C			
Approach Delay (s)	Err	Err	0.8				1.3			
Approach LOS	F	F								

Intersection Summary			
Average Delay	1227.4		
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	5	174	160	217	219	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0			100	0	0
Storage Lanes	0			1	1	0
Taper Length (ft)	25			25	25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850	0.997	
Flt Protected		0.998			0.953	
Satd. Flow (prot)	0	1746	1716	1488	1647	0
Flt Permitted		0.998			0.953	
Satd. Flow (perm)	0	1746	1716	1488	1647	0
Link Speed (mph)		25	25		25	
Link Distance (ft)		2305	403		1964	
Travel Time (s)		62.9	11.0		53.6	
Confl. Peds. (#/hr)	5			5	3	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	2%	0%	1%	0%
Adj. Flow (vph)	6	193	178	241	243	6
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	199	178	241	249	0
Sign Control		Stop	Stop		Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Lane Configurations						
Volume (veh/h)	5	174	160	217	219	5
Sign Control		Stop	Stop		Free	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	193	178	241	243	6
Pedestrians		4	3		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)				4		
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	587	496	499	8	3	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	587	496	499	8	3	
tC, single (s)	7.1	6.5	6.5	6.2	4.1	
tC, 2 stage (s)						
tF (s)	3.5	4.0	4.0	3.3	2.2	
p0 queue free %	97	52	56	78	85	
cM capacity (veh/h)	189	404	400	1073	1622	

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	199	419	249
Volume Left	6	0	243
Volume Right	0	241	6
cSH	391	942	1622
Volume to Capacity	0.51	0.44	0.15
Queue Length 95th (ft)	69	58	13
Control Delay (s)	23.3	14.3	7.5
Lane LOS	C	B	A
Approach Delay (s)	23.3	14.3	7.5
Approach LOS	C	B	

Intersection Summary			
Average Delay	14.4		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.998			0.978			0.890	
Flt Protected		0.977			0.997			0.970			0.999	
Satd. Flow (prot)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Flt Permitted		0.977			0.997			0.970			0.999	
Satd. Flow (perm)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		403			853			1453			709	
Travel Time (s)		11.0			23.3			39.6			19.3	
Confl. Peds. (#/hr)	5					5			5	5		
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
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	142	161	92	10	170	3	119	42	31	2	27	127
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	303	92	0	183	0	0	192	0	0	156	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
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)	142	161	92	10	170	3	119	42	31	2	27	127

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	303	92	183	192	156
Volume Left (vph)	142	0	10	119	2
Volume Right (vph)	0	92	3	31	127
Hadj (s)	0.23	-0.70	0.00	0.03	-0.49
Departure Headway (s)	6.0	5.1	5.6	5.7	5.3
Degree Utilization, x	0.51	0.13	0.29	0.31	0.23
Capacity (veh/h)	573	677	591	567	601
Control Delay (s)	13.8	7.6	10.9	11.3	9.9
Approach Delay (s)	12.3		10.9	11.3	9.9
Approach LOS	B		B	B	A

Intersection Summary			
Delay	11.4		
HCM Level of Service	B		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥			✥			✥	
Volume (vph)	113	273	8	2	246	82	0	2	1	47	4	57
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			-1%			1%	
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.996			0.966			0.955			0.929	
Flt Protected	0.950										0.979	
Satd. Flow (prot)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Flt Permitted	0.950										0.979	
Satd. Flow (perm)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		559			839			582			1453	
Travel Time (s)		15.2			22.9			15.9			39.6	
Confl. Peds. (#/hr)			7	7					7	7		
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
Heavy Vehicles (%)	1%	1%	0%	0%	1%	0%	0%	0%	100%	3%	25%	2%
Adj. Flow (vph)	126	303	9	2	273	91	0	2	1	52	4	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	126	312	0	0	366	0	0	3	0	0	119	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	113	273	8	2	246	82	0	2	1	47	4	57
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-1%			1%	
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)	126	303	9	2	273	91	0	2	1	52	4	63
Pedestrians					7			7				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					4.0			4.0				
Percent Blockage					1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	364			319			955	935	322	887	894	319
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	364			319			955	935	322	887	894	319
tC, single (s)	4.1			4.1			7.1	6.5	7.2	7.1	6.8	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	4.2	3.5	4.2	3.3
p0 queue free %	90			100			100	99	100	78	98	91
cM capacity (veh/h)	1200			1245			196	238	534	237	229	722

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	126	312	367	3	120
Volume Left	126	0	2	0	52
Volume Right	0	9	91	1	63
cSH	1200	1700	1245	292	367
Volume to Capacity	0.10	0.18	0.00	0.01	0.33
Queue Length 95th (ft)	9	0	0	1	35
Control Delay (s)	8.4	0.0	0.1	17.5	19.5
Lane LOS	A		A	C	C
Approach Delay (s)	2.4		0.1	17.5	19.5
Approach LOS				C	C

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (vph)	62	366	132	30	298	11	72	87	23	3	80	41
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			0%			2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.968			0.996			0.983			0.955	
Flt Protected		0.994			0.996			0.981			0.999	
Satd. Flow (prot)	0	1667	0	0	1694	0	0	1664	0	0	1653	0
Flt Permitted		0.994			0.996			0.981			0.999	
Satd. Flow (perm)	0	1667	0	0	1694	0	0	1664	0	0	1653	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		643			960			563			720	
Travel Time (s)		17.5			26.2			15.4			19.6	
Confl. Peds. (#/hr)	3		14	14		3	6		3	3		6
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
Heavy Vehicles (%)	3%	1%	0%	8%	2%	0%	0%	3%	0%	0%	0%	0%
Adj. Flow (vph)	69	407	147	33	331	12	80	97	26	3	89	46
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	623	0	0	376	0	0	203	0	0	138	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	62	366	132	30	298	11	72	87	23	3	80	41
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			2%	
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)	69	407	147	33	331	12	80	97	26	3	89	46
Pedestrians		6			3			14			3	
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		1			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	346			567			1132	1045	497	1102	1112	346
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	346			567			1132	1045	497	1102	1112	346
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			97			18	53	96	97	53	93
cM capacity (veh/h)	1204			964			98	204	569	106	189	696

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	622	377	202	138
Volume Left	69	33	80	3
Volume Right	147	12	26	46
cSH	1204	964	151	243
Volume to Capacity	0.06	0.03	1.33	0.57
Queue Length 95th (ft)	5	3	311	79
Control Delay (s)	1.5	1.1	245.4	37.7
Lane LOS	A	A	F	E
Approach Delay (s)	1.5	1.1	245.4	37.7
Approach LOS			F	E

Intersection Summary			
Average Delay	42.0		
Intersection Capacity Utilization	77.0%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.971			0.958			0.978			0.993	
Flt Protected		0.995			0.997			0.988			0.980	
Satd. Flow (prot)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Flt Permitted		0.995			0.997			0.988			0.980	
Satd. Flow (perm)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		3269			1699			1136			924	
Travel Time (s)		89.2			46.3			31.0			25.2	
Confl. Peds. (#/hr)	1		15	15		1	9		3	3		9
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
Heavy Vehicles (%)	7%	1%	0%	0%	1%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	36	234	74	24	234	118	96	221	63	115	160	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	344	0	0	376	0	0	380	0	0	289	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
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)	36	234	74	24	234	118	96	221	63	115	160	14

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	344	376	379	290
Volume Left (vph)	36	24	96	115
Volume Right (vph)	74	118	63	14
Hadj (s)	-0.08	-0.16	-0.01	0.07
Departure Headway (s)	8.0	7.8	8.0	8.4
Degree Utilization, x	0.77	0.82	0.84	0.68
Capacity (veh/h)	422	438	434	385
Control Delay (s)	32.7	37.3	40.3	27.1
Approach Delay (s)	32.7	37.3	40.3	27.1
Approach LOS	D	E	E	D

Intersection Summary			
Delay	34.9		
HCM Level of Service	D		
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		0	0		25	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978				0.850		0.987			0.985	
Flt Protected		0.994			0.995			0.991			0.981	
Satd. Flow (prot)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Flt Permitted		0.994			0.995			0.991			0.981	
Satd. Flow (perm)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		679			2026			1723			3269	
Travel Time (s)		18.5			55.3			47.0			89.2	
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
Heavy Vehicles (%)	0%	2%	0%	0%	0%	1%	0%	0%	0%	0%	2%	0%
Adj. Flow (vph)	38	244	55	26	243	104	51	212	29	95	127	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	337	0	0	269	104	0	292	0	0	250	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
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)	38	244	55	26	243	104	51	212	29	95	127	28

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	337	268	104	291	249
Volume Left (vph)	38	26	0	51	95
Volume Right (vph)	55	0	104	29	28
Hadj (s)	-0.05	0.05	-0.68	-0.02	0.03
Departure Headway (s)	6.7	7.2	6.5	6.8	7.0
Degree Utilization, x	0.63	0.54	0.19	0.55	0.48
Capacity (veh/h)	492	458	512	479	457
Control Delay (s)	20.5	17.1	9.7	17.9	16.4
Approach Delay (s)	20.5	15.0		17.9	16.4
Approach LOS	C	C		C	C

Intersection Summary			
Delay	17.4		
HCM Level of Service	C		
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	122	343	472	97	78	99
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Grade (%)		0%	0%		2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.977		0.925	
Flt Protected		0.987			0.978	
Satd. Flow (prot)	0	1693	1704	0	1567	0
Flt Permitted		0.987			0.978	
Satd. Flow (perm)	0	1693	1704	0	1567	0
Link Speed (mph)		30	30		35	
Link Distance (ft)		819	1665		1723	
Travel Time (s)		18.6	37.8		33.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	5%	1%	0%	2%	0%	0%
Adj. Flow (vph)	136	381	524	108	87	110
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	517	632	0	197	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	122	343	472	97	78	99
Sign Control		Free	Free		Stop	
Grade		0%	0%		2%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	136	381	524	108	87	110
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	632				1231	578
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	632				1231	578
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	86				49	79
cM capacity (veh/h)	936				169	519

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	517	632	197
Volume Left	136	0	87
Volume Right	0	108	110
cSH	936	1700	271
Volume to Capacity	0.14	0.37	0.72
Queue Length 95th (ft)	13	0	128
Control Delay (s)	3.8	0.0	46.7
Lane LOS	A		E
Approach Delay (s)	3.8	0.0	46.7
Approach LOS			E

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

Appendix 2D Technical Memorandum #4: Transportation Solutions

TECHNICAL MEMORANDUM

City of St. Helens Transportation System Plan Update

Date:	February 25, 2011	Project #: 10639
To:	Jacob Graichen, City of St. Helens Seth Brumley, ODOT	
From:	Chris Brehmer, P.E. and Matt Bell	
Project:	St. Helens TSP Update	
Subject:	Final Transportation System Solutions Report	
Cc:	Technical Advisory Committee and Citizens Advisory Committee	

This memorandum presents multimodal improvement options available to the city of St. Helens to address existing and future transportation system deficiencies. The options presented in this memorandum include strategies to improve system operations, manage travel demand, and to provide multimodal facilities to improve capacity and connectivity.

The options are grouped into three packages. The first package is limited to connectivity and street improvements that do not require major capital investments. The second package includes a majority of the recommendations from the 1997 Transportation System Plan (TSP). The third package includes elements identified in the 2009 *Lower Columbia River Rail Corridor Plan*. Each package lists a number of transportation options as proposed improvement projects that are in turn evaluated based on the criteria described below. The packages are also evaluated based on how well they address system deficiencies relative to mobility standards.

As you review this material, it is important to recognize that none of the three individual option packages fully addresses the community's long-term transportation system needs. As such, it is expected that the final transportation system plan will likely be developed as a combination of elements of the three packages evaluated in this memorandum. The final preferred alternative will be developed based on community feedback and guidance received on the options analysis.

SUMMARY OF NEEDS AND DEFICIENCIES

The existing conditions assessment identified several deficiencies in the pedestrian and bicycle systems, many of which are further exacerbated by truck traffic, railroad, and other motorized vehicle operations. Few study intersection capacity deficiencies were identified under existing conditions.

The forecast year 2031 traffic conditions identified several deficiencies at the study intersections along US 30 and Columbia Boulevard. While these deficiencies do not represent the full extent of the transportation deficiencies identified in St. Helens, they are good indicators of larger system issues, such as:

- Limited connectivity between areas east and west of US 30 and the Portland & Western Railroad (PNWR).

- A lack of north-south collector or arterial level routes on city streets parallel to US 30.
- Local road intersections in close proximity to the highway.

Based on ODOT mobility standards and City level-of-service standards, key study intersection failures in 2031 include:

- Millard Road/US 30
- Gable Road/US 30
- Wyeth Road/US 30
- Pittsburgh Road/US 30
- Deer Island Road/US 30
- 12th Street/Columbia Boulevard

In addition to the intersections above, the Columbia Boulevard/US 30, Columbia Boulevard/Sykes Road, and Columbia Boulevard/Gable Road intersections were noted to be operating close to their respective operating standards.

Figure 1 illustrates the intersection deficiencies identified in the year 2031 no-build traffic conditions analysis, which represent the anticipated 2031 traffic conditions in St. Helens assuming growth in housing and employment occurs without any improvements the transportation system.

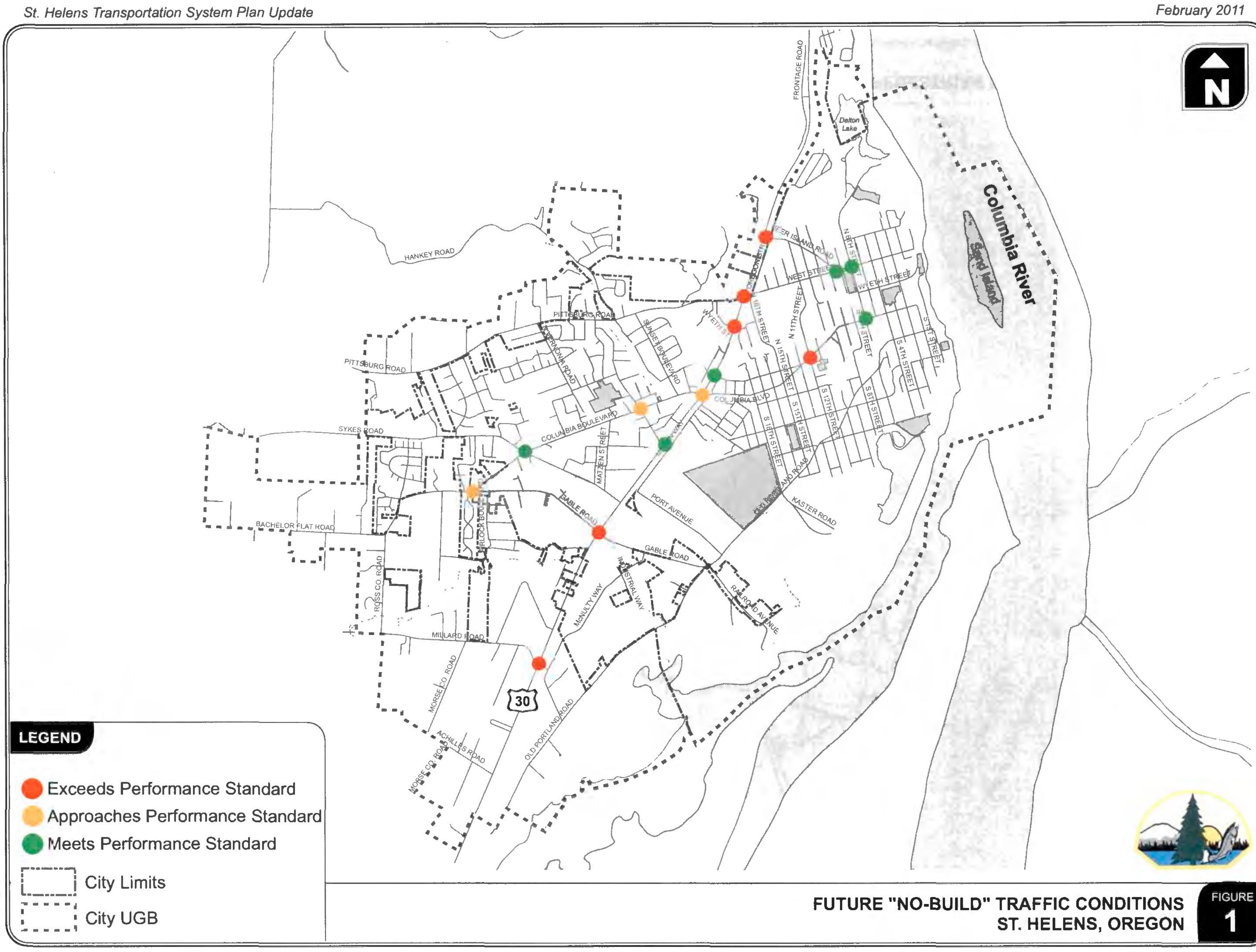
Figures 2 and 3 illustrate the pedestrian and bicycle facility deficiencies identified along arterial and collector roadways within the City of St. Helens.

EVALUATION CRITERIA

The project goals and policies outlined in Section 2 of the TSP update were used to develop a set of evaluation criteria to guide the project screening and prioritization process. The policies, ratings, and descriptions of the rating methods are shown in Table 1.

As shown in Table 1, there are ten policy considerations included in the evaluation criteria that represent the six policies identified in Section 2. Three of the policies were separated into two categories in order to identify projects that meet one aspect of a policy, but not the other. In addition, while each policy identified in Section 2 included some provisions for rail operations, the Rail Corridor Enhancements criteria was created separately to better evaluate how each project impacts rail corridor operations and safety.

The evaluation criteria are used to assess the overall quality of individual projects and how well the projects meet the goals and policies of the City.



FUTURE "NO-BUILD" TRAFFIC CONDITIONS
ST. HELENS, OREGON
FIGURE 1

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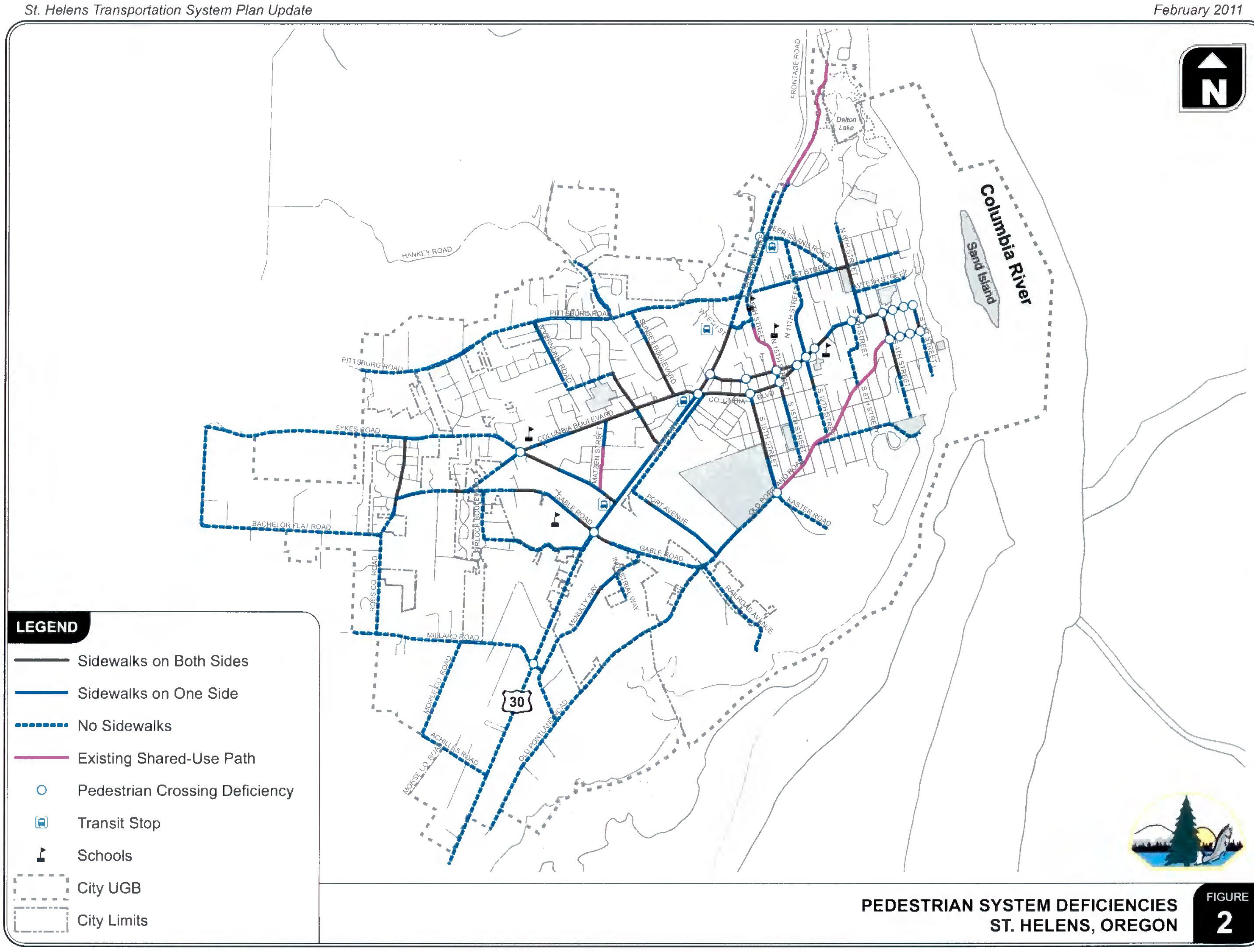

PEDESTRIAN SYSTEM DEFICIENCIES
ST. HELENS, OREGON
FIGURE 2

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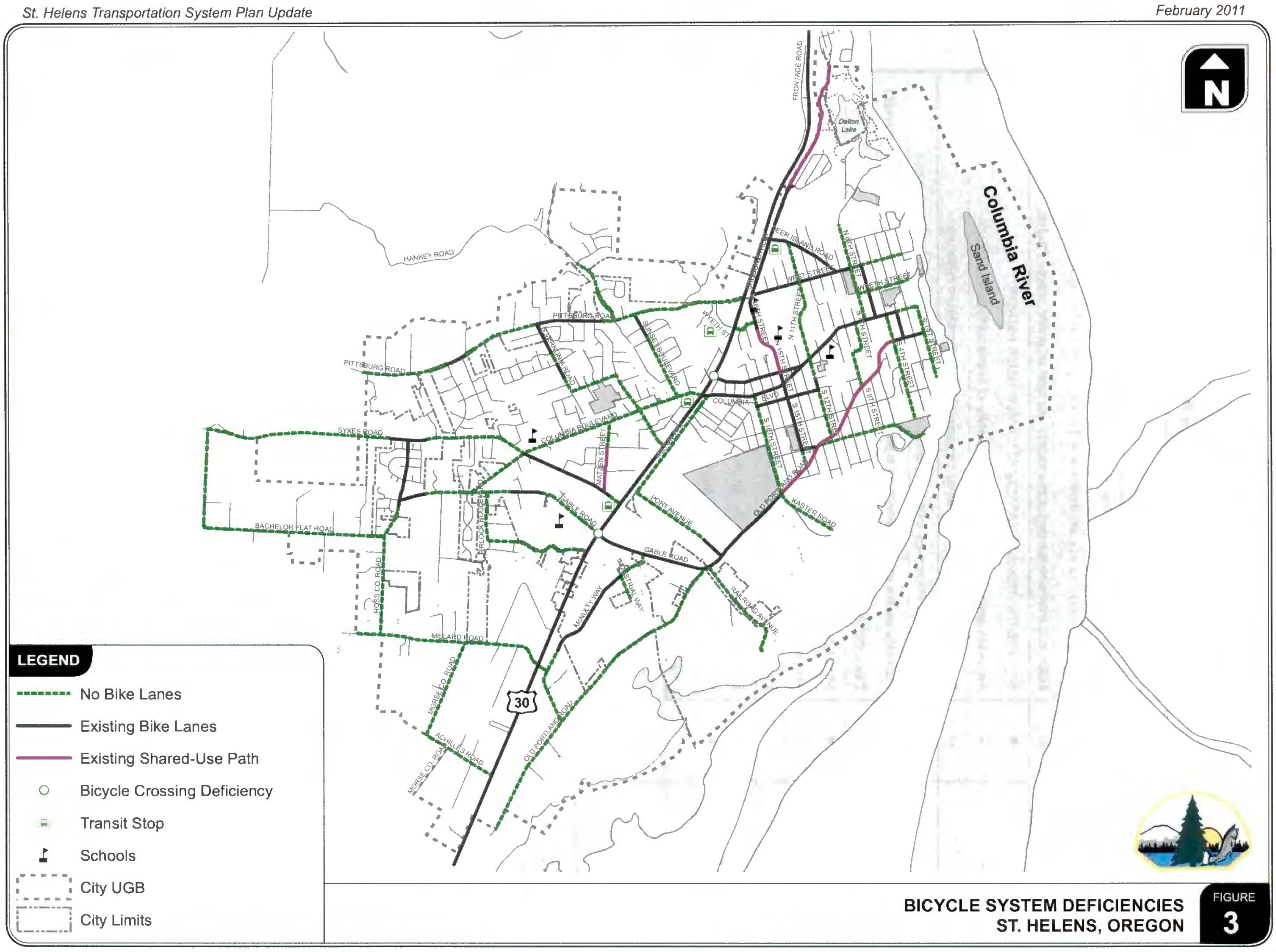

BICYCLE SYSTEM DEFICIENCIES
ST. HELENS, OREGON
FIGURE 3

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Table 1 Proposed Qualitative Rating System

Policy Consideration	Rating	Considerations
Safety	●	Significantly improves safety for one or more travel modes
	◍	Provides some safety improvement for one or more travel modes
	○	Does not improve or degrades safety for one or more travel modes
Capacity	●	Significantly improves capacity of transportation network
	◍	Provides some improvement to capacity of transportation network
	○	Does not improve or degrades capacity of transportation network
Multimodal	●	Significantly improves transportation options, or connectivity within a mode
	◍	Provides some improvement to transportation options, or connectivity within a mode
	○	Does not change transportation options or connectivity
Economic Development	●	Significantly improves economic viability of community
	◍	Provides some improvement to economic viability of community
	○	Does not improve or degrades economic viability of community
Natural Resources and Recreations	●	Enhances parks, wetlands, or other environmentally sensitive areas
	◍	Does not impact parks, wetlands, or any environmentally sensitive areas
	○	Negatively impacts parks, wetlands, or any environmentally sensitive areas
Connectivity	●	Significantly improves access with the community
	◍	Provides some improvement to access within the community
	○	Does not improve or degrades access within community
Historical Character	●	Improvement contributes to the historic character of the area
	◍	Improvement does not degrade the historic character of the area
	○	Improvement degrades the historical character of area
Consistency with other jurisdiction plans and policies	●	Included as part of other local jurisdiction, regional, and/or state plans
	◍	Not included as part of other local jurisdiction, regional, and/or state plans
	○	Inconsistent with local, regional, and/or state plans
Construction/ Maintenance Costs	●	Provides significant improvement to transportation system compared to costs
	◍	Provides reasonable improvement to transportation system compared to costs
	○	Provides little or no improvement to transportation system compared to costs
Rail Corridor Enhancements	●	Significantly improves operations at rail crossing
	◍	Provides some improvements to operations at rail crossing
	○	Does not change or degrades conditions at rail crossing

Complete Streets Option

The Complete Streets Option seeks to improve the future transportation system through completion of existing facilities. No new intersection capacity-driven improvements are included with this option. The Complete Streets option is organized as follows:

- Pedestrian System Improvements
- Bicycle System Improvements
- Multi-use Path System Improvements
- Transit System Improvements
- Potential Roadway Functional Classification Plan Revisions
- Potential Roadway Cross Section Standard Revisions

The Complete Streets Option includes many of the Transportation Demand Management (TDM) strategies recommended in the 1997 TSP, including many of the recommended pedestrian and bicycle facility improvements. Many new pedestrian and bicycle projects identified throughout the current TSP update process are included as well.

PEDESTRIAN SYSTEM IMPROVEMENTS

The pedestrian system within St. Helens includes sidewalks, multi-use paths, and trails as well as marked and unmarked, signalized and unsignalized pedestrian crossings. Multi-use path improvements are discussed in a subsequent section because of their utility for both pedestrians and bicyclists.

Types of Pedestrian Improvements

The potential pedestrian improvement projects identified for St. Helens have been separated into two categories: sidewalks and pedestrian crossings. The sidewalk improvement projects include installing sidewalks on one or both sides of an existing roadway (to improve connections between residential areas and schools, transit stops, or employment areas as well as to fill in gaps in the pedestrian system). Some sidewalk projects require additional right-of-way acquisition and thus additional cost.

The pedestrian crossing improvement projects include a variety of potential treatments that could be implemented at key intersections and along corridors in St. Helens. A summary of these treatments, including advantages, challenges, and location considerations are presented below.

Leading Pedestrian Interval

Leading Pedestrian Intervals allow pedestrians to begin crossing at the crosswalk before conflicting vehicles start moving. For example, left or right-turning vehicles may have a red light for five to seven seconds while pedestrians and through vehicles are allowed to begin moving through the intersection.

ADVANTAGES	CHALLENGES	LOCATION TYPE
• Minimal staff time for signal re-timing • Reduces vehicle/ pedestrian conflicts • Improves driver yielding	• Reduces green time for conflicting vehicles • Right-turn-on-red is often prohibited	• Signalized intersections with heavy turning volumes

Pedestrian Countdown Signals

Pedestrian Countdown Signals inform pedestrians of the time remaining to cross the street with a countdown on the signal head. The countdown should include enough time for the pedestrian to cross the full length of the street, or in rare cases, reach a refuge island. The 2009 *Manual on Uniform Traffic Control Devices* (MUTCD) requires all new pedestrian signals, and any retrofitted signals to include pedestrian countdown signals.

ADVANTAGES	CHALLENGES	LOCATION TYPE
• Complies with 2009 MUTCD • Fewer pedestrians crossing the street late in countdown • Fewer pedestrian left in crosswalk during steady don't walk phase	• *None*	• Signalized intersections without countdown heads

Curb Extensions

Curb extensions create additional space for pedestrians and allow pedestrians and vehicles to better see each other at crosswalks. Curb extensions are typically installed at intersections along roadways with on-street parking and help reduce crossing distances and the amount of exposure pedestrians have to vehicle traffic. Curb extension also narrow the vehicle path, slow down traffic, and prohibit fast turns.

ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Shorter crossing distances for pedestrians ▪ Reduces motorist turning speeds ▪ Increased visibility between motorists and pedestrians ▪ Enables permanent parking ▪ Enables tree and landscape planting, and water runoff treatment	▪ Can only be used on streets with unrestricted on-street parking ▪ Physical barrier can be exposed to traffic ▪ Greater cost and time to install than high visibility crosswalks ▪ May require changes to roadway drainage system in retrofit applications	▪ Streets with on-street parking

Raised Median Islands

Raised median islands provide a protected area in the middle of a crosswalk for pedestrians to stop while crossing the street. The raised median island allows pedestrians to complete a two-stage crossing if needed. The *ODOT Traffic Manual* states that for state highways a raised median, in combination with a marked crosswalk is desired when average daily traffic (ADT) volumes are greater than 10,000 such as on US 30.

ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Reduces the number of crashes at marked and unmarked crosswalks ▪ Preferred on multi-lane streets ▪ Requires shorter gaps in traffic to cross the street ▪ Used to create entry point into area of high pedestrian activity	▪ Must have at least 6 feet of space to accommodate wheelchairs; not all streets will have adequate space ▪ Physical barrier in the street	▪ Areas with high volume traffic conflict or high pedestrian crash locations

Raised Crosswalk

A raised crosswalk is raised higher that the surface of the street to give motorists and pedestrians a better view of the crossing area. A raised crosswalk is similar to a speed table marked and signed for pedestrian crossing.

ADVANTAGES	CHALLENGES	LOCATION TYPE
▪ Provides better view for pedestrians and motorists ▪ Slows motorists travel speeds ▪ Broad application on both arterial & collector streets	▪ Can be difficult to navigate for large trucks, buses, and snow plows	▪ Areas with high speeds and/or difficulty crossing street

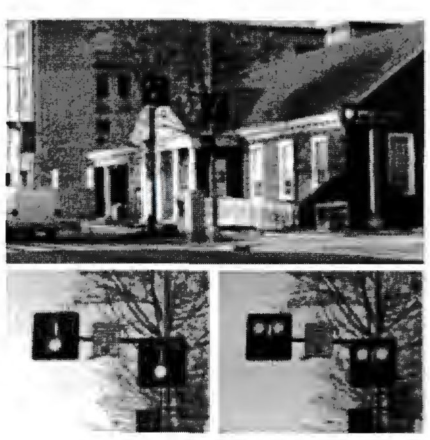
Rectangular Rapid Flashing Beacon

Rectangular Rapid Flashing Beacons, or RRFBs, are user-actuated amber lights that have an irregular flash pattern similar to emergency flashers on police vehicles. These supplemental warning lights are used at unsignalized intersections or mid-block crosswalks to improve safety for pedestrians using a crosswalk.

ADVANTAGES	CHALLENGES	LOCATION TYPE
• Typically increases motorists yielding behavior • Warning information to drivers at eye level • May be used at unsignalized intersections and mid-block crossings • May be installed on two-lane or multi lane roadways • Low-cost alternative to traffic signals and hybrid signals	• Motorists may not understand flashing lights • Pedestrians may not activate flashing light	• Areas with high mid-block crossings

Pedestrian Hybrid Signal

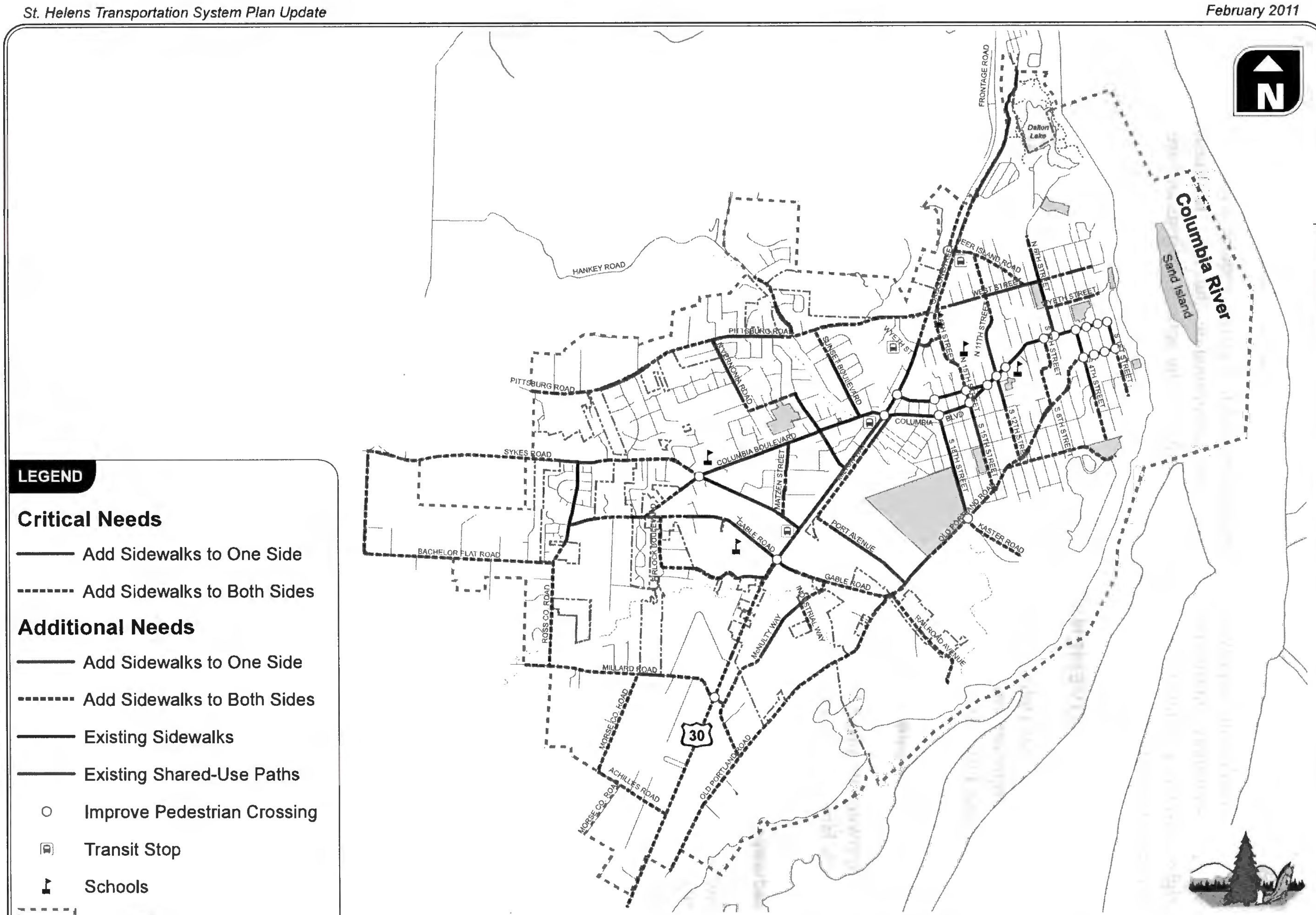
The pedestrian hybrid signal is a pedestrian-actuated hybrid signal that stops traffic on the mainline to provide a protected crossing for pedestrians at an unsignalized location. Warrants for the installation of pedestrian-actuated hybrid signal are based on the number of pedestrian crossings per hour (PPH), vehicles per hour on the roadway, and the length of the crosswalk. Thresholds are available for two types of roadways: locations where prevailing speeds are above 35 mph and locations where prevailing speeds are below 35 mph.



ADVANTAGES	CHALLENGES	LOCATION TYPE
• A very high rate of motorists yielding to pedestrians • Drivers experience less delay at hybrid signals compared to other signalized intersections	• Expensive compared to other crossing treatments • Requires pedestrian activation	• Larger roadways where mid-block crossing is difficult or crossing opportunities are limited (e.g. Columbia Blvd.)

Proposed Pedestrian System Improvements

Figure 4 illustrates the location of the pedestrian improvement projects proposed as part of the Complete Streets Option. The roadway segments shown as solid lines involve the addition of a sidewalk to one side of the street (completing the pedestrian facilities as a sidewalk is already present on the other side of the road), while the roadway segments shown as dashed lines involve the addition of sidewalks on both sides of the street. The segments shown in red have been identified as priorities by City Staff and by the general public through an on-line interactive map. *Appendix "A" contains the sidewalk and pedestrian crossing improvement projects in tabulated form.*



PROPOSED PEDESTRIAN IMPROVEMENT PROJECTS
ST. HELENS, OREGON
FIGURE 4

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Many of the proposed sidewalk improvement projects identified in Figure 4 require widening the roadway and potentially additional right-of-way to accommodate the new facilities. Additional right-of-way requirements were not evaluated as part of the options analysis and are not reflected in the cost estimates for each project.

BICYCLE SYSTEM IMPROVEMENTS

The bicycle system within St. Helens includes bicycle lanes, shared roadways, and multi-use paths. Multi-use path improvements are discussed in a subsequent section because of their utility for both pedestrians and bicyclists.

Types of Bicycle Improvements

The bicycle improvement projects identified for St. Helens have been separated into three categories: bicycle lanes, bicycle crossings, and off-road facilities.

Shared Roadways

Any roadway without a dedicated bicycle facility is generally considered a shared roadway. Where traffic volumes are low, shared roadways are generally safe and comfortable facilities for cyclists. However, the *ODOT Bicycle and Pedestrian Plan* (Reference 1) does not recommend shared roadways where automobile volumes or vehicle speeds are high. Thresholds for where shared-lanes are appropriate are based on several factors, including land-use and grade. Generally, bike lanes are preferred on most roadways with greater than 3,000 average daily trips or with a speed limit greater than 25 miles per hour. For these roadways, dedicated bicycle facilities, typically bicycle lanes, are recommended.

Shared-lane Pavement Marking

Shared-lane pavement markings (often called "sharrows") are a tool designed to help accommodate bicyclists on roadways where bicycle lanes are desirable but infeasible to construct. The sharrow marking indicates a shared roadway space, and are typically centered approximately four feet from the edge of the travelway to encourage cyclists to ride further away from parked and parking cars and/or the curb. Typically, sharrows are suitable on roadways with fewer than 3,000 average daily trips. For reference, Millard Road carries this level of traffic today.

ADVANTAGES	CHALLENGES	LOCATION TYPE
• Reduce wrong-way and sidewalk riding • Improves cyclists positioning in the roadway • Informs motorists of bicyclists • Used on streets without adequate space for bike lane markings	• Pavement marking maintenance • Not as effective as a bike lane	• Streets with moderate speeds and traffic volumes and where space for bike lane markings is limited

Bicycle lanes

Bicycle lanes are striped lanes on the roadway dedicated for the exclusive use of bicycles. Typically, bicycle lanes are placed at the outer edge of pavement (but to the inside of right-turn lanes and/or on-street parking). Bicycle lanes improve bicycle safety, improve cyclist security, and (if comprehensive) can provide direct connection between origins and destinations. However, inexperienced cyclists often feel uncomfortable riding on busy streets, even when they include bicycle lanes. City of St. Helens street standards currently include bicycle lanes on all arterial and collector streets.

ADVANTAGES	CHALLENGES	LOCATION TYPE
• Improves safety and comfort by increasing the visibility and awareness of cyclists • Provides facilities for bicyclists	• May still have conflicts with motorists (e.g. dooring) • Motorists may illegally park in bike lane	• Non-local streets with adequate space for accommodation

Bicycle Detection

Many traffic signals in St. Helens are actuated, meaning that green indications are only given to a movement when the signal detects the presence of a vehicle. However, actuating a signal as a cyclist is difficult if there is no information about the location of detection equipment. Pavement markings should be used, including actuated left-turn lanes, to show cyclists where to stand to actuate a signal. Additionally, the sensitivity of all loop detectors should be set to allow for bicycle activation.

Off-street Facilities

Bicycle Parking

Bicyclists also benefit from several other types of bicycle support facilities, such as secure bicycle parking, either open or covered U-shaped racks, and storage lockers for clothing and gear. Areas that typically provide secured bicycle parking are often located at areas of high bicycle and pedestrian traffic such as transit stations, shopping centers, schools, and multi-use trails. The City currently requires bicycle parking included in new development as a condition of approval. Columbia County Rider buses are outfitted with bicycle racks that allow cyclists to bring their bikes with them on transit. Allowing bicycles on transit vehicles increases the range of trips possible by both transit and bicycling, and reduces cyclists' fears of being stranded in the event of a mechanical or physical breakdown.

ADVANTAGES	CHALLENGES	LOCATION TYPE
• Provides a secure location to store and lock bicycles • Locations are generally very close to and visible from the point of interest • Relatively inexpensive and easy installation • Encourages community bicycle use	• Requires space in potentially busy area • May remove an on-street parking space	• Bicycle parking could be either implemented or expanded at areas of high bicycle ridership and pedestrian traffic (e.g., busy bus stops, shopping centers, libraries, schools, etc.

Wayfinding Signs

Wayfinding signs direct pedestrians and bicyclists towards destinations in the area. They typically include distances and average walk/cycle times.

ADVANTAGES	CHALLENGES	LOCATION TYPE
• Eases navigation for residents and visitors by bicycle • Provides guidance to destinations from streets and along multi-use trails • Offers another indication to motorists of the presences of bicycles	• Maintenance and vandalism	• Areas adjacent to bicycle and pedestrian facilities

Proposed Bicycle System Improvements

Figure 5 illustrates the location of the bicycle improvement projects proposed as part of the Complete Streets Option. The roadway segments shown as thick red and blue lines involve the installation of bicycle lanes, while the roadway segments shown as thick green lines involve the installation of sharrows along the roadway. The roadway segments shown in red were identified as priorities by City staff, the St. Helens Pedestrian and Bicycle Committee, and by the general public through an interactive Safe Routes to School map. The blue dots shown on the map represent areas where bicycle parking is recommended based on recommendations in the 1997 TSP as well as the location of Columbia County Rider park and ride and transit facilities. *Appendix "A" contains the bicycle and off-street facility improvement projects in tabulated form.*

Many of the proposed bicycle improvement projects identified in Figure 5 require widening the roadway and potentially additional right-of-way to accommodate the new facilities. Additional right-of-way requirements were not evaluated as part of the options analysis and are not reflected in the cost estimates for each project.

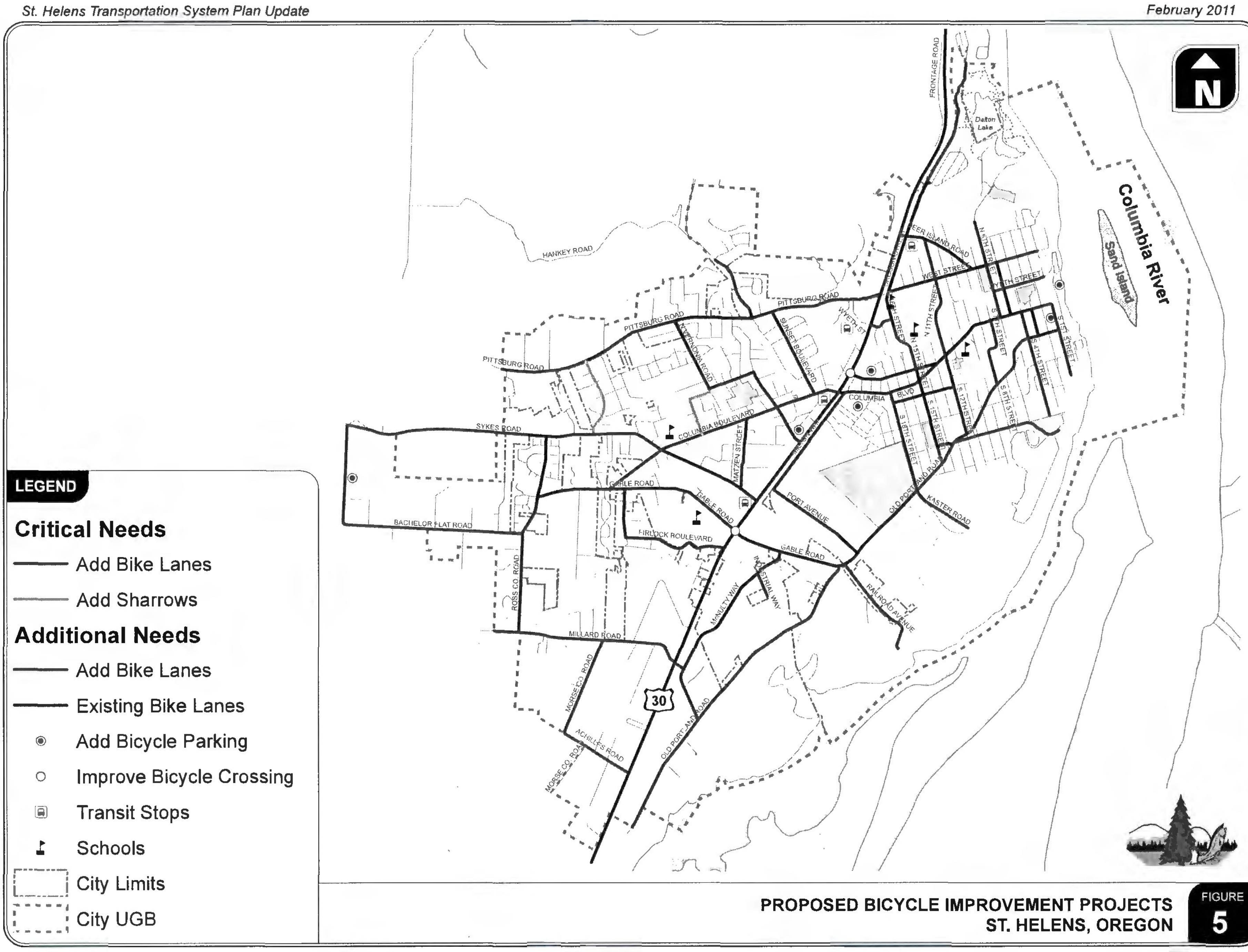
MULTI-USE PATHS AND TRAILS

There are several multi-use paths and trails in St. Helens dedicated to pedestrians and bicyclists. These paths and trails have an integral role in recreation, commuting, and accessibility for residents. Rutherford Parkway is among the many paths and trails located within the City. It offers a paved, multi-use path extending north from Oregon Street to Columbia City. Rutherford Parkway also connects into the Dalton Lake Recreational Area, which includes a system of trails around Dalton Lake.

There are several other multi-use paths and trails throughout the city as well as new trail systems in various stages of planning and construction that can and will help provide short, local connections. Multi-use paths and trails can provide numerous benefits including:

- providing children and seniors with a safe, off-street alternatives to substandard roadways with no bike lanes, shoulders, or sidewalks;
- providing a safe, traffic-free path for walkers, joggers, cyclists, and others to exercise and enjoy the outdoors;
- supporting downtown economic development by providing an off-street transportation route to downtown businesses; and,
- providing direct, non-motorized access to bus stops.

ADVANTAGES	CHALLENGES	LOCATION TYPE
• Separates bicyclists from vehicle traffic • Combination of pedestrians and bicyclists requires less space than separate facilities for each	• Needs adequate space to accommodate buffer from street and width to allow the passing of bicyclists and pedestrians • Bicycle and pedestrian conflicts • Unsafe in highly urban areas or along roads with driveways	• Create new links to and expansion of Rutherford Parkway



PROPOSED BICYCLE IMPROVEMENT PROJECTS
ST. HELENS, OREGON

FIGURE 5

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Figure 6 illustrates the connectivity sought through a variety of potential trail improvement projects suggested as part of the Complete Streets Option. The trail improvement projects involve the installation of trails that connect the Dalton Lake trail system to the local street system and the downtown waterfront area per recommendations in the Conceptual Draft Dalton Lake Recreational Plan and the City's Waterfront Development Plan. Both plans include provisions for pedestrian access to waterfront areas through the development of a continuous trails system. The alignment of, and right-of-way required for, such trails would need to be further refined and may incorporate use of existing sidewalks as well as integration with roadway and intersection improvements.

In addition to enhancing trails, the City continues to explore potential future river access to Sand Island. The possibility of some form of boat shuttle service has been considered, but no plans for implementation are currently underway.

TRANSIT SYSTEM IMPROVEMENTS

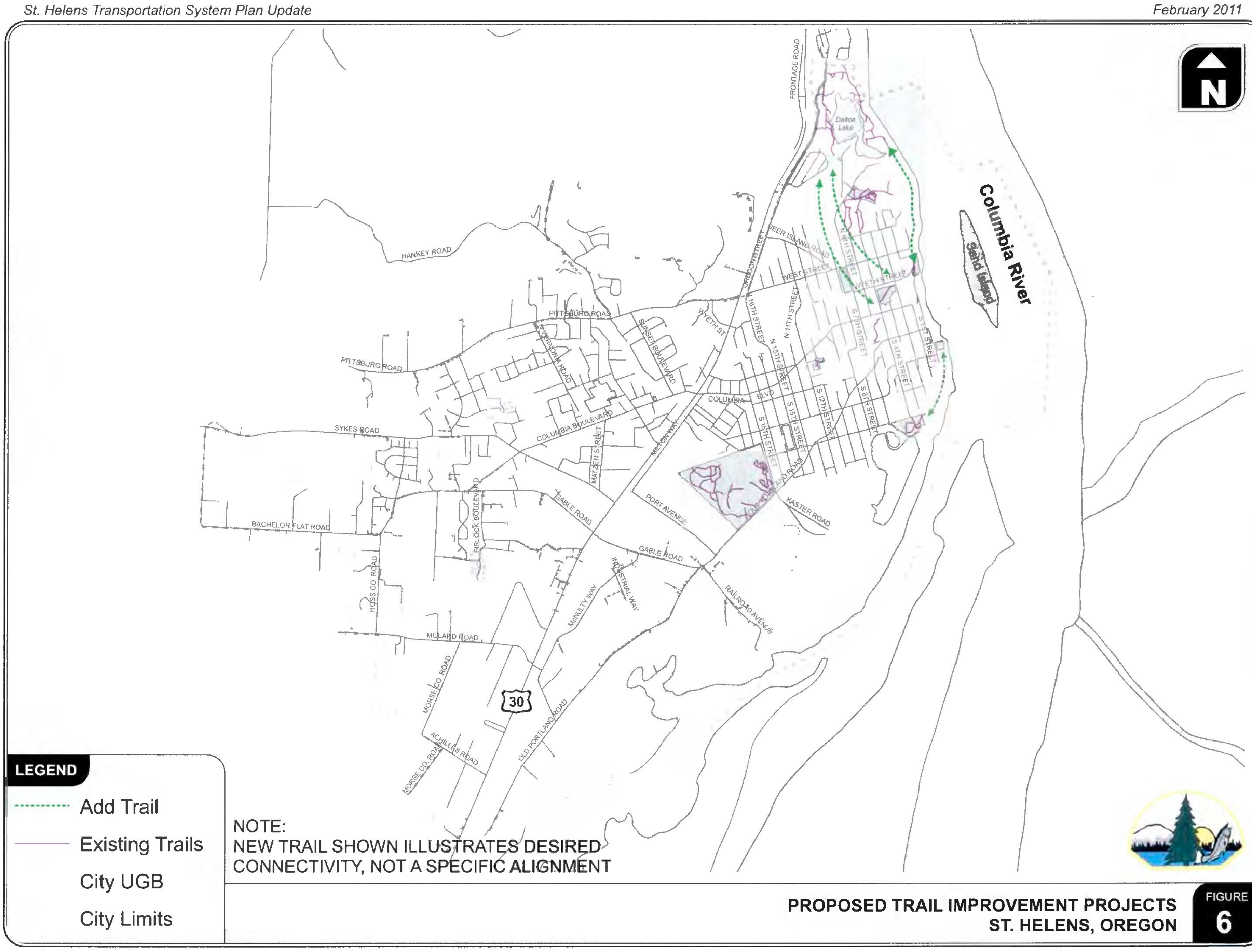
Columbia County completed a Transit Access Plan in 2009 that included the identification of specific transit improvements within the city of St. Helens. The transit system improvements include the location and design of future transit stops and an evaluation of existing and future conditions at each stop. The recommendations were previously vetted through a community outreach process and are adopted by the County. As such, the City of St. Helens agreed to formally incorporate the recommendations into the TSP update.

Figure 7 illustrates park and ride lots and a proposed transit center location within St. Helens. *Appendix "A" contains additional information related to the bus stops and transit center from the Transit Access Plan.*

POTENTIAL FUNCTIONAL CLASSIFICATION PLAN REVISIONS

The City of St. Helens classifies roadways as major arterials, minor arterials, collectors, or local streets. Most of the City's functional classification designations are maintained as part of this update. However, it was observed that some streets designated as minor arterials have a considerable number of residential properties fronting the street where high traffic speeds and volumes may be undesirable and arterial access spacing standards are inappropriate. While these roadways should maintain an ability to distribute traffic between major arterials, collectors, and local streets, a lower functional classification may be more appropriate based on existing conditions. Other roadways may have too low of a designation based on the form and function of the roadway. Table 2 summarizes proposed functional classification revisions and Figure 8 illustrates the proposed Functional Classification Plan.

The proposed roadway changes are consistent with Columbia County's roadway network plans as presented in the Columbia County Transportation System Plan. For example, Columbia County currently classifies Bachelor Flat Road as a Minor Collector roadway.



PROPOSED TRAIL IMPROVEMENT PROJECTS
ST. HELENS, OREGON

FIGURE 6

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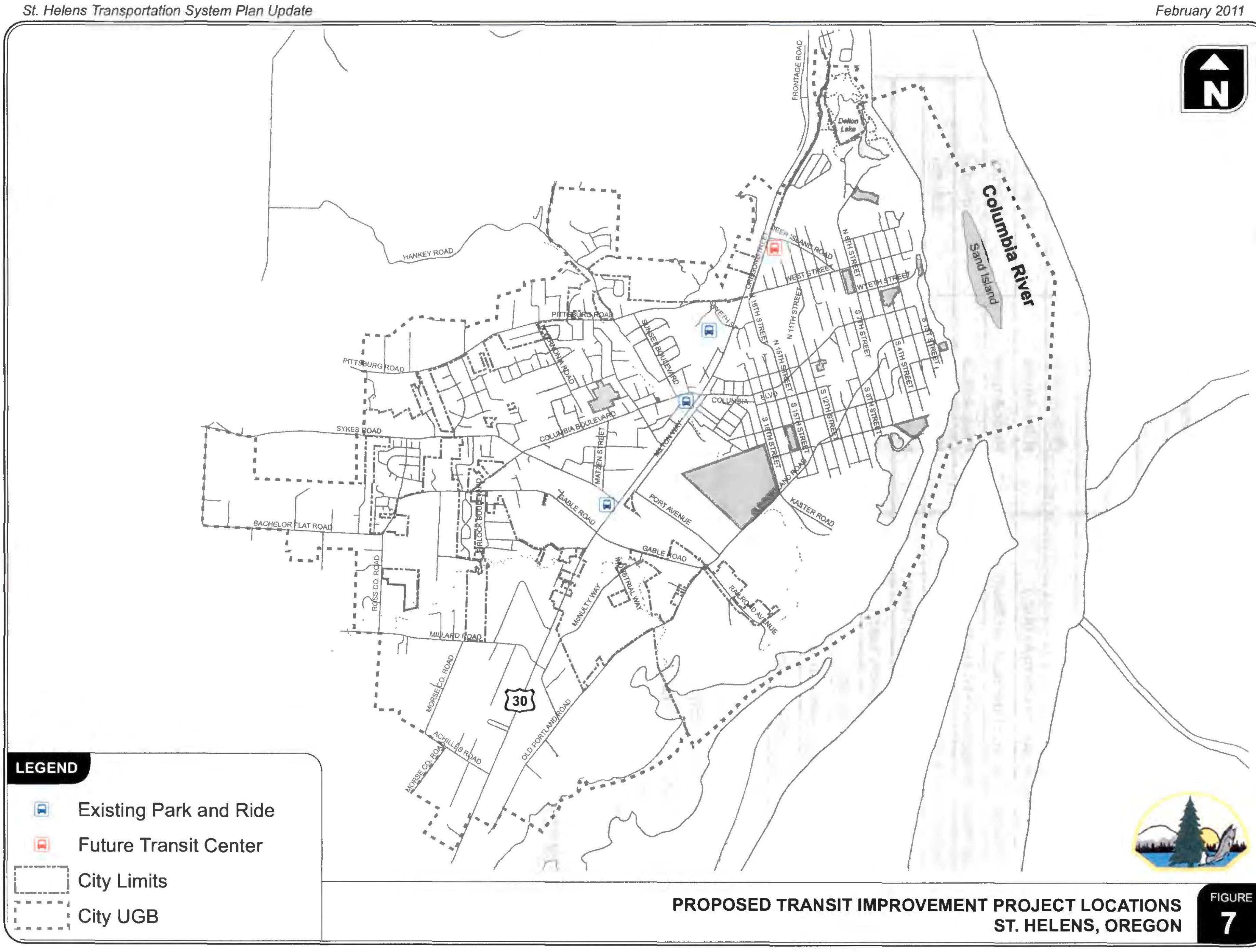

PROPOSED TRANSIT IMPROVEMENT PROJECT LOCATIONS
ST. HELENS, OREGON

FIGURE 7

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Table 2 Proposed Changes in Functional Classifications for Minor Arterial Roadways

Roadway	1997 TSP	Proposed Change
Columbia Blvd. (West of US 30)	Minor Arterial	Collector
Vernonia Road (South of Columbia Blvd.)	Minor Arterial	Collector
Gable Road (West of US 30)	Minor Arterial	Collector
Bachelor Flat Road (Saulser to Columbia Blvd.)	Minor Arterial	Collector
Summit View Drive (north of Bachelor Flat Road)	Minor Arterial	Collector
Ross Road (Millard to Bachelor Flat Road)	Minor Arterial	Collector
Achilles Road (Morse Road to US 30)	Minor Arterial	Collector
S 1st Street (Columbia Blvd. to St. Helens Street	Minor Arterial	Collector
Saulser Road (Bachelor Flat to Sykes Road)	Local Street	Collector
N 6th Street (North of West Street)	Local Street	Collector
S 4th Street (south of St. Helens Street)	Local Street	Collector
S 1st Street (South of St. Helens Street)	Local Street	Collector

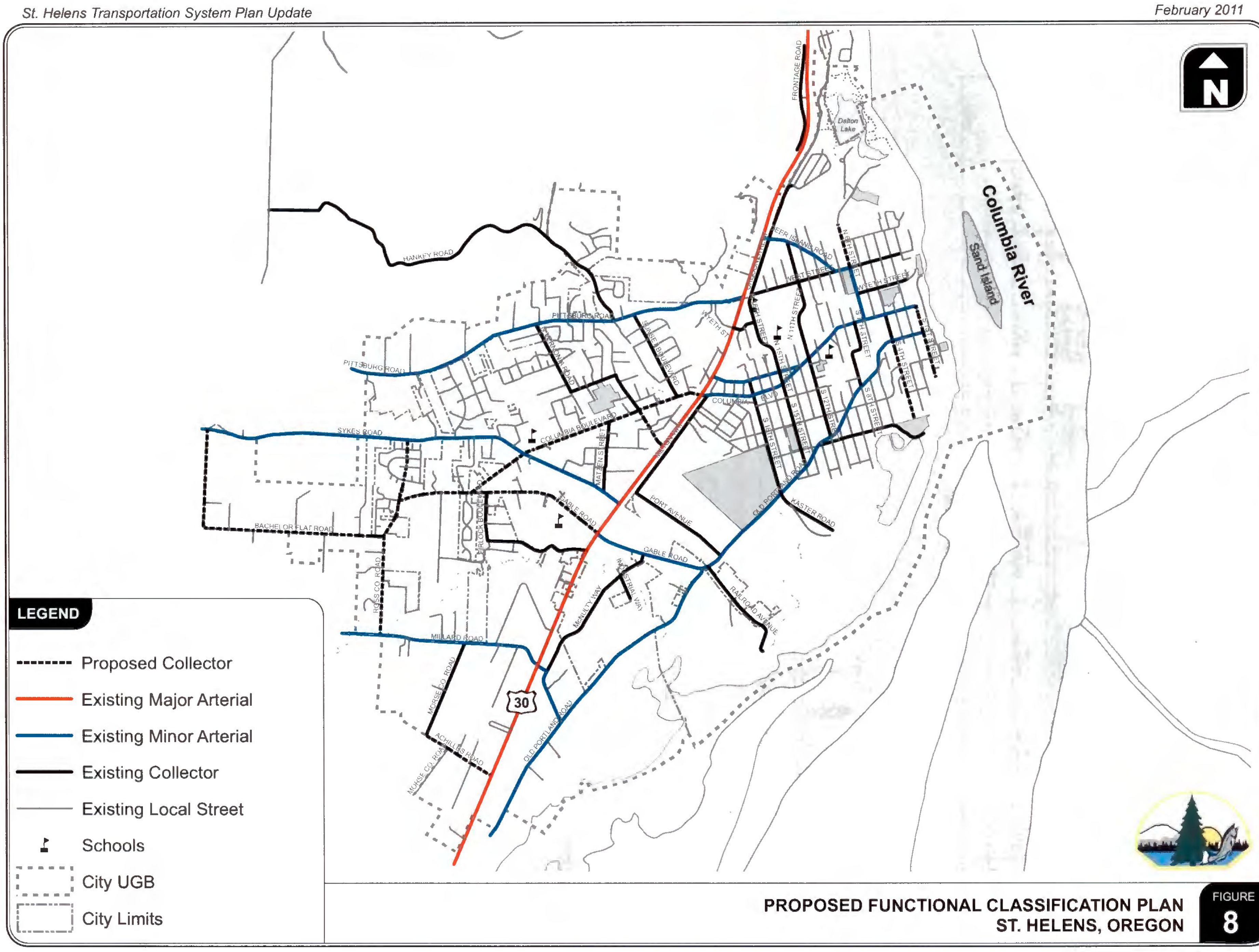
In considering potential functional classification plan changes, it should be noted that Federal funding of roadway improvement projects through grants and other funding packages is generally targeted to roadways that have an arterial or higher classification. While collector facilities are less likely to receive external federal funding for improvements, there are state grants available for collector street improvements.

POTENTIAL ROADWAY CROSS SECTION STANDARD REVISIONS

As indicated in the existing conditions analysis, the roadway cross sections shown in the 1997 TSP are inconsistent with the street cross section information included in the City's Community Development Code. Therefore, new cross sections were developed for each of the functional classifications with assistance from City staff. Figures 9 and 10 illustrate the proposed street cross sections included in the Complete Streets Options.

As shown in Figures 9 and 10, standard cross sections are provided for US 30 as well as St. Helens Street and Columbia Boulevard. Landscape strips and streets trees were incorporated into the standard cross sections based on community feedback and direction provided by the City. The addition of street trees was approved and adopted by the City on December 1st, 2010. Incorporating street trees and landscaping offers benefits including reduced travel speeds, an enhanced pedestrian experience, and beautification of the roadway.

Because the new improvements in the Complete Streets package do not include new capacity at intersections, the study intersections in failure under unmitigated 2031 traffic conditions are expected to continue to fail as shown in Figure 1.



PROPOSED FUNCTIONAL CLASSIFICATION PLAN
ST. HELENS, OREGON

FIGURE 8

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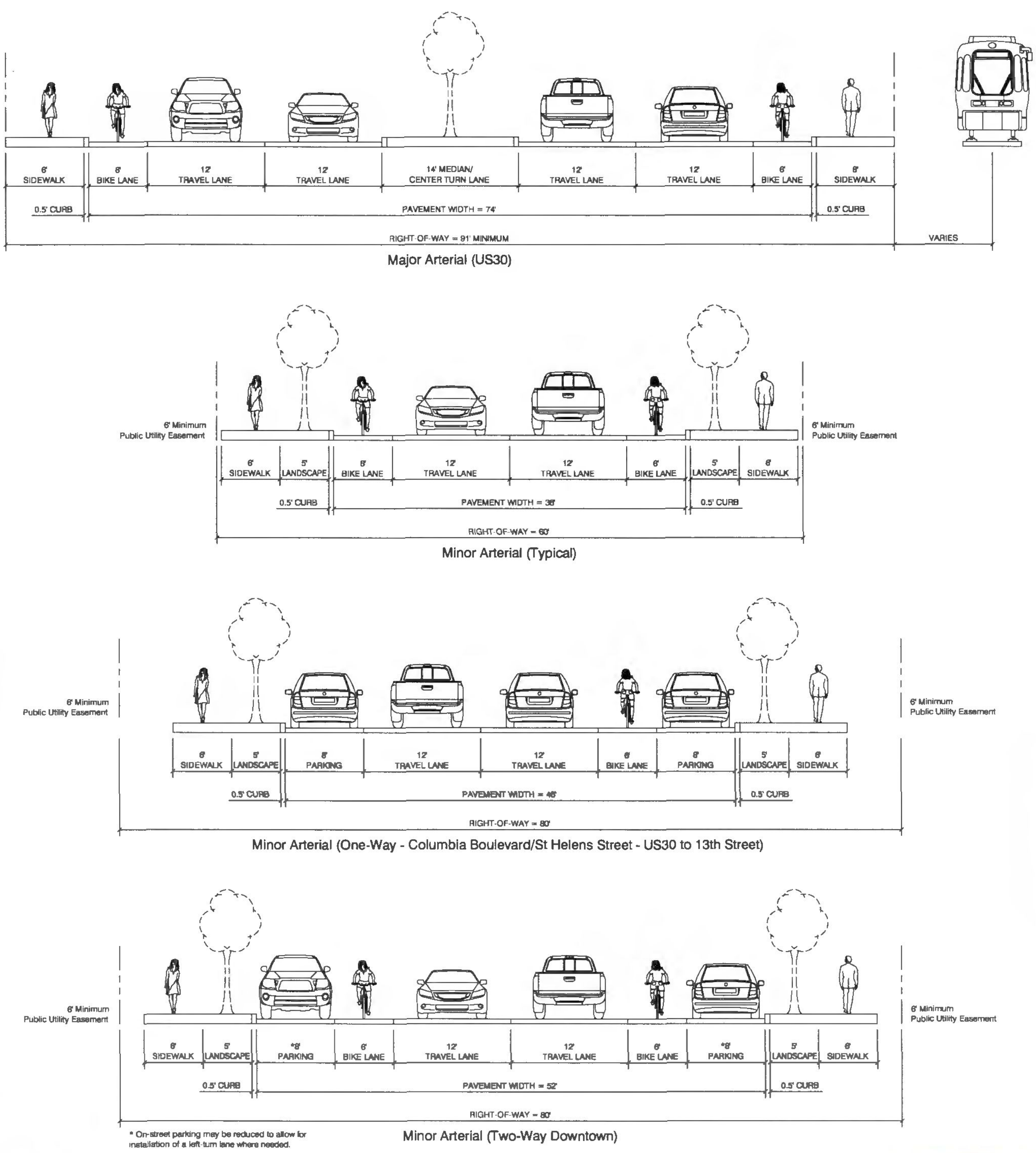

LEGEND

TREES TO BE PROVIDED AS APPROPRIATE PER CITY CODE AND LOCATION SPECIFIC CONSIDERATIONS

PROPOSED CROSS SECTIONS
ST. HELENS, OREGON

FIGURE 9

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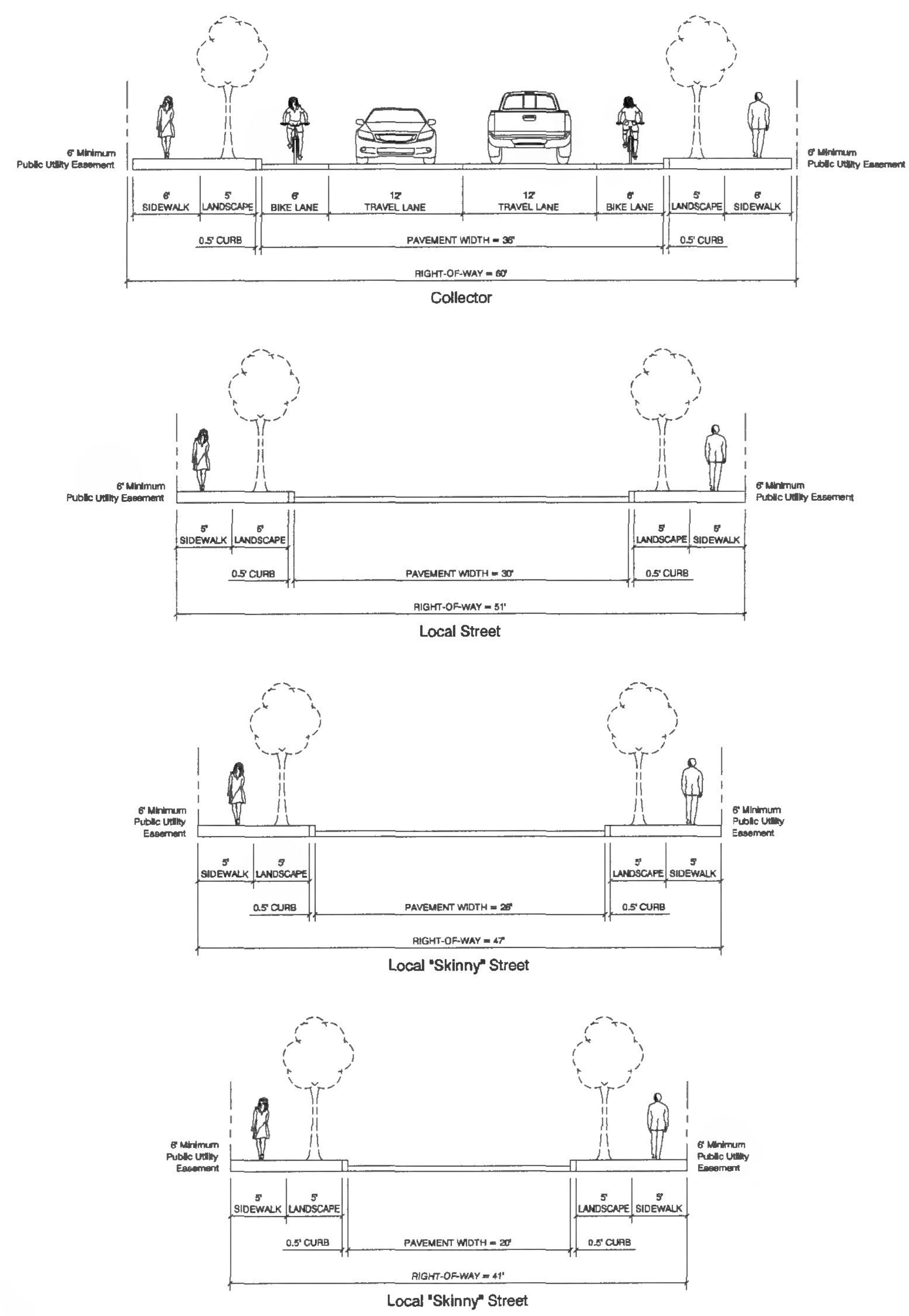

LEGEND

TREES TO BE PROVIDED AS APPROPRIATE PER CITY CODE AND LOCATION SPECIFIC CONSIDERATIONS

PROPOSED CROSS SECTIONS
ST. HELENS, OREGON

FIGURE **10**

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1997 TSP Option

The 1997 TSP Option fully implements the capacity improvements recommended in the currently adopted TSP unless otherwise noted. The option incorporates the Transportation System Management (TSM) strategies identified in the 1997 TSP, including the addition of several new roadway facilities and the installation of several new traffic signals at key study intersections.

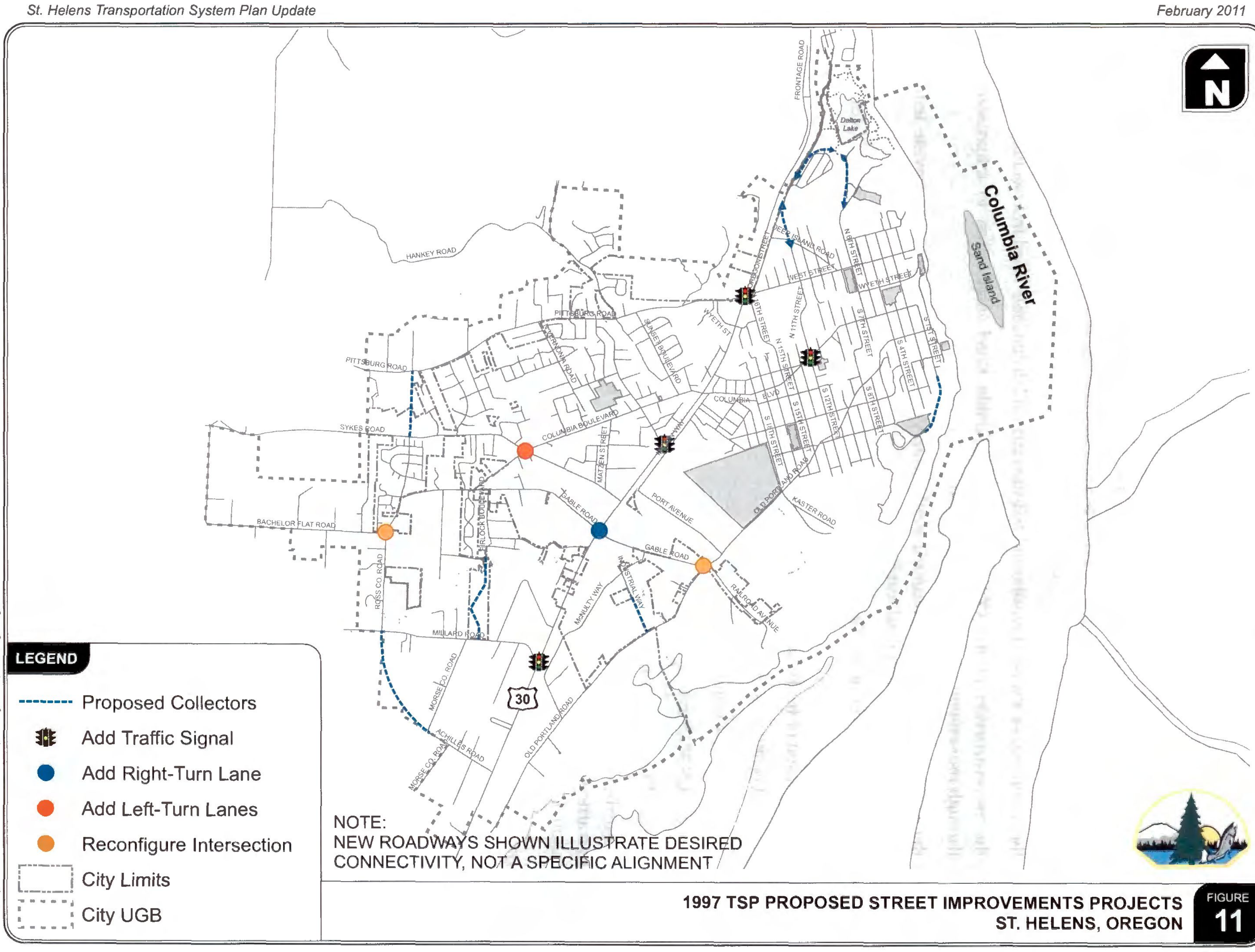
STREET SYSTEM IMPROVEMENTS

Several of the new roadway facilities recommended in the 1997 TSP have been completed or are in various stages of completion, while others are no longer deemed viable. This option includes applicable facilities from the 1997 TSP as well as new facilities identified throughout the TSP update process. Figure 11 illustrates the location of the new roadway facilities and the potential alignment of two future facilities included in the 1997 TSP Option. All of the roadway projects shown in Figure 11 include the addition of sidewalks, bicycle lanes, travel lanes, and on-street parking based on the functional classification of the individual roadway. *Appendix "B" summarizes the new roadway improvement projects in tabular form.*

Improvement Projects Proposed for Removal from 1997 TSP

Based a review of existing development patterns and feedback from city staff, the following roadway projects recommended in the 1997 TSP now appear impractical:

- **St. Helens Street Extension (US 30 to Columbia Boulevard):** this project no longer appears viable given its significant impact on existing developments west of US 30, the challenges associated with connecting St. Helens Street and Columbia Boulevard at a new intersection west of US 30, and the minimal operational improvement gained.
- **Milton Way Extension (Port Avenue to Gable Road):** this project requires a new at-grade rail crossing that is not considered feasible in the foreseeable future.
- **US 30 Frontage Roads:** a system of frontage roads west of, and parallel to, US 30 was identified in the 1997 TSP but has proven nearly impossible to implement since the TSP was adopted. The project is now considered infeasible given significant impacts on existing developments west of US 30 and the amount of right-of-way required for each segment of new roadway.



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Intersection Improvements

Capacity improvement projects identified in the 1997 TSP are included in the 1997 TSP Option along with a several new improvement projects identified throughout the TSP update process, including:

- the additional of a second westbound left-turn lane at US 30/Gable Road intersection,
- the reconstruction of the Old Portland Road/Gable Road intersection to emphasize through movements on Old Portland Road,
- the reconstruction of the Columbia Boulevard/Sykes Road intersection to provide left-turn lanes on Columbia Boulevard,
- the reconstruction of the Ross Road/Bachelor Flat Road intersection to provide left-turn lanes, and,
- the provision of traffic signals at four locations, including:
  - US 30/Millard Road
  - US 30/Vernonia Road
  - US 30/Pittsburg Road
  - Columbia Boulevard/12th Street

The TSP further identified the need to coordinate the new traffic signals along US 30 with the existing traffic signals and to retime and optimize the entire signal system. Figure 11 illustrates the location and type of intersection improvement projects included in the 1997 TSP Option.

In addition to the capacity improvements identified above, regrading of the southwest corner of the US 30/Millard Road intersection is recommended to provide clear sight distance for eastbound drivers looking in the southern direction. Further, available sight lines for eastbound drivers facing south at the intersection can be enhanced by removing temporary and permanent signs located on the intersection corner that limit drivers view.

Appendix "B" summarizes the intersection improvement projects in tabular form.

Intersection Improvements Proposed for Removal from TSP

The 1997 TSP recommended the installation of traffic signals at two additional intersections when warranted. However, based on the 2031 traffic volume projections, signalization of these intersections is not anticipated to be warranted within the 20-year planning horizon and the intersections are forecast to continue to operate acceptably from a capacity perspective. The two locations are:

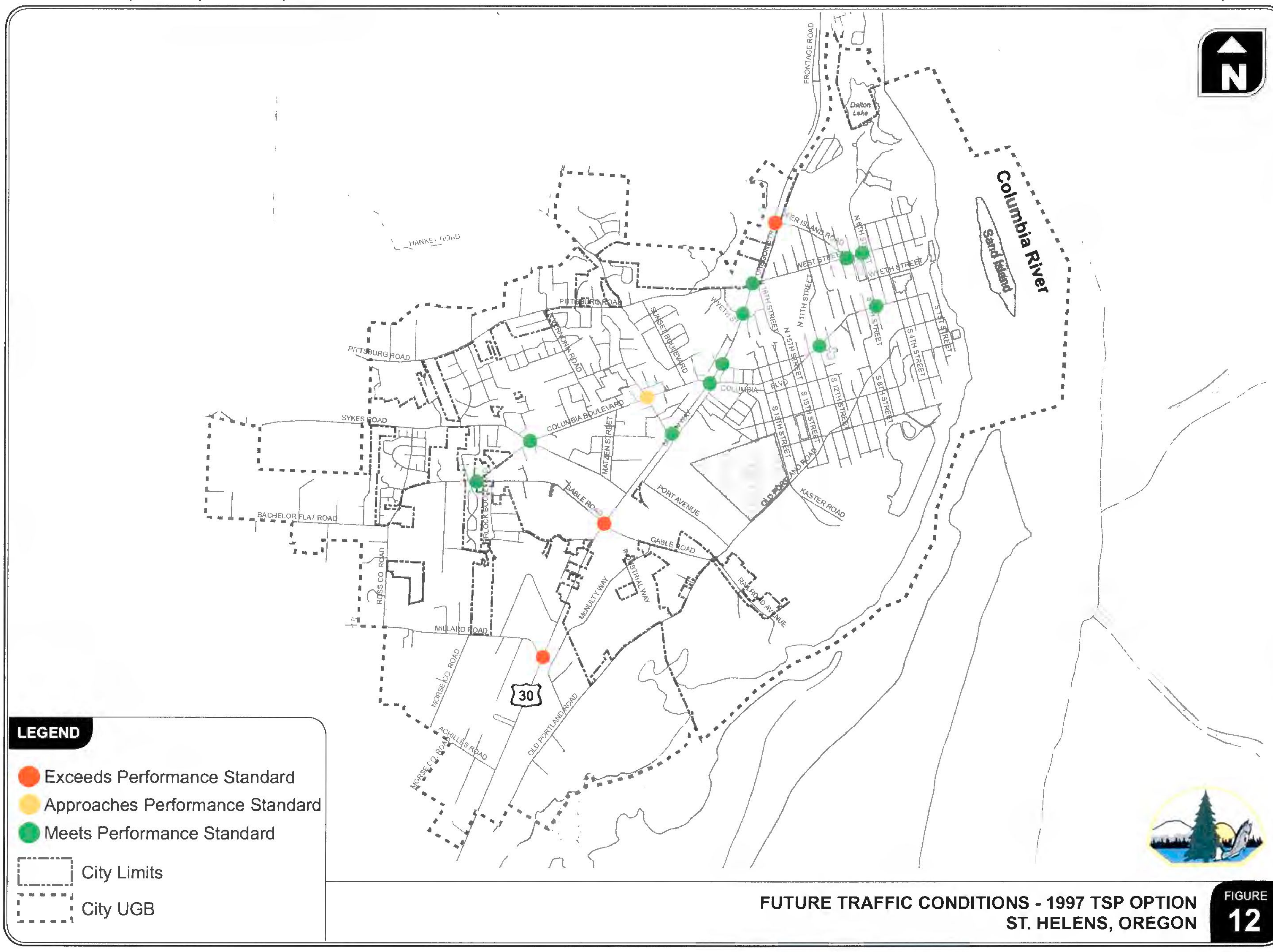
- Columbia Boulevard/Vernonia Road
- Columbia Boulevard/6th Street

Other types of traffic control, such as all-way stop control, could be considered at the Columbia Boulevard/6th Street intersection for safety or capacity reasons as traffic volumes increase. Roundabouts could also be considered at several locations throughout the city as a way of mitigating safety concerns at unsignalized intersections or operational issues at intersections that do not meet mobility standards, but do not meet signal warrants. The following intersections have been identified as potential roundabout locations:

- Columbia Boulevard/12th Street: Although the 1997 TSP recommended a traffic signal at this location, a traffic signal is not expected to be warranted based on evaluation of preliminary signal warrants. A roundabout in this location, however, could improve traffic operations and serve as a gateway treatment into the commercial areas along Columbia Boulevard and St. Helens Street as well as into the downtown. In addition to serving a traffic control function, roundabouts present opportunities to create community focal points, landscaping, and other gateway features within an intersection form that is safe and efficient.
- Columbia Boulevard/Sykes Road: Both this intersection and the Columbia Boulevard/12th Street intersection are near schools. A primary benefit of a roundabout is enhanced safety and the reduction of vehicle speeds in and around the roundabout. Roundabouts improve pedestrian crossing opportunities, providing mid-block refuge and the ability for pedestrians to focus on one traffic stream at a time while crossing with or without crossing guards.
- 1st Street/Cowlitz Street: A roundabout at this intersection, or perhaps further to the south, could serve as another gateway treatment into the downtown area when the Plymouth street extension is complete. A roundabout could also enhance the U-turn movement that has occurred at this location for some time.

STUDY INTERSECTION OPERATIONS IMPACT

Figure 12 summarizes those intersections that operate acceptably, unacceptably, and near capacity assuming the improvements identified in the 1997 TSP Option. As shown in the figure, the Millard Road/US 30, Gable Road/US 30, and Deer Island Road/US 30 intersections continue to operate in failure under the TSP-mitigated 2031 traffic conditions. Also shown in the figure, operations at the Bachelor Flat/Gable Road intersection improve as east-westbound vehicles re-route toward the south with the provision of a traffic signal at the US 30/Millard Road intersection. Potential additional mitigation measures are described below. *Appendix "B" contains the year 2031 traffic conditions worksheets used in the analysis.*



FUTURE TRAFFIC CONDITIONS - 1997 TSP OPTION
ST. HELENS, OREGON

FIGURE 12

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Rail Corridor Option

The primary focus of the Rail Corridor Option is the development of an ultimate highway/rail grade crossing plan along the Portland and Western Railroad (PNWR)/US 30 corridor. This option includes improvements to key study intersections/rail crossings as identified in the *Lower Columbia River Rail Corridor Plan* (LCRRC – Reference 2). This option also includes site specific improvements identified in the study to improve safety near rail crossings and along US 30.

RAIL CORRIDOR IMPROVEMENTS

Grade Crossings

Grade crossings are classified by the type of protection provided and are considered either active or passive. Active crossing systems generally have an electronic train detection system with flashing lights that warn the motorist when a train is approaching or at the crossing. Although an active crossing system is relatively expensive to install and maintain, it provides a safer grade crossing as compared to a passive system. A passive system simply denotes the location of the crossing (typically through signing or pavement markings) and depends on the motorist to detect and yield the right-of-way to the train. Depending on the available sight distance and train speeds, passive crossings require a comparatively high level of awareness on the part of the motorist. All of the PNWR railroad crossings adjacent to US 30 in St. Helens have active crossing systems.

Pre-emption and Interconnect Requirements

For safety reasons, traffic signals on US 30 in St. Helens adjacent to the PNWR grade crossings are able to communicate with each other using "interconnect" between the traffic signal equipment and the railroad equipment. The interconnect link allows the railroad equipment to communicate the approach and presence of a train to the traffic signal equipment.

Interconnect is currently provided at the grade crossings of Gable Road, Columbia Boulevard, St. Helens Road, and Deer Island Road. When a train approaches each of these crossings, the adjacent traffic signal's normal operations are pre-empted and the traffic signal shifts focus to moving vehicles off of the roadway approach with the grade crossing. Signs are also illuminated on the highway to prevent highway traffic from turning onto the grade crossing.

Potential Railroad Grade Crossing Closures

Within St. Helens, the LCRRC study recommends studying the potential closure of the Wyeth Street railroad grade crossing, which would require westbound vehicles currently using the intersection to reroute either toward the south via St. Helens Street or toward the north via Deer Island Road. Pedestrians and bicyclists would also have to reroute and access US 30 from either the grade crossing at Deer Island Road or St. Helens Street. The LCRRC study provides context for closing grade crossings as follows:

> *Eliminating redundant or unnecessary roadway/railroad at-grade crossings is an important part of improving safety of rail corridors. Yet, closing a road is a serious, and possibly contentious, undertaking. Property owners must be provided access to the transportation network, and even with alternative access, there is often resistance to changing long-standing travel patterns. Thus, the goals of safety, public necessity, convenience, economics and the right to access property along a railroad alignment must be balanced, when considering closing roads.*
>
> *The ODOT (Rail Division) has the authority, within Oregon, to eliminate highway/rail at grade crossings (ORS Section 824.206 (1998)). Closure requests can be initiated by ODOT, the railroad or the local jurisdiction. In an effort to make closures more attractive to local communities, ODOT Rail offers assistance in improving intersections at locations near those which can be closed. Because at-grade crossing safety upgrades are expensive ODOT Rail's approach to closures enables more frequently used crossings to receive the needed safety upgrades.*

Roadway-Focused Solutions

US 30 Turn Lane Capacity Near Railroad Crossings

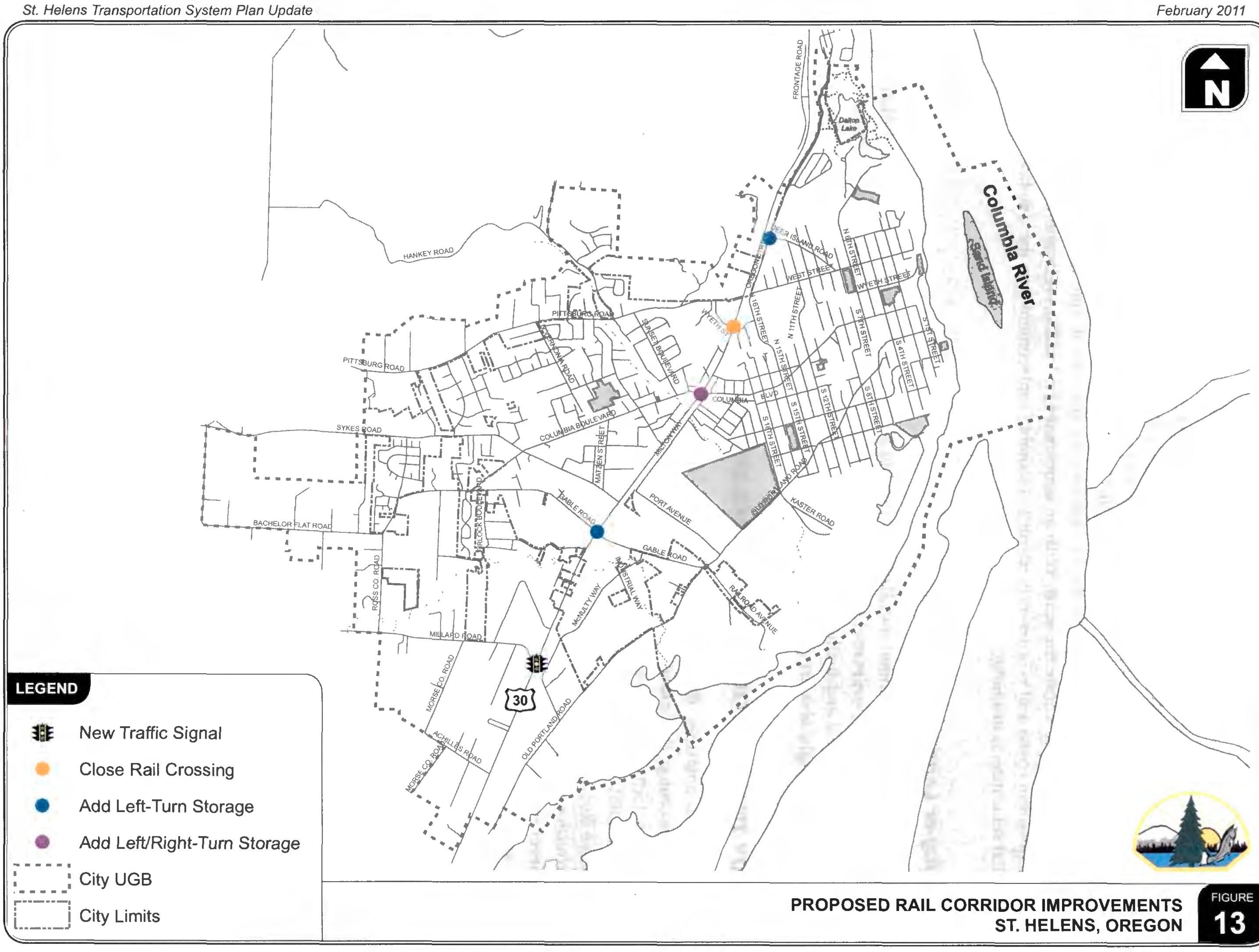
Traffic, especially during the evening peak period, can begin to queue to make right turns onto streets with at-grade highway/rail crossings along US 30. Without adequate storage, these queues can block through traffic on US 30, and create the potential for rear-end collisions or other crashes. The LCRRC study recommends extending the right-turn lane storage at the US 30/Columbia Boulevard intersection by 65-feet.

Similarly, southbound motorists wishing to make left hand turns onto cross streets with highway/rail grade crossings can be blocked by trains. Queues at signalized US 30 intersections can back up significantly during peak periods (notably morning peaks). This situation adds to congestion, and poses a safety concern as motorists encounter a long queue and/or try to go around it. Additional storage and/or signalization is recommended at several locations on the corridor as part of the Rail Corridor Option.

Figure 13 illustrates the changes to affected study intersection lane configurations and traffic control devices under the Rail Corridor Option as per the LCRRC Plan. Other non-intersection improvements are summarized below.

Relocate St. Helens Switching Operations

St. Helens Yard is a rail yard that supports local rail-served customers. It also creates a mobility



PROPOSED RAIL CORRIDOR IMPROVEMENTS
ST. HELENS, OREGON
FIGURE 13

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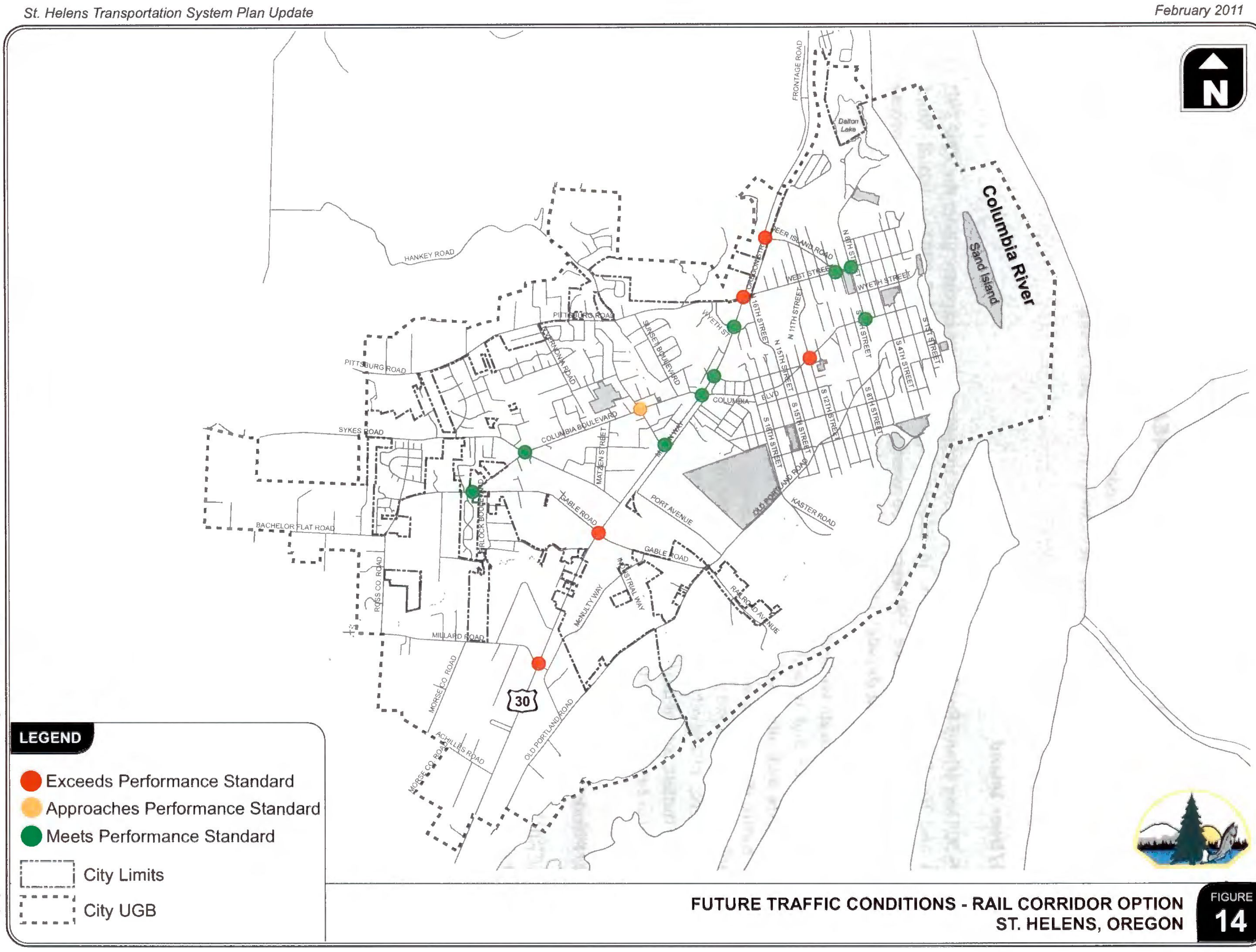
barrier within the community for motor vehicle and pedestrian traffic. As indicated in the existing conditions analysis, both the community and the railroad are concerned about trespassing, as it represents a potential safety risk and liability issue. The LCRRC Plan noted the potential option of relocating the rail yard outside City limits. The Plan further notes that PNWR will continue to serve customers in the St. Helens area and that it may be impossible for the railroad to completely vacate the yard. With an estimated $3.67 million relocation cost (without land acquisition costs) and no currently identified suitable replacement site, the timeline for any potential relocation is unknown.

Fencing or Landscape Barriers

The LCRRC Plan recommended installation of fencing along St. Helens yard as a partial solution to trespassers. The plan estimated an order-of-magnitude chain-link fencing cost of $84,000 not including maintenance and further noted that more visually appropriate fencing solutions (such as incorporating sight-obscuring slats or landscape elements) would involve additional costs.

STUDY INTERSECTION OPERATIONS IMPACT

Figure 14 summarizes those intersections that operate acceptably, unacceptably, and near capacity assuming the improvements identified in the Rail Corridor Option. As shown in the figure, a majority of the intersections continue to operate in failure under the Rail Corridor-mitigated 2031 traffic conditions. As in the previous package, operations at the Bachelor Flat/Gable Road intersection improve as east-westbound vehicles re-route toward the south with the provision of a traffic signal at the US 30/Millard Road intersection. Potential additional mitigation measures are described below. *Appendix "C" contains the year 2031 traffic conditions worksheets under the Rail Corridor Option.*



FUTURE TRAFFIC CONDITIONS - RAIL CORRIDOR OPTION
ST. HELENS, OREGON

FIGURE
14

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POTENTIAL ADDITIONAL MITIGATION MEASURES

None of the three options packages fully mitigated all of the study intersections. Potential additional mitigation measures were reviewed at the still-failing study intersections as summarized below.

US 30/Deer Island

The US 30/Deer Island Road intersection is forecast to operate above capacity under the 1997 TSP option and the Rail Corridor option. In addition, queuing at the US 30/Deer Island Road intersection is shown to exceed 550-feet in the westbound direction and would block access to/from Oregon Street and the site of the future St. Helens Transit Center.

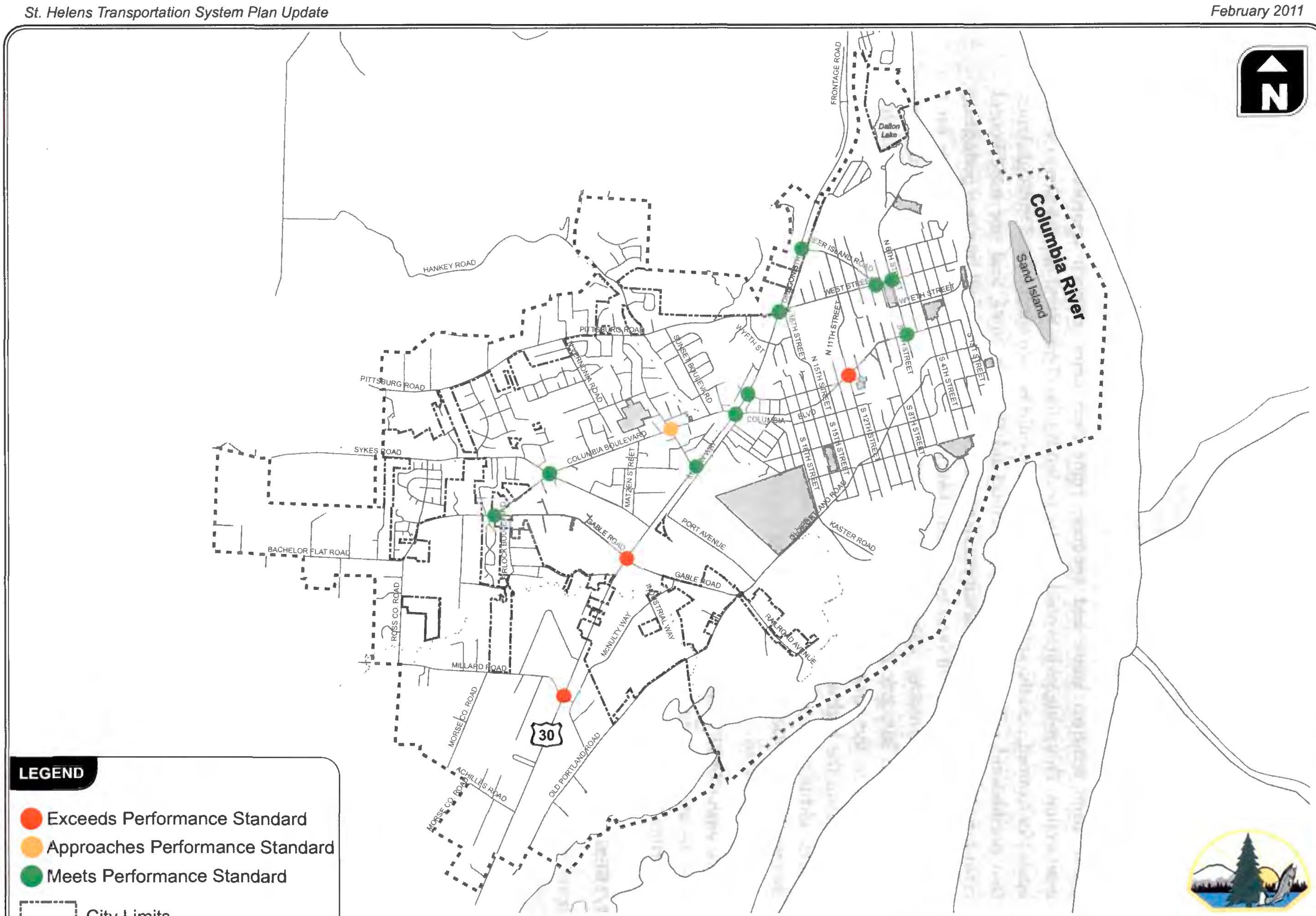
Installation of a separate westbound left-turn lane would improve the intersection operations to a v/c ratio of 0.75 and would reduce westbound queuing. The addition of the left-turn lane would require widening and reconstruction of the adjacent PNWR grade crossing as well as part of the traffic signal and may involve right-of-way acquisition. The cost associated with this mitigation would be substantial yet queuing at the intersection will likely continue to extend past Oregon Street, effectively rendering Oregon Street to a right-in/right-out only. As such, additional outlets for the north and southbound thru-left turn movements or a re-alignment of Oregon Street further east should be considered.

US 30/Pittsburg Road-West Street Overpass

The LCRRC study highlighted the potential need for an overpass in St. Helens near the US 30/Pittsburg Road intersection, although the project was not included in the final study recommendations. Based on the study, the future overpass would extend over both US 30 and the railroad and cost between $5.6 and $9 million dollars and would likely have to be funded as a State Transportation Improvement Program (STIP) project.

Figure 15 illustrates the results of an operations analysis at the study intersections with the overpass assumed to be in place and the Wyeth Street access to US 30 assumed to be closed. As shown in Figure 15, operations at the US 30/Deer Island intersection improve with the overpass assuming a majority of the westbound left-turn movements would reroute toward the overpass. Constructed in isolation without other US 30 intersection improvements, a northern overpass would not mitigate the US 30/Gable Road and US 30/Millard Road intersection.

The grade separation project would improve emergency services dispatch options during the passage of trains through the City and/or in the event that a train blocked crossings for an extended period due to a derailment. School buses crossing US 30 and the railroad tracks could also be directed to the new overpass to reduce their delay in crossing the PNWR rail line.



LEGEND

- Exceeds Performance Standard
- Approaches Performance Standard
- Meets Performance Standard
- City Limits
- City UGB

FUTURE TRAFFIC CONDITIONS - RAIL CORRIDOR OPTION - NORTHERN OVERPASS
ST. HELENS, OREGON

FIGURE
15

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US 30/Gable Road

The US 30/Gable Road intersection also operates above capacity under the 1997 TSP Option and the Rail Corridor Option. The following additional improvements could be considered to mitigate the intersection:

- Install dual left-turn lanes and separate right turn lanes at each approach to the intersection. This mitigation would require widening the Gable Road approaches to seven lanes (for example, on the south approach there would be two southbound through lanes, two northbound left-turn lanes, two northbound through lanes, and one northbound right-turn lane). Widening to accommodate the additional lanes will increase pedestrian exposure, increase the rail crossing width (likely requiring median channelization for a center railroad crossing gate), and necessitate significant right-of-way acquisition. Further, the US 30/Gable Road intersection will likely become the most heavily traveled intersection on the corridor, complicating the ability to implement coordinated signal timing along the highway corridor through St. Helens. Even with these improvements, unless additional left turns can be diverted to other intersections such as Millard and Bennett Road to the south, the resulting v/c ratio (0.87) still does not meet the applicable mobility standard.
- Work with ODOT to allow a higher mobility standard at the intersection (v/c=0.85). This may be achieved through the establishment of a Special Transportation Area (STA) as described below.

US 30/Millard Road

The signalized US 30/Millard Road intersection operates with a v/c ratio of 0.94 under the 1997 TSP Option and the Rail Corridor Option. The following additional improvements could be considered to mitigate the intersection:

- Work with ODOT to allow a higher mobility standard at the intersection (v/c=.85).
- Install separate right turn lanes on the east and westbound approaches to the intersection. Note the additional right turn lane at the westbound approach would require widening and reconstruction of the adjacent PNWR grade crossing. The cost associated with this mitigation would be substantial yet, similar to Gable Road, the resulting v/c ratio (0.87) still does not meet the applicable mobility standard.
- Install dual left-turn lanes, a separate through lane, and a separate right turn lane on the east-west intersection approaches. Widening to accommodate the additional lanes will increase the rail crossing width (likely requiring median channelization for a center railroad crossing gate), and necessitate right-of-way acquisition.

Southern Overpass

The consideration of an overpass at the southern end of the City would enhance operations at the US 30/Millard Road intersection and the US 30/Gable Road intersection by 1) shifting westbound left-turns (trips headed south out of St. Helens) and truck traffic further south, 2) creating alternative east-west connectivity across US 30 and the railroad tracks, and 3) providing a higher-capacity intersection treatment at US 30/Millard Road. Ideally, the overpass would be situated to create a loop connection linking Old Portland Road on the east side of the City with Millard Road and the future north-south collector network on the west side of the City. Compared to an overpass at Deer Island Road, this improvement would likely have a more dramatic impact on operations all along US 30, including:

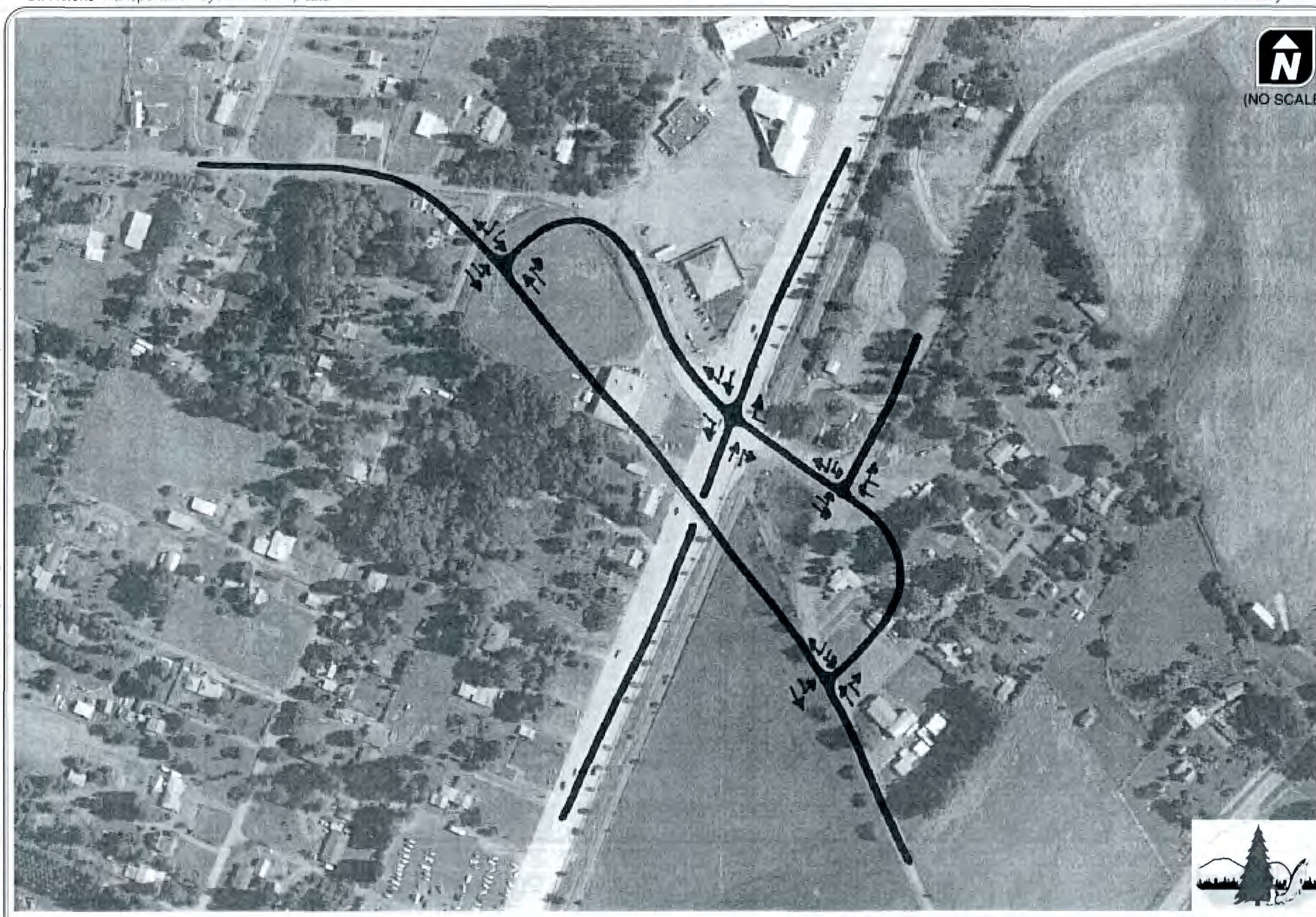
- Improved vehicular access and circulation to the residential areas east and west of US 30.
- Improved truck circulation to the industrial area east of US 30 assuming trucks would access US 30 at the overpass (reducing the potential for rail/truck interaction).
- Improved access and circulation for emergency response vehicles to areas both east and west of US 30.

In addition, as a majority of the traffic in St. Helens occurs near the southern end of the city, a southern overpass would improve operations through the City on the US 30 corridor (including the US 30/Gable Road intersection) by shifting a greater portion of local traffic circulation from US 30 onto the City roadway network before it reaches the more congested areas in the city.

ODOT's preliminary engineering team developed a concept for the US 30/Millard Road intersection that includes provision of an overpass that spans both the highway and the rail line, but continues to rely on the existing intersection for right-in/right-out turning movements. Based on information provided by ODOT, complete intersection grade separation is not practical at this location given the close proximity of the rail line to the highway and the need to get vehicles, including large trucks, up and an over the rail line. Figure 16 illustrates the overpass concept and shows the turning movements required to make left-turns at the intersection.

Figure 17 summarizes the results of intersection operations analysis with the overpass concept in place. As shown in Figure 17, operations at the US 30/Millard Road intersection improve with the overpass because all of the left-turn movements are converted to right turn movements and all of the east-west through movements are completed on the overpass. Also shown in Figure 17, operations at the US 30/Gable Road intersection improve. The improvement at Gable Road reflects trips shifting to the higher-capacity overpass as well as the provision of a westbound right-turn lane. Similar assumptions were made all along the US 30 corridor as a majority of the previously forecast northbound left-turn movements, including those at US 30/Pittsburg Road, were assumed to occur at the overpass. This redistribution of trips is predicated on the assumption that the adjacent roadway network is improved prior to, or along with the development of the overpass. The reduction in the northbound left-turns does not fully mitigate all of the capacity needs along US 30. As with the northern overpass option, some of the remaining unsignalized study intersections on US 30 would continue to fail.

A southern overpass was also considered further to the south near Achilles Road. However, the PNWR rail corridor elevation is above the highway elevation south of Millard Road. As a result of the elevation difference and the rail line's proximity to US 30, ODOT's preliminary engineering team indicated that building a structure over both US 30 and the PNWR line would be difficult and potentially cost prohibitive.



SOUTHERN OVERPASS CONCEPTAUL DESIGN
ST. HELENS, OREGON

FIGURE 16

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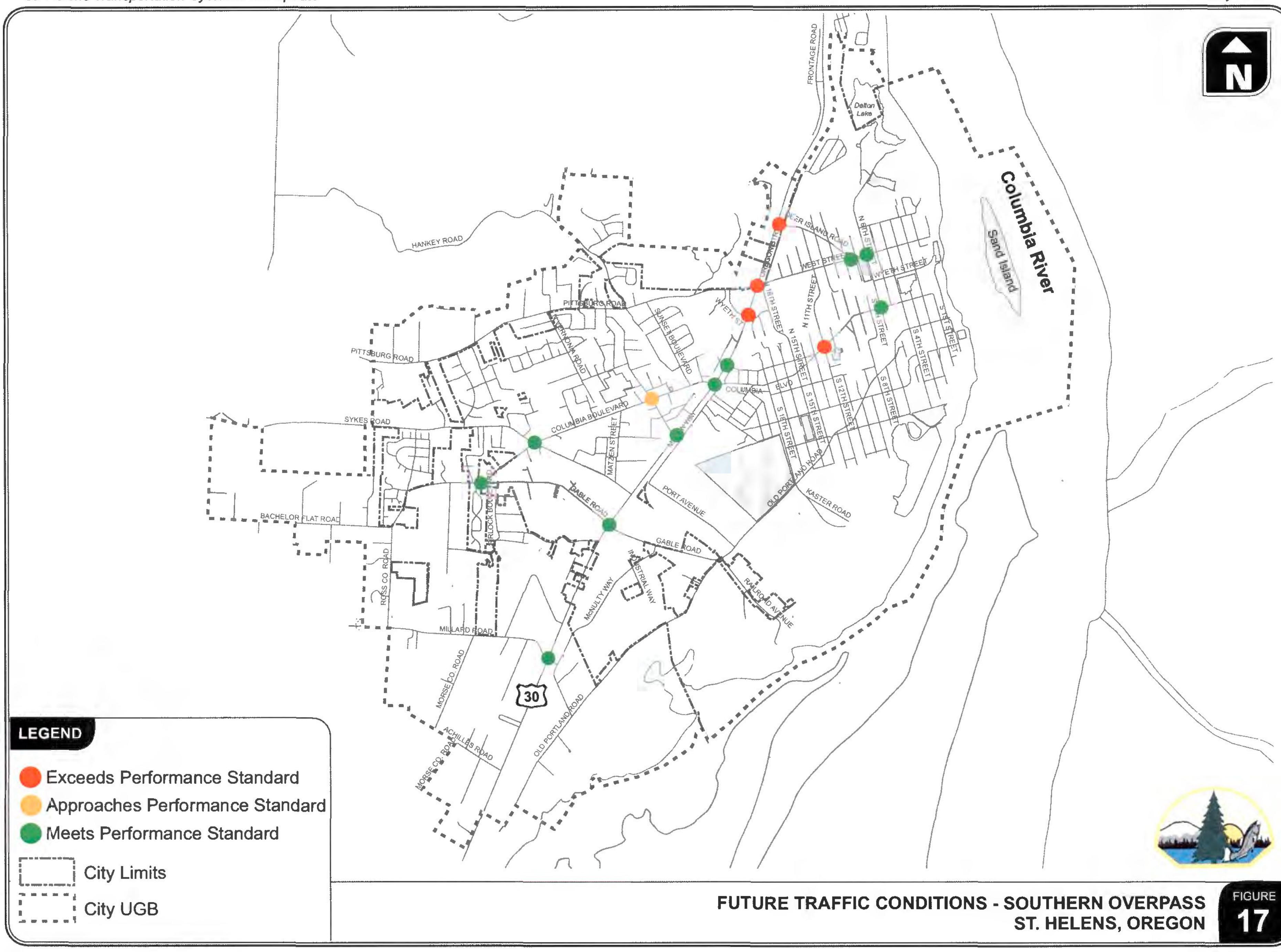

FUTURE TRAFFIC CONDITIONS - SOUTHERN OVERPASS
ST. HELENS, OREGON

FIGURE 17

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US 30/Bennett Road Signal

Signalizing the US 30/Bennett Road intersection could significantly improve operations at the US 30/Millard Road and US 30/Gable Road intersections by diverting a large number of vehicles (particularly northbound right and westbound left-turns) off of US 30 at the new signal. This route offers vehicles (and particularly trucks) traveling south of St. Helens a relatively straight path to US 30 that would avoid impacting the US 30/Millard Road and US 30/Gable Road intersections. Both Gable Road and Millard Road are expected to carry substantial east-west through traffic in the future as they link employment areas on the east side of US 30 with the residential areas on the west as well as the commercial area along Gable Road. Given the potential for relatively heavy eastbound through movements at Gable Road and Millard Road, shifting the truck traffic and a substantial number of westbound left-turns south to Bennett Road would benefit US 30 by minimizing conflicting east-west turn movement demand (and green time) at Gable Road and Millard Road.

ODOT traffic and preliminary engineering staff have expressed concern about signalizing the US 30/Bennett Road intersection, citing safety concerns involving the relatively rural and high speed nature of US 30 at the intersection, the potential to increase rear-end crashes, the current low Bennett Road traffic volumes and a general desire to avoid rural traffic signals.

Gable/Sykes Road Couplet

The conversion of Gable Road to a one-way westbound roadway between US 30 and Columbia Boulevard and Sykes Road to a one-way eastbound roadway between Columbia Boulevard and US 30 was considered as a potential solution to address the capacity needs identified at the US 30/Gable Road intersection. A preliminary review of the existing roadway network suggests that a one-way couplet system would severely limit access to the residential and commercial properties adjacent to Gable Road as well the St. Helens High School. This is primarily due to the lack of north/south roadways between Gable and Sykes Road between Columbia Boulevard and St. Helens Street. Based on these observations it was determined that a one-way couplet system at this location is not feasible at this time.

OPTIONS EVALUATION

The evaluation criteria identified at the beginning of this memo were qualitatively applied to the three options packages to assess how well the packages meet the goals and policies of the City. This preliminary assessment is summarized in Table 3 below. A more detailed and meaningful assessment of individual projects will be prepared during future phases of the TSP preparation as the Preferred Improvement Alternative is developed.

Table 3 Preliminary Options Evaluation

Evaluation Criteria	Complete Streets Option	1997 TSP Option	Rail Corridor Option
Safety	• Provides separation of pedestrians and bicyclists from motorists	• Provides some safety improvements along US 30 and at city intersections	• Provides improved pedestrian and bicycle facilities at rail crossings on US 30
Capacity	O No capacity related improvements are included in this option	● Improves capacity of several US 30 and city intersections	• Improves capacity of some US 30 intersections
Multimodal	● Provides improvements for pedestrians and bicyclists	• Provides improvements for motorists, pedestrians and bicyclists	• Provides improvements for motorists, pedestrians and bicyclists
Economic Development	• Creates pedestrian and bicycle friendly commercial areas and downtown	• Improves access and circulation in commercial and employment areas for motorists	• Improves rail corridor operations and some vehicular circulation
Natural Resources and Recreations	To be determined on a project-by-project basis	To be determined on a project-by-project basis	To be determined on a project-by-project basis
Connectivity	● Provides sidewalks and bike lanes along major pedestrian and bicycle routes	● Provides new roadway connections east and west of US 30	• Provides improved pedestrian access across US 30.
Historical Character	To be determined on a project-by-project basis	To be determined on a project-by-project basis	To be determined on a project-by-project basis
Consistency with other jurisdiction plans and policies	● Projects are consistent with the *Oregon Highway Plan* and the adopted 1997 TSP	● Projects are consistent with the adopted 1997 TSP	● Projects are consistent with the Lower Columbia River Rail Corridor Study
Construction/ Maintenance Costs	To be determined on a project-by-project basis	To be determined on a project-by-project basis	To be determined on a project-by-project basis
Rail Corridor Enhancements	O Provides no improvements to rail crossings	• Provides some improvements at or near rail crossings	● Provides some improvements at or near rail crossings

Legend: ● Significantly improves
• Provides some improvement
O Does not improve or degrades

REFERENCES

1. Oregon Department of Transportation, *Bicycle and Pedestrian Plan.* 1995.
2. Columbia & Clatsop County, *Lower Columbia River Rail Corridor Rail Safety Study*. 2009.
3. Oregon Department of Transportation, *Oregon Highway Plan.* 1999

APPENDICES

A. Complete Street Option Projects and Analysis Results

B. 1997 TSP Option Projects and Analysis Results

C. Rail Corridor Option Projects and Analysis Results

Appendix A
Complete Streets Option
Projects and Analysis Results

SIDEWALK IMPROVEMENT PROJECTS

Table A-1 summarizes sidewalk improvement projects included in the Complete Streets Option. The improvement projects shown in gray have been identified as priorities by City Staff and by the general public through the interactive Safe Routes to School map. The estimated project costs reflect the total planning level costs associated with the installation of sidewalks and/or curbs on one or two sides of a given roadway in accordance with the proposed street cross sectional guidelines. The costs also include estimates for mobilization, landscaping, traffic control, architectural/ engineering, and construction management. The costs do not include the purchase of additional right-of-way or widening the road (road widening is accounted for in the bicycle improvement projects).

Table A-1 Pedestrian Improvement Projects

Project No.	Project Roadway	From/To	Description	Order-of-Magnitude Project Cost
P01	Pittsburg Road	City Limits to Barr Road	Add 6 ft sidewalk and curb	$503,000
P02	Pittsburg Road	Barr Road to Vernonia Road	Add 6 ft sidewalk and curb	$553,000
P03	Pittsburg Road	Vernonia Road to US 30	Add 6 ft sidewalk and curb	$1,047,000
P04	Sykes Road	Saulser Road to Summit View Drive	Add 6 ft sidewalk and curb	$1,125,000
P05	Sykes Road	Summit View Drive to Columbia Blvd.	Add 6 ft sidewalk and curb	$654,000
P06	Sykes Road	Columbia Blvd. to US 30	Add 6 ft sidewalk and curb	$155,000
P07	Bachelor Flat Road	Saulser Road to Ross Road	Add 6 ft sidewalk and curb	$1,009,000
P08	Bachelor Flat Road	Ross Road to Columbia Blvd.	Add 6 ft sidewalk and curb	$605,000
P09	Columbia Blvd.	Gable Road to Sykes Road	Add 6 ft sidewalk and curb	$325,000
P10	Columbia Blvd.	Sykes Road to US 30	Add 6 ft sidewalk and curb	$1,100,000
P11	Gable Road.	Columbia Blvd. to US 30	Add 6 ft sidewalk and curb	$570,000
P12	Firlock Blvd.	Gable Road to US 30	Add 6 ft sidewalk and curb	$897,000
P13	Millard Road	Ross Road to US 30	Add 6 ft sidewalk and curb	$1,122,000
P14	Achilles Road	N Morse Road to US 30	Add 6 ft sidewalk and curb	$430,000
P15	Vernonia Road	Pittsburg Road to US 30	Add 6 ft sidewalk and curb	$826,000
P16	Sunset Blvd.	Pittsburg Road to Columbia Blvd.	Add 6 ft sidewalk and curb	$543,000
P17	Matzen Street	Columbia Blvd. to Sykes Road	Add 6 ft sidewalk and curb	$344,000
P18	Ross Road	Millard Road to Bachelor Flat Road	Add 6 ft sidewalk and curb	$583,000
P19	Morse County Road	Achilles Road to Millar Road	Add 6 ft sidewalk and curb	$599,000
P20	Millard Road	US 30 Old Portland Road	Add 6 ft sidewalk and curb	$388,000
P21	McNulty Way	Gable Road to Millard Road	Add 6 ft sidewalk and curb	$625,000
P22	Old Portland Road	Gable to Millard Road	Add 6 ft sidewalk and curb	$1,249,000
P23	Gable Road	US 30 to Old Portland Road	Add 6 ft sidewalk and curb	$524,000
P24	Port Avenue	Milton Way to Old Portland Road	Add 6 ft sidewalk and curb	$368,000

P25	Milton Way	Columbia Blvd. to Port Avenue	Add 6 ft sidewalk and curb	$615,000
P26	18th Street	Columbia Blvd. to Old Portland Road	Add 6 ft sidewalk and curb	$518,000
P27	15th Street	Columbia Blvd. to Old Portland Road	Add 6 ft sidewalk and curb	$506,000
P28	12th Street	Columbia Blvd. to Old Portland Road	Add 6 ft sidewalk and curb	$472,000
P29	Old Portland Road	Gable Road to St. Helens Street	Add 6 ft sidewalk and curb	$1,787,000
P30	Oregon Street	West Street to Rutherford Parkway	Add 6 ft sidewalk and curb	$683,000
P31	West Street	Oregon Street to Deer Island Road	Add 6 ft sidewalk and curb	$296,000
P32	West Street	Deer Island Road to 1st Street	Add 6 ft sidewalk and curb	$431,000
P33	16th Street	West Street to Jr. High School Dwy	Add 6 ft sidewalk and curb	$216,000
P34	16th Street	Jr. High School Dwy to St. Helens Street	Add 6 ft sidewalk and curb	$298,000
P35	Deer Island Road	US 30 to West Street	Add 6 ft sidewalk and curb	$480,000
P36	11th/12th Street	Deer Island Road to Columbia Blvd.	Add 6 ft sidewalk and curb	$475,000
P37	US 30	Gable Road to Columbia Blvd.	Add 8 ft sidewalk	$466,000

Note: The north side of Columbia Boulevard between 7th and 9th Streets cannot accommodate a sidewalk due to an existing rock wall.

INTERSECTION IMPROVEMENT PROJECTS

Table A-2 summarizes the proposed pedestrian improvement projects included in the Complete Streets Option.

Table A-2 Intersection Improvement Projects

Project No.	Intersections	Description	Order-of-Magnitude Project Cost
P38	Columbia Blvd./Sykes Road	Install 2 striped crosswalks and 6 new ADA ramps	$19,000
P39	18th Street/Old Portland Road	Install 2 striped crosswalks and new 6 ADA ramps	$19,000
P40	Columbia Blvd./St. Helens Couplet	Install curb extensions (4 locations)	$106,000
P41	Columbia Blvd. Couplet to 2nd St.	Install curb extensions and island refuges (8 locations)	$200,000
P42	Columbia Blvd./1st Street	Install 1 striped crosswalk and 3 new ADA ramps	$10,000
P43	St Helens Street	Install curb extensions (4 locations)	$106,000
P43	US 30/Gable Road	Install Pedestrian Countdown Heads	$3,000

BICYCLE IMPROVEMENT PROJECTS

Table A-3 summarizes the proposed bicycle improvement projects included in the Complete Streets Option. The bicycle projects shown in gray have been tentatively identified as priorities by City Staff, the St. Helens Pedestrian/Bicycle Committee, and the general public through the interactive Safe Routes to School map. The estimated project costs reflect the total planning level costs associated with widening on one or two sides of a given roadway to accommodate bicycle lanes if needed and installing bicycle pavement markings. The costs also include estimates for relocating storm drains, signing and striping, mobilization, traffic control, architectural/engineering, and construction management. The costs do not include the purchase of additional right-of-way.

Table A-3 Bicycle Lane Improvement projects

Project No.	Project Roadway	From/To	Description	Order-of-Magnitude Project Cost
B01	Pittsburg Road	City Limits to Barr Road	Widening/Bike Lanes/Markings	$909,000
B02	Pittsburg Road	Barr Road to Vernonia Road	Widening/Bike Lanes/Markings	$1,002,000
B03	Pittsburg Road	Vernonia Road to US 30	Widening/Bike Lanes/Markings	$1,877,000
B04	Sykes Road	Saulser Road to Summit View Drive	Widening/Bike Lanes/Markings	$2,028,000
B05	Sykes Road	Summit View Drive to Columbia Blvd.	Widening/Bike Lanes/Markings	$1,177,000
B06	Sykes Road	Columbia Blvd. to US 30	Widening/Bike Lanes/Markings	$55,000
B07	Bachelor Flat Road	Saulser Road to Ross Road	Widening/Bike Lanes/Markings	$1,975,000
B08	Bachelor Flat Road	Ross Road to Columbia Blvd.	Widening/Bike Lanes/Markings	$819,000
B09	Columbia Blvd.	Gable Road to Sykes Road	Widening/Bike Lanes/Markings	$525,000
B10	Columbia Blvd.	Sykes Road to US 30	Widening/Bike Lanes/Markings	$420,000
B11	Gable Road	Columbia Blvd. to US 30	Widening/Bike Lanes/Markings	$809,000
B12	Firlock Blvd.	Gable Road to US 30	Widening/Bike Lanes/Markings	$1,454,000
B13	Millard Road	Ross Road to US 30	Widening/Bike Lanes/Markings	$2,045,000
B14	Achilles Road	N Morse Road to US 30	Widening/Bike Lanes/Markings	$876,000
B15	Vernonia Road	Pittsburg Road to US 30	Widening/Bike Lanes/Markings	$918,000
B16	Sunset Blvd.	Pittsburg Road to Columbia Blvd.	Widening/Bike Lanes/Markings	$128,000
B17	Matzen Street	Columbia Blvd. to Sykes Road	Widening/Bike Lanes/Markings	$419,000
B18	Ross Road	Millard Road to Bachelor Flat Road	Widening/Bike Lanes/Markings	$1,186,000
B19	Morse County Road	Achilles Road to Millar Road	Widening/Bike Lanes/Markings	$1,220,000
B20	Millard Road	US 30 Old Portland Road	Widening/Bike Lanes/Markings	$576,000
B21	McNulty Way	Gable Road to Millard Road	Widening/Bike Lanes/Markings	$458,000
B22	Old Portland Road	Gable to Millard Road	Widening/Bike Lanes/Markings	$2,256,000
B23	Gable Road	US 30 to Old Portland Road	Widening/Bike Lanes/Markings	$265,000
B24	Port Avenue	Milton Way to Old Portland Road	Widening/Bike Lanes/Markings	$644,000
B25	Milton Way	Columbia Blvd. to Port Avenue	Widening/Bike Lanes/Markings	$1,133,000
B26	18th Street	Columbia Blvd. to Old Portland Road	Widening/Bike Lanes/Markings	$566,000
B27	15th Street	Columbia Blvd. to Old Portland Road	Widening/Bike Lanes/Markings	$517,000
B28	12th Street	Columbia Blvd. to Old Portland Road	Widening/Bike Lanes/Markings	$500,000
B29	Old Portland Road	Gable Road to St. Helens Street	Widening/Bike Lanes/Markings	$2,356,000
B30	Oregon Street	West Street to Rutherford Parkway	Widening/Bike Lanes/Markings	$555,000
B31	West Street	Oregon Street to Deer Island Road	Widening/Bike Lanes/Markings	$257,000

B32	West Street	Deer Island Road to 1st Street	Widening/Bike Lanes/Markings	$383,000
B33	16th Street	West Street to Jr. High School	Widening/Bike Lanes/Markings	$143,000
B34	16th Street	Jr. High School to St. Helens Street	Widening/Bike Lanes/Markings	$403,000
B35	Deer Island Road	US 30 to West Street	Widening/Bike Lanes/Markings	$390,000
B36	11th/12th Street	Deer Island Road to Columbia Blvd.	Widening/Bike Lanes/Markings	$1,073,000
B37	Cherrywood Drive	Vernonia Road to Columbia Blvd.	Add Sharrow Markings	$4,500
B38	Barr Avenue	Pittsburg Road to Sykes Road	Add Sharrow Markings	$5,500

BICYCLE CROSSING IMPROVEMENT PROJECTS

Table A-4 summarizes the proposed bicycle crossing improvement projects included in the Complete Streets Options.

Table A-4 Bicycle Crossing Improvement Projects

Project No.	Intersections	Description	Order-of-Magnitude Project Cost
B43	US 30/St. Helens Street	Reconfigure bike lane striping across right turn lane	$5,000
B44	US 30/Gable Road	Reconfigure bike lane striping across right turn lane	$5,000

OFF STREET IMPROVEMENTS

Table A-5 summarizes the proposed off-street bicycle facility improvement projects included in the Complete Streets Options.

Table A-5 Off-Street Bicycle Facility Improvement Projects

Project No.	Location	Description	Order-of-Magnitude Project Cost
B45	Columbia Country Rider Park and Ride (3 locations)	Add bicycle parking	$1,500
B46	Columbia County Rider Transit Center	Add bicycle parking	$500
B47	Commercial Area Along US 30	Add bicycle parking	$500
B48	Commercial Area Along Columbia Blvd.	Add bicycle parking	$500
B49	Commercial Area Along St. Helens Street	Add bicycle parking	$500
B50	Old Town Area	Add bicycle parking	$500
B51	Riverfront Area	Add bicycle parking	$500
B52	Columbia County Fairgrounds	Add bicycle parking	$500

TRANSIT IMPROVEMENT PROJECTS

The transit improvements projects listed below reflect the recommendations from the recent Columbia County Transit Access Plan and include the location and design of future transit stops and an evaluation of existing and future conditions at each stop. Table A-5 summarizes the park-and-ride locations in St. Helens and the recommended improvements by location.

There are two types of transit facilities identified for St. Helens:

Park-and-ride lots provide all-day parking for bus passengers. The majority of the stop's passengers will arrive by automobile, although a few may walk or bike to the stop, depending on the adjacent land uses. The lot sizes evaluated range from 10–75 spaces. Lots can be located on property owned by the County, or can be located on private property, where the landowners have given permission. All park-and-ride lots should have bus stop signage, wayfinding signage from the highway to the parking lot, posted bus information, and (at lots on private property) signing and/or paint markings indicating which spaces are designated for park-and-ride use. Whenever possible, an accessible bus shelter should be provided (this may not be possible on private property). Lighting should be available at the site.

Transit centers provide opportunities for passengers to transfer between bus routes. Many passengers will arrive and depart by bus. All of the sites evaluated as potential transit enters also have room for park-and-ride lots, so some passengers will also arrive by automobile. Depending on the adjacent land uses, some passengers may also arrive on foot or by bicycle. Transit centers provide multiple bus stops, to facilitate timed transfers between bus routes. They should also have wayfinding signage from the highway to the park-and-ride lot, posted bus information, and covered waiting areas (e.g., an accessible bus shelter or, at the former gas station sites, an accessible waiting room). Lighting should be available at the site.

Table A-5 Summary of Recommended Transit Improvements by Bus Stop Location

Recommended Improvement	Stop Location on US 30			
	Safeway/RiteAid at Gable Road	**Ace Hardware at Columbia Boulevard**	**Columbia Commons at Pittsburg Road**	**Stimson Site at Deer Island Road**
Bus Stop	Provide bus service information	Provide bus stop sign Provide bus service information	Bus service information Because the bus shelter is located flush with the parking lot (i.e., not behind a curb), bollards are recommended at the exposed corners of the shelter to protect it from errant vehicles.	Bus stop signs (3—one for each *bus bay*) Accessible shelters and benches (3—one for each bus bay) Off-street bus bays (3) with concrete pads Bus service information On-site lighting
Parking	Work with the property owner to construct an accessible sidewalk along the driveway from US 30 to the *bus stop; the sidewalk would* also provide a pedestrian route, currently lacking, from US 30 to the shopping center's two main stores. It is recommended that a formal agreement to use the site as a park-and-ride be developed *prior to investing in further on-site* improvements. Work with the property owner to construct a shelter and landing pad to serve northbound riders (for example, in the landscaping strip between the driveway and the parking spaces to the north), so passengers do not have to walk into the parking lot driveway when boarding a northbound bus.		If a transit center is constructed at the Stimson site, parking demand at this location will likely decrease in the short term. In the longer term, work with the property owners to retain some park-and-ride spaces to serve residents of St. Helens living on the west side of US 30.	Construct a 65-space park-and-ride lot.
Street	Provide park-and-ride signage from US 30 (2 signs, one each direction) at the parking lot entrance.	New or reconstructed curb ramps are required at the US 30/Columbia Boulevard intersection. Some curb ramps are missing (e.g., northwest corner); others do not line up with the crosswalk (e.g., southwest corner). A sidewalk connection and accessible pedestrian route across the railroad tracks is needed on the south side of Columbia Boulevard between US 30 and Milton Way.	Provide park-and-ride signage from US 30 (2 signs, one for each direction, located at the Columbia Commons driveway entrance). Provide one sign for eastbound Pittsburg Road.	Based on correspondence from ODOT Rail, the spur track leading into the site would need to be removed and its associated railroad crossing equipment at Deer Island Road relocated to align with the mainline crossing. Frontage improvements (street widening, sidewalks) on Deer Island Road and Oregon Street to meet City and County standards. Provide park-and-ride signage from US 30 (4 signs, one for each direction on US 30 prior to Deer *Island Road, one on Deer Island* Road eastbound at Oregon Street, and one on Oregon Street at the parking lot entrance). Transit signal priority provision for the US 30/Deer Island Road traffic *signal to facilitate the movement* of buses leaving the transit center. Lengthen the southbound left turn lane from US 30 to Deer Island Road by restriping a portion of the center two-way left-turn lane.
Order-of-Magnitude Cost Estimate	Information display case for the existing shelter: $500 New accessible shelter, bus stop sign, and information display: $8,000 Sidewalk into site, with 5 curb ramps: $36,000 2 park-and-ride signs: $500	Bus stop sign and information: $600 Sidewalk and 12 new/reconstructed curb ramps: $67,000	Information panel for bus shelter: $500 3 bollards: $2,400 3 park-and-ride signs: $750	On-site transit center improvements, including buildings and park-and-ride: $2,344,800 Frontage improvements on Deer Island Road and Oregon Street: $162,000 4 park-and-ride signs: $1,000 Restripe southbound left-turn lane on US 30: $10,400 Transit signal priority installation: $42,000

Additional St. Helens Transit Center Stimson Site Background Information

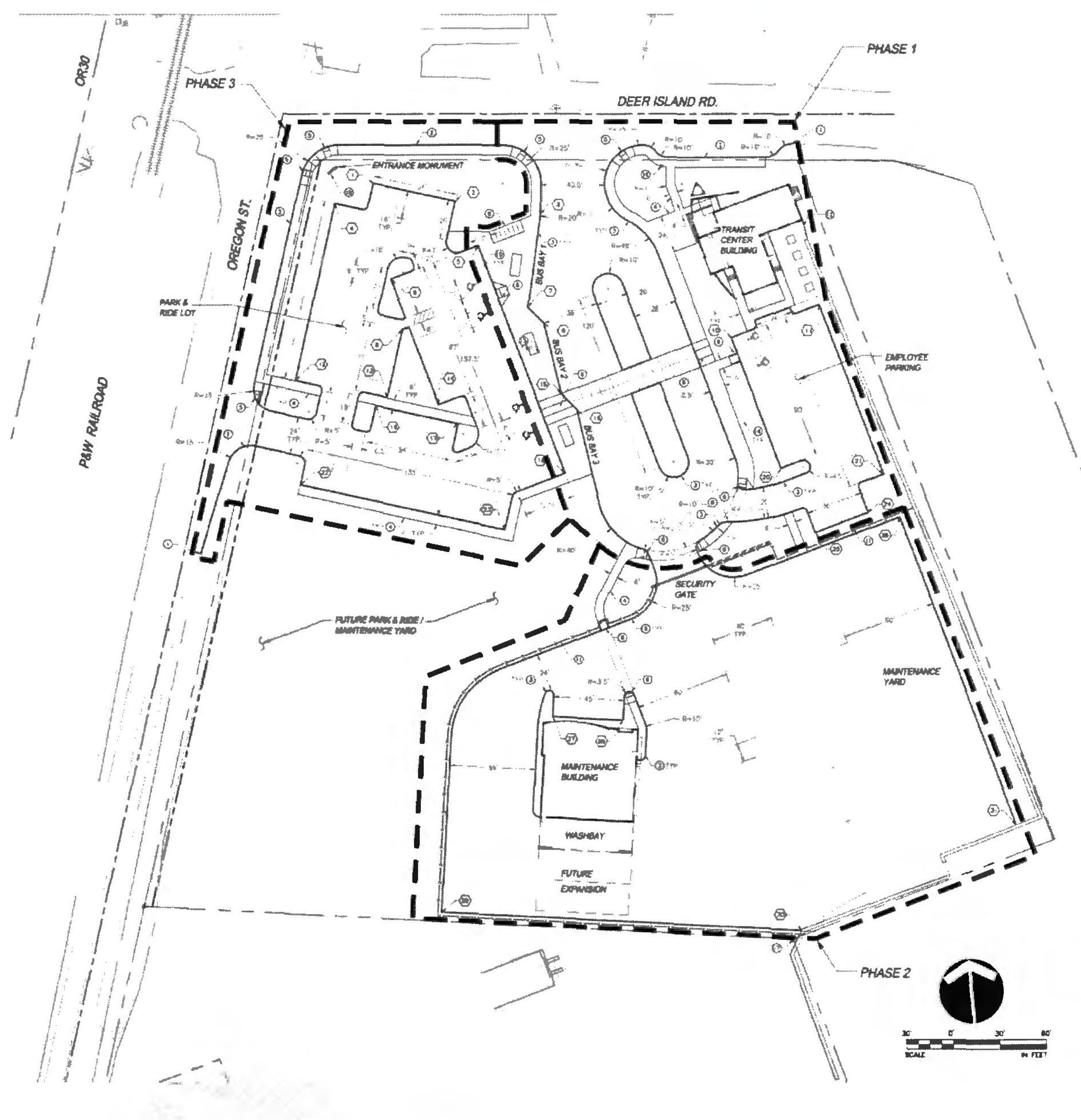
The Stimson site is being developed as a future transit, maintenance facility, and transit administration building. A brief summary of the project is provided below for context.

View looking east

US 30/Deer Island Road

Site Description

This site is located at the former Stimson lumber yard east of Oregon Street and south of Deer Island Road. The site is proposed to be redeveloped with the following uses: bus transfer center, park-and-ride, bus maintenance and storage facility, and transit administration building. A site has also been reserved for a potential future building in the southwest corner of the site adjacent to Oregon Street. The site would be the primary transfer point for Columbia County bus routes. The current site concept is shown below. Access to the site from US 30 is via the signalized intersection at Deer Island Road and turn lanes are available for the bus movements (northbound right turn and southbound left turn). Land uses immediately adjacent to US 30 and Oregon Street are primarily industrial, but residential neighborhoods are located to the south and east. The posted speed on US 30 at Deer Island Road is 45 mph, increasing to 55 mph to the north.


PHASE 1
PHASE 3
OR30
DEER ISLAND RD.
ENTRANCE MONUMENT
OREGON ST.
PARK & RIDE LOT
TRANSIT CENTER BUILDING
BUS BAY 1
BUS BAY 2
BUS BAY 3
EMPLOYEE PARKING
P&W RAILROAD
SECURITY GATE
FUTURE PARK & RIDE / MAINTENANCE YARD
MAINTENANCE YARD
MAINTENANCE BUILDING
WASHBAY
FUTURE EXPANSION
PHASE 2
SCALE
IN FEET

Appendix B
1997 TSP Options and Analysis Results

STREET IMPROVEMENT PROJECTS

Table B-1 summarizes the new street improvement projects included in the 1997 TSP Option.

Table B-1 Street Improvement Projects (New Roadways)

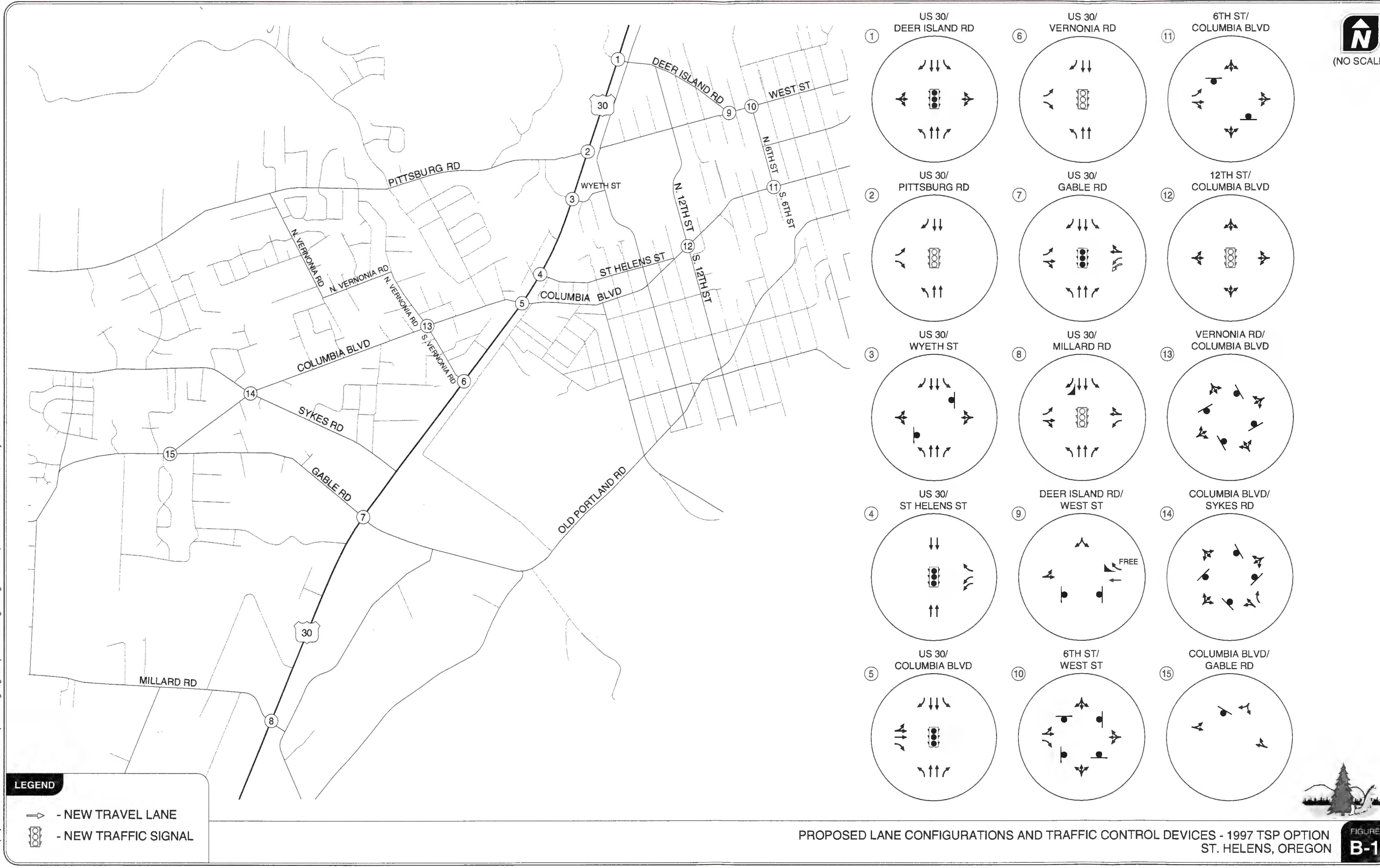
Project No.	Project Roadway	From/To	Order-of-Magnitude Project Cost
S01	10th or 11th Street Extension	Deer Island to Oregon Street	$928,000
S02	Lemont Street Extension	Deer Island to 6th Street	$804,000
S03	Summit View Extension	Sykes Road to Pittsburg Road	$1,679,000
S04	Achilles Road Extension	N Morse Road to Ross Road	$2,994,000
S05	Industrial Way Extension	To Old Portland Road	$1,014,000
S06	Plymouth Street Extension	Plymouth Street to 1st Street	$1,526,000
S07	Firlock Park Street Extension	Firlock Park Boulevard to Millard Road	$2,158,000

INTERSECTION IMPROVEMENT PROJECTS

Table B-3 summarizes the intersection improvement projects included in the 1997 TSP Option.

Table B-3 Intersection Improvement Projects

Project No.	Project Roadway	Project Description	Order-of-Magnitude Project Cost
S08	US 30/Millard Road	Install traffic signal, re-stripe intersection to include separate east/westbound lefts and east-westbound through-right turn-lanes	$400,000
S09	US 30/Vernonia Road	Install Traffic Signal	$250,000
S10	US 30/Pittsburg Road	Install Traffic Signal	$250,000
S11	Columbia Blvd./12th Street	Install Traffic Signal	$250,000
S12	US 30/Gable Road	Install a second westbound left-turn lane	$485,000
S13	Old Portland Road/Gable Road	Realign intersection to allow through movements on Old Portland Road	$2,785,000
S14	Columbia Blvd./Sykes Road	Install left-turn lanes on Columbia Blvd.	$370,000
S15	Ross Road/Bachelor Flat Road	Reconfigure intersection and install left-turn lanes	$770,000



PROPOSED LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES - 1997 TSP OPTION
ST. HELENS, OREGON

FIGURE B-1

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LEGEND

STD = MOBILITY STANDARD
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

TOTAL TRAFFIC CONDITIONS - 1997 TSP OPTION
WEEKDAY PM PEAK HOUR
ST. HELENS, OREGON

FIGURE B-2

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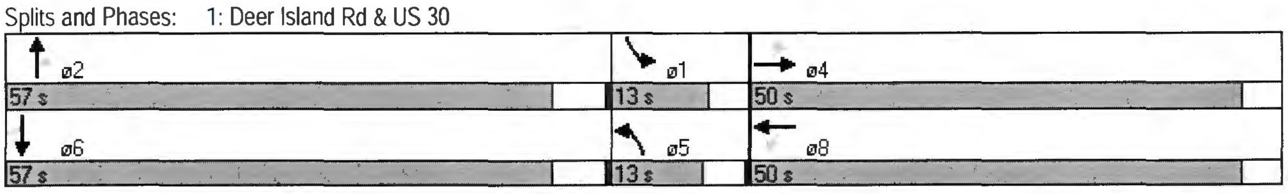
Lane Configurations												
Volume (vph)	5	1	7	298	2	134	5	1160	321	85	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	110		300	110		110
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.927			0.958				0.850			0.850
Flt Protected		0.981			0.967		0.950			0.950		
Satd. Flow (prot)	0	1215	0	0	1621	0	1710	3353	1473	1662	3288	916
Flt Permitted		0.894			0.787		0.950			0.950		
Satd. Flow (perm)	0	1107	0	0	1319	0	1710	3353	1473	1662	3288	916
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			22				338			4
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		225			179			1625			999	
Travel Time (s)		5.1			4.1			22.2			13.6	
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
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Adj. Flow (vph)	5	1	7	314	2	141	5	1221	338	89	723	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	13	0	0	457	0	5	1221	338	89	723	6
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	34.0	34.0		34.0	34.0		8.5	30.5	30.5	9.5	32.5	32.5
Total Split (s)	50.0	50.0	0.0	50.0	50.0	0.0	13.0	57.0	57.0	13.0	57.0	57.0
Total Split (%)	41.7%	41.7%	0.0%	41.7%	41.7%	0.0%	10.8%	47.5%	47.5%	10.8%	47.5%	47.5%
Maximum Green (s)	46.0	46.0		46.0	46.0		8.5	51.5	51.5	9.0	51.5	51.5
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.5	0.5	0.5	0.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.5	5.5	5.5	4.0	5.5	5.5
Lead/Lag							Lag	Lead	Lead	Lag	Lead	Lead
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	5.1	5.1	2.5	5.1	5.1
Minimum Gap (s)	2.0	2.0		2.0	2.0		1.0	3.1	3.1	1.0	3.1	3.1
Time Before Reduce (s)	5.0	5.0		5.0	5.0		8.0	10.0	10.0	8.0	10.0	10.0
Time To Reduce (s)	5.0	5.0		5.0	5.0		3.0	20.0	20.0	3.0	20.0	20.0
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)	21.0	21.0		21.0	21.0			11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	1	1		1	1			1	1		1	1
v/c Ratio		0.03			0.94		0.06	0.80	0.39	0.74	0.41	0.01
Control Delay		16.2			63.9		41.6	23.5	2.0	88.9	18.5	12.5
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		16.2			63.9		41.6	23.5	2.0	88.9	18.5	12.5
Queue Length 50th (ft)		3			313		4	396	1	69	167	1
Queue Length 95th (ft)		17			#515		m8	362	24	#153	270	9
Internal Link Dist (ft)		145			99			1545			919	
Turn Bay Length (ft)							110		300	110		110
Base Capacity (vph)		429			519		121	1534	857	125	1779	497
Starvation Cap Reductn		0			0		0	0	0	0	0	0
Spillback Cap Reductn		0			0		0	0	0	0	0	0
Storage Cap Reductn		0			0		0	0	0	0	0	0
Reduced v/c Ratio		0.03			0.88		0.04	0.80	0.39	0.71	0.41	0.01

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 81 (68%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Deer Island Rd & US 30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1	7	298	2	134	5	1160	321	85	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Lane Util. Factor		1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.93			0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98			0.97		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1215			1621		1710	3353	1473	1662	3288	916
Flt Permitted		0.89			0.79		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1107			1320		1710	3353	1473	1662	3288	916
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)	5	1	7	314	2	141	5	1221	338	89	723	6
RTOR Reduction (vph)	0	4	0	0	14	0	0	0	194	0	0	2
Lane Group Flow (vph)	0	9	0	0	443	0	5	1221	144	89	723	4
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)		43.0			43.0		1.7	51.3	51.3	12.2	61.3	61.3
Effective Green, g (s)		43.0			43.0		1.7	51.3	51.3	12.2	61.3	61.3
Actuated g/C Ratio		0.36			0.36		0.01	0.43	0.43	0.10	0.51	0.51
Clearance Time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Vehicle Extension (s)		2.5			2.5		2.5	5.1	5.1	2.5	5.1	5.1
Lane Grp Cap (vph)		397			473		24	1433	630	169	1680	468
v/s Ratio Prot							0.00	c0.36		c0.05	0.22	
v/s Ratio Perm		0.01			c0.34				0.10			0.00
v/c Ratio		0.02			0.94		0.21	0.85	0.23	0.53	0.43	0.01
Uniform Delay, d1		24.9			37.2		58.5	30.9	21.8	51.2	18.4	14.4
Progression Factor		1.00			1.00		0.76	0.67	0.33	1.00	1.00	1.00
Incremental Delay, d2		0.0			26.0		2.8	6.0	0.8	2.3	0.8	0.0
Delay (s)		24.9			63.2		47.1	26.6	7.9	53.4	19.2	14.5
Level of Service		C			E		D	C	A	D	B	B
Approach Delay (s)		24.9			63.2			22.6			22.9	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM Average Control Delay	29.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		

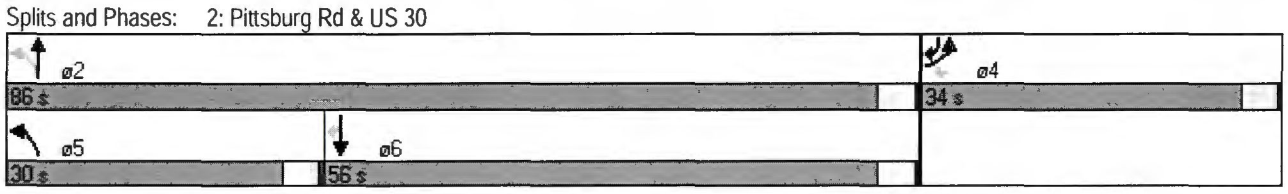
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	177	172	270	1233	785	179
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	25	100			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor	1.00					
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1599	1377	1629	3320	3257	1443
Flt Permitted	0.950		0.286			
Satd. Flow (perm)	1596	1377	490	3320	3257	1443
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		78				137
Link Speed (mph)	35			40	40	
Link Distance (ft)	567			871	1625	
Travel Time (s)	11.0			14.8	27.7	
Confl. Peds. (#/hr)	1					
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	4%	8%	5%	3%	5%	6%
Adj. Flow (vph)	184	179	281	1284	818	186
Shared Lane Traffic (%)						
Lane Group Flow (vph)	184	179	281	1284	818	186
Turn Type		Perm	pm+pt			pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	30.0	30.0	8.0	20.0	20.0	30.0
Total Split (s)	34.0	34.0	30.0	86.0	56.0	34.0
Total Split (%)	28.3%	28.3%	25.0%	71.7%	46.7%	28.3%
Maximum Green (s)	30.0	30.0	26.0	82.0	52.0	30.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	C-Max	C-Max	None
Walk Time (s)	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	21.0	21.0		11.0	11.0	21.0
Pedestrian Calls (#/hr)	1	1		1	1	1
v/c Ratio	0.72	0.63	0.57	0.50	0.39	0.15
Control Delay	62.8	35.1	6.7	4.4	6.4	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.8	35.1	6.7	4.4	6.4	0.6

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Queue Length 50th (ft)	137	73	27	67	93	2
Queue Length 95th (ft)	201	141	62	218	m115	m10
Internal Link Dist (ft)	487			791	1545	
Turn Bay Length (ft)		25	100			50
Base Capacity (vph)	400	403	626	2567	2084	1338
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.44	0.45	0.50	0.39	0.14

Intersection Summary
Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 106 (88%), Referenced to phase 2:NBTL and 6:SBT, Start of Yellow
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Pittsburg Rd & US 30



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	177	172	270	1233	785	179
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1599	1377	1629	3320	3257	1443
Flt Permitted	0.95	1.00	0.29	1.00	1.00	1.00
Satd. Flow (perm)	1599	1377	489	3320	3257	1443
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	184	179	281	1284	818	186
RTOR Reduction (vph)	0	66	0	0	0	27
Lane Group Flow (vph)	184	113	281	1284	818	159
Confl. Peds. (#/hr)	1					
Heavy Vehicles (%)	4%	8%	5%	3%	5%	6%
Turn Type		Perm	pm+pt			pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4	2			6
Actuated Green, G (s)	19.2	19.2	92.8	92.8	76.8	96.0
Effective Green, g (s)	19.2	19.2	92.8	92.8	76.8	96.0
Actuated g/C Ratio	0.16	0.16	0.77	0.77	0.64	0.80
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	256	220	492	2567	2084	1203
v/s Ratio Prot	c0.12		c0.06	0.39	0.25	0.02
v/s Ratio Perm		0.08	c0.38			0.09
v/c Ratio	0.72	0.52	0.57	0.50	0.39	0.13
Uniform Delay, d1	47.8	46.1	5.2	5.0	10.4	2.7
Progression Factor	1.00	1.00	0.72	0.68	0.50	0.51
Incremental Delay, d2	9.3	2.0	1.2	0.5	0.5	0.0
Delay (s)	57.1	48.2	4.9	3.9	5.6	1.4
Level of Service	E	D	A	A	A	A
Approach Delay (s)	52.7			4.1	4.9	
Approach LOS	D			A	A	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	3	6	80	46	2	34	40	1457	202	40	907	11
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	85		250	85		25
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor												
Frt		0.878			0.943				0.850			0.850
Flt Protected		0.998			0.973		0.950			0.950		
Satd. Flow (prot)	0	1439	0	0	1588	0	1710	3226	1488	1662	3196	1530
Flt Permitted		0.998			0.973		0.950			0.950		
Satd. Flow (perm)	0	1439	0	0	1588	0	1710	3226	1488	1662	3196	1530
Link Speed (mph)		25			25			40			40	
Link Distance (ft)		275			614			1403			871	
Travel Time (s)		7.5			16.7			23.9			14.8	
Confl. Peds. (#/hr)			3	3								
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
Heavy Vehicles (%)	8%	0%	7%	2%	0%	0%	0%	6%	0%	0%	7%	0%
Adj. Flow (vph)	3	6	84	48	2	36	42	1534	213	42	955	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	93	0	0	86	0	42	1534	213	42	955	12
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	6	80	46	2	34	40	1457	202	40	907	11
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)	3	6	84	48	2	36	42	1534	213	42	955	12
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											871	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	1927	2869	480	2270	2668	767	966			1746		
vC1, stage 1 conf vol	1039	1039		1618	1618							
vC2, stage 2 conf vol	888	1831		652	1051							
vCu, unblocked vol	1802	2854	187	2185	2630	767	730			1746		
tC, single (s)	7.7	6.5	7.0	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.7	5.5		6.5	5.5							
tF (s)	3.6	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	92	88	50	98	90	95			88		
cM capacity (veh/h)	158	75	721	96	130	349	791			364		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	94	86	42	767	767	213	42	477	477	12
Volume Left	3	48	42	0	0	0	42	0	0	0
Volume Right	84	36	0	0	0	213	0	0	0	12
cSH	424	139	791	1700	1700	1700	364	1700	1700	1700
Volume to Capacity	0.22	0.62	0.05	0.45	0.45	0.13	0.12	0.28	0.28	0.01
Queue Length 95th (ft)	21	82	4	0	0	0	10	0	0	0
Control Delay (s)	15.9	66.5	9.8	0.0	0.0	0.0	16.2	0.0	0.0	0.0
Lane LOS	C	F	A				C			
Approach Delay (s)	15.9	66.5	0.2				0.7			
Approach LOS	C	F								

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		

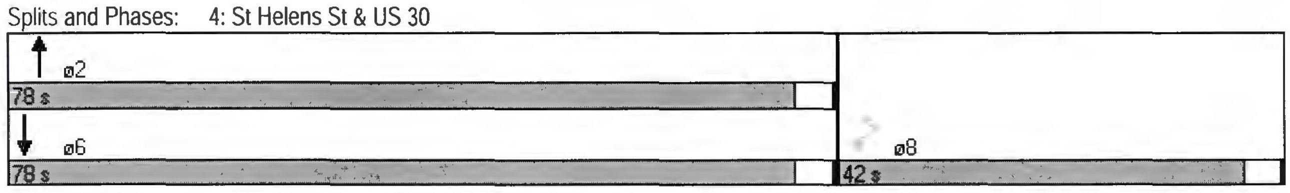
	↙	↖	↑	↗	↘	↓
Lane Configurations	↰↰	↱	↑↑			↑↑
Volume (vph)	614	290	1456	0	0	1032
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor		0.99				
Frt		0.850				
Flt Protected	0.950					
Satd. Flow (prot)	3193	1458	3226	0	0	3420
Flt Permitted	0.950					
Satd. Flow (perm)	3193	1437	3226	0	0	3420
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		38				
Link Speed (mph)	25		35			35
Link Distance (ft)	349		598			1403
Travel Time (s)	9.5		11.6			27.3
Confl. Bikes (#/hr)		4				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Adj. Flow (vph)	646	305	1533	0	0	1086
Shared Lane Traffic (%)						
Lane Group Flow (vph)	646	305	1533	0	0	1086
Turn Type		custom				
Protected Phases			2			6
Permitted Phases	8	8				
Detector Phase	8	8	2			6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0			4.0
Minimum Split (s)	30.0	30.0	20.0			20.0
Total Split (s)	42.0	42.0	78.0	0.0	0.0	78.0
Total Split (%)	35.0%	35.0%	65.0%	0.0%	0.0%	65.0%
Maximum Green (s)	38.0	38.0	74.0			74.0
Yellow Time (s)	3.5	3.5	3.5			3.5
All-Red Time (s)	0.5	0.5	0.5			0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
Walk Time (s)	5.0	5.0	5.0			5.0
Flash Dont Walk (s)	21.0	21.0	11.0			11.0
Pedestrian Calls (#/hr)	1	1	1			1
v/c Ratio	0.79	0.77	0.70			0.47
Control Delay	49.0	49.2	5.4			6.0
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	49.0	49.2	5.4			6.0
Queue Length 50th (ft)	242	195	89			163
Queue Length 95th (ft)	284	279	96			75
Internal Link Dist (ft)	269		518			1323

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Turn Bay Length (ft)						
Base Capacity (vph)	1011	481	2187			2319
Starvation Cap Reductn	0	0	2			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.64	0.63	0.70			0.47

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 40 (33%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 4: St Helens St & US 30



	↙	↖	↑	↗	↘	↓
Lane Configurations	↰↰	↱	↑↑			↑↑
Volume (vph)	614	290	1456	0	0	1032
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3193	1436	3226			3420
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3193	1436	3226			3420
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	646	305	1533	0	0	1086
RTOR Reduction (vph)	0	28	0	0	0	0
Lane Group Flow (vph)	646	277	1533	0	0	1086
Confl. Bikes (#/hr)		4				
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Turn Type		custom				
Protected Phases			2			6
Permitted Phases	8	8				
Actuated Green, G (s)	30.6	30.6	81.4			81.4
Effective Green, g (s)	30.6	30.6	81.4			81.4
Actuated g/C Ratio	0.26	0.26	0.68			0.68
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	814	366	2188			2320
v/s Ratio Prot			c0.48			0.32
v/s Ratio Perm	c0.20	0.19				
v/c Ratio	0.79	0.76	0.70			0.47
Uniform Delay, d1	41.8	41.3	11.8			9.1
Progression Factor	1.00	1.00	0.31			0.54
Incremental Delay, d2	5.4	8.6	1.3			0.6
Delay (s)	47.1	49.9	5.0			5.6
Level of Service	D	D	A			A
Approach Delay (s)	48.0		5.0			5.6
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	16.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	261	72	0	0	0	45	1302	271	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	80		80	0		0	120		430	120		155
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			0.850
Flt Protected		0.982					0.950			0.950		
Satd. Flow (prot)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Flt Permitted		0.982					0.950			0.950		
Satd. Flow (perm)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			53						244			264
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1699			1325			1662			598	
Travel Time (s)		46.3			36.1			32.4			11.6	
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
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Adj. Flow (vph)	160	275	76	0	0	0	47	1371	285	160	1255	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	435	76	0	0	0	47	1371	285	160	1255	317
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Detector Phase	4	4	4				5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	30.0	30.0	30.0				8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	30.0	30.0	30.0	0.0	0.0	0.0	13.0	67.0	67.0	23.0	77.0	77.0
Total Split (%)	25.0%	25.0%	25.0%	0.0%	0.0%	0.0%	10.8%	55.8%	55.8%	19.2%	64.2%	64.2%
Maximum Green (s)	26.0	26.0	26.0				9.0	63.0	63.0	19.0	73.0	73.0
Yellow Time (s)	3.5	3.5	3.5				3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5				0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None				None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0					5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	21.0	21.0	21.0					11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	1	1	1					1	1	1	1	1
v/c Ratio		0.74	0.24				0.41	0.73	0.30	0.73	0.58	0.29
Control Delay		54.4	17.9				54.2	17.4	2.5	65.9	7.2	0.8
Queue Delay		0.0	0.0				0.0	0.0	0.0	0.0	0.2	0.0
Total Delay		54.4	17.9				54.2	17.4	2.5	65.9	7.3	0.8
Queue Length 50th (ft)		168	15				33	304	17	105	252	0
Queue Length 95th (ft)		218	57				m55	325	26	185	268	11

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1619			1245			1582			518	
Turn Bay Length (ft)			80				120		430	120		155
Base Capacity (vph)		703	364				125	1887	946	258	2170	1108
Starvation Cap Reductn		0	0				0	0	0	0	236	0
Spillback Cap Reductn		0	0				0	0	0	0	0	0
Storage Cap Reductn		0	0				0	0	0	0	0	0
Reduced v/c Ratio		0.62	0.21				0.38	0.73	0.30	0.62	0.65	0.29

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 18 (15%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow

Natural Cycle: 90

Control Type: Actuated-Coordinated

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Columbia Blvd & US 30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱				↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	152	261	72	0	0	0	45	1302	271	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	1.00				1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85				1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3244	1488				1660	3226	1444	1614	3257	1530
Flt Permitted		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3244	1488				1660	3226	1444	1614	3257	1530
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)	160	275	76	0	0	0	47	1371	285	160	1255	317
RTOR Reduction (vph)	0	0	43	0	0	0	0	0	101	0	0	90
Lane Group Flow (vph)	0	435	33	0	0	0	47	1371	184	160	1255	227
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Actuated Green, G (s)		21.6	21.6				7.2	70.2	70.2	16.2	79.2	79.2
Effective Green, g (s)		21.6	21.6				7.2	70.2	70.2	16.2	79.2	79.2
Actuated g/C Ratio		0.18	0.18				0.06	0.59	0.59	0.13	0.66	0.66
Clearance Time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		584	268				100	1887	845	218	2150	1010
v/s Ratio Prot							0.03	c0.42		c0.10	0.39	
v/s Ratio Perm		0.13	0.02						0.13			0.15
v/c Ratio		0.74	0.12				0.47	0.73	0.22	0.73	0.58	0.22
Uniform Delay, d1		46.6	41.2				54.6	18.0	11.8	49.8	11.3	8.1
Progression Factor		1.00	1.00				0.86	0.78	0.63	0.98	0.50	0.12
Incremental Delay, d2		5.1	0.2				2.7	1.9	0.5	10.4	1.0	0.4
Delay (s)		51.7	41.4				49.6	16.0	7.9	59.4	6.7	1.4
Level of Service		D	D				D	B	A	E	A	A
Approach Delay (s)		50.2			0.0			15.6			10.6	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

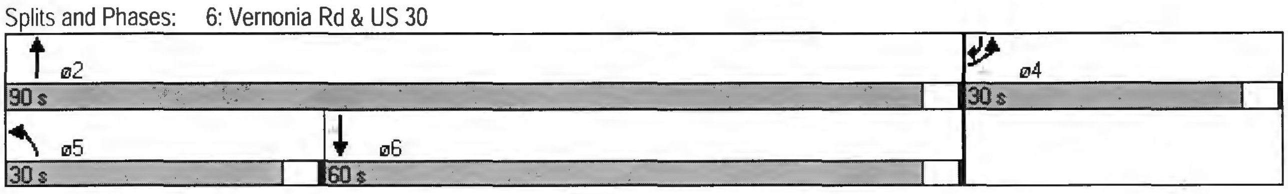
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	25	202	257	1700	1197	44
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	50	85			25
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor	1.00		1.00			0.97
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1662	1444	1693	3353	3257	1485
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1660	1444	1686	3353	3257	1436
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		213				13
Link Speed (mph)	25			35	35	
Link Distance (ft)	1136			1937	1662	
Travel Time (s)	31.0			37.7	32.4	
Confl. Peds. (#/hr)	1		6			6
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	3%	1%	2%	5%	3%
Adj. Flow (vph)	26	213	271	1789	1260	46
Shared Lane Traffic (%)						
Lane Group Flow (vph)	26	213	271	1789	1260	46
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4				6
Detector Phase	4	4	5	2	6	4
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	30.0	30.0	20.0	20.0	20.0	30.0
Total Split (s)	30.0	30.0	30.0	90.0	60.0	30.0
Total Split (%)	25.0%	25.0%	25.0%	75.0%	50.0%	25.0%
Maximum Green (s)	26.0	26.0	26.0	86.0	56.0	26.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	C-Max	C-Max	None
Walk Time (s)	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)	21.0	21.0		11.0	11.0	21.0
Pedestrian Calls (#/hr)	1	1		1	1	1
v/c Ratio	0.17	0.66	0.83	0.63	0.63	0.05
Control Delay	48.9	15.8	60.5	3.0	13.3	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.9	15.8	60.5	3.0	13.3	1.1

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Queue Length 50th (ft)	20	0	194	69	144	2
Queue Length 95th (ft)	41	64	m255	351	506	m0
Internal Link Dist (ft)	1056			1857	1582	
Turn Bay Length (ft)		50	85			25
Base Capacity (vph)	360	480	372	2825	2004	1208
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.44	0.73	0.63	0.63	0.04

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 23 (19%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Vernonia Rd & US 30



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Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	25	202	257	1700	1197	44
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1662	1444	1693	3353	3257	1442
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1662	1444	1693	3353	3257	1442
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	213	271	1789	1260	46
RTOR Reduction (vph)	0	194	0	0	0	4
Lane Group Flow (vph)	26	19	271	1789	1260	42
Confl. Peds. (#/hr)	1		6			6
Heavy Vehicles (%)	0%	3%	1%	2%	5%	3%
Turn Type		Perm	Prot			pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4				6
Actuated Green, G (s)	10.9	10.9	23.3	101.1	73.8	84.7
Effective Green, g (s)	10.9	10.9	23.3	101.1	73.8	84.7
Actuated g/C Ratio	0.09	0.09	0.19	0.84	0.61	0.71
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	151	131	329	2825	2003	1066
v/s Ratio Prot	c0.02		c0.16	c0.53	0.39	0.00
v/s Ratio Perm		0.01				0.03
v/c Ratio	0.17	0.15	0.82	0.63	0.63	0.04
Uniform Delay, d1	50.4	50.3	46.4	3.2	14.5	5.3
Progression Factor	1.00	1.00	1.02	0.51	0.71	0.26
Incremental Delay, d2	0.5	0.5	9.6	0.7	1.3	0.0
Delay (s)	50.9	50.8	57.1	2.3	11.6	1.4
Level of Service	D	D	E	A	B	A
Approach Delay (s)	50.8			9.5	11.2	
Approach LOS	D			A	B	

Intersection Summary			
HCM Average Control Delay	12.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	219	269	107	209	239	278	151	1569	133	205	998	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	130		0	215		0	130		310	130		140
Storage Lanes	1		0	2		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor		1.00										0.98
Frt		0.957			0.919				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1646	1669	0	3131	1559	0	1710	3320	1365	1525	3320	1530
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1646	1669	0	3131	1559	0	1710	3320	1365	1525	3320	1498
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			49				132			128
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		1390			1323			3867			969	
Travel Time (s)		31.6			30.1			75.3			18.9	
Confl. Bikes (#/hr)			1									1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Adj. Flow (vph)	223	274	109	213	244	284	154	1601	136	209	1018	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	223	383	0	213	528	0	154	1601	136	209	1018	182
Turn Type	Prot			Prot			Prot		pm+ov	Prot		pm+ov
Protected Phases	7			3	8		5	2	3	1	6	7
Permitted Phases		4							2			6
Detector Phase	7	4		3	8		5	2	3	1	6	7
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	10.0	4.0	4.0	10.0	4.0
Minimum Split (s)	8.5	39.0		8.5	39.0		8.5	24.5	8.5	8.5	24.5	8.5
Total Split (s)	16.0	39.0	0.0	16.0	39.0	0.0	16.0	49.0	16.0	16.0	49.0	16.0
Total Split (%)	13.3%	32.5%	0.0%	13.3%	32.5%	0.0%	13.3%	40.8%	13.3%	13.3%	40.8%	13.3%
Maximum Green (s)	12.0	35.0		12.0	35.0		12.0	44.5	12.0	12.0	44.5	12.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.5	4.0	4.0	4.5	4.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.0	4.0	4.5	4.0
Lead/Lag	Lag	Lead		Lag	Lead		Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	2.3	2.3		2.3	2.3		2.3	4.1	2.3	2.3	4.1	2.3
Minimum Gap (s)	0.5	1.0		0.5	1.0		0.5	2.1	0.5	0.5	2.1	0.5
Time Before Reduce (s)	8.0	8.0		8.0	8.0		8.0	10.0	8.0	8.0	10.0	8.0
Time To Reduce (s)	3.0	3.0		3.0	3.0		3.0	20.0	3.0	3.0	20.0	3.0
Recall Mode	None	None		None	None		None	C-Max	None	None	C-Max	None
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		21.0			21.0			11.0			14.0	
Pedestrian Calls (#/hr)		1			1			1			1	
v/c Ratio	1.35	0.88		0.49	1.08		0.90	1.30	0.17	1.37	0.83	0.23

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	233.8	63.3		53.4	101.0		78.0	160.7	0.3	227.7	25.7	4.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	233.8	63.3		53.4	101.0		78.0	160.7	0.3	227.7	25.7	4.1
Queue Length 50th (ft)	~227	271		80	~429		128	~843	0	~218	192	12
Queue Length 95th (ft)	#386	#386		125	#648		m#146	m#964	m1	#373	291	28
Internal Link Dist (ft)		1310			1243			3787			889	
Turn Bay Length (ft)	130			215			130		310	130		140
Base Capacity (vph)	165	499		439	489		171	1231	808	153	1231	782
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	1.35	0.77		0.49	1.08		0.90	1.30	0.17	1.37	0.83	0.23

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 71 (59%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 135
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Gable Rd & US30

ø2	ø1	ø4	ø3
49 s	16 s	39 s	16 s
ø6	ø5	ø8	ø7
49 s	16 s	39 s	16 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	219	269	107	209	239	278	151	1569	133	205	998	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.5	4.0	4.0	4.5	4.0
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	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
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1646	1669		3131	1560		1710	3320	1365	1525	3320	1505
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1646	1669		3131	1560		1710	3320	1365	1525	3320	1505
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)	223	274	109	213	244	284	154	1601	136	209	1018	182
RTOR Reduction (vph)	0	13	0	0	35	0	0	0	65	0	0	68
Lane Group Flow (vph)	223	370	0	213	493	0	154	1601	71	209	1018	114
Confl. Bikes (#/hr)			1									1
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Turn Type	Prot			Prot			Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases		4							2			6
Actuated Green, G (s)	12.0	30.2		16.8	35.0		12.0	44.5	61.3	12.0	44.5	56.5
Effective Green, g (s)	12.0	30.2		16.8	35.0		12.0	44.5	61.3	12.0	44.5	56.5
Actuated g/C Ratio	0.10	0.25		0.14	0.29		0.10	0.37	0.51	0.10	0.37	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.5	4.0	4.0	4.5	4.0
Vehicle Extension (s)	2.3	2.3		2.3	2.3		2.3	4.1	2.3	2.3	4.1	2.3
Lane Grp Cap (vph)	165	420		438	455		171	1231	743	153	1231	759
v/s Ratio Prot	c0.14			0.07	c0.32		0.09	c0.48	0.01	c0.14	0.31	0.02
v/s Ratio Perm		0.22							0.04			0.06
v/c Ratio	1.35	0.88		0.49	1.08		0.90	1.30	0.10	1.37	0.83	0.15
Uniform Delay, d1	54.0	43.2		47.6	42.5		53.4	37.8	15.1	54.0	34.3	18.1
Progression Factor	1.00	1.00		1.00	1.00		0.96	0.55	0.05	0.64	0.58	0.65
Incremental Delay, d2	192.6	18.8		0.5	66.8		22.5	137.9	0.0	196.7	5.7	0.0
Delay (s)	246.6	62.0		48.1	109.3		73.9	158.5	0.7	231.2	25.4	11.7
Level of Service	F	E		D	F		E	F	A	F	C	B
Approach Delay (s)		129.9			91.7			140.3			54.2	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM Average Control Delay	105.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	117.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

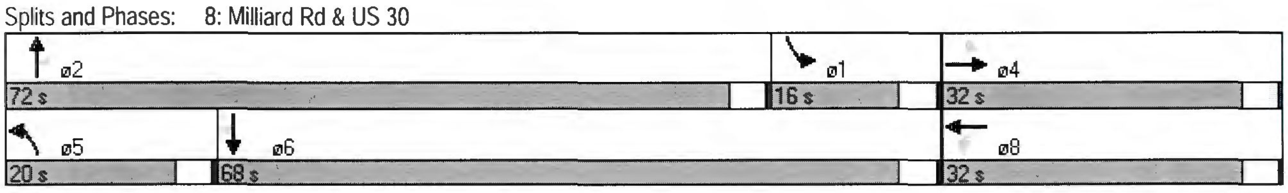
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	119	161	70	137	160	79	119	1654	85	138	1021	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		250	0		110	110		150	150		200
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00		0.98	1.00		0.97
Frt		0.955			0.951				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	1663	0	1662	1657	0	1693	3288	1153	1662	3288	1530
Flt Permitted	0.357			0.372			0.950			0.950		
Satd. Flow (perm)	623	1663	0	650	1657	0	1689	3288	1126	1662	3288	1483
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			19				48			159
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		737			300			1086			3867	
Travel Time (s)		12.6			5.1			16.5			58.6	
Confl. Peds. (#/hr)	3		3	1		1	3		1	1		3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	4%	29%	0%	4%	0%
Adj. Flow (vph)	124	168	73	143	167	82	124	1723	89	144	1064	159
Shared Lane Traffic (%)												
Lane Group Flow (vph)	124	241	0	143	249	0	124	1723	89	144	1064	159
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	30.0	30.0		30.0	30.0		8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	32.0	32.0	0.0	32.0	32.0	0.0	20.0	72.0	72.0	16.0	68.0	68.0
Total Split (%)	26.7%	26.7%	0.0%	26.7%	26.7%	0.0%	16.7%	60.0%	60.0%	13.3%	56.7%	56.7%
Maximum Green (s)	28.0	28.0		28.0	28.0		16.0	68.0	68.0	12.0	64.0	64.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)	21.0	21.0		21.0	21.0			11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	1	1		1	1			1	1		1	1
v/c Ratio	0.89	0.63		0.98	0.65		0.66	0.91	0.13	0.87	0.57	0.18
Control Delay	98.0	46.6		117.1	47.3		67.7	31.6	6.7	64.1	3.2	0.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.0	46.6		117.1	47.3		67.7	31.6	6.7	64.1	3.2	0.3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	92	156		110	161		93	608	14	115	40	1
Queue Length 95th (ft)	#208	245		#242	252		156	#767	39	m#164	46	m0
Internal Link Dist (ft)		657			220			1006			3787	
Turn Bay Length (ft)							110		150	150		200
Base Capacity (vph)	145	401		152	401		226	1895	669	166	1860	908
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.60		0.94	0.62		0.55	0.91	0.13	0.87	0.57	0.18

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 116 (97%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Milliard Rd & US 30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	161	70	137	160	79	119	1654	85	138	1021	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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		1.00	1.00		1.00	1.00	0.98	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1659	1662		1661	1656		1693	3288	1126	1662	3288	1483
Flt Permitted	0.36	1.00		0.37	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	624	1662		651	1656		1693	3288	1126	1662	3288	1483
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)	124	168	73	143	167	82	124	1723	89	144	1064	159
RTOR Reduction (vph)	0	13	0	0	15	0	0	0	20	0	0	69
Lane Group Flow (vph)	124	228	0	143	234	0	124	1723	69	144	1064	90
Confl. Peds. (#/hr)	3		3	1		1	3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	4%	29%	0%	4%	0%
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	26.8	26.8		26.8	26.8		13.3	69.2	69.2	12.0	67.9	67.9
Effective Green, g (s)	26.8	26.8		26.8	26.8		13.3	69.2	69.2	12.0	67.9	67.9
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.11	0.58	0.58	0.10	0.57	0.57
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	139	371		145	370		188	1896	649	166	1860	839
v/s Ratio Prot		0.14			0.14		0.07	c0.52		c0.09	0.32	
v/s Ratio Perm	0.20			c0.22					0.06			0.06
v/c Ratio	0.89	0.61		0.99	0.63		0.66	0.91	0.11	0.87	0.57	0.11
Uniform Delay, d1	45.2	41.9		46.4	42.2		51.2	22.6	11.5	53.2	16.7	12.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.58	0.13	0.00
Incremental Delay, d2	45.5	3.0		70.0	3.5		8.1	7.9	0.3	24.8	0.8	0.2
Delay (s)	90.7	44.9		116.4	45.7		59.3	30.5	11.8	55.8	3.0	0.2
Level of Service	F	D		F	D		E	C	B	E	A	A
Approach Delay (s)		60.5			71.5			31.5			8.3	
Approach LOS		E			E			C			A	

Intersection Summary			
HCM Average Control Delay	30.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	5	174	160	217	219	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0			100	0	0
Storage Lanes	0			1	1	0
Taper Length (ft)	25			25	25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850	0.997	
Flt Protected		0.998			0.953	
Satd. Flow (prot)	0	1746	1716	1488	1647	0
Flt Permitted		0.998			0.953	
Satd. Flow (perm)	0	1746	1716	1488	1647	0
Link Speed (mph)		25	25		25	
Link Distance (ft)		2305	403		1964	
Travel Time (s)		62.9	11.0		53.6	
Confl. Peds. (#/hr)	5			5	3	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	2%	0%	1%	0%
Adj. Flow (vph)	6	193	178	241	243	6
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	199	178	241	249	0
Sign Control		Stop	Stop		Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	174	160	217	219	5
Sign Control		Stop	Stop		Free	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	193	178	241	243	6
Pedestrians		4	3		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)				4		
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	587	496	499	8	3	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	587	496	499	8	3	
tC, single (s)	7.1	6.5	6.5	6.2	4.1	
tC, 2 stage (s)						
tF (s)	3.5	4.0	4.0	3.3	2.2	
p0 queue free %	97	52	56	78	85	
cM capacity (veh/h)	189	404	400	1073	1622	

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	199	419	249
Volume Left	6	0	243
Volume Right	0	241	6
cSH	391	942	1622
Volume to Capacity	0.51	0.44	0.15
Queue Length 95th (ft)	69	58	13
Control Delay (s)	23.3	14.3	7.5
Lane LOS	C	B	A
Approach Delay (s)	23.3	14.3	7.5
Approach LOS	C	B	

Intersection Summary			
Average Delay	14.4		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.998			0.978			0.890	
Flt Protected		0.977			0.997			0.970			0.999	
Satd. Flow (prot)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Flt Permitted		0.977			0.997			0.970			0.999	
Satd. Flow (perm)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		403			853			1453			709	
Travel Time (s)		11.0			23.3			39.6			19.3	
Confl. Peds. (#/hr)	5					5			5	5		
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
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	142	161	92	10	170	3	119	42	31	2	27	127
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	303	92	0	183	0	0	192	0	0	156	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
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)	142	161	92	10	170	3	119	42	31	2	27	127

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	303	92	183	192	156
Volume Left (vph)	142	0	10	119	2
Volume Right (vph)	0	92	3	31	127
Hadj (s)	0.23	-0.70	0.00	0.03	-0.49
Departure Headway (s)	6.0	5.1	5.6	5.7	5.3
Degree Utilization, x	0.51	0.13	0.29	0.31	0.23
Capacity (veh/h)	573	677	591	567	601
Control Delay (s)	13.8	7.6	10.9	11.3	9.9
Approach Delay (s)	12.3		10.9	11.3	9.9
Approach LOS	B		B	B	A

Intersection Summary			
Delay	11.4		
HCM Level of Service	B		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥			✥			✥	
Volume (vph)	113	273	8	2	246	82	0	2	1	47	4	57
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			-1%			1%	
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.996			0.966			0.955			0.929	
Flt Protected	0.950										0.979	
Satd. Flow (prot)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Flt Permitted	0.950										0.979	
Satd. Flow (perm)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		559			839			582			1453	
Travel Time (s)		15.2			22.9			15.9			39.6	
Confl. Peds. (#/hr)			7	7					7	7		
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
Heavy Vehicles (%)	1%	1%	0%	0%	1%	0%	0%	0%	100%	3%	25%	2%
Adj. Flow (vph)	126	303	9	2	273	91	0	2	1	52	4	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	126	312	0	0	366	0	0	3	0	0	119	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥			✥			✥	
Volume (veh/h)	113	273	8	2	246	82	0	2	1	47	4	57
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-1%			1%	
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)	126	303	9	2	273	91	0	2	1	52	4	63
Pedestrians					7			7				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					4.0			4.0				
Percent Blockage					1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	364			319			955	935	322	887	894	319
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	364			319			955	935	322	887	894	319
tC, single (s)	4.1			4.1			7.1	6.5	7.2	7.1	6.8	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	4.2	3.5	4.2	3.3
p0 queue free %	90			100			100	99	100	78	98	91
cM capacity (veh/h)	1200			1245			196	238	534	237	229	722

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	126	312	367	3	120
Volume Left	126	0	2	0	52
Volume Right	0	9	91	1	63
cSH	1200	1700	1245	292	367
Volume to Capacity	0.10	0.18	0.00	0.01	0.33
Queue Length 95th (ft)	9	0	0	1	35
Control Delay (s)	8.4	0.0	0.1	17.5	19.5
Lane LOS	A		A	C	C
Approach Delay (s)	2.4		0.1	17.5	19.5
Approach LOS				C	C

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	366	132	30	298	11	97	112	23	3	80	41
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			0%			2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99			1.00			0.99			0.99	
Frt		0.968			0.996			0.986			0.955	
Flt Protected		0.994			0.996			0.979			0.999	
Satd. Flow (prot)	0	1649	0	0	1693	0	0	1661	0	0	1636	0
Flt Permitted		0.925			0.929			0.823			0.994	
Satd. Flow (perm)	0	1534	0	0	1578	0	0	1391	0	0	1627	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		43			5			10			43	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		643			960			563			720	
Travel Time (s)		17.5			26.2			15.4			19.6	
Confl. Peds. (#/hr)	3		14	14		3	6		3	3		6
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
Heavy Vehicles (%)	3%	1%	0%	8%	2%	0%	0%	3%	0%	0%	0%	0%
Adj. Flow (vph)	69	407	147	33	331	12	108	124	26	3	89	46
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	623	0	0	376	0	0	258	0	0	138	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	38.0	38.0	0.0	38.0	38.0	0.0	22.0	22.0	0.0	22.0	22.0	0.0
Total Split (%)	63.3%	63.3%	0.0%	63.3%	63.3%	0.0%	36.7%	36.7%	0.0%	36.7%	36.7%	0.0%
Maximum Green (s)	34.0	34.0		34.0	34.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
v/c Ratio		0.82			0.50			0.51			0.22	
Control Delay		20.3			10.8			19.2			11.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		20.3			10.8			19.2			11.8	
Queue Length 50th (ft)		133			67			58			19	
Queue Length 95th (ft)		246			120			145			62	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		563			880			483			640	
Turn Bay Length (ft)												
Base Capacity (vph)		1059			1076			508			614	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.59			0.35			0.51			0.22	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 51.1
Natural Cycle: 60
Control Type: Semi Act-Uncoord

Splits and Phases: 12: Columbia Blvd & 12th St

ø2 22 s	ø4 38 s
ø6 22 s	ø8 38 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	366	132	30	298	11	97	112	23	3	80	41
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			0%			2%	
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.99			1.00			1.00			0.99	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.97			1.00			0.99			0.95	
Flt Protected		0.99			1.00			0.98			1.00	
Satd. Flow (prot)		1652			1691			1657			1636	
Flt Permitted		0.92			0.93			0.82			0.99	
Satd. Flow (perm)		1536			1578			1392			1629	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	69	407	147	33	331	12	108	124	26	3	89	46
RTOR Reduction (vph)	0	22	0	0	3	0	0	6	0	0	27	0
Lane Group Flow (vph)	0	601	0	0	373	0	0	252	0	0	111	0
Confl. Peds. (#/hr)	3		14	14		3	6		3	3		6
Heavy Vehicles (%)	3%	1%	0%	8%	2%	0%	0%	3%	0%	0%	0%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		24.5			24.5			18.4			18.4	
Effective Green, g (s)		24.5			24.5			18.4			18.4	
Actuated g/C Ratio		0.48			0.48			0.36			0.36	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		739			760			503			589	
v/s Ratio Prot												
v/s Ratio Perm		c0.39			0.24			c0.18			0.07	
v/c Ratio		0.81			0.49			0.50			0.19	
Uniform Delay, d1		11.2			9.0			12.7			11.1	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		6.8			0.5			3.5			0.7	
Delay (s)		18.1			9.5			16.2			11.8	
Level of Service		B			A			B			B	
Approach Delay (s)		18.1			9.5			16.2			11.8	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	50.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.971			0.958			0.978			0.993	
Flt Protected		0.995			0.997			0.988			0.980	
Satd. Flow (prot)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Flt Permitted		0.995			0.997			0.988			0.980	
Satd. Flow (perm)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		3269			1699			1136			924	
Travel Time (s)		89.2			46.3			31.0			25.2	
Confl. Peds. (#/hr)	1		15	15		1	9		3	3		9
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
Heavy Vehicles (%)	7%	1%	0%	0%	1%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	36	234	74	24	234	118	96	221	63	115	160	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	344	0	0	376	0	0	380	0	0	289	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
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)	36	234	74	24	234	118	96	221	63	115	160	14

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	344	376	379	290
Volume Left (vph)	36	24	96	115
Volume Right (vph)	74	118	63	14
Hadj (s)	-0.08	-0.16	-0.01	0.07
Departure Headway (s)	8.0	7.8	8.0	8.4
Degree Utilization, x	0.77	0.82	0.84	0.68
Capacity (veh/h)	422	438	434	385
Control Delay (s)	32.7	37.3	40.3	27.1
Approach Delay (s)	32.7	37.3	40.3	27.1
Approach LOS	D	E	E	D

Intersection Summary			
Delay	34.9		
HCM Level of Service	D		
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑	↱		↰↑↱			↰↑↱	
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		0	0		25	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978				0.850		0.987			0.985	
Flt Protected		0.994			0.995			0.991			0.981	
Satd. Flow (prot)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Flt Permitted		0.994			0.995			0.991			0.981	
Satd. Flow (perm)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		679			2026			1723			3269	
Travel Time (s)		18.5			55.3			47.0			89.2	
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
Heavy Vehicles (%)	0%	2%	0%	0%	0%	1%	0%	0%	0%	0%	2%	0%
Adj. Flow (vph)	38	244	55	26	243	104	51	212	29	95	127	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	337	0	0	269	104	0	292	0	0	250	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
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)	38	244	55	26	243	104	51	212	29	95	127	28

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	337	268	104	291	249
Volume Left (vph)	38	26	0	51	95
Volume Right (vph)	55	0	104	29	28
Hadj (s)	-0.05	0.05	-0.68	-0.02	0.03
Departure Headway (s)	6.7	7.2	6.5	6.8	7.0
Degree Utilization, x	0.63	0.54	0.19	0.55	0.48
Capacity (veh/h)	492	458	512	479	457
Control Delay (s)	20.5	17.1	9.7	17.9	16.4
Approach Delay (s)	20.5	15.0		17.9	16.4
Approach LOS	C	C		C	C

Intersection Summary			
Delay	17.4		
HCM Level of Service	C		
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	122	253	382	97	78	99
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Grade (%)		0%	0%		2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.973		0.925	
Flt Protected		0.984			0.978	
Satd. Flow (prot)	0	1683	1696	0	1567	0
Flt Permitted		0.984			0.978	
Satd. Flow (perm)	0	1683	1696	0	1567	0
Link Speed (mph)		30	30		35	
Link Distance (ft)		819	1665		1723	
Travel Time (s)		18.6	37.8		33.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	5%	1%	0%	2%	0%	0%
Adj. Flow (vph)	136	281	424	108	87	110
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	417	532	0	197	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	122	253	382	97	78	99
Sign Control		Free	Free		Stop	
Grade		0%	0%		2%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	136	281	424	108	87	110
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	532				1031	478
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	532				1031	478
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	87				62	81
cM capacity (veh/h)	1020				226	591

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	417	532	197
Volume Left	136	0	87
Volume Right	0	108	110
cSH	1020	1700	345
Volume to Capacity	0.13	0.31	0.57
Queue Length 95th (ft)	11	0	84
Control Delay (s)	3.9	0.0	28.4
Lane LOS	A		D
Approach Delay (s)	3.9	0.0	28.4
Approach LOS			D

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

Appendix C:
Rail Corridor Option Projects
and Analysis Results

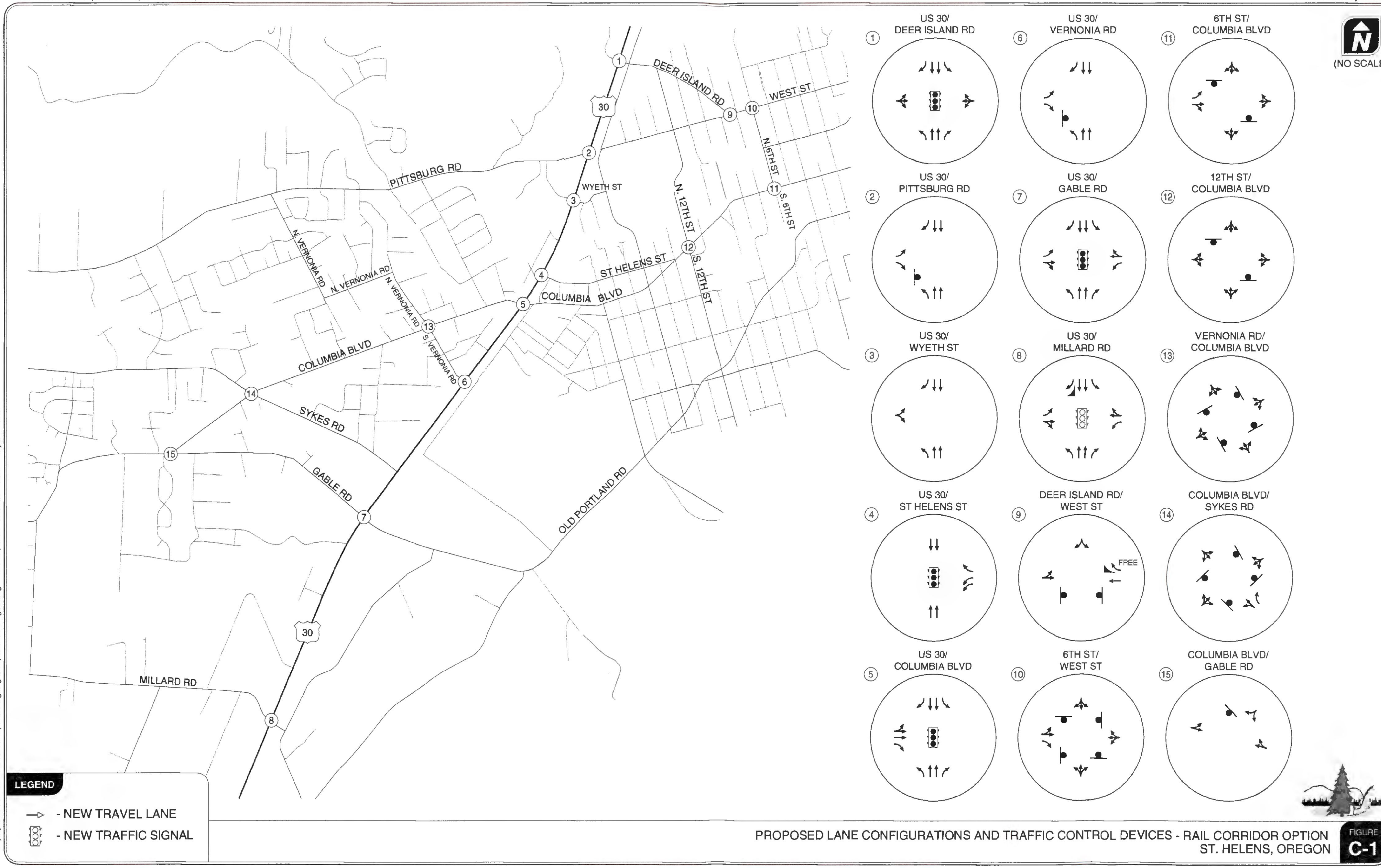
RAIL CORRIDOR IMPROVEMENT PROJECTS

Table C-1 summarizes the intersection and roadway improvement projects included in the Rail Corridor Option as described in LCRRC. The order-of-magnitude costs were obtained from the LCRRC report.

Table C-1 Intersection Improvement Projects

Project No.	Intersection	Project Description	Order-of-Magnitude Project Cost
R01	US 30/Wyeth Road	Study potential closure	TBD
R02[1]	US 30/Columbia Blvd.	Close pedestrian access or adjust signal timing to provide sufficient crossing time for pedestrians	$0
R03	US 30/Columbia Blvd.	Add 215 feet southbound left turn queue storage	$56,800
R04	US 30/Columbia Blvd.	Add 65 feet to existing northbound right turn storage	$17,200
R05[1]	US 30/Millard Road	Install traffic signal inter-tied with existing railroad crossing protection (8 phase signal)	$250,000
R05	US 30/Millard Road	Add pedestrian grade crossing	$45,000
R06	US 30 Deer Island Road	Remove abandoned rail line and restripe the intersection of Deer Island Road/Oregon Road	$25,000
R07	US 30 Deer Island Road	Relocate gate, design for future transit center	$25,000
R08	US 30 Deer Island Road	Install pedestrian Grade Crossing	$45,000
R10	US 30 Deer Island Road	Add 150 feet southbound left turn queue storage	$62,265
R11	US 30/St. Helens Street	Install pedestrian grade crossing	$45,000
R12	US 30/St. Helens Street	Replace obsolete gate	$90,000
R13	US 30/Gable Road	Add 210 southbound left-turn queue storage	$55,400
R14	US 30/Gable Road	Install ADA compliant pedestrian/bicycle overpass over railroad and US 30	$6,100,000

[1]Project require approval by State Traffic Engineer



PROPOSED LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES - RAIL CORRIDOR OPTION
ST. HELENS, OREGON

FIGURE C-1

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LEGEND

STD = MOBILITY STANDARD
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

TOTAL TRAFFIC CONDITIONS - RAIL CORRIDOR OPTION
WEEKDAY PM PEAK HOUR
ST. HELENS, OREGON

FIGURE C-2

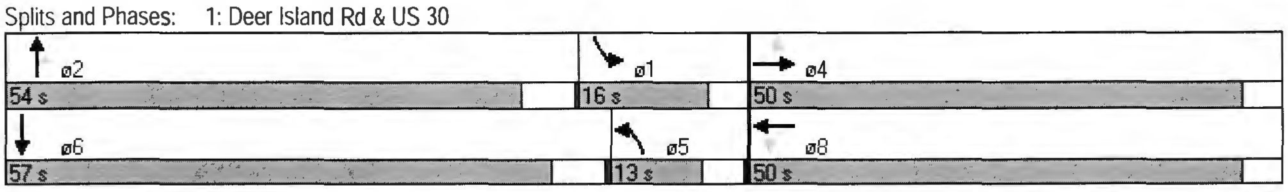
Lane Configurations												
Volume (vph)	5	7	7	298	2	168	5	1126	321	125	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	110		300	150		110
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.950			0.952				0.850			0.850
Flt Protected		0.987			0.969		0.950			0.950		
Satd. Flow (prot)	0	1074	0	0	1614	0	1710	3353	1473	1662	3288	916
Flt Permitted		0.916			0.796		0.950			0.950		
Satd. Flow (perm)	0	997	0	0	1326	0	1710	3353	1473	1662	3288	916
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			27				338			4
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		225			179			1625			999	
Travel Time (s)		5.1			4.1			22.2			13.6	
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
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Adj. Flow (vph)	5	7	7	314	2	177	5	1185	338	132	723	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	19	0	0	493	0	5	1185	338	132	723	6
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	34.0	34.0		34.0	34.0		8.5	30.5	30.5	9.5	32.5	32.5
Total Split (s)	50.0	50.0	0.0	50.0	50.0	0.0	13.0	54.0	54.0	16.0	57.0	57.0
Total Split (%)	41.7%	41.7%	0.0%	41.7%	41.7%	0.0%	10.8%	45.0%	45.0%	13.3%	47.5%	47.5%
Maximum Green (s)	46.0	46.0		46.0	46.0		8.5	48.5	48.5	12.0	51.5	51.5
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.5	0.5	0.5	0.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.5	5.5	5.5	4.0	5.5	5.5
Lead/Lag							Lag	Lead	Lead	Lag	Lead	Lead
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	5.1	5.1	2.5	5.1	5.1
Minimum Gap (s)	2.0	2.0		2.0	2.0		1.0	3.1	3.1	1.0	3.1	3.1
Time Before Reduce (s)	5.0	5.0		5.0	5.0		8.0	10.0	10.0	8.0	10.0	10.0
Time To Reduce (s)	5.0	5.0		5.0	5.0		3.0	20.0	20.0	3.0	20.0	20.0
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)	21.0	21.0		21.0	21.0			11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	1	1		1	1			1	1		1	1
v/c Ratio		0.05			0.96		0.06	0.84	0.42	0.82	0.42	0.01
Control Delay		17.9			67.4		43.2	33.0	2.5	90.3	19.2	12.5
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		17.9			67.4		43.2	33.0	2.5	90.3	19.2	12.5
Queue Length 50th (ft)		6			349		4	426	3	102	167	1
Queue Length 95th (ft)		22			#572		m7	492	31	#208	270	9
Internal Link Dist (ft)		145			99			1545			919	
Turn Bay Length (ft)							110		300	150		110
Base Capacity (vph)		387			525		121	1405	814	166	1732	484
Starvation Cap Reductn		0			0		0	0	0	0	0	0
Spillback Cap Reductn		0			0		0	0	0	0	0	0
Storage Cap Reductn		0			0		0	0	0	0	0	0
Reduced v/c Ratio		0.05			0.94		0.04	0.84	0.42	0.80	0.42	0.01

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 67 (56%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Deer Island Rd & US 30



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	5	7	7	298	2	168	5	1126	321	125	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Lane Util. Factor		1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.95			0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.99			0.97		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1074			1614		1710	3353	1473	1662	3288	916
Flt Permitted		0.92			0.80		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		997			1325		1710	3353	1473	1662	3288	916
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)	5	7	7	314	2	177	5	1185	338	132	723	6
RTOR Reduction (vph)	0	4	0	0	17	0	0	0	206	0	0	2
Lane Group Flow (vph)	0	15	0	0	476	0	5	1185	132	132	723	4
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)		44.7			44.7		1.7	46.7	46.7	15.1	59.6	59.6
Effective Green, g (s)		44.7			44.7		1.7	46.7	46.7	15.1	59.6	59.6
Actuated g/C Ratio		0.37			0.37		0.01	0.39	0.39	0.13	0.50	0.50
Clearance Time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Vehicle Extension (s)		2.5			2.5		2.5	5.1	5.1	2.5	5.1	5.1
Lane Grp Cap (vph)		371			494		24	1305	573	209	1633	455
v/s Ratio Prot							0.00	c0.35		c0.08	0.22	
v/s Ratio Perm		0.01			c0.36				0.09			0.00
v/c Ratio		0.04			0.96		0.21	0.91	0.23	0.63	0.44	0.01
Uniform Delay, d1		24.0			36.9		58.5	34.6	24.6	49.8	19.5	15.3
Progression Factor		1.00			1.00		0.79	0.84	0.46	1.00	1.00	1.00
Incremental Delay, d2		0.0			31.1		2.7	9.5	0.8	5.3	0.9	0.0
Delay (s)		24.0			68.0		48.7	38.8	12.1	55.2	20.4	15.3
Level of Service		C			E		D	D	B	E	C	B
Approach Delay (s)		24.0			68.0			32.9			25.7	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM Average Control Delay	36.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	87.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	167	172	270	1199	745	179
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	25	100			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1599	1377	1629	3320	3257	1443
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1599	1377	1629	3320	3257	1443
Link Speed (mph)	35			40	40	
Link Distance (ft)	567			871	1625	
Travel Time (s)	11.0			14.8	27.7	
Confl. Peds. (#/hr)	1					
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	4%	8%	5%	3%	5%	6%
Adj. Flow (vph)	174	179	281	1249	776	186
Shared Lane Traffic (%)						
Lane Group Flow (vph)	174	179	281	1249	776	186
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	167	172	270	1199	745	179
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	174	179	281	1249	776	186
Pedestrians					1	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)		1				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1964	388	776			
vC1, stage 1 conf vol	776					
vC2, stage 2 conf vol	1188					
vCu, unblocked vol	1964	388	776			
tC, single (s)	6.9	7.1	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.4	2.2			
p0 queue free %	0	70	66			
cM capacity (veh/h)	149	594	817			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	353	281	624	624	388	388	186
Volume Left	174	281	0	0	0	0	0
Volume Right	179	0	0	0	0	0	186
cSH	246	817	1700	1700	1700	1700	1700
Volume to Capacity	1.44	0.34	0.37	0.37	0.23	0.23	0.11
Queue Length 95th (ft)	500	39	0	0	0	0	0
Control Delay (s)	255.8	11.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	B					
Approach Delay (s)	255.8	2.2			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay	32.9		
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	13	80	40	1532	907	11
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	0	85			25
Storage Lanes	0	0	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt	0.871					0.850
Flt Protected	0.993		0.950			
Satd. Flow (prot)	0	0	1710	3226	3196	1530
Flt Permitted	0.993		0.950			
Satd. Flow (perm)	0	0	1710	3226	3196	1530
Link Speed (mph)	25			40	40	
Link Distance (ft)	275			1403	871	
Travel Time (s)	7.5			23.9	14.8	
Confl. Peds. (#/hr)		3				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	8%	7%	0%	6%	7%	0%
Adj. Flow (vph)	14	84	42	1613	955	12
Shared Lane Traffic (%)						
Lane Group Flow (vph)	98	0	42	1613	955	12
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	13	80	40	1532	907	11
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)	14	84	42	1613	955	12
Pedestrians				3		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				4.0		
Percent Blockage				0		
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1845	480	966			
vC1, stage 1 conf vol	955					
vC2, stage 2 conf vol	891					
vCu, unblocked vol	1845	480	966			
tC, single (s)	7.0	7.0	4.1			
tC, 2 stage (s)	6.0					
tF (s)	3.6	3.4	2.2			
p0 queue free %	94	84	94			
cM capacity (veh/h)	230	517	721			

Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	42	806	806	477	477	12
Volume Left	42	0	0	0	0	0
Volume Right	0	0	0	0	0	12
cSH	721	1700	1700	1700	1700	1700
Volume to Capacity	0.06	0.47	0.47	0.28	0.28	0.01
Queue Length 95th (ft)	5	0	0	0	0	0
Control Delay (s)	10.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	B					
Approach Delay (s)	0.3			0.0		
Approach LOS						

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

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	662	290	1329	0	0	948
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor		0.99				
Frt		0.850				
Flt Protected	0.950					
Satd. Flow (prot)	3193	1458	3226	0	0	3420
Flt Permitted	0.950					
Satd. Flow (perm)	3193	1437	3226	0	0	3420
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		50				
Link Speed (mph)	25		35			35
Link Distance (ft)	349		598			1403
Travel Time (s)	9.5		11.6			27.3
Confl. Bikes (#/hr)		4				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Adj. Flow (vph)	697	305	1399	0	0	998
Shared Lane Traffic (%)						
Lane Group Flow (vph)	697	305	1399	0	0	998
Turn Type		Perm				
Protected Phases	8		2			6
Permitted Phases		8				
Detector Phase	8	8	2			6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0			4.0
Minimum Split (s)	30.0	30.0	20.0			20.0
Total Split (s)	43.0	43.0	77.0	0.0	0.0	77.0
Total Split (%)	35.8%	35.8%	64.2%	0.0%	0.0%	64.2%
Maximum Green (s)	39.0	39.0	73.0			73.0
Yellow Time (s)	3.5	3.5	3.5			3.5
All-Red Time (s)	0.5	0.5	0.5			0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
Walk Time (s)	5.0	5.0	5.0			5.0
Flash Dont Walk (s)	21.0	21.0	11.0			11.0
Pedestrian Calls (#/hr)	1	1	1			1
v/c Ratio	0.81	0.72	0.65			0.44
Control Delay	48.4	42.3	4.7			7.8
Queue Delay	0.0	0.0	0.2			0.0
Total Delay	48.4	42.3	5.0			7.8
Queue Length 50th (ft)	258	179	58			132
Queue Length 95th (ft)	307	266	66			m167
Internal Link Dist (ft)	269		518			1323

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Turn Bay Length (ft)						
Base Capacity (vph)	1038	501	2139			2268
Starvation Cap Reductn	0	0	195			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.67	0.61	0.72			0.44

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 32 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: St Helens St & US 30

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	662	290	1329	0	0	948
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3193	1436	3226			3420
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3193	1436	3226			3420
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	697	305	1399	0	0	998
RTOR Reduction (vph)	0	37	0	0	0	0
Lane Group Flow (vph)	697	269	1399	0	0	998
Confl. Bikes (#/hr)		4				
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Turn Type		Perm				
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	32.4	32.4	79.6			79.6
Effective Green, g (s)	32.4	32.4	79.6			79.6
Actuated g/C Ratio	0.27	0.27	0.66			0.66
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	862	388	2140			2269
v/s Ratio Prot	c0.22		c0.43			0.29
v/s Ratio Perm		0.19				
v/c Ratio	0.81	0.69	0.65			0.44
Uniform Delay, d1	40.9	39.3	12.0			9.6
Progression Factor	1.00	1.00	0.28			0.70
Incremental Delay, d2	5.6	5.3	1.1			0.6
Delay (s)	46.5	44.6	4.4			7.3
Level of Service	D	D	A			A
Approach Delay (s)	45.9		4.4			7.3
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

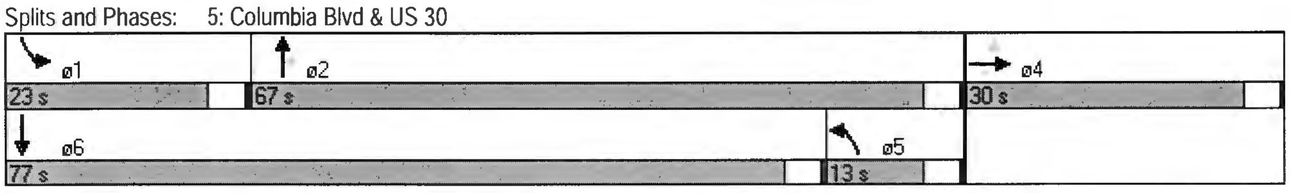
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱				↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	152	261	72	0	0	0	45	1302	398	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	80		80	0		0	120		430	215		155
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			0.850
Flt Protected		0.982					0.950			0.950		
Satd. Flow (prot)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Flt Permitted		0.982					0.950			0.950		
Satd. Flow (perm)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			53						244			264
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1699			1325			1662			598	
Travel Time (s)		46.3			36.1			32.4			11.6	
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
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Adj. Flow (vph)	160	275	76	0	0	0	47	1371	419	160	1255	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	435	76	0	0	0	47	1371	419	160	1255	317
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Detector Phase	4	4	4				5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	30.0	30.0	30.0				8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	30.0	30.0	30.0	0.0	0.0	0.0	13.0	67.0	67.0	23.0	77.0	77.0
Total Split (%)	25.0%	25.0%	25.0%	0.0%	0.0%	0.0%	10.8%	55.8%	55.8%	19.2%	64.2%	64.2%
Maximum Green (s)	26.0	26.0	26.0				9.0	63.0	63.0	19.0	73.0	73.0
Yellow Time (s)	3.5	3.5	3.5				3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5				0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None				None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0					5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	21.0	21.0	21.0					11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	1	1	1					1	1	1	1	1
v/c Ratio		0.74	0.24				0.41	0.73	0.44	0.73	0.58	0.29
Control Delay		54.4	17.9				52.9	16.4	5.0	72.0	6.3	0.6
Queue Delay		0.0	0.0				0.0	0.0	0.0	0.0	0.2	0.0
Total Delay		54.4	17.9				52.9	16.4	5.0	72.0	6.5	0.6
Queue Length 50th (ft)		168	15				33	257	28	104	91	0
Queue Length 95th (ft)		218	57				m45	453	m62	m180	184	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1619			1245			1582			518	
Turn Bay Length (ft)			80				120		430	215		155
Base Capacity (vph)		703	364				125	1887	946	258	2170	1108
Starvation Cap Reductn		0	0				0	0	0	0	259	0
Spillback Cap Reductn		0	0				0	0	0	0	0	0
Storage Cap Reductn		0	0				0	0	0	0	0	0
Reduced v/c Ratio		0.62	0.21				0.38	0.73	0.44	0.62	0.66	0.29

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 2 (2%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Columbia Blvd & US 30



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Configurations		↰↑	↱				↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	152	261	72	0	0	0	45	1302	398	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	1.00				1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85				1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3244	1488				1660	3226	1444	1614	3257	1530
Flt Permitted		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3244	1488				1660	3226	1444	1614	3257	1530
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)	160	275	76	0	0	0	47	1371	419	160	1255	317
RTOR Reduction (vph)	0	0	43	0	0	0	0	0	101	0	0	90
Lane Group Flow (vph)	0	435	33	0	0	0	47	1371	318	160	1255	227
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Actuated Green, G (s)		21.6	21.6				7.2	70.2	70.2	16.2	79.2	79.2
Effective Green, g (s)		21.6	21.6				7.2	70.2	70.2	16.2	79.2	79.2
Actuated g/C Ratio		0.18	0.18				0.06	0.59	0.59	0.13	0.66	0.66
Clearance Time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		584	268				100	1887	845	218	2150	1010
v/s Ratio Prot							0.03	c0.42		c0.10	0.39	
v/s Ratio Perm		0.13	0.02						0.22			0.15
v/c Ratio		0.74	0.12				0.47	0.73	0.38	0.73	0.58	0.22
Uniform Delay, d1		46.6	41.2				54.6	18.0	13.2	49.8	11.3	8.1
Progression Factor		1.00	1.00				0.87	0.75	0.64	1.10	0.43	0.04
Incremental Delay, d2		5.1	0.2				2.2	1.6	0.8	10.5	1.0	0.4
Delay (s)		51.7	41.4				49.4	15.1	9.3	65.5	5.8	0.8
Level of Service		D	D				D	B	A	E	A	A
Approach Delay (s)		50.2			0.0			14.6			10.4	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	25	202	257	1700	1197	44
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	50	85			25
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1662	1444	1693	3353	3257	1485
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1662	1444	1693	3353	3257	1485
Link Speed (mph)	25			35	35	
Link Distance (ft)	1136			1937	1662	
Travel Time (s)	31.0			37.7	32.4	
Confl. Peds. (#/hr)	1		6			6
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	3%	1%	2%	5%	3%
Adj. Flow (vph)	26	213	271	1789	1260	46
Shared Lane Traffic (%)						
Lane Group Flow (vph)	26	213	271	1789	1260	46
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	202	257	1700	1197	44
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	213	271	1789	1260	46
Pedestrians	6				1	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	1				0	
Right turn flare (veh)		2				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2703	636	1312			
vC1, stage 1 conf vol	1266					
vC2, stage 2 conf vol	1437					
vCu, unblocked vol	2703	636	1312			
tC, single (s)	6.8	7.0	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	68	49	49			
cM capacity (veh/h)	82	416	526			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	239	271	895	895	630	630	46
Volume Left	26	271	0	0	0	0	0
Volume Right	213	0	0	0	0	0	46
cSH	468	526	1700	1700	1700	1700	1700
Volume to Capacity	0.51	0.51	0.53	0.53	0.37	0.37	0.03
Queue Length 95th (ft)	71	73	0	0	0	0	0
Control Delay (s)	27.4	18.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	D	C					
Approach Delay (s)	27.4	2.5			0.0		
Approach LOS	D						

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		

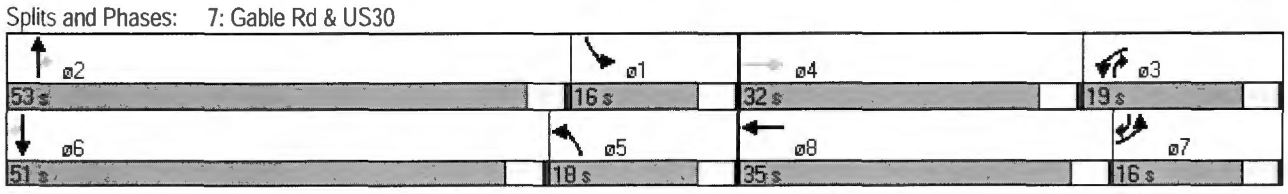
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	219	269	107	209	239	278	151	1569	133	205	998	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	130		0	215		0	130		310	210		140
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor		1.00										0.98
Frt		0.957			0.919				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1646	1669	0	1614	1559	0	1710	3320	1365	1525	3320	1530
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1646	1669	0	1614	1559	0	1710	3320	1365	1525	3320	1498
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			47				136			132
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		1390			1323			3867			969	
Travel Time (s)		31.6			30.1			75.3			18.9	
Confl. Bikes (#/hr)			1									1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Adj. Flow (vph)	223	274	109	213	244	284	154	1601	136	209	1018	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	223	383	0	213	528	0	154	1601	136	209	1018	182
Turn Type	Prot			Prot			Prot		pm+ov	Prot		pm+ov
Protected Phases	7			3	8		5	2	3	1	6	7
Permitted Phases		4							2			6
Detector Phase	7	4		3	8		5	2	3	1	6	7
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	30.0		8.0	30.0		8.0	20.0	8.0	8.0	23.0	8.0
Total Split (s)	16.0	32.0	0.0	19.0	35.0	0.0	18.0	53.0	19.0	16.0	51.0	16.0
Total Split (%)	13.3%	26.7%	0.0%	15.8%	29.2%	0.0%	15.0%	44.2%	15.8%	13.3%	42.5%	13.3%
Maximum Green (s)	12.0	28.0		15.0	31.0		14.0	49.0	15.0	12.0	47.0	12.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lead		Lag	Lead		Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	C-Max	None	None	C-Max	None
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		21.0			21.0			11.0			14.0	
Pedestrian Calls (#/hr)		1			1			1			1	
v/c Ratio	1.35	0.96		1.04	1.21		0.77	1.18	0.16	1.37	0.78	0.23
Control Delay	233.8	80.6		124.0	148.2		61.2	105.8	0.2	234.7	31.9	6.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	233.8	80.6		124.0	148.2		61.2	105.8	0.2	234.7	31.9	6.6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	~227	284		~181	~472		128	~788	0	~211	240	18
Queue Length 95th (ft)	#386	#480		#337	#691		m144	m#910	m0	#377	327	66
Internal Link Dist (ft)		1310			1243			3787			889	
Turn Bay Length (ft)	130			215			130		310	210		140
Base Capacity (vph)	165	402		205	438		200	1356	835	153	1300	807
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	1.35	0.95		1.04	1.21		0.77	1.18	0.16	1.37	0.78	0.23

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 49 (41%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 120
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Gable Rd & US30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	219	269	107	209	239	278	151	1569	133	205	998	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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		1.00	1.00		1.00	1.00	1.00	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
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1646	1669		1614	1560		1710	3320	1365	1525	3320	1505
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1646	1669		1614	1560		1710	3320	1365	1525	3320	1505
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)	223	274	109	213	244	284	154	1601	136	209	1018	182
RTOR Reduction (vph)	0	12	0	0	35	0	0	0	63	0	0	67
Lane Group Flow (vph)	223	371	0	213	493	0	154	1601	73	209	1018	115
Confl. Bikes (#/hr)			1									1
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Turn Type	Prot			Prot			Prot		pm+ov	Prot		pm+ov
Protected Phases	7			3	8		5	2	3	1	6	7
Permitted Phases		4							2			6
Actuated Green, G (s)	12.0	27.7		15.3	31.0		14.0	49.0	64.3	12.0	47.0	59.0
Effective Green, g (s)	12.0	27.7		15.3	31.0		14.0	49.0	64.3	12.0	47.0	59.0
Actuated g/C Ratio	0.10	0.23		0.13	0.26		0.12	0.41	0.54	0.10	0.39	0.49
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	165	385		206	403		200	1356	777	153	1300	790
v/s Ratio Prot	c0.14			c0.13	c0.32		0.09	c0.48	0.01	c0.14	0.31	0.01
v/s Ratio Perm		0.22							0.04			0.06
v/c Ratio	1.35	0.96		1.03	1.22		0.77	1.18	0.09	1.37	0.78	0.15
Uniform Delay, d1	54.0	45.6		52.4	44.5		51.4	35.5	13.6	54.0	32.0	16.7
Progression Factor	1.00	1.00		1.00	1.00		0.95	0.51	0.00	0.90	0.86	1.27
Incremental Delay, d2	192.6	36.0		71.9	121.0		7.6	84.8	0.0	196.7	4.2	0.1
Delay (s)	246.6	81.6		124.2	165.5		56.4	103.1	0.0	245.1	31.6	21.3
Level of Service	F	F		F	F		E	F	A	F	C	C
Approach Delay (s)		142.3			153.6			91.9			61.9	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	99.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	116.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

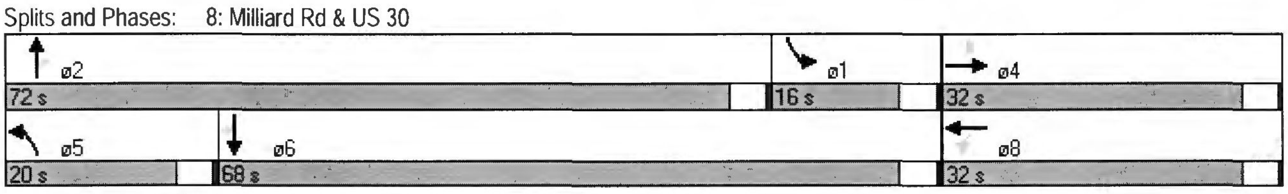
Lane Configurations												
Volume (vph)	119	161	70	137	160	79	119	1654	85	138	1021	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		250	0		110	110		150	150		200
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor	1.00	1.00		1.00	1.00		1.00		0.98	1.00		0.97
Frt		0.955			0.951				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	1663	0	1662	1656	0	1693	3288	1153	1662	3288	1530
Flt Permitted	0.357			0.372			0.950			0.950		
Satd. Flow (perm)	623	1663	0	650	1656	0	1689	3288	1126	1662	3288	1483
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			19				48			159
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		737			300			1086			3867	
Travel Time (s)		12.6			5.1			16.5			58.6	
Confl. Peds. (#/hr)	3		3	1		1	3		1	1		3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	4%	29%	0%	4%	0%
Adj. Flow (vph)	124	168	73	143	167	82	124	1723	89	144	1064	159
Shared Lane Traffic (%)												
Lane Group Flow (vph)	124	241	0	143	249	0	124	1723	89	144	1064	159
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	30.0	30.0		20.0	20.0		8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	32.0	32.0	0.0	32.0	32.0	0.0	20.0	72.0	72.0	16.0	68.0	68.0
Total Split (%)	26.7%	26.7%	0.0%	26.7%	26.7%	0.0%	16.7%	60.0%	60.0%	13.3%	56.7%	56.7%
Maximum Green (s)	28.0	28.0		28.0	28.0		16.0	68.0	68.0	12.0	64.0	64.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)	21.0	21.0		11.0	11.0			11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	1	1		1	1			1	1		1	1
v/c Ratio	0.89	0.63		0.98	0.65		0.66	0.91	0.13	0.87	0.57	0.18
Control Delay	98.0	46.6		117.1	47.3		67.7	31.6	6.7	63.5	3.5	0.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.0	46.6		117.1	47.3		67.7	31.6	6.7	63.5	3.5	0.3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	92	156		110	161		93	608	14	116	55	0
Queue Length 95th (ft)	#208	245		#242	252		156	#767	39	m#153	m85	m0
Internal Link Dist (ft)		657			220			1006			3787	
Turn Bay Length (ft)							110		150	150		200
Base Capacity (vph)	145	401		152	401		226	1895	669	166	1860	908
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.60		0.94	0.62		0.55	0.91	0.13	0.87	0.57	0.18

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 96 (80%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Milliard Rd & US 30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	119	161	70	137	160	79	119	1654	85	138	1021	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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		1.00	1.00		1.00	1.00	0.98	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.95		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1657	1662		1661	1656		1693	3288	1126	1662	3288	1483
Flt Permitted	0.36	1.00		0.37	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	623	1662		651	1656		1693	3288	1126	1662	3288	1483
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)	124	168	73	143	167	82	124	1723	89	144	1064	159
RTOR Reduction (vph)	0	13	0	0	15	0	0	0	20	0	0	69
Lane Group Flow (vph)	124	228	0	143	234	0	124	1723	69	144	1064	90
Confl. Peds. (#/hr)	3		3	1		1	3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	4%	29%	0%	4%	0%
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)	26.8	26.8		26.8	26.8		13.3	69.2	69.2	12.0	67.9	67.9
Effective Green, g (s)	26.8	26.8		26.8	26.8		13.3	69.2	69.2	12.0	67.9	67.9
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.11	0.58	0.58	0.10	0.57	0.57
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	139	371		145	370		188	1896	649	166	1860	839
v/s Ratio Prot		0.14			0.14		0.07	c0.52		c0.09	0.32	
v/s Ratio Perm	0.20			c0.22					0.06			0.06
v/c Ratio	0.89	0.61		0.99	0.63		0.66	0.91	0.11	0.87	0.57	0.11
Uniform Delay, d1	45.2	41.9		46.4	42.2		51.2	22.6	11.5	53.2	16.7	12.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.64	0.16	0.03
Incremental Delay, d2	45.5	3.0		70.0	3.5		8.1	7.9	0.3	21.9	0.7	0.1
Delay (s)	90.7	44.9		116.4	45.7		59.3	30.5	11.8	56.0	3.3	0.5
Level of Service	F	D		F	D		E	C	B	E	A	A
Approach Delay (s)		60.5			71.5			31.5			8.5	
Approach LOS		E			E			C			A	

Intersection Summary			
HCM Average Control Delay	30.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	[illegible]	[illegible]	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	5	174	160	217	219	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0			100	0	0
Storage Lanes	0			1	1	0
Taper Length (ft)	25			25	25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850	0.997	
Flt Protected		0.998			0.953	
Satd. Flow (prot)	0	1746	1716	1488	1647	0
Flt Permitted		0.998			0.953	
Satd. Flow (perm)	0	1746	1716	1488	1647	0
Link Speed (mph)		25	25		25	
Link Distance (ft)		2305	403		1964	
Travel Time (s)		62.9	11.0		53.6	
Confl. Peds. (#/hr)	5			5	3	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	2%	0%	1%	0%
Adj. Flow (vph)	6	193	178	241	243	6
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	199	178	241	249	0
Sign Control		Stop	Stop		Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	174	160	217	219	5
Sign Control		Stop	Stop		Free	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	193	178	241	243	6
Pedestrians		4	3		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)				4		
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	587	496	499	8	3	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	587	496	499	8	3	
tC, single (s)	7.1	6.5	6.5	6.2	4.1	
tC, 2 stage (s)						
tF (s)	3.5	4.0	4.0	3.3	2.2	
p0 queue free %	97	52	56	78	85	
cM capacity (veh/h)	189	404	400	1073	1622	

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	199	419	249
Volume Left	6	0	243
Volume Right	0	241	6
cSH	391	942	1622
Volume to Capacity	0.51	0.44	0.15
Queue Length 95th (ft)	69	58	13
Control Delay (s)	23.3	14.3	7.5
Lane LOS	C	B	A
Approach Delay (s)	23.3	14.3	7.5
Approach LOS	C	B	

Intersection Summary			
Average Delay	14.4		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.998			0.978			0.890	
Flt Protected		0.977			0.997			0.970			0.999	
Satd. Flow (prot)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Flt Permitted		0.977			0.997			0.970			0.999	
Satd. Flow (perm)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		403			853			1453			709	
Travel Time (s)		11.0			23.3			39.6			19.3	
Confl. Peds. (#/hr)	5					5			5	5		
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
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	142	161	92	10	170	3	119	42	31	2	27	127
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	303	92	0	183	0	0	192	0	0	156	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
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)	142	161	92	10	170	3	119	42	31	2	27	127

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	303	92	183	192	156
Volume Left (vph)	142	0	10	119	2
Volume Right (vph)	0	92	3	31	127
Hadj (s)	0.23	-0.70	0.00	0.03	-0.49
Departure Headway (s)	6.0	5.1	5.6	5.7	5.3
Degree Utilization, x	0.51	0.13	0.29	0.31	0.23
Capacity (veh/h)	573	677	591	567	601
Control Delay (s)	13.8	7.6	10.9	11.3	9.9
Approach Delay (s)	12.3		10.9	11.3	9.9
Approach LOS	B		B	B	A

Intersection Summary			
Delay	11.4		
HCM Level of Service	B		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥			✥			✥	
Volume (vph)	138	273	8	2	246	82	0	2	1	47	4	57
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			-1%			1%	
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.996			0.966			0.955			0.929	
Flt Protected	0.950										0.979	
Satd. Flow (prot)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Flt Permitted	0.950										0.979	
Satd. Flow (perm)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		559			839			582			1453	
Travel Time (s)		15.2			22.9			15.9			39.6	
Confl. Peds. (#/hr)			7	7					7	7		
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
Heavy Vehicles (%)	1%	1%	0%	0%	1%	0%	0%	0%	100%	3%	25%	2%
Adj. Flow (vph)	153	303	9	2	273	91	0	2	1	52	4	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	153	312	0	0	366	0	0	3	0	0	119	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Lane Configurations												
Volume (veh/h)	138	273	8	2	246	82	0	2	1	47	4	57
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-1%			1%	
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)	153	303	9	2	273	91	0	2	1	52	4	63
Pedestrians					7			7				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					4.0			4.0				
Percent Blockage					1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	364			319			1010	990	322	943	949	319
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	364			319			1010	990	322	943	949	319
tC, single (s)	4.1			4.1			7.1	6.5	7.2	7.1	6.8	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	4.2	3.5	4.2	3.3
p0 queue free %	87			100			100	99	100	76	98	91
cM capacity (veh/h)	1200			1245			176	215	534	213	206	722

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	153	312	367	3	120
Volume Left	153	0	2	0	52
Volume Right	0	9	91	1	63
cSH	1200	1700	1245	268	339
Volume to Capacity	0.13	0.18	0.00	0.01	0.35
Queue Length 95th (ft)	11	0	0	1	39
Control Delay (s)	8.4	0.0	0.1	18.6	21.3
Lane LOS	A		A	C	C
Approach Delay (s)	2.8		0.1	18.6	21.3
Approach LOS				C	C

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (vph)	112	391	132	30	298	11	97	112	23	3	80	41
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			0%			2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.972			0.996			0.986			0.955	
Flt Protected		0.991			0.996			0.979			0.999	
Satd. Flow (prot)	0	1667	0	0	1694	0	0	1665	0	0	1653	0
Flt Permitted		0.991			0.996			0.979			0.999	
Satd. Flow (perm)	0	1667	0	0	1694	0	0	1665	0	0	1653	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		643			960			563			720	
Travel Time (s)		17.5			26.2			15.4			19.6	
Confl. Peds. (#/hr)	3		14	14		3	6		3	3		6
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
Heavy Vehicles (%)	3%	1%	0%	8%	2%	0%	0%	3%	0%	0%	0%	0%
Adj. Flow (vph)	124	434	147	33	331	12	108	124	26	3	89	46
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	705	0	0	376	0	0	258	0	0	138	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	112	391	132	30	298	11	97	112	23	3	80	41
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			2%	
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)	124	434	147	33	331	12	108	124	26	3	89	46
Pedestrians		6			3			14			3	
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		1			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	346			595			1271	1184	525	1254	1251	346
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	346			595			1271	1184	525	1254	1251	346
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	90			96			0	23	95	93	40	93
cM capacity (veh/h)	1204			941			63	161	549	47	148	696

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	706	377	258	138
Volume Left	124	33	108	3
Volume Right	147	12	26	46
cSH	1204	941	102	187
Volume to Capacity	0.10	0.04	2.53	0.74
Queue Length 95th (ft)	9	3	589	119
Control Delay (s)	2.5	1.2	781.6	64.5
Lane LOS	A	A	F	F
Approach Delay (s)	2.5	1.2	781.6	64.5
Approach LOS			F	F

Intersection Summary			
Average Delay	143.9		
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.971			0.958			0.978			0.993	
Flt Protected		0.995			0.997			0.988			0.980	
Satd. Flow (prot)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Flt Permitted		0.995			0.997			0.988			0.980	
Satd. Flow (perm)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		3269			1699			1136			924	
Travel Time (s)		89.2			46.3			31.0			25.2	
Confl. Peds. (#/hr)	1		15	15		1	9		3	3		9
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
Heavy Vehicles (%)	7%	1%	0%	0%	1%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	36	234	74	24	234	118	96	221	63	115	160	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	344	0	0	376	0	0	380	0	0	289	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
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)	36	234	74	24	234	118	96	221	63	115	160	14

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	344	376	379	290
Volume Left (vph)	36	24	96	115
Volume Right (vph)	74	118	63	14
Hadj (s)	-0.08	-0.16	-0.01	0.07
Departure Headway (s)	8.0	7.8	8.0	8.4
Degree Utilization, x	0.77	0.82	0.84	0.68
Capacity (veh/h)	422	438	434	385
Control Delay (s)	32.7	37.3	40.3	27.1
Approach Delay (s)	32.7	37.3	40.3	27.1
Approach LOS	D	E	E	D

Intersection Summary			
Delay	34.9		
HCM Level of Service	D		
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		0	0		25	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978				0.850		0.987			0.985	
Flt Protected		0.994			0.995			0.991			0.981	
Satd. Flow (prot)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Flt Permitted		0.994			0.995			0.991			0.981	
Satd. Flow (perm)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		679			2026			1723			3269	
Travel Time (s)		18.5			55.3			47.0			89.2	
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
Heavy Vehicles (%)	0%	2%	0%	0%	0%	1%	0%	0%	0%	0%	2%	0%
Adj. Flow (vph)	38	244	55	26	243	104	51	212	29	95	127	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	337	0	0	269	104	0	292	0	0	250	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
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)	38	244	55	26	243	104	51	212	29	95	127	28

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	337	268	104	291	249
Volume Left (vph)	38	26	0	51	95
Volume Right (vph)	55	0	104	29	28
Hadj (s)	-0.05	0.05	-0.68	-0.02	0.03
Departure Headway (s)	6.7	7.2	6.5	6.8	7.0
Degree Utilization, x	0.63	0.54	0.19	0.55	0.48
Capacity (veh/h)	492	458	512	479	457
Control Delay (s)	20.5	17.1	9.7	17.9	16.4
Approach Delay (s)	20.5	15.0		17.9	16.4
Approach LOS	C	C		C	C

Intersection Summary			
Delay	17.4		
HCM Level of Service	C		
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	122	253	382	97	78	99
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Grade (%)		0%	0%		2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.973		0.925	
Flt Protected		0.984			0.978	
Satd. Flow (prot)	0	1683	1696	0	1567	0
Flt Permitted		0.984			0.978	
Satd. Flow (perm)	0	1683	1696	0	1567	0
Link Speed (mph)		30	30		35	
Link Distance (ft)		819	1665		1723	
Travel Time (s)		18.6	37.8		33.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	5%	1%	0%	2%	0%	0%
Adj. Flow (vph)	136	281	424	108	87	110
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	417	532	0	197	0
Sign Control		Free	Free		Stop	

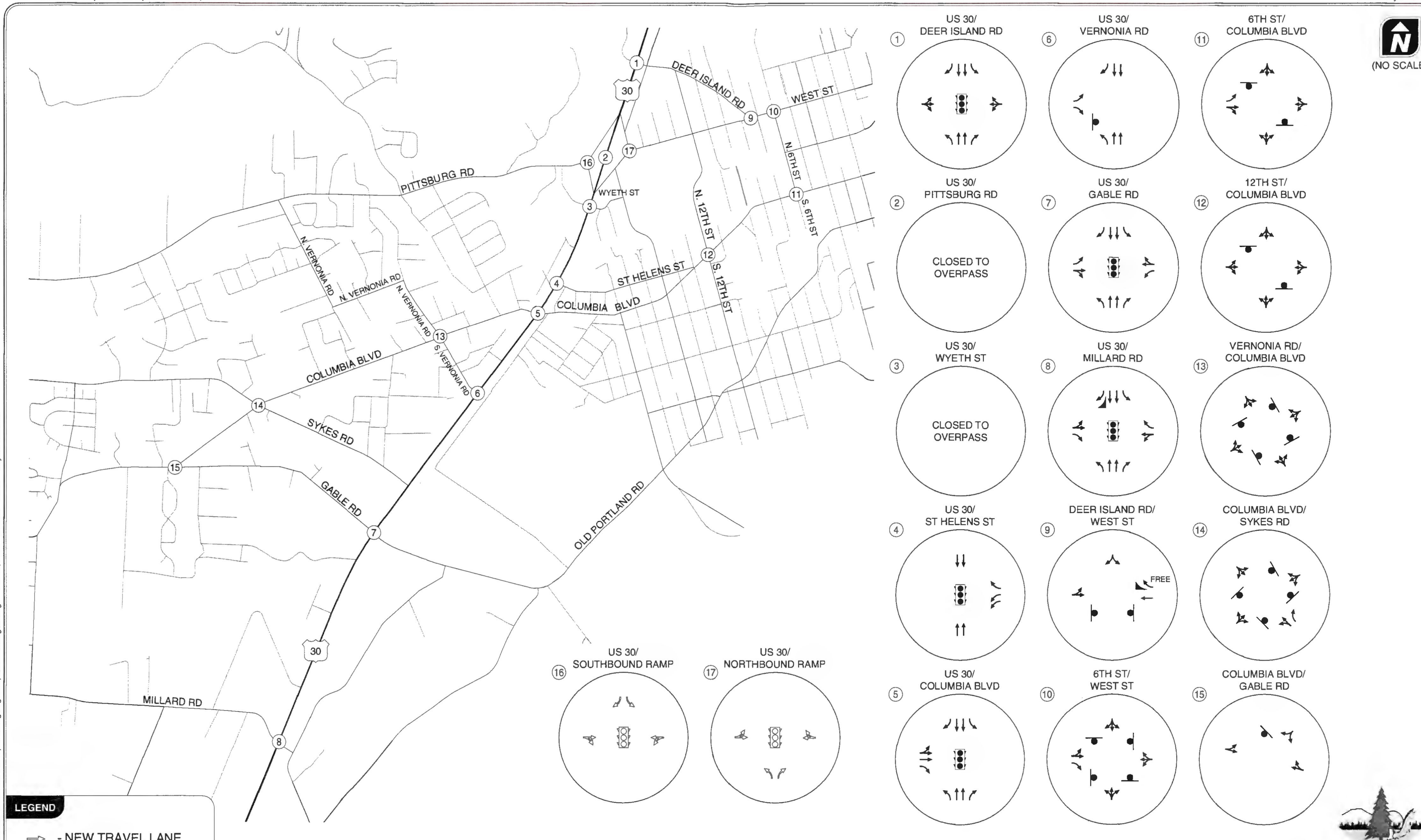
Intersection Summary

Area Type: Other
Control Type: Unsignalized

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	122	253	382	97	78	99
Sign Control		Free	Free		Stop	
Grade		0%	0%		2%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	136	281	424	108	87	110
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	532				1031	478
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	532				1031	478
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	87				62	81
cM capacity (veh/h)	1020				226	591

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	417	532	197
Volume Left	136	0	87
Volume Right	0	108	110
cSH	1020	1700	345
Volume to Capacity	0.13	0.31	0.57
Queue Length 95th (ft)	11	0	84
Control Delay (s)	3.9	0.0	28.4
Lane LOS	A		D
Approach Delay (s)	3.9	0.0	28.4
Approach LOS			D

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		



PROPOSED LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES - RAIL CORRIDOR OPTION - NORTHERN OVERPASS
ST. HELENS, OREGON

FIGURE C-3

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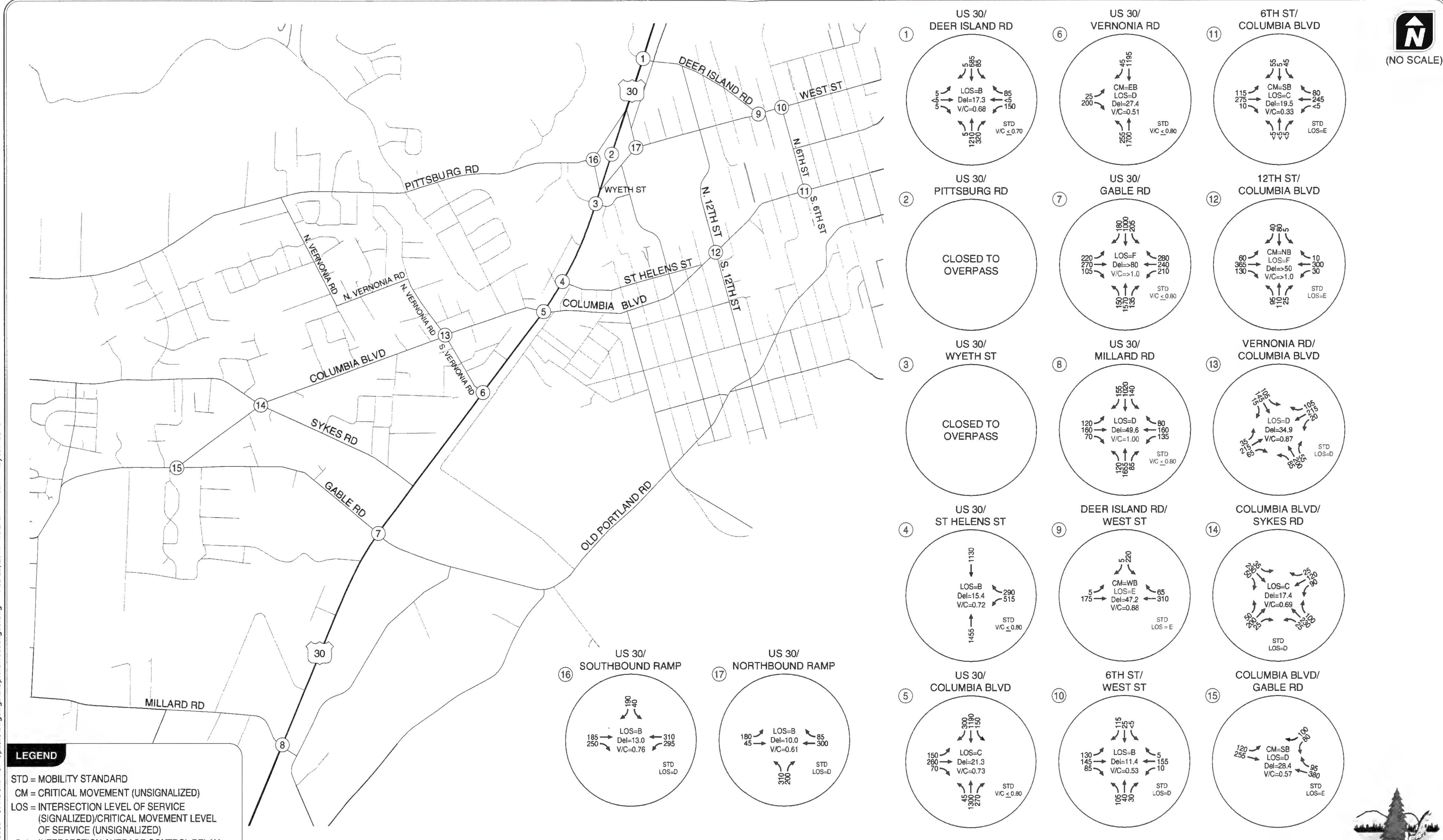

LEGEND

STD = MOBILITY STANDARD
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

TOTAL TRAFFIC CONDITIONS - RAIL CORRIDOR OPTION - NORTHERN OVERPASS
ST. HELENS, OREGON

FIGURE C-4

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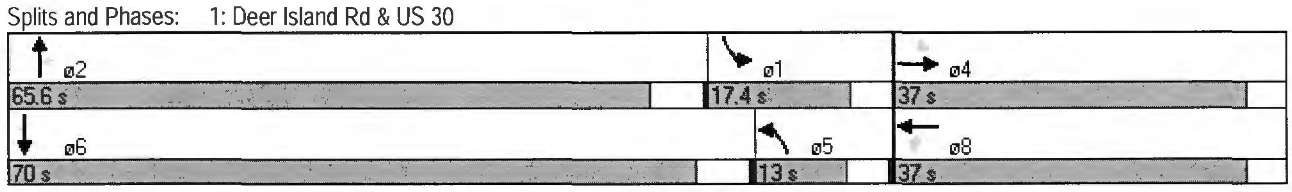
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1	7	148	2	84	5	1210	321	85	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	110		300	110		110
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.927			0.952				0.850			0.850
Flt Protected		0.981			0.969		0.950			0.950		
Satd. Flow (prot)	0	1215	0	0	1614	0	1710	3353	1473	1662	3288	916
Flt Permitted		0.917			0.800		0.950			0.950		
Satd. Flow (perm)	0	1136	0	0	1333	0	1710	3353	1473	1662	3288	916
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			23				338			6
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		225			179			1625			999	
Travel Time (s)		5.1			4.1			22.2			13.6	
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
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Adj. Flow (vph)	5	1	7	156	2	88	5	1274	338	89	723	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	13	0	0	246	0	5	1274	338	89	723	6
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	34.0	34.0		34.0	34.0		8.5	30.5	30.5	9.5	32.5	32.5
Total Split (s)	37.0	37.0	0.0	37.0	37.0	0.0	13.0	65.6	65.6	17.4	70.0	70.0
Total Split (%)	30.8%	30.8%	0.0%	30.8%	30.8%	0.0%	10.8%	54.7%	54.7%	14.5%	58.3%	58.3%
Maximum Green (s)	33.0	33.0		33.0	33.0		8.5	60.1	60.1	13.4	64.5	64.5
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.5	0.5	0.5	0.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.5	5.5	5.5	4.0	5.5	5.5
Lead/Lag							Lag	Lead	Lead	Lag	Lead	Lead
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	5.1	5.1	2.5	5.1	5.1
Minimum Gap (s)	2.0	2.0		2.0	2.0		1.0	3.1	3.1	1.0	3.1	3.1
Time Before Reduce (s)	5.0	5.0		5.0	5.0		8.0	10.0	10.0	8.0	10.0	10.0
Time To Reduce (s)	5.0	5.0		5.0	5.0		3.0	20.0	20.0	3.0	20.0	20.0
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)	21.0	21.0		21.0	21.0			11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	1	1		1	1			1	1		1	1
v/c Ratio		0.05			0.84		0.06	0.64	0.33	0.60	0.32	0.01
Control Delay		23.6			64.3		50.6	13.7	1.0	68.4	9.3	6.3
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		23.6			64.3		50.6	13.7	1.0	68.4	9.3	6.3
Queue Length 50th (ft)		4			167		4	215	0	67	97	0
Queue Length 95th (ft)		20			246		m8	366	3	121	213	7
Internal Link Dist (ft)		145			99			1545			919	
Turn Bay Length (ft)							110		300	110		110
Base Capacity (vph)		317			383		121	1982	1009	186	2277	636
Starvation Cap Reductn		0			0		0	0	0	0	0	0
Spillback Cap Reductn		0			0		0	0	0	0	0	0
Storage Cap Reductn		0			0		0	0	0	0	0	0
Reduced v/c Ratio		0.04			0.64		0.04	0.64	0.33	0.48	0.32	0.01

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 14 (12%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Deer Island Rd & US 30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✢			✢		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	5	1	7	148	2	84	5	1210	321	85	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Lane Util. Factor		1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.93			0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98			0.97		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1215			1614		1710	3353	1473	1662	3288	916
Flt Permitted		0.92			0.80		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1136			1332		1710	3353	1473	1662	3288	916
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)	5	1	7	156	2	88	5	1274	338	89	723	6
RTOR Reduction (vph)	0	6	0	0	18	0	0	0	148	0	0	2
Lane Group Flow (vph)	0	7	0	0	228	0	5	1274	190	89	723	4
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)		24.8			24.8		1.7	67.3	67.3	14.4	79.5	79.5
Effective Green, g (s)		24.8			24.8		1.7	67.3	67.3	14.4	79.5	79.5
Actuated g/C Ratio		0.21			0.21		0.01	0.56	0.56	0.12	0.66	0.66
Clearance Time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Vehicle Extension (s)		2.5			2.5		2.5	5.1	5.1	2.5	5.1	5.1
Lane Grp Cap (vph)		235			275		24	1880	826	199	2178	607
v/s Ratio Prot							0.00	c0.38		c0.05	0.22	
v/s Ratio Perm		0.01			c0.17				0.13			0.00
v/c Ratio		0.03			0.83		0.21	0.68	0.23	0.45	0.33	0.01
Uniform Delay, d1		38.0			45.6		58.5	18.7	13.3	49.1	8.8	6.9
Progression Factor		1.00			1.00		0.93	0.68	0.11	1.00	1.00	1.00
Incremental Delay, d2		0.0			17.8		2.7	1.7	0.6	1.2	0.4	0.0
Delay (s)		38.1			63.4		56.8	14.4	2.0	50.3	9.2	6.9
Level of Service		D			E		E	B	A	D	A	A
Approach Delay (s)		38.1			63.4			11.9			13.6	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	0	0	1220	785	0
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	25	100			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt						
Flt Protected						
Satd. Flow (prot)	1683	1620	1714	3320	3257	1698
Flt Permitted						
Satd. Flow (perm)	1683	1620	1714	3320	3257	1698
Link Speed (mph)	35			40	40	
Link Distance (ft)	567			871	1625	
Travel Time (s)	11.0			14.8	27.7	
Confl. Peds. (#/hr)	1					
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	4%	8%	5%	3%	5%	6%
Adj. Flow (vph)	0	0	0	1271	818	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	1271	818	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	0	0	0	1220	785	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	0	0	1271	818	0
Pedestrians					1	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)		1				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1454	409	818			
vC1, stage 1 conf vol	818					
vC2, stage 2 conf vol	636					
vCu, unblocked vol	1454	409	818			
tC, single (s)	6.9	7.1	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.4	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	317	575	787			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	0	0	635	635	409	409	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.37	0.37	0.24	0.24	0.00
Queue Length 95th (ft)	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A						
Approach Delay (s)	0.0	0.0			0.0		
Approach LOS	A						

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	38.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			↑↑		↰	↑↑	↱
Volume (vph)	0	0	0	0	0	0	0	1699	0	0	907	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	85		250	85		25
Storage Lanes	0		0	0		0	0		0	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor												
Frt												
Flt Protected												
Satd. Flow (prot)	0	1750	0	0	1750	0	0	3226	0	1750	3196	1800
Flt Permitted												
Satd. Flow (perm)	0	1750	0	0	1750	0	0	3226	0	1750	3196	1800
Link Speed (mph)		25			25			40			40	
Link Distance (ft)		275			614			1403			871	
Travel Time (s)		7.5			16.7			23.9			14.8	
Confl. Peds. (#/hr)			3	3								
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
Heavy Vehicles (%)	8%	0%	7%	2%	0%	0%	0%	6%	0%	0%	7%	0%
Adj. Flow (vph)	0	0	0	0	0	0	0	1788	0	0	955	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	0	0	0	1788	0	0	955	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			↑↑		↰	↑↑	↱
Volume (veh/h)	0	0	0	0	0	0	0	1699	0	0	907	0
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	0	0	0	0	0	1788	0	0	955	0
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1849	2743	480	2269	2743	894	955			1788		
vC1, stage 1 conf vol	955	955		1788	1788							
vC2, stage 2 conf vol	894	1788		480	955							
vCu, unblocked vol	1849	2743	480	2269	2743	894	955			1788		
tC, single (s)	7.7	6.5	7.0	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.7	5.5		6.5	5.5							
tF (s)	3.6	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	100	100			100		
cM capacity (veh/h)	195	122	517	81	122	288	728			351		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	0	0	894	894	0	477	477	0
Volume Left	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.53	0.53	0.00	0.28	0.28	0.00
Queue Length 95th (ft)	0	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	A						
Approach Delay (s)	0.0	0.0	0.0		0.0			
Approach LOS	A	A						

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑			↓↓
Volume (vph)	514	290	1456	0	0	1132
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor		0.99				
Frt		0.850				
Flt Protected	0.950					
Satd. Flow (prot)	3193	1458	3226	0	0	3420
Flt Permitted	0.950					
Satd. Flow (perm)	3193	1437	3226	0	0	3420
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		38				
Link Speed (mph)	25		35			35
Link Distance (ft)	349		598			1403
Travel Time (s)	9.5		11.6			27.3
Confl. Bikes (#/hr)		4				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Adj. Flow (vph)	541	305	1533	0	0	1192
Shared Lane Traffic (%)						
Lane Group Flow (vph)	541	305	1533	0	0	1192
Turn Type		Perm				
Protected Phases	8		2			6
Permitted Phases		8				
Detector Phase	8	8	2			6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0			4.0
Minimum Split (s)	30.0	30.0	20.0			20.0
Total Split (s)	42.0	42.0	78.0	0.0	0.0	78.0
Total Split (%)	35.0%	35.0%	65.0%	0.0%	0.0%	65.0%
Maximum Green (s)	38.0	38.0	74.0			74.0
Yellow Time (s)	3.5	3.5	3.5			3.5
All-Red Time (s)	0.5	0.5	0.5			0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	C-Max			C-Max
Walk Time (s)	5.0	5.0	5.0			5.0
Flash Dont Walk (s)	21.0	21.0	11.0			11.0
Pedestrian Calls (#/hr)	1	1	1			1
v/c Ratio	0.70	0.81	0.69			0.50
Control Delay	46.0	53.8	4.8			7.2
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	46.0	53.8	4.8			7.2
Queue Length 50th (ft)	197	198	82			164
Queue Length 95th (ft)	233	279	89			167
Internal Link Dist (ft)	269		518			1323

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Turn Bay Length (ft)						
Base Capacity (vph)	1011	481	2232			2367
Starvation Cap Reductn	0	0	2			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.54	0.63	0.69			0.50

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 80 (67%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 4: St Helens St & US 30

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑			↑↑
Volume (vph)	514	290	1456	0	0	1132
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3193	1435	3226			3420
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3193	1435	3226			3420
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	541	305	1533	0	0	1192
RTOR Reduction (vph)	0	29	0	0	0	0
Lane Group Flow (vph)	541	276	1533	0	0	1192
Confl. Bikes (#/hr)		4				
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Turn Type		Perm				
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	29.0	29.0	83.0			83.0
Effective Green, g (s)	29.0	29.0	83.0			83.0
Actuated g/C Ratio	0.24	0.24	0.69			0.69
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	772	347	2231			2366
v/s Ratio Prot	0.17		c0.48			0.35
v/s Ratio Perm		c0.19				
v/c Ratio	0.70	0.80	0.69			0.50
Uniform Delay, d1	41.5	42.7	10.9			8.8
Progression Factor	1.00	1.00	0.29			0.66
Incremental Delay, d2	2.9	11.9	1.2			0.8
Delay (s)	44.4	54.6	4.3			6.5
Level of Service	D	D	A			A
Approach Delay (s)	48.1		4.3			6.5
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

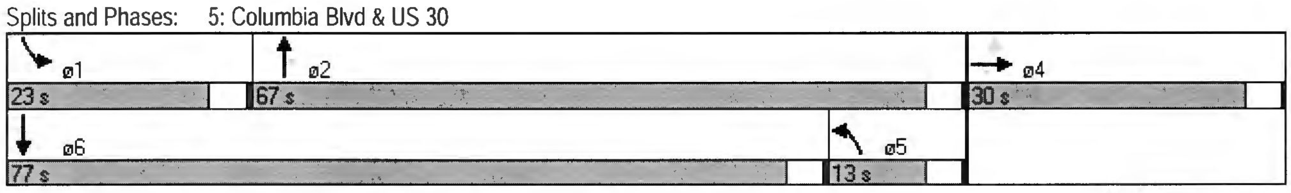
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	261	72	0	0	0	45	1302	271	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	80		80	0		0	120		430	120		155
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			0.850
Flt Protected		0.982					0.950			0.950		
Satd. Flow (prot)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Flt Permitted		0.982					0.950			0.950		
Satd. Flow (perm)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			53						244			264
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1699			1325			1662			598	
Travel Time (s)		46.3			36.1			32.4			11.6	
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
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Adj. Flow (vph)	160	275	76	0	0	0	47	1371	285	160	1255	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	435	76	0	0	0	47	1371	285	160	1255	317
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Detector Phase	4	4	4				5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	30.0	30.0	30.0				8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	30.0	30.0	30.0	0.0	0.0	0.0	13.0	67.0	67.0	23.0	77.0	77.0
Total Split (%)	25.0%	25.0%	25.0%	0.0%	0.0%	0.0%	10.8%	55.8%	55.8%	19.2%	64.2%	64.2%
Maximum Green (s)	26.0	26.0	26.0				9.0	63.0	63.0	19.0	73.0	73.0
Yellow Time (s)	3.5	3.5	3.5				3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5				0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None				None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0					5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	21.0	21.0	21.0					11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	1	1	1					1	1	1	1	1
v/c Ratio		0.74	0.24				0.41	0.73	0.30	0.73	0.58	0.29
Control Delay		54.4	17.9				60.2	23.4	5.9	67.2	8.7	0.8
Queue Delay		0.0	0.0				0.0	0.0	0.0	0.0	0.1	0.0
Total Delay		54.4	17.9				60.2	23.4	5.9	67.2	8.9	0.8
Queue Length 50th (ft)		168	15				34	376	37	112	256	0
Queue Length 95th (ft)		218	57				m44	507	m47	196	284	8

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1619			1245			1582			518	
Turn Bay Length (ft)			80				120		430	120		155
Base Capacity (vph)		703	364				125	1887	946	258	2170	1108
Starvation Cap Reductn		0	0				0	0	0	0	205	0
Spillback Cap Reductn		0	0				0	0	0	0	0	0
Storage Cap Reductn		0	0				0	0	0	0	0	0
Reduced v/c Ratio		0.62	0.21				0.38	0.73	0.30	0.62	0.64	0.29

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 57 (48%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Columbia Blvd & US 30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱				↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	152	261	72	0	0	0	45	1302	271	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	1.00				1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85				1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3244	1488				1660	3226	1444	1614	3257	1530
Flt Permitted		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3244	1488				1660	3226	1444	1614	3257	1530
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)	160	275	76	0	0	0	47	1371	285	160	1255	317
RTOR Reduction (vph)	0	0	43	0	0	0	0	0	101	0	0	90
Lane Group Flow (vph)	0	435	33	0	0	0	47	1371	184	160	1255	227
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Actuated Green, G (s)		21.6	21.6				7.2	70.2	70.2	16.2	79.2	79.2
Effective Green, g (s)		21.6	21.6				7.2	70.2	70.2	16.2	79.2	79.2
Actuated g/C Ratio		0.18	0.18				0.06	0.59	0.59	0.13	0.66	0.66
Clearance Time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		584	268				100	1887	845	218	2150	1010
v/s Ratio Prot							0.03	c0.42		c0.10	0.39	
v/s Ratio Perm		0.13	0.02						0.13			0.15
v/c Ratio		0.74	0.12				0.47	0.73	0.22	0.73	0.58	0.22
Uniform Delay, d1		46.6	41.2				54.6	18.0	11.8	49.8	11.3	8.1
Progression Factor		1.00	1.00				1.01	1.11	1.80	1.00	0.63	0.10
Incremental Delay, d2		5.1	0.2				2.1	1.5	0.4	10.6	1.0	0.4
Delay (s)		51.7	41.4				57.0	21.4	21.7	60.7	8.1	1.2
Level of Service		D	D				E	C	C	E	A	A
Approach Delay (s)		50.2			0.0			22.4			11.7	
Approach LOS		D			A			C			B	

Intersection Summary			
HCM Average Control Delay	21.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	25	202	257	1700	1197	44
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	50	85			25
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1662	1444	1693	3353	3257	1485
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1662	1444	1693	3353	3257	1485
Link Speed (mph)	25			35	35	
Link Distance (ft)	1136			1937	1662	
Travel Time (s)	31.0			37.7	32.4	
Confl. Peds. (#/hr)	1		6			6
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	3%	1%	2%	5%	3%
Adj. Flow (vph)	26	213	271	1789	1260	46
Shared Lane Traffic (%)						
Lane Group Flow (vph)	26	213	271	1789	1260	46
Sign Control	Stop			Free	Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	202	257	1700	1197	44
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	213	271	1789	1260	46
Pedestrians	6				1	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	1				0	
Right turn flare (veh)		2				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2703	636	1312			
vC1, stage 1 conf vol	1266					
vC2, stage 2 conf vol	1437					
vCu, unblocked vol	2703	636	1312			
tC, single (s)	6.8	7.0	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	68	49	49			
cM capacity (veh/h)	82	416	526			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	239	271	895	895	630	630	46
Volume Left	26	271	0	0	0	0	0
Volume Right	213	0	0	0	0	0	46
cSH	468	526	1700	1700	1700	1700	1700
Volume to Capacity	0.51	0.51	0.53	0.53	0.37	0.37	0.03
Queue Length 95th (ft)	71	73	0	0	0	0	0
Control Delay (s)	27.4	18.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	D	C					
Approach Delay (s)	27.4	2.5			0.0		
Approach LOS	D						

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	219	269	107	209	239	278	151	1569	133	205	998	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	130		0	215		0	130		310	130		140
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor		1.00										0.98
Frt		0.957			0.919				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1646	1669	0	1614	1559	0	1710	3320	1365	1525	3320	1530
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1646	1669	0	1614	1559	0	1710	3320	1365	1525	3320	1498
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			47				136			132
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		1390			1323			3867			969	
Travel Time (s)		31.6			30.1			75.3			18.9	
Confl. Bikes (#/hr)			1									1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Adj. Flow (vph)	223	274	109	213	244	284	154	1601	136	209	1018	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	223	383	0	213	528	0	154	1601	136	209	1018	182
Turn Type	Prot			Prot			Prot		pm+ov	Prot		pm+ov
Protected Phases	7			3	8		5	2	3	1	6	7
Permitted Phases		4							2			6
Detector Phase	7	4		3	8		5	2	3	1	6	7
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	30.0		8.0	30.0		8.0	20.0	8.0	8.0	23.0	8.0
Total Split (s)	16.0	32.0	0.0	19.0	35.0	0.0	18.0	53.0	19.0	16.0	51.0	16.0
Total Split (%)	13.3%	26.7%	0.0%	15.8%	29.2%	0.0%	15.0%	44.2%	15.8%	13.3%	42.5%	13.3%
Maximum Green (s)	12.0	28.0		15.0	31.0		14.0	49.0	15.0	12.0	47.0	12.0
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lead		Lag	Lead		Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None		None	C-Max	None	None	C-Max	None
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		21.0			21.0			11.0			14.0	
Pedestrian Calls (#/hr)		1			1			1			1	
v/c Ratio	1.35	0.96		1.04	1.21		0.77	1.18	0.16	1.37	0.78	0.23
Control Delay	233.8	80.6		124.0	148.2		45.7	97.8	0.0	230.7	24.8	4.5
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	233.8	80.6		124.0	148.2		45.7	97.8	0.0	230.7	24.8	4.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)	~227	284		~181	~472		128	~766	0	~217	141	2
Queue Length 95th (ft)	#386	#480		#337	#691		m124	m#701	m0	#370	291	43
Internal Link Dist (ft)		1310			1243			3787			889	
Turn Bay Length (ft)	130			215			130		310	130		140
Base Capacity (vph)	165	402		205	438		200	1356	835	153	1300	807
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	1.35	0.95		1.04	1.21		0.77	1.18	0.16	1.37	0.78	0.23

Intersection Summary

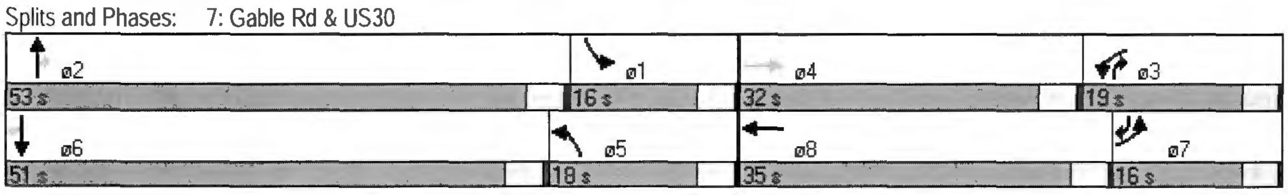
Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 3 (3%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 120
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Gable Rd & US30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	219	269	107	209	239	278	151	1569	133	205	998	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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		1.00	1.00		1.00	1.00	1.00	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
Frt	1.00	0.96		1.00	0.92		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1646	1669		1614	1560		1710	3320	1365	1525	3320	1505
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1646	1669		1614	1560		1710	3320	1365	1525	3320	1505
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)	223	274	109	213	244	284	154	1601	136	209	1018	182
RTOR Reduction (vph)	0	12	0	0	35	0	0	0	63	0	0	67
Lane Group Flow (vph)	223	371	0	213	493	0	154	1601	73	209	1018	115
Confl. Bikes (#/hr)			1									1
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Turn Type	Prot			Prot			Prot		pm+ov	Prot		pm+ov
Protected Phases	7			3	8		5	2	3	1	6	7
Permitted Phases		4							2			6
Actuated Green, G (s)	12.0	27.7		15.3	31.0		14.0	49.0	64.3	12.0	47.0	59.0
Effective Green, g (s)	12.0	27.7		15.3	31.0		14.0	49.0	64.3	12.0	47.0	59.0
Actuated g/C Ratio	0.10	0.23		0.13	0.26		0.12	0.41	0.54	0.10	0.39	0.49
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	165	385		206	403		200	1356	777	153	1300	790
v/s Ratio Prot	c0.14			c0.13	c0.32		0.09	c0.48	0.01	c0.14	0.31	0.01
v/s Ratio Perm		0.22							0.04			0.06
v/c Ratio	1.35	0.96		1.03	1.22		0.77	1.18	0.09	1.37	0.78	0.15
Uniform Delay, d1	54.0	45.6		52.4	44.5		51.4	35.5	13.6	54.0	32.0	16.7
Progression Factor	1.00	1.00		1.00	1.00		0.81	0.31	0.00	0.75	0.64	0.81
Incremental Delay, d2	192.6	36.0		71.9	121.0		1.7	82.1	0.0	196.7	4.2	0.1
Delay (s)	246.6	81.6		124.2	165.5		43.5	92.9	0.0	237.2	24.5	13.7
Level of Service	F	F		F	F		D	F	A	F	C	B
Approach Delay (s)		142.3			153.6			82.2			54.7	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM Average Control Delay	93.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	116.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	161	70	137	160	79	119	1654	85	138	1021	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		250	0		110	110		150	150		200
Storage Lanes	0		1	0		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor		1.00	0.98		1.00	0.99			0.98			0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.979			0.977		0.950			0.950		
Satd. Flow (prot)	0	1713	1488	0	1710	1488	1693	3288	1153	1662	3288	1530
Flt Permitted		0.517			0.510		0.120			0.080		
Satd. Flow (perm)	0	904	1464	0	892	1466	214	3288	1126	140	3288	1483
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			73			64			41			148
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		737			300			1086			3867	
Travel Time (s)		12.6			5.1			16.5			58.6	
Confl. Peds. (#/hr)	3		3	1		1	3		1	1		3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	4%	29%	0%	4%	0%
Adj. Flow (vph)	124	168	73	143	167	82	124	1723	89	144	1064	159
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	292	73	0	310	82	124	1723	89	144	1064	159
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	30.0	30.0	30.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	44.0	44.0	44.0	44.0	44.0	44.0	14.0	63.0	63.0	13.0	62.0	62.0
Total Split (%)	36.7%	36.7%	36.7%	36.7%	36.7%	36.7%	11.7%	52.5%	52.5%	10.8%	51.7%	51.7%
Maximum Green (s)	40.0	40.0	40.0	40.0	40.0	40.0	10.0	59.0	59.0	9.0	58.0	58.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)	21.0	21.0	21.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)	1	1	1	1	1	1		1	1		1	1
v/c Ratio		0.97	0.14		1.04	0.15	0.57	1.07	0.16	0.79	0.66	0.20
Control Delay		85.3	7.0		103.9	10.4	27.2	72.6	10.3	40.2	5.3	0.5
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		85.3	7.0		103.9	10.4	27.2	72.6	10.3	40.2	5.3	0.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (ft)		222	0		~260	9	51	~775	19	62	96	1
Queue Length 95th (ft)		#404	33		#441	46	88	#915	50	m89	m116	m3
Internal Link Dist (ft)		657			220			1006			3787	
Turn Bay Length (ft)			250			110	110		150	150		200
Base Capacity (vph)		301	537		297	531	228	1617	574	183	1610	801
Starvation Cap Reductn		0	0		0	0	0	0	0	0	0	0
Spillback Cap Reductn		0	0		0	0	0	0	0	0	0	0
Storage Cap Reductn		0	0		0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.97	0.14		1.04	0.15	0.54	1.07	0.16	0.79	0.66	0.20

Intersection Summary

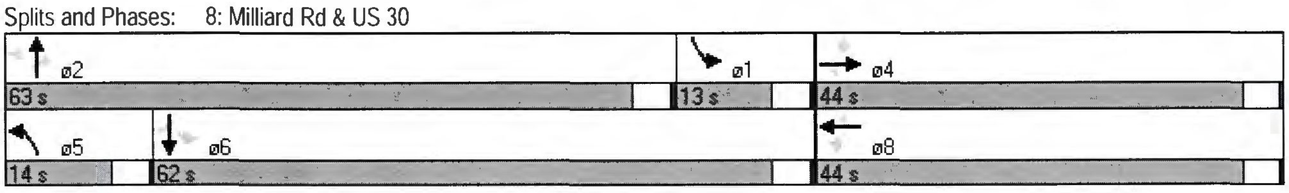
Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 50 (42%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Milliard Rd & US 30



Lane Configurations												
Volume (vph)	119	161	70	137	160	79	119	1654	85	138	1021	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		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	0.98		1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.97
Flpb, ped/bikes		1.00	1.00		1.00	1.00	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	0.85
Flt Protected		0.98	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1712	1464		1710	1466	1693	3288	1126	1662	3288	1483
Flt Permitted		0.52	1.00		0.51	1.00	0.12	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)		904	1464		892	1466	213	3288	1126	141	3288	1483
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)	124	168	73	143	167	82	124	1723	89	144	1064	159
RTOR Reduction (vph)	0	0	49	0	0	43	0	0	21	0	0	75
Lane Group Flow (vph)	0	292	24	0	310	39	124	1723	68	144	1064	84
Confl. Peds. (#/hr)	3		3	1		1	3		1	1		3
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	4%	29%	0%	4%	0%
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		40.0	40.0		40.0	40.0	59.0	59.0	59.0	58.8	58.8	58.8
Effective Green, g (s)		40.0	40.0		40.0	40.0	59.0	59.0	59.0	58.8	58.8	58.8
Actuated g/C Ratio		0.33	0.33		0.33	0.33	0.49	0.49	0.49	0.49	0.49	0.49
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		301	488		297	489	218	1617	554	183	1611	727
v/s Ratio Prot							0.04	c0.52		0.06	c0.32	
v/s Ratio Perm		0.32	0.02		c0.35	0.03	0.24		0.06	0.33		0.06
v/c Ratio		0.97	0.05		1.04	0.08	0.57	1.07	0.12	0.79	0.66	0.11
Uniform Delay, d1		39.4	27.1		40.0	27.4	21.0	30.5	16.5	50.6	23.1	16.5
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.49	0.17	0.05
Incremental Delay, d2		43.6	0.0		64.1	0.1	3.4	42.2	0.5	11.5	1.2	0.2
Delay (s)		83.0	27.2		104.1	27.5	24.4	72.7	17.0	36.2	5.2	1.1
Level of Service		F	C		F	C	C	E	B	D	A	A
Approach Delay (s)		71.8			88.1			67.0			8.0	
Approach LOS		E			F			E			A	

Intersection Summary

HCM Average Control Delay	49.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	104.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	5	174	310	67	219	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0			100	0	0
Storage Lanes	0			1	1	0
Taper Length (ft)	25			25	25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850	0.997	
Flt Protected		0.998			0.953	
Satd. Flow (prot)	0	1746	1716	1488	1647	0
Flt Permitted		0.998			0.953	
Satd. Flow (perm)	0	1746	1716	1488	1647	0
Link Speed (mph)		25	25		25	
Link Distance (ft)		2305	403		1964	
Travel Time (s)		62.9	11.0		53.6	
Confl. Peds. (#/hr)	5			5	3	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	2%	0%	1%	0%
Adj. Flow (vph)	6	193	344	74	243	6
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	199	344	74	249	0
Sign Control		Stop	Stop		Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	174	310	67	219	5
Sign Control		Stop	Stop		Free	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	193	344	74	243	6
Pedestrians		4	3		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)				4		
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	671	496	499	8	3	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	671	496	499	8	3	
tC, single (s)	7.1	6.5	6.5	6.2	4.1	
tC, 2 stage (s)						
tF (s)	3.5	4.0	4.0	3.3	2.2	
p0 queue free %	93	52	14	93	85	
cM capacity (veh/h)	84	404	400	1073	1622	

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	199	419	249
Volume Left	6	0	243
Volume Right	0	74	6
cSH	365	474	1622
Volume to Capacity	0.55	0.88	0.15
Queue Length 95th (ft)	78	239	13
Control Delay (s)	26.1	47.2	7.5
Lane LOS	D	E	A
Approach Delay (s)	26.1	47.2	7.5
Approach LOS	D	E	

Intersection Summary			
Average Delay	31.0		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.998			0.978			0.890	
Flt Protected		0.977			0.997			0.970			0.999	
Satd. Flow (prot)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Flt Permitted		0.977			0.997			0.970			0.999	
Satd. Flow (perm)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		403			853			1453			709	
Travel Time (s)		11.0			23.3			39.6			19.3	
Confl. Peds. (#/hr)	5					5			5	5		
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
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	142	161	92	10	170	3	119	42	31	2	27	127
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	303	92	0	183	0	0	192	0	0	156	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
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)	142	161	92	10	170	3	119	42	31	2	27	127

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	303	92	183	192	156
Volume Left (vph)	142	0	10	119	2
Volume Right (vph)	0	92	3	31	127
Hadj (s)	0.23	-0.70	0.00	0.03	-0.49
Departure Headway (s)	6.0	5.1	5.6	5.7	5.3
Degree Utilization, x	0.51	0.13	0.29	0.31	0.23
Capacity (veh/h)	573	677	591	567	601
Control Delay (s)	13.8	7.6	10.9	11.3	9.9
Approach Delay (s)	12.3		10.9	11.3	9.9
Approach LOS	B		B	B	A

Intersection Summary			
Delay	11.4		
HCM Level of Service	B		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	273	8	2	246	82	0	2	1	47	4	57
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			-1%			1%	
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.996			0.966			0.955			0.929	
Flt Protected	0.950										0.979	
Satd. Flow (prot)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Flt Permitted	0.950										0.979	
Satd. Flow (perm)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		559			839			582			1453	
Travel Time (s)		15.2			22.9			15.9			39.6	
Confl. Peds. (#/hr)			7	7					7	7		
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
Heavy Vehicles (%)	1%	1%	0%	0%	1%	0%	0%	0%	100%	3%	25%	2%
Adj. Flow (vph)	126	303	9	2	273	91	0	2	1	52	4	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	126	312	0	0	366	0	0	3	0	0	119	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥			✥			✥	
Volume (veh/h)	113	273	8	2	246	82	0	2	1	47	4	57
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-1%			1%	
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)	126	303	9	2	273	91	0	2	1	52	4	63
Pedestrians					7			7				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					4.0			4.0				
Percent Blockage					1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	364			319			955	935	322	887	894	319
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	364			319			955	935	322	887	894	319
tC, single (s)	4.1			4.1			7.1	6.5	7.2	7.1	6.8	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	4.2	3.5	4.2	3.3
p0 queue free %	90			100			100	99	100	78	98	91
cM capacity (veh/h)	1200			1245			196	238	534	237	229	722

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	126	312	367	3	120
Volume Left	126	0	2	0	52
Volume Right	0	9	91	1	63
cSH	1200	1700	1245	292	367
Volume to Capacity	0.10	0.18	0.00	0.01	0.33
Queue Length 95th (ft)	9	0	0	1	35
Control Delay (s)	8.4	0.0	0.1	17.5	19.5
Lane LOS	A		A	C	C
Approach Delay (s)	2.4		0.1	17.5	19.5
Approach LOS				C	C

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (vph)	62	366	132	30	298	11	97	112	23	3	80	41
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			0%			2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.968			0.996			0.986			0.955	
Flt Protected		0.994			0.996			0.979			0.999	
Satd. Flow (prot)	0	1667	0	0	1694	0	0	1665	0	0	1653	0
Flt Permitted		0.994			0.996			0.979			0.999	
Satd. Flow (perm)	0	1667	0	0	1694	0	0	1665	0	0	1653	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		643			960			563			720	
Travel Time (s)		17.5			26.2			15.4			19.6	
Confl. Peds. (#/hr)	3		14	14		3	6		3	3		6
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
Heavy Vehicles (%)	3%	1%	0%	8%	2%	0%	0%	3%	0%	0%	0%	0%
Adj. Flow (vph)	69	407	147	33	331	12	108	124	26	3	89	46
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	623	0	0	376	0	0	258	0	0	138	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	62	366	132	30	298	11	97	112	23	3	80	41
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			2%	
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)	69	407	147	33	331	12	108	124	26	3	89	46
Pedestrians		6			3			14			3	
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		1			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	346			567			1132	1045	497	1115	1112	346
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	346			567			1132	1045	497	1115	1112	346
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			97			0	39	96	96	53	93
cM capacity (veh/h)	1204			964			98	204	569	85	189	696

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	622	377	258	138
Volume Left	69	33	108	3
Volume Right	147	12	26	46
cSH	1204	964	147	239
Volume to Capacity	0.06	0.03	1.75	0.58
Queue Length 95th (ft)	5	3	474	81
Control Delay (s)	1.5	1.1	418.7	38.7
Lane LOS	A	A	F	E
Approach Delay (s)	1.5	1.1	418.7	38.7
Approach LOS			F	E

Intersection Summary			
Average Delay	82.2		
Intersection Capacity Utilization	79.7%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.971			0.958			0.978			0.993	
Flt Protected		0.995			0.997			0.988			0.980	
Satd. Flow (prot)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Flt Permitted		0.995			0.997			0.988			0.980	
Satd. Flow (perm)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		3269			1699			1136			924	
Travel Time (s)		89.2			46.3			31.0			25.2	
Confl. Peds. (#/hr)	1		15	15		1	9		3	3		9
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
Heavy Vehicles (%)	7%	1%	0%	0%	1%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	36	234	74	24	234	118	96	221	63	115	160	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	344	0	0	376	0	0	380	0	0	289	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
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)	36	234	74	24	234	118	96	221	63	115	160	14

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	344	376	379	290
Volume Left (vph)	36	24	96	115
Volume Right (vph)	74	118	63	14
Hadj (s)	-0.08	-0.16	-0.01	0.07
Departure Headway (s)	8.0	7.8	8.0	8.4
Degree Utilization, x	0.77	0.82	0.84	0.68
Capacity (veh/h)	422	438	434	385
Control Delay (s)	32.7	37.3	40.3	27.1
Approach Delay (s)	32.7	37.3	40.3	27.1
Approach LOS	D	E	E	D

Intersection Summary			
Delay	34.9		
HCM Level of Service	D		
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		0	0		25	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978				0.850		0.987			0.985	
Flt Protected		0.994			0.995			0.991			0.981	
Satd. Flow (prot)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Flt Permitted		0.994			0.995			0.991			0.981	
Satd. Flow (perm)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		679			2026			1723			3269	
Travel Time (s)		18.5			55.3			47.0			89.2	
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
Heavy Vehicles (%)	0%	2%	0%	0%	0%	1%	0%	0%	0%	0%	2%	0%
Adj. Flow (vph)	38	244	55	26	243	104	51	212	29	95	127	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	337	0	0	269	104	0	292	0	0	250	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
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)	38	244	55	26	243	104	51	212	29	95	127	28

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	337	268	104	291	249
Volume Left (vph)	38	26	0	51	95
Volume Right (vph)	55	0	104	29	28
Hadj (s)	-0.05	0.05	-0.68	-0.02	0.03
Departure Headway (s)	6.7	7.2	6.5	6.8	7.0
Degree Utilization, x	0.63	0.54	0.19	0.55	0.48
Capacity (veh/h)	492	458	512	479	457
Control Delay (s)	20.5	17.1	9.7	17.9	16.4
Approach Delay (s)	20.5	15.0		17.9	16.4
Approach LOS	C	C		C	C

Intersection Summary			
Delay	17.4		
HCM Level of Service	C		
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	122	253	382	97	78	99
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Grade (%)		0%	0%		2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.973		0.925	
Flt Protected		0.984			0.978	
Satd. Flow (prot)	0	1683	1696	0	1567	0
Flt Permitted		0.984			0.978	
Satd. Flow (perm)	0	1683	1696	0	1567	0
Link Speed (mph)		30	30		35	
Link Distance (ft)		819	1665		1723	
Travel Time (s)		18.6	37.8		33.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	5%	1%	0%	2%	0%	0%
Adj. Flow (vph)	136	281	424	108	87	110
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	417	532	0	197	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	122	253	382	97	78	99
Sign Control		Free	Free		Stop	
Grade		0%	0%		2%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	136	281	424	108	87	110
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	532				1031	478
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	532				1031	478
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	87				62	81
cM capacity (veh/h)	1020				226	591

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	417	532	197
Volume Left	136	0	87
Volume Right	0	108	110
cSH	1020	1700	345
Volume to Capacity	0.13	0.31	0.57
Queue Length 95th (ft)	11	0	84
Control Delay (s)	3.9	0.0	28.4
Lane LOS	A		D
Approach Delay (s)	3.9	0.0	28.4
Approach LOS			D

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

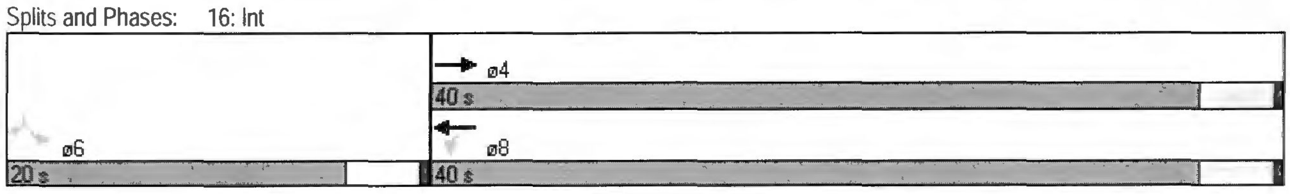
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	186	252	296	312	0	0	0	0	40	0	190
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.922										0.850
Flt Protected					0.976					0.950		
Satd. Flow (prot)	0	1582	0	0	1675	0	0	0	0	1630	0	1458
Flt Permitted					0.606					0.950		
Satd. Flow (perm)	0	1582	0	0	1040	0	0	0	0	1630	0	1458
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		203										200
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		248			489			335			338	
Travel Time (s)		5.6			11.1			7.6			7.7	
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
Adj. Flow (vph)	0	196	265	312	328	0	0	0	0	42	0	200
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	461	0	0	640	0	0	0	0	42	0	200
Turn Type				Perm						custom		custom
Protected Phases		4			8							
Permitted Phases				8						6		6
Detector Phase		4		8	8					6		6
Switch Phase												
Minimum Initial (s)		4.0		4.0	4.0					4.0		4.0
Minimum Split (s)		20.0		20.0	20.0					20.0		20.0
Total Split (s)	0.0	40.0	0.0	40.0	40.0	0.0	0.0	0.0	0.0	20.0	0.0	20.0
Total Split (%)	0.0%	66.7%	0.0%	66.7%	66.7%	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	33.3%
Maximum Green (s)		36.0		36.0	36.0					16.0		16.0
Yellow Time (s)		3.5		3.5	3.5					3.5		3.5
All-Red Time (s)		0.5		0.5	0.5					0.5		0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0		3.0	3.0					3.0		3.0
Recall Mode		None		None	None					Min		Min
Walk Time (s)		5.0		5.0	5.0					5.0		5.0
Flash Dont Walk (s)		11.0		11.0	11.0					11.0		11.0
Pedestrian Calls (#/hr)		0		0	0					0		0
v/c Ratio		0.39			0.88					0.18		0.53
Control Delay		3.0			24.8					20.9		9.3
Queue Delay		0.0			0.0					0.0		0.0
Total Delay		3.0			24.8					20.9		9.3
Queue Length 50th (ft)		19			101					11		0
Queue Length 95th (ft)		62			#385					33		44
Internal Link Dist (ft)		168			409			255			258	
Turn Bay Length (ft)												
Base Capacity (vph)		1170			729					508		592
Starvation Cap Reductn		0			0					0		0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0			0					0		0
Storage Cap Reductn		0			0					0		0
Reduced v/c Ratio		0.39			0.88					0.08		0.34

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 51.4
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
\# *95th percentile volume exceeds capacity, queue may be longer.*
Queue shown is maximum after two cycles.

Splits and Phases: 16: Int



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	186	252	296	312	0	0	0	0	40	0	190
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
Lane Util. Factor		1.00			1.00					1.00		1.00
Frt		0.92			1.00					1.00		0.85
Flt Protected		1.00			0.98					0.95		1.00
Satd. Flow (prot)		1583			1675					1630		1458
Flt Permitted		1.00			0.61					0.95		1.00
Satd. Flow (perm)		1583			1040					1630		1458
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)	0	196	265	312	328	0	0	0	0	42	0	200
RTOR Reduction (vph)	0	61	0	0	0	0	0	0	0	0	0	171
Lane Group Flow (vph)	0	400	0	0	640	0	0	0	0	42	0	29
Turn Type				Perm						custom		custom
Protected Phases		4			8							
Permitted Phases				8						6		6
Actuated Green, G (s)		36.1			36.1					7.4		7.4
Effective Green, g (s)		36.1			36.1					7.4		7.4
Actuated g/C Ratio		0.70			0.70					0.14		0.14
Clearance Time (s)		4.0			4.0					4.0		4.0
Vehicle Extension (s)		3.0			3.0					3.0		3.0
Lane Grp Cap (vph)		1110			729					234		209
v/s Ratio Prot		0.25										
v/s Ratio Perm					c0.62					c0.03		0.02
v/c Ratio		0.36			0.88					0.18		0.14
Uniform Delay, d1		3.1			6.0					19.4		19.3
Progression Factor		1.00			1.00					1.00		1.00
Incremental Delay, d2		0.2			11.6					0.4		0.3
Delay (s)		3.3			17.6					19.8		19.6
Level of Service		A			B					B		B
Approach Delay (s)		3.3			17.6			0.0			19.6	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	51.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↱		↰		↱			
Volume (vph)	180	46	0	0	298	84	310	0	202	0	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.970				0.850			
Flt Protected		0.962					0.950					
Satd. Flow (prot)	0	1650	0	0	1664	0	1630	0	1458	0	0	0
Flt Permitted		0.489					0.950					
Satd. Flow (perm)	0	839	0	0	1664	0	1630	0	1458	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					34				213			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		489			371			364			347	
Travel Time (s)		11.1			8.4			8.3			7.9	
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
Adj. Flow (vph)	189	48	0	0	314	88	326	0	213	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	237	0	0	402	0	326	0	213	0	0	0
Turn Type	Perm						custom		custom			
Protected Phases		4			8							
Permitted Phases	4						2		2			
Detector Phase	4	4			8		2		2			
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0		4.0		4.0			
Minimum Split (s)	20.0	20.0			20.0		20.0		20.0			
Total Split (s)	34.0	34.0	0.0	0.0	34.0	0.0	26.0	0.0	26.0	0.0	0.0	0.0
Total Split (%)	56.7%	56.7%	0.0%	0.0%	56.7%	0.0%	43.3%	0.0%	43.3%	0.0%	0.0%	0.0%
Maximum Green (s)	30.0	30.0			30.0		22.0		22.0			
Yellow Time (s)	3.5	3.5			3.5		3.5		3.5			
All-Red Time (s)	0.5	0.5			0.5		0.5		0.5			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0		3.0		3.0			
Recall Mode	None	None			None		Min		Min			
Walk Time (s)	5.0	5.0			5.0		5.0		5.0			
Flash Dont Walk (s)	11.0	11.0			11.0		11.0		11.0			
Pedestrian Calls (#/hr)	0	0			0		0		0			
v/c Ratio		0.66			0.55		0.58		0.33			
Control Delay		19.7			11.1		16.7		4.0			
Queue Delay		0.0			0.0		0.0		0.0			
Total Delay		19.7			11.1		16.7		4.0			
Queue Length 50th (ft)		34			48		50		0			
Queue Length 95th (ft)		122			142		161		36			
Internal Link Dist (ft)		409			291			284			267	
Turn Bay Length (ft)												
Base Capacity (vph)		667			1331		1025		996			
Starvation Cap Reductn		0			0		0		0			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0			0		0		0			
Storage Cap Reductn		0			0		0		0			
Reduced v/c Ratio		0.36			0.30		0.32		0.21			

Intersection Summary

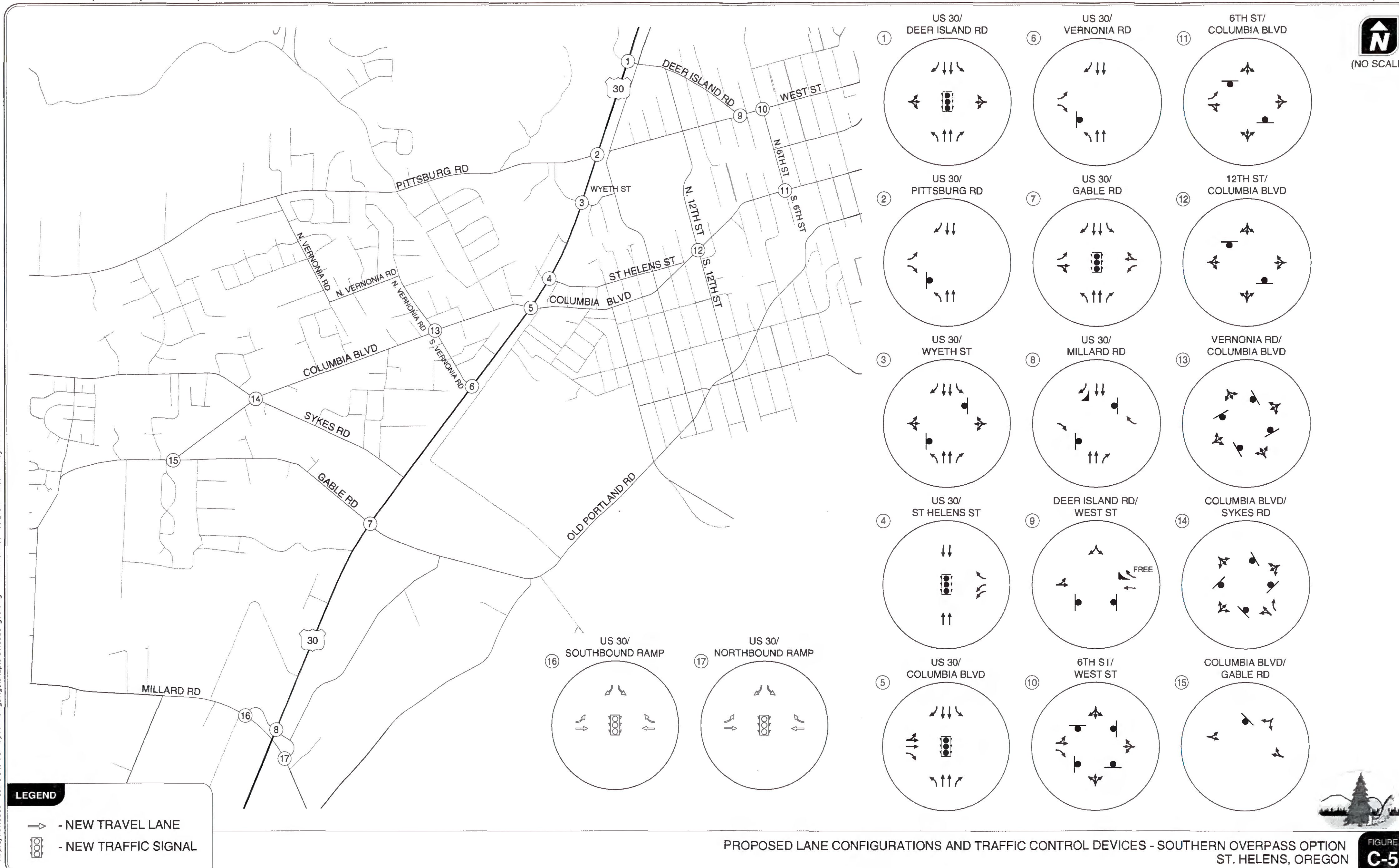
Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 39
Natural Cycle: 50
Control Type: Actuated-Uncoordinated

Splits and Phases: 17: Int

ø2 26 s
ø4 34 s
ø8 34 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↱		↰		↱			
Volume (vph)	180	46	0	0	298	84	310	0	202	0	0	0
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			
Lane Util. Factor		1.00			1.00		1.00		1.00			
Frt		1.00			0.97		1.00		0.85			
Flt Protected		0.96			1.00		0.95		1.00			
Satd. Flow (prot)		1650			1665		1630		1458			
Flt Permitted		0.49			1.00		0.95		1.00			
Satd. Flow (perm)		839			1665		1630		1458			
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)	189	48	0	0	314	88	326	0	213	0	0	0
RTOR Reduction (vph)	0	0	0	0	19	0	0	0	138	0	0	0
Lane Group Flow (vph)	0	237	0	0	383	0	326	0	75	0	0	0
Turn Type	Perm						custom		custom			
Protected Phases		4			8							
Permitted Phases	4						2		2			
Actuated Green, G (s)		16.6			16.6		13.5		13.5			
Effective Green, g (s)		16.6			16.6		13.5		13.5			
Actuated g/C Ratio		0.44			0.44		0.35		0.35			
Clearance Time (s)		4.0			4.0		4.0		4.0			
Vehicle Extension (s)		3.0			3.0		3.0		3.0			
Lane Grp Cap (vph)		366			725		578		517			
v/s Ratio Prot					0.23							
v/s Ratio Perm		c0.28					c0.20		0.05			
v/c Ratio		0.65			0.53		0.56		0.15			
Uniform Delay, d1		8.5			7.9		9.9		8.4			
Progression Factor		1.00			1.00		1.00		1.00			
Incremental Delay, d2		3.9			0.7		1.3		0.1			
Delay (s)		12.4			8.6		11.2		8.5			
Level of Service		B			A		B		A			
Approach Delay (s)		12.4			8.6			10.1			0.0	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM Average Control Delay	10.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	38.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



PROPOSED LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES - SOUTHERN OVERPASS OPTION
ST. HELENS, OREGON

FIGURE C-5

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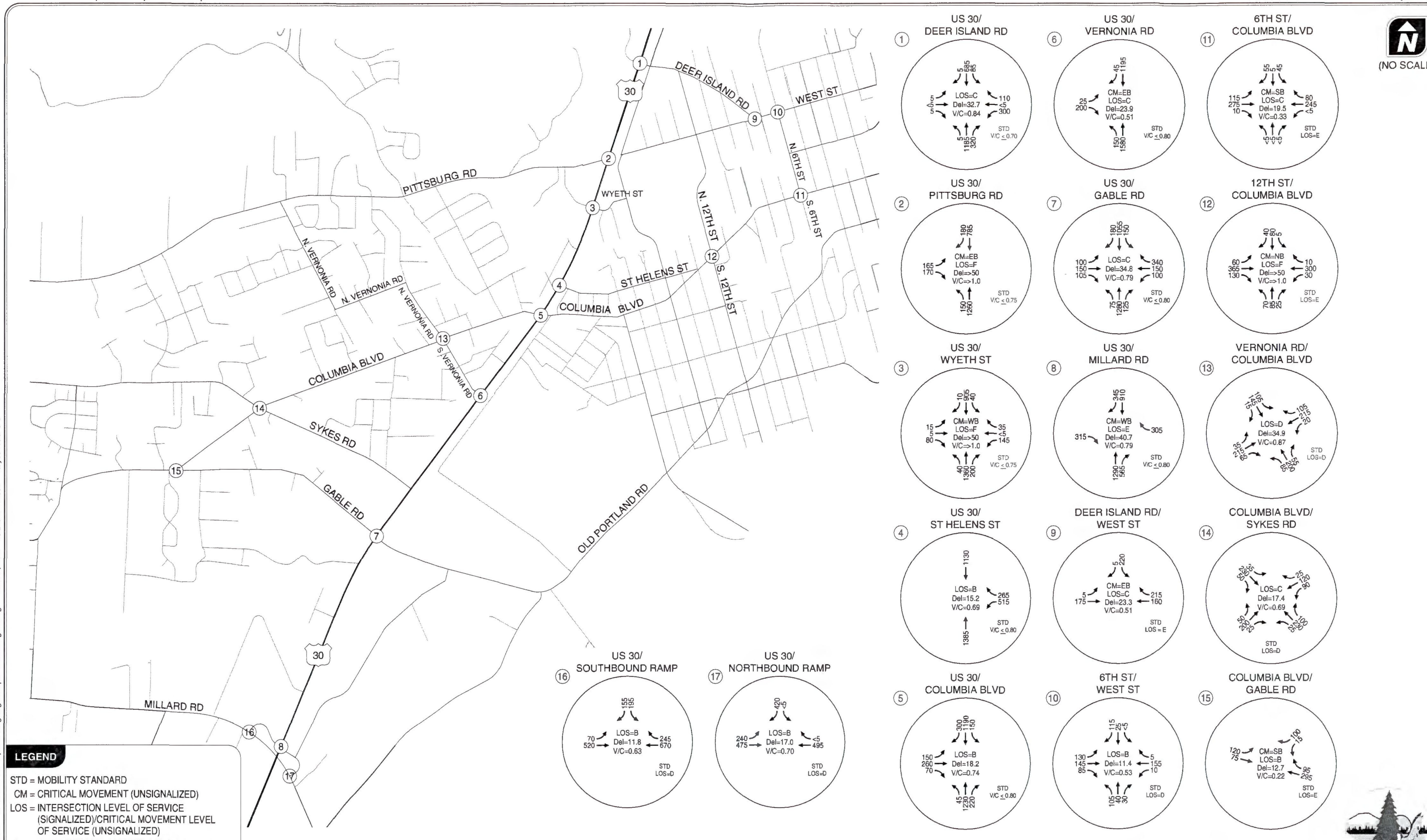


LEGEND

STD = MOBILITY STANDARD
CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

TOTAL TRAFFIC CONDITIONS - SOUTHERN OVERPASS OPTION
ST. HELENS, OREGON

FIGURE C-6

H:\projfile\10639 - St Helens TSP Update\dwgs\figs\chapter5\10639fig03.dwg Feb 23, 2011 - 10:27am - mbell Layout Tab: C-6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	5	1	7	298	2	109	5	1185	321	85	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	110		300	110		110
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.927			0.964				0.850			0.850
Flt Protected		0.981			0.965		0.950			0.950		
Satd. Flow (prot)	0	1215	0	0	1628	0	1710	3353	1473	1662	3288	916
Flt Permitted		0.895			0.777		0.950			0.950		
Satd. Flow (perm)	0	1108	0	0	1311	0	1710	3353	1473	1662	3288	916
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			17				338			5
Link Speed (mph)		30			30			50			50	
Link Distance (ft)		225			179			1625			999	
Travel Time (s)		5.1			4.1			22.2			13.6	
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
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Adj. Flow (vph)	5	1	7	314	2	115	5	1247	338	89	723	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	13	0	0	431	0	5	1247	338	89	723	6
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	34.0	34.0		34.0	34.0		8.5	30.5	30.5	9.5	32.5	32.5
Total Split (s)	48.0	48.0	0.0	48.0	48.0	0.0	8.5	58.0	58.0	14.0	63.5	63.5
Total Split (%)	40.0%	40.0%	0.0%	40.0%	40.0%	0.0%	7.1%	48.3%	48.3%	11.7%	52.9%	52.9%
Maximum Green (s)	44.0	44.0		44.0	44.0		4.0	52.5	52.5	10.0	58.0	58.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	5.0	5.0	4.0	5.0	5.0
All-Red Time (s)	0.0	0.0		0.0	0.0		0.5	0.5	0.5	0.0	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.5	5.5	5.5	4.0	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	5.1	5.1	2.5	5.1	5.1
Minimum Gap (s)	2.0	2.0		2.0	2.0		1.0	3.1	3.1	1.0	3.1	3.1
Time Before Reduce (s)	5.0	5.0		5.0	5.0		8.0	10.0	10.0	8.0	10.0	10.0
Time To Reduce (s)	5.0	5.0		5.0	5.0		3.0	20.0	20.0	3.0	20.0	20.0
Recall Mode	None	None		None	None		None	Max	Max	None	Max	Max
Walk Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Flash Dont Walk (s)	25.0	25.0		25.0	25.0			20.0	20.0		22.0	22.0
Pedestrian Calls (#/hr)	0	0		0	0			0	0		0	0
v/c Ratio		0.03			0.94		0.08	0.81	0.39	0.67	0.39	0.01
Control Delay		17.3			64.4		59.2	33.0	3.6	77.2	16.2	9.7
Queue Delay		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		17.3			64.4		59.2	33.0	3.6	77.2	16.2	9.7
Queue Length 50th (ft)		3			299		4	446	0	68	161	0
Queue Length 95th (ft)		17			#493		18	546	54	#141	242	8
Internal Link Dist (ft)		145			99			1545			919	
Turn Bay Length (ft)							110		300	110		110
Base Capacity (vph)		431			515		60	1541	860	146	1841	515
Starvation Cap Reductn		0			0		0	0	0	0	0	0
Spillback Cap Reductn		0			0		0	0	0	0	0	0
Storage Cap Reductn		0			0		0	0	0	0	0	0
Reduced v/c Ratio		0.03			0.84		0.08	0.81	0.39	0.61	0.39	0.01

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 114.8
Natural Cycle: 90
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Deer Island Rd & US 30

Lane Configurations												
Volume (vph)	5	1	7	298	2	109	5	1185	321	85	687	6
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Lane Util. Factor		1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.93			0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98			0.96		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1215			1628		1710	3353	1473	1662	3288	916
Flt Permitted		0.89			0.78		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1109			1310		1710	3353	1473	1662	3288	916
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)	5	1	7	314	2	115	5	1247	338	89	723	6
RTOR Reduction (vph)	0	5	0	0	11	0	0	0	177	0	0	2
Lane Group Flow (vph)	0	8	0	0	420	0	5	1247	161	89	723	4
Heavy Vehicles (%)	20%	100%	29%	0%	0%	0%	0%	2%	1%	0%	4%	67%
Turn Type	Perm			Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Actuated Green, G (s)		39.3			39.3		0.8	56.5	56.5	9.1	64.3	64.3
Effective Green, g (s)		39.3			39.3		0.8	56.5	56.5	9.1	64.3	64.3
Actuated g/C Ratio		0.33			0.33		0.01	0.48	0.48	0.08	0.54	0.54
Clearance Time (s)		4.0			4.0		4.5	5.5	5.5	4.0	5.5	5.5
Vehicle Extension (s)		2.5			2.5		2.5	5.1	5.1	2.5	5.1	5.1
Lane Grp Cap (vph)		368			435		12	1600	703	128	1786	497
v/s Ratio Prot							0.00	c0.37		c0.05	0.22	
v/s Ratio Perm		0.01			c0.32				0.11			0.00
v/c Ratio		0.02			0.96		0.42	0.78	0.23	0.70	0.40	0.01
Uniform Delay, d1		26.6			38.9		58.6	25.8	18.2	53.3	15.8	12.4
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0			33.8		16.1	3.8	0.8	14.0	0.7	0.0
Delay (s)		26.6			72.7		74.7	29.6	18.9	67.3	16.5	12.4
Level of Service		C			E		E	C	B	E	B	B
Approach Delay (s)		26.6			72.7			27.5			22.0	
Approach LOS		C			E			C			C	

Intersection Summary			
HCM Average Control Delay	32.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	118.4	Sum of lost time (s)	13.5
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	167	172	150	1258	785	179
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	25	100			50
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1599	1377	1629	3320	3257	1443
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1599	1377	1629	3320	3257	1443
Link Speed (mph)	35			40	40	
Link Distance (ft)	567			871	1625	
Travel Time (s)	11.0			14.8	27.7	
Confl. Peds. (#/hr)	1					
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	4%	8%	5%	3%	5%	6%
Adj. Flow (vph)	174	179	156	1310	818	186
Shared Lane Traffic (%)						
Lane Group Flow (vph)	174	179	156	1310	818	186
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Lane Configurations						
Volume (veh/h)	167	172	150	1258	785	179
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	174	179	156	1310	818	186
Pedestrians					1	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)		1				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1786	409	818			
vC1, stage 1 conf vol	818					
vC2, stage 2 conf vol	969					
vCu, unblocked vol	1786	409	818			
tC, single (s)	6.9	7.1	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.4	2.2			
p0 queue free %	20	69	80			
cM capacity (veh/h)	216	575	787			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	353	156	655	655	409	409	186
Volume Left	174	156	0	0	0	0	0
Volume Right	179	0	0	0	0	0	186
cSH	347	787	1700	1700	1700	1700	1700
Volume to Capacity	1.02	0.20	0.39	0.39	0.24	0.24	0.11
Queue Length 95th (ft)	297	18	0	0	0	0	0
Control Delay (s)	88.3	10.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	B					
Approach Delay (s)	88.3	1.1			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay	11.6		
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	13	6	80	146	2	34	40	1362	202	40	907	11
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		0	0		0	85		250	85		25
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor												
Frt		0.891			0.975				0.850			0.850
Flt Protected		0.993			0.961		0.950			0.950		
Satd. Flow (prot)	0	1451	0	0	1614	0	1710	3226	1488	1662	3196	1530
Flt Permitted		0.993			0.961		0.950			0.950		
Satd. Flow (perm)	0	1451	0	0	1614	0	1710	3226	1488	1662	3196	1530
Link Speed (mph)		25			25			40			40	
Link Distance (ft)		275			614			1403			871	
Travel Time (s)		7.5			16.7			23.9			14.8	
Confl. Peds. (#/hr)			3	3								
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
Heavy Vehicles (%)	8%	0%	7%	2%	0%	0%	0%	6%	0%	0%	7%	0%
Adj. Flow (vph)	14	6	84	154	2	36	42	1434	213	42	955	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	104	0	0	192	0	42	1434	213	42	955	12
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	13	6	80	146	2	34	40	1362	202	40	907	11
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)	14	6	84	154	2	36	42	1434	213	42	955	12
Pedestrians								3				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1877	2769	480	2170	2568	717	966			1646		
vC1, stage 1 conf vol	1039	1039		1518	1518							
vC2, stage 2 conf vol	838	1731		652	1051							
vCu, unblocked vol	1877	2769	480	2170	2568	717	966			1646		
tC, single (s)	7.7	6.5	7.0	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.7	5.5		6.5	5.5							
tF (s)	3.6	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	93	84	0	98	90	94			89		
cM capacity (veh/h)	151	87	517	105	135	377	721			398		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	104	192	42	717	717	213	42	477	477	12
Volume Left	14	154	42	0	0	0	42	0	0	0
Volume Right	84	36	0	0	0	213	0	0	0	12
cSH	320	121	721	1700	1700	1700	398	1700	1700	1700
Volume to Capacity	0.33	1.58	0.06	0.42	0.42	0.13	0.11	0.28	0.28	0.01
Queue Length 95th (ft)	35	349	5	0	0	0	9	0	0	0
Control Delay (s)	21.6	360.4	10.3	0.0	0.0	0.0	15.1	0.0	0.0	0.0
Lane LOS	C	F	B				C			
Approach Delay (s)	21.6	360.4	0.3				0.6			
Approach LOS	C	F								

Intersection Summary			
Average Delay	24.2		
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↱	↑↑			↑↑
Volume (vph)	514	265	1386	0	0	1132
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor		0.98				
Frt		0.850				
Flt Protected	0.950					
Satd. Flow (prot)	3193	1458	3226	0	0	3420
Flt Permitted	0.950					
Satd. Flow (perm)	3193	1436	3226	0	0	3420
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		52				
Link Speed (mph)	25		35			35
Link Distance (ft)	349		598			1403
Travel Time (s)	9.5		11.6			27.3
Confl. Bikes (#/hr)		4				
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Adj. Flow (vph)	541	279	1459	0	0	1192
Shared Lane Traffic (%)						
Lane Group Flow (vph)	541	279	1459	0	0	1192
Turn Type		Perm				
Protected Phases	8		2			6
Permitted Phases		8				
Detector Phase	8	8	2			6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0			4.0
Minimum Split (s)	20.0	20.0	20.0			20.0
Total Split (s)	28.0	28.0	62.0	0.0	0.0	62.0
Total Split (%)	31.1%	31.1%	68.9%	0.0%	0.0%	68.9%
Maximum Green (s)	24.0	24.0	58.0			58.0
Yellow Time (s)	3.5	3.5	3.5			3.5
All-Red Time (s)	0.5	0.5	0.5			0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Recall Mode	None	None	Max			Max
Walk Time (s)	5.0	5.0	5.0			5.0
Flash Dont Walk (s)	11.0	11.0	11.0			11.0
Pedestrian Calls (#/hr)	0	0	0			0
v/c Ratio	0.74	0.75	0.67			0.51
Control Delay	37.1	38.4	10.7			8.4
Queue Delay	0.0	0.0	0.4			0.0
Total Delay	37.1	38.4	11.1			8.4
Queue Length 50th (ft)	139	115	218			150
Queue Length 95th (ft)	194	204	329			224
Internal Link Dist (ft)	269		518			1323

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Turn Bay Length (ft)						
Base Capacity (vph)	894	440	2184			2315
Starvation Cap Reductn	0	0	255			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.61	0.63	0.76			0.51

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 85.9
Natural Cycle: 60
Control Type: Semi Act-Uncoord

Splits and Phases: 4: St Helens St & US 30

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	514	265	1386	0	0	1132
Ideal Flow (vphpl)	1750	1750	1800	1750	1750	1800
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	0.97	1.00	0.95			0.95
Frpb, ped/bikes	1.00	0.98	1.00			1.00
Flpb, ped/bikes	1.00	1.00	1.00			1.00
Frt	1.00	0.85	1.00			1.00
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	3193	1435	3226			3420
Flt Permitted	0.95	1.00	1.00			1.00
Satd. Flow (perm)	3193	1435	3226			3420
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	541	279	1459	0	0	1192
RTOR Reduction (vph)	0	40	0	0	0	0
Lane Group Flow (vph)	541	239	1459	0	0	1192
Confl. Bikes (#/hr)		4				
Heavy Vehicles (%)	1%	2%	6%	0%	5%	0%
Turn Type		Perm				
Protected Phases	8		2			6
Permitted Phases		8				
Actuated Green, G (s)	19.7	19.7	58.1			58.1
Effective Green, g (s)	19.7	19.7	58.1			58.1
Actuated g/C Ratio	0.23	0.23	0.68			0.68
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	733	329	2185			2316
v/s Ratio Prot	c0.17		c0.45			0.35
v/s Ratio Perm		0.17				
v/c Ratio	0.74	0.73	0.67			0.51
Uniform Delay, d1	30.7	30.6	8.2			6.9
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	3.9	7.8	1.6			0.8
Delay (s)	34.6	38.3	9.8			7.7
Level of Service	C	D	A			A
Approach Delay (s)	35.8		9.8			7.7
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	85.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

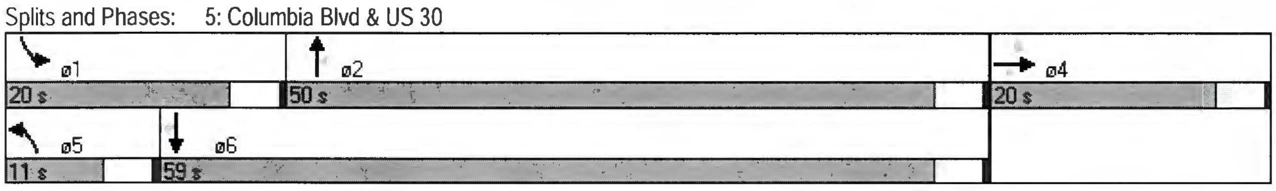
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱				↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	152	261	72	0	0	0	45	1232	221	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	80		80	0		0	120		430	120		155
Storage Lanes	1		1	0		0	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			0.850
Flt Protected		0.982					0.950			0.950		
Satd. Flow (prot)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Flt Permitted		0.982					0.950			0.950		
Satd. Flow (perm)	0	3245	1488	0	0	0	1660	3226	1444	1614	3257	1530
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			68						227			317
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		1699			1325			1662			598	
Travel Time (s)		46.3			36.1			32.4			11.6	
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
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Adj. Flow (vph)	160	275	76	0	0	0	47	1297	233	160	1255	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	435	76	0	0	0	47	1297	233	160	1255	317
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Detector Phase	4	4	4				5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0				8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	0.0	0.0	0.0	11.0	50.0	50.0	20.0	59.0	59.0
Total Split (%)	22.2%	22.2%	22.2%	0.0%	0.0%	0.0%	12.2%	55.6%	55.6%	22.2%	65.6%	65.6%
Maximum Green (s)	16.0	16.0	16.0				7.0	46.0	46.0	16.0	55.0	55.0
Yellow Time (s)	3.5	3.5	3.5				3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5				0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None				None	Max	Max	None	None	None
Walk Time (s)	5.0	5.0	5.0					5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0					11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0					0	0	0	0	0
v/c Ratio		0.78	0.24				0.37	0.75	0.26	0.66	0.58	0.28
Control Delay		44.9	12.3				47.6	19.7	2.7	48.1	10.6	1.6
Queue Delay		0.0	0.0				0.0	0.0	0.0	0.0	0.1	0.0
Total Delay		44.9	12.3				47.6	19.7	2.7	48.1	10.7	1.6
Queue Length 50th (ft)		121	4				25	284	2	84	216	0
Queue Length 95th (ft)		#182	41				61	392	36	148	281	30

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1619			1245			1582			518	
Turn Bay Length (ft)			80				120		430	120		155
Base Capacity (vph)		606	333				135	1731	880	301	2164	1123
Starvation Cap Reductn		0	0				0	0	0	0	200	0
Spillback Cap Reductn		0	0				0	0	0	0	0	0
Storage Cap Reductn		0	0				0	0	0	0	0	0
Reduced v/c Ratio		0.72	0.23				0.35	0.75	0.26	0.53	0.64	0.28

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 86
Natural Cycle: 75
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Columbia Blvd & US 30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	261	72	0	0	0	45	1232	221	152	1192	301
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		0.95	1.00				1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85				1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3244	1488				1660	3226	1444	1614	3257	1530
Flt Permitted		0.98	1.00				0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3244	1488				1660	3226	1444	1614	3257	1530
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)	160	275	76	0	0	0	47	1297	233	160	1255	317
RTOR Reduction (vph)	0	0	56	0	0	0	0	0	103	0	0	112
Lane Group Flow (vph)	0	435	20	0	0	0	47	1297	130	160	1255	205
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	3%	6%	3%	3%	5%	0%
Turn Type	Perm		Perm				Prot		Perm	Prot		Perm
Protected Phases		4					5	2		1	6	
Permitted Phases	4		4						2			6
Actuated Green, G (s)		14.9	14.9				4.0	47.7	47.7	13.0	56.7	56.7
Effective Green, g (s)		14.9	14.9				4.0	47.7	47.7	13.0	56.7	56.7
Actuated g/C Ratio		0.17	0.17				0.05	0.54	0.54	0.15	0.65	0.65
Clearance Time (s)		4.0	4.0				4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0				3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		552	253				76	1757	786	240	2108	990
v/s Ratio Prot							0.03	c0.40		c0.10	0.39	
v/s Ratio Perm		0.13	0.01						0.09			0.13
v/c Ratio		0.79	0.08				0.62	0.74	0.16	0.67	0.60	0.21
Uniform Delay, d1		34.8	30.6				41.1	15.2	10.0	35.3	8.9	6.3
Progression Factor		1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		7.3	0.1				14.1	2.8	0.5	6.8	0.5	0.1
Delay (s)		42.2	30.7				55.1	18.0	10.4	42.1	9.3	6.4
Level of Service		D	C				E	B	B	D	A	A
Approach Delay (s)		40.5			0.0			18.0			11.8	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	87.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	25	202	150	1580	1197	44
Ideal Flow (vphpl)	1750	1750	1800	1800	1800	1800
Storage Length (ft)	0	50	85			25
Storage Lanes	1	1	1			1
Taper Length (ft)	25	25	25			25
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1662	1444	1693	3353	3257	1485
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1662	1444	1693	3353	3257	1485
Link Speed (mph)	25			35	35	
Link Distance (ft)	1136			1937	1662	
Travel Time (s)	31.0			37.7	32.4	
Confl. Peds. (#/hr)	1		6			6
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	3%	1%	2%	5%	3%
Adj. Flow (vph)	26	213	158	1663	1260	46
Shared Lane Traffic (%)						
Lane Group Flow (vph)	26	213	158	1663	1260	46
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

	↗	↘	↖	↑	↓	↙
Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	25	202	150	1580	1197	44
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	213	158	1663	1260	46
Pedestrians	6				1	
Lane Width (ft)	12.0				12.0	
Walking Speed (ft/s)	4.0				4.0	
Percent Blockage	1				0	
Right turn flare (veh)		2				
Median type				TWLTL	TWLTL	
Median storage veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2414	636	1312			
vC1, stage 1 conf vol	1266					
vC2, stage 2 conf vol	1148					
vCu, unblocked vol	2414	636	1312			
tC, single (s)	6.8	7.0	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	49	70			
cM capacity (veh/h)	141	416	526			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	239	158	832	832	630	630	46
Volume Left	26	158	0	0	0	0	0
Volume Right	213	0	0	0	0	0	46
cSH	468	526	1700	1700	1700	1700	1700
Volume to Capacity	0.51	0.30	0.49	0.49	0.37	0.37	0.03
Queue Length 95th (ft)	71	31	0	0	0	0	0
Control Delay (s)	23.9	14.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	B					
Approach Delay (s)	23.9	1.3			0.0		
Approach LOS	C						

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑	↱	↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	100	150	107	100	150	340	75	1280	123	150	1053	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	130		0	215		0	130		310	130		140
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor		0.99										0.98
Frt		0.938				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1646	1633	0	1614	1733	1417	1710	3320	1365	1525	3320	1530
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1646	1633	0	1614	1733	1417	1710	3320	1365	1525	3320	1498
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29				249			126			113
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		1390			1323			3867			969	
Travel Time (s)		31.6			30.1			75.3			18.9	
Confl. Bikes (#/hr)			1									1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Adj. Flow (vph)	102	153	109	102	153	347	77	1306	126	153	1074	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	102	262	0	102	153	347	77	1306	126	153	1074	182
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7			3	8		5	2		1	6	
Permitted Phases		4				8			2			6
Detector Phase	7	4		3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	8.0	35.0		8.0	34.0	34.0	8.5	24.5	24.5	8.5	24.5	24.5
Total Split (s)	13.0	35.0	0.0	12.0	34.0	34.0	16.2	55.0	55.0	18.0	56.8	56.8
Total Split (%)	10.8%	29.2%	0.0%	10.0%	28.3%	28.3%	13.5%	45.8%	45.8%	15.0%	47.3%	47.3%
Maximum Green (s)	9.0	31.0		8.0	30.0	30.0	12.2	50.5	50.5	14.0	52.3	52.3
Yellow Time (s)	3.5	4.0		3.5	4.0	4.0	4.0	4.5	4.5	4.0	4.5	4.5
All-Red Time (s)	0.5	0.0		0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.5	4.0	4.5	4.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	2.3		3.0	2.3	2.3	2.3	4.1	4.1	2.3	4.1	4.1
Minimum Gap (s)	3.0	1.0		3.0	1.0	1.0	0.5	2.1	2.1	0.5	2.1	2.1
Time Before Reduce (s)	0.0	8.0		0.0	8.0	8.0	8.0	10.0	10.0	8.0	10.0	10.0
Time To Reduce (s)	0.0	3.0		0.0	3.0	3.0	3.0	20.0	20.0	3.0	20.0	20.0
Recall Mode	None	None		None	None	None	None	Max	Max	None	None	None
Walk Time (s)		5.0			5.0	5.0		5.0	5.0		5.0	5.0
Flash Dont Walk (s)		26.0			25.0	25.0		15.0	15.0		13.0	13.0
Pedestrian Calls (#/hr)		1			1	1		1	1		1	1
v/c Ratio	0.76	0.79		0.86	0.49	0.76	0.53	0.85	0.18	0.82	0.62	0.22

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	83.4	55.1		103.8	45.5	23.7	63.0	33.4	4.2	80.5	22.8	8.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	83.4	55.1		103.8	45.5	23.7	63.0	33.4	4.2	80.5	22.8	8.1
Queue Length 50th (ft)	71	159		72	98	62	52	415	0	105	281	24
Queue Length 95th (ft)	#181	250		#194	161	171	108	#653	37	#240	442	79
Internal Link Dist (ft)		1310			1243			3787			889	
Turn Bay Length (ft)	130			215			130		310	130		140
Base Capacity (vph)	136	487		119	478	572	192	1543	701	197	1734	837
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.54		0.86	0.32	0.61	0.40	0.85	0.18	0.78	0.62	0.22

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 109.2
Natural Cycle: 110
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Gable Rd & US30

ø2 55 s	ø1 18 s	ø3 12 s	ø4 35 s
ø5 16.2 s	ø6 56.8 s	ø7 13 s	ø8 34 s

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	150	107	100	150	340	75	1280	123	150	1053	178
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.5	4.5	4.0	4.5	4.5
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	0.99		1.00	1.00	1.00	1.00	1.00	1.00	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	0.94		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1646	1632		1614	1733	1417	1710	3320	1365	1525	3320	1498
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1646	1632		1614	1733	1417	1710	3320	1365	1525	3320	1498
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)	102	153	109	102	153	347	77	1306	126	153	1074	182
RTOR Reduction (vph)	0	24	0	0	0	205	0	0	68	0	0	54
Lane Group Flow (vph)	102	238	0	102	153	142	77	1306	58	153	1074	128
Confl. Bikes (#/hr)			1									1
Heavy Vehicles (%)	1%	0%	0%	3%	1%	5%	0%	3%	9%	9%	3%	0%
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7			3	8		5	2		1	6	
Permitted Phases		4				8			2			6
Actuated Green, G (s)	9.0	20.5		8.0	19.5	19.5	8.0	50.7	50.7	14.3	57.0	57.0
Effective Green, g (s)	9.0	20.5		8.0	19.5	19.5	8.0	50.7	50.7	14.3	57.0	57.0
Actuated g/C Ratio	0.08	0.19		0.07	0.18	0.18	0.07	0.46	0.46	0.13	0.52	0.52
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.5	4.5	4.0	4.5	4.5
Vehicle Extension (s)	3.0	2.3		3.0	2.3	2.3	2.3	4.1	4.1	2.3	4.1	4.1
Lane Grp Cap (vph)	135	304		117	307	251	124	1530	629	198	1720	776
v/s Ratio Prot	0.06			c0.06	0.09		0.05	c0.39		c0.10	0.32	
v/s Ratio Perm		c0.15				0.10			0.04			0.09
v/c Ratio	0.76	0.78		0.87	0.50	0.57	0.62	0.85	0.09	0.77	0.62	0.16
Uniform Delay, d1	49.4	42.6		50.5	40.8	41.4	49.5	26.4	16.7	46.3	18.9	14.0
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	21.1	11.8		46.1	0.7	2.1	7.6	6.3	0.3	16.0	0.8	0.1
Delay (s)	70.5	54.5		96.6	41.6	43.5	57.1	32.6	17.0	62.3	19.7	14.1
Level of Service	E	D		F	D	D	E	C	B	E	B	B
Approach Delay (s)		59.0			52.0			32.6			23.6	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.5
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱			↱			↑↑	↱		↑↑	↱
Volume (vph)	0	0	316	0	0	305	0	1291	567	0	912	346
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1800	1800	1750	1750	1800	1800
Storage Length (ft)	0		250	0		110	0		150	0		200
Storage Lanes	0		0	0		0	0		1	0		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor												
Frt		0.865			0.865				0.850			0.850
Flt Protected												
Satd. Flow (prot)	0	1514	0	0	1514	0	0	3288	1153	0	3288	1530
Flt Permitted												
Satd. Flow (perm)	0	1514	0	0	1514	0	0	3288	1153	0	3288	1530
Link Speed (mph)		40			40			45			45	
Link Distance (ft)		737			300			1086			3867	
Travel Time (s)		12.6			5.1			16.5			58.6	
Confl. Peds. (#/hr)			3			1			1			3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	29%	0%	4%	0%
Adj. Flow (vph)	0	0	329	0	0	318	0	1345	591	0	950	360
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	329	0	0	318	0	0	1345	591	0	950	360
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱			↱			↑↑	↱		↑↑	↱
Volume (veh/h)	0	0	316	0	0	305	0	1291	567	0	912	346
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	0	0	329	0	0	318	0	1345	591	0	950	360
Pedestrians		3			1			3			1	
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			TWLTL	
Median storage veh)											2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1944	2889	481	2153	2299	674	953			1936		
vC1, stage 1 conf vol	953	953		1346	1346							
vC2, stage 2 conf vol	991	1936		807	953							
vCu, unblocked vol	1944	2889	481	2153	2299	674	953			1936		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	38	100	100	21	100			100		
cM capacity (veh/h)	53	105	534	98	183	401	727			307		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	329	318	672	672	591	475	475	360
Volume Left	0	0	0	0	0	0	0	0
Volume Right	329	318	0	0	591	0	0	360
cSH	534	401	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.62	0.79	0.40	0.40	0.35	0.28	0.28	0.21
Queue Length 95th (ft)	104	172	0	0	0	0	0	0
Control Delay (s)	22.0	40.7	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	E						
Approach Delay (s)	22.0	40.7	0.0			0.0		
Approach LOS	C	E						

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Configurations						
Volume (vph)	5	174	160	217	219	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0			100	0	0
Storage Lanes	0			1	1	0
Taper Length (ft)	25			25	25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850	0.997	
Flt Protected		0.998			0.953	
Satd. Flow (prot)	0	1746	1716	1488	1647	0
Flt Permitted		0.998			0.953	
Satd. Flow (perm)	0	1746	1716	1488	1647	0
Link Speed (mph)		25	25		25	
Link Distance (ft)		2305	403		1964	
Travel Time (s)		62.9	11.0		53.6	
Confl. Peds. (#/hr)	5			5	3	4
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	2%	0%	1%	0%
Adj. Flow (vph)	6	193	178	241	243	6
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	199	178	241	249	0
Sign Control		Stop	Stop		Free	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	174	160	217	219	5
Sign Control		Stop	Stop		Free	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	6	193	178	241	243	6
Pedestrians		4	3		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)				4		
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	587	496	499	8	3	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	587	496	499	8	3	
tC, single (s)	7.1	6.5	6.5	6.2	4.1	
tC, 2 stage (s)						
tF (s)	3.5	4.0	4.0	3.3	2.2	
p0 queue free %	97	52	56	78	85	
cM capacity (veh/h)	189	404	400	1073	1622	

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	199	419	249
Volume Left	6	0	243
Volume Right	0	241	6
cSH	391	942	1622
Volume to Capacity	0.51	0.44	0.15
Queue Length 95th (ft)	69	58	13
Control Delay (s)	23.3	14.3	7.5
Lane LOS	C	B	A
Approach Delay (s)	23.3	14.3	7.5
Approach LOS	C	B	

Intersection Summary			
Average Delay	14.4		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		100	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.998			0.978			0.890	
Flt Protected		0.977			0.997			0.970			0.999	
Satd. Flow (prot)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Flt Permitted		0.977			0.997			0.970			0.999	
Satd. Flow (perm)	0	1710	1488	0	1741	0	0	1660	0	0	1556	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		403			853			1453			709	
Travel Time (s)		11.0			23.3			39.6			19.3	
Confl. Peds. (#/hr)	5					5			5	5		
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
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	142	161	92	10	170	3	119	42	31	2	27	127
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	303	92	0	183	0	0	192	0	0	156	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	128	145	83	9	153	3	107	38	28	2	24	114
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)	142	161	92	10	170	3	119	42	31	2	27	127

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	303	92	183	192	156
Volume Left (vph)	142	0	10	119	2
Volume Right (vph)	0	92	3	31	127
Hadj (s)	0.23	-0.70	0.00	0.03	-0.49
Departure Headway (s)	6.0	5.1	5.6	5.7	5.3
Degree Utilization, x	0.51	0.13	0.29	0.31	0.23
Capacity (veh/h)	573	677	591	567	601
Control Delay (s)	13.8	7.6	10.9	11.3	9.9
Approach Delay (s)	12.3		10.9	11.3	9.9
Approach LOS	B		B	B	A

Intersection Summary			
Delay	11.4		
HCM Level of Service	B		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥			✥			✥	
Volume (vph)	113	273	8	2	246	82	0	2	1	47	4	57
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			-1%			1%	
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.996			0.966			0.955			0.929	
Flt Protected	0.950										0.979	
Satd. Flow (prot)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Flt Permitted	0.950										0.979	
Satd. Flow (perm)	1646	1726	0	0	1678	0	0	1260	0	0	1534	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		559			839			582			1453	
Travel Time (s)		15.2			22.9			15.9			39.6	
Confl. Peds. (#/hr)			7	7					7	7		
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
Heavy Vehicles (%)	1%	1%	0%	0%	1%	0%	0%	0%	100%	3%	25%	2%
Adj. Flow (vph)	126	303	9	2	273	91	0	2	1	52	4	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	126	312	0	0	366	0	0	3	0	0	119	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	113	273	8	2	246	82	0	2	1	47	4	57
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			-1%			1%	
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)	126	303	9	2	273	91	0	2	1	52	4	63
Pedestrians					7			7				
Lane Width (ft)					12.0			12.0				
Walking Speed (ft/s)					4.0			4.0				
Percent Blockage					1			1				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	364			319			955	935	322	887	894	319
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	364			319			955	935	322	887	894	319
tC, single (s)	4.1			4.1			7.1	6.5	7.2	7.1	6.8	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	4.2	3.5	4.2	3.3
p0 queue free %	90			100			100	99	100	78	98	91
cM capacity (veh/h)	1200			1245			196	238	534	237	229	722

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	126	312	367	3	120
Volume Left	126	0	2	0	52
Volume Right	0	9	91	1	63
cSH	1200	1700	1245	292	367
Volume to Capacity	0.10	0.18	0.00	0.01	0.33
Queue Length 95th (ft)	9	0	0	1	35
Control Delay (s)	8.4	0.0	0.1	17.5	19.5
Lane LOS	A		A	C	C
Approach Delay (s)	2.4		0.1	17.5	19.5
Approach LOS				C	C

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (vph)	62	366	132	30	298	11	72	87	23	3	80	41
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Grade (%)		0%			0%			0%			2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.968			0.996			0.983			0.955	
Flt Protected		0.994			0.996			0.981			0.999	
Satd. Flow (prot)	0	1667	0	0	1694	0	0	1664	0	0	1653	0
Flt Permitted		0.994			0.996			0.981			0.999	
Satd. Flow (perm)	0	1667	0	0	1694	0	0	1664	0	0	1653	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		643			960			563			720	
Travel Time (s)		17.5			26.2			15.4			19.6	
Confl. Peds. (#/hr)	3		14	14		3	6		3	3		6
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
Heavy Vehicles (%)	3%	1%	0%	8%	2%	0%	0%	3%	0%	0%	0%	0%
Adj. Flow (vph)	69	407	147	33	331	12	80	97	26	3	89	46
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	623	0	0	376	0	0	203	0	0	138	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	62	366	132	30	298	11	72	87	23	3	80	41
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			2%	
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)	69	407	147	33	331	12	80	97	26	3	89	46
Pedestrians		6			3			14			3	
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		1			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	346			567			1132	1045	497	1102	1112	346
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	346			567			1132	1045	497	1102	1112	346
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			97			18	53	96	97	53	93
cM capacity (veh/h)	1204			964			98	204	569	106	189	696

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	622	377	202	138
Volume Left	69	33	80	3
Volume Right	147	12	26	46
cSH	1204	964	151	243
Volume to Capacity	0.06	0.03	1.33	0.57
Queue Length 95th (ft)	5	3	311	79
Control Delay (s)	1.5	1.1	245.4	37.7
Lane LOS	A	A	F	E
Approach Delay (s)	1.5	1.1	245.4	37.7
Approach LOS			F	E

Intersection Summary			
Average Delay	42.0		
Intersection Capacity Utilization	77.0%	ICU Level of Service	D
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.971			0.958			0.978			0.993	
Flt Protected		0.995			0.997			0.988			0.980	
Satd. Flow (prot)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Flt Permitted		0.995			0.997			0.988			0.980	
Satd. Flow (perm)	0	1667	0	0	1661	0	0	1653	0	0	1684	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		3269			1699			1136			924	
Travel Time (s)		89.2			46.3			31.0			25.2	
Confl. Peds. (#/hr)	1		15	15		1	9		3	3		9
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
Heavy Vehicles (%)	7%	1%	0%	0%	1%	0%	0%	4%	0%	0%	2%	0%
Adj. Flow (vph)	36	234	74	24	234	118	96	221	63	115	160	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	344	0	0	376	0	0	380	0	0	289	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	33	213	67	22	213	107	87	201	57	105	146	13
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)	36	234	74	24	234	118	96	221	63	115	160	14

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	344	376	379	290
Volume Left (vph)	36	24	96	115
Volume Right (vph)	74	118	63	14
Hadj (s)	-0.08	-0.16	-0.01	0.07
Departure Headway (s)	8.0	7.8	8.0	8.4
Degree Utilization, x	0.77	0.82	0.84	0.68
Capacity (veh/h)	422	438	434	385
Control Delay (s)	32.7	37.3	40.3	27.1
Approach Delay (s)	32.7	37.3	40.3	27.1
Approach LOS	D	E	E	D

Intersection Summary			
Delay	34.9		
HCM Level of Service	D		
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	0		0	0		25	0		0	0		0
Storage Lanes	0		0	0		1	0		0	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978				0.850		0.987			0.985	
Flt Protected		0.994			0.995			0.991			0.981	
Satd. Flow (prot)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Flt Permitted		0.994			0.995			0.991			0.981	
Satd. Flow (perm)	0	1677	0	0	1741	1473	0	1712	0	0	1674	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		679			2026			1723			3269	
Travel Time (s)		18.5			55.3			47.0			89.2	
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
Heavy Vehicles (%)	0%	2%	0%	0%	0%	1%	0%	0%	0%	0%	2%	0%
Adj. Flow (vph)	38	244	55	26	243	104	51	212	29	95	127	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	337	0	0	269	104	0	292	0	0	250	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			⬑	↱		✣			✣	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	36	229	52	24	228	98	48	199	27	89	119	26
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)	38	244	55	26	243	104	51	212	29	95	127	28

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	337	268	104	291	249
Volume Left (vph)	38	26	0	51	95
Volume Right (vph)	55	0	104	29	28
Hadj (s)	-0.05	0.05	-0.68	-0.02	0.03
Departure Headway (s)	6.7	7.2	6.5	6.8	7.0
Degree Utilization, x	0.63	0.54	0.19	0.55	0.48
Capacity (veh/h)	492	458	512	479	457
Control Delay (s)	20.5	17.1	9.7	17.9	16.4
Approach Delay (s)	20.5	15.0		17.9	16.4
Approach LOS	C	C		C	C

Intersection Summary			
Delay	17.4		
HCM Level of Service	C		
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

	↗	→	←	↖	↘	↙
Lane Configurations						
Volume (vph)	122	77	293	97	16	99
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Grade (%)		0%	0%		2%	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.966		0.884	
Flt Protected		0.970			0.993	
Satd. Flow (prot)	0	1641	1682	0	1521	0
Flt Permitted		0.970			0.993	
Satd. Flow (perm)	0	1641	1682	0	1521	0
Link Speed (mph)		30	30		35	
Link Distance (ft)		819	1665		1723	
Travel Time (s)		18.6	37.8		33.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	5%	1%	0%	2%	0%	0%
Adj. Flow (vph)	136	86	326	108	18	110
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	222	434	0	128	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	122	77	293	97	16	99
Sign Control		Free	Free		Stop	
Grade		0%	0%		2%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	136	86	326	108	18	110
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	433				736	379
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	433				736	379
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	88				95	84
cM capacity (veh/h)	1110				341	672

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	221	433	128
Volume Left	136	0	18
Volume Right	0	108	110
cSH	1110	1700	592
Volume to Capacity	0.12	0.25	0.22
Queue Length 95th (ft)	10	0	20
Control Delay (s)	5.8	0.0	12.7
Lane LOS	A		B
Approach Delay (s)	5.8	0.0	12.7
Approach LOS			B

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

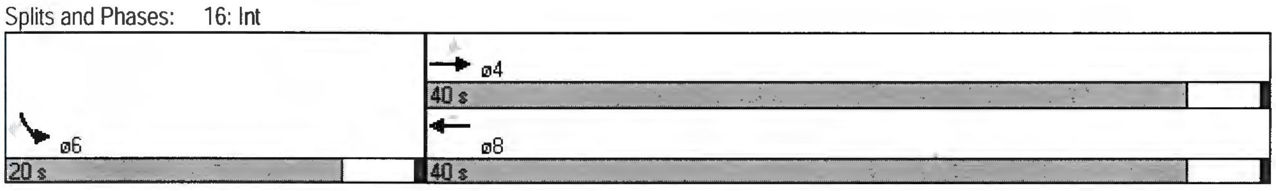
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	70	518	671	246	193	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (ft)	150			150	100	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25			25	25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1630	1716	1716	1458	1630	1458
Flt Permitted	0.223				0.950	
Satd. Flow (perm)	383	1716	1716	1458	1630	1458
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				259		161
Link Speed (mph)		30	30		30	
Link Distance (ft)		443	652		362	
Travel Time (s)		10.1	14.8		8.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	545	706	259	203	161
Shared Lane Traffic (%)						
Lane Group Flow (vph)	74	545	706	259	203	161
Turn Type	Perm			Perm		Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	40.0	40.0	40.0	40.0	20.0	20.0
Total Split (%)	66.7%	66.7%	66.7%	66.7%	33.3%	33.3%
Maximum Green (s)	36.0	36.0	36.0	36.0	16.0	16.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	Max	Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
v/c Ratio	0.37	0.61	0.79	0.29	0.39	0.28
Control Delay	12.6	11.3	16.7	1.8	19.2	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.6	11.3	16.7	1.8	19.2	5.3
Queue Length 50th (ft)	12	100	150	0	48	0
Queue Length 95th (ft)	37	170	261	22	117	38
Internal Link Dist (ft)		363	572		282	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Turn Bay Length (ft)	150			150	100	
Base Capacity (vph)	274	1229	1229	1117	519	574
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.44	0.57	0.23	0.39	0.28

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 51.5
Natural Cycle: 55
Control Type: Semi Act-Uncoord

Splits and Phases: 16: Int



	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	70	518	671	246	193	153
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1630	1716	1716	1458	1630	1458
Flt Permitted	0.22	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	383	1716	1716	1458	1630	1458
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	74	545	706	259	203	161
RTOR Reduction (vph)	0	0	0	123	0	110
Lane Group Flow (vph)	74	545	706	136	203	51
Turn Type	Perm			Perm		Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	26.9	26.9	26.9	26.9	16.4	16.4
Effective Green, g (s)	26.9	26.9	26.9	26.9	16.4	16.4
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.32	0.32
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	201	900	900	765	521	466
v/s Ratio Prot		0.32	c0.41		c0.12	
v/s Ratio Perm	0.19			0.09		0.04
v/c Ratio	0.37	0.61	0.78	0.18	0.39	0.11
Uniform Delay, d1	7.2	8.5	9.9	6.4	13.6	12.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	1.2	4.5	0.1	2.2	0.5
Delay (s)	8.3	9.7	14.4	6.5	15.7	12.8
Level of Service	A	A	B	A	B	B
Approach Delay (s)		9.5	12.3		14.4	
Approach LOS		A	B		B	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	51.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

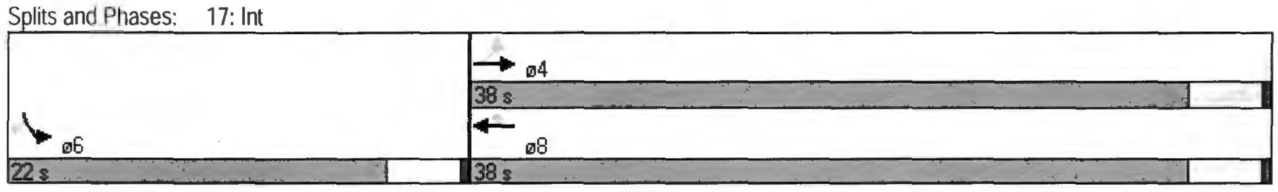
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	↰	↱
Volume (vph)	238	473	495	0	0	422
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (ft)	150			100	100	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25			25	25	25
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected	0.950					
Satd. Flow (prot)	1630	1716	1716	1716	1716	1458
Flt Permitted	0.338					
Satd. Flow (perm)	580	1716	1716	1716	1716	1458
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						331
Link Speed (mph)		30	30		30	
Link Distance (ft)		652	328		372	
Travel Time (s)		14.8	7.5		8.5	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	251	498	521	0	0	444
Shared Lane Traffic (%)						
Lane Group Flow (vph)	251	498	521	0	0	444
Turn Type	Perm			Perm		Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	38.0	38.0	38.0	38.0	22.0	22.0
Total Split (%)	63.3%	63.3%	63.3%	63.3%	36.7%	36.7%
Maximum Green (s)	34.0	34.0	34.0	34.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	Max	Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
v/c Ratio	0.91	0.61	0.64			0.60
Control Delay	51.0	12.8	13.4			9.0
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	51.0	12.8	13.4			9.0
Queue Length 50th (ft)	62	98	104			24
Queue Length 95th (ft)	#190	166	177			114
Internal Link Dist (ft)		572	248		292	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Turn Bay Length (ft)	150					
Base Capacity (vph)	399	1181	1181			742
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.63	0.42	0.44			0.60

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 51
Natural Cycle: 60
Control Type: Semi Act-Uncoord
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 17: Int



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑	↱	↰	↱
Volume (vph)	238	473	495	0	0	422
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0			4.0
Lane Util. Factor	1.00	1.00	1.00			1.00
Frt	1.00	1.00	1.00			0.85
Flt Protected	0.95	1.00	1.00			1.00
Satd. Flow (prot)	1630	1716	1716			1458
Flt Permitted	0.34	1.00	1.00			1.00
Satd. Flow (perm)	580	1716	1716			1458
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	251	498	521	0	0	444
RTOR Reduction (vph)	0	0	0	0	0	210
Lane Group Flow (vph)	251	498	521	0	0	234
Turn Type	Perm			Perm		Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Actuated Green, G (s)	24.2	24.2	24.2			18.6
Effective Green, g (s)	24.2	24.2	24.2			18.6
Actuated g/C Ratio	0.48	0.48	0.48			0.37
Clearance Time (s)	4.0	4.0	4.0			4.0
Vehicle Extension (s)	3.0	3.0	3.0			3.0
Lane Grp Cap (vph)	276	817	817			534
v/s Ratio Prot		0.29	0.30			
v/s Ratio Perm	c0.43					c0.16
v/c Ratio	0.91	0.61	0.64			0.44
Uniform Delay, d1	12.3	9.8	10.0			12.2
Progression Factor	1.00	1.00	1.00			1.00
Incremental Delay, d2	31.2	1.3	1.6			2.6
Delay (s)	43.5	11.1	11.6			14.8
Level of Service	D	B	B			B
Approach Delay (s)		22.0	11.6		14.8	
Approach LOS		C	B		B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	50.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

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