Appendices

Interstate 84 Exit 62 Interchange Area Management Plan

Interstate 84/ Cascade Avenue (Historic Columbia River Highway)

Interstate 84 Exit 63 & 64 Interchange Area Management Plan

Interstate 84/ 2nd Street & Interstate 84/ Button Bridge Road

Hood River, Oregon

Prepared for

City of Hood River
Hood River County
Oregon Department of Transportation

Prepared by

DKS Associates
Angelo Planning Group
Parametrix

December 2011

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF APPENDICES

APPENDIX A

City of Hood River Comprehensive Plan Amendments (Hearing Draft) – Exhibit C

EXHIBIT C

(To be inserted in **Goal 12 – Transportation** section of the Hood River Comprehensive Plan after Goal 7.)

INTERCHANGE AREA MANAGEMENT

GOAL 8: Protect the function and operation of the interstate highway interchanges consistent with the planned land uses in the vicinity of the interchanges.

POLICIES:

1. Provide for an adequate system of local roads and streets for access and circulation within the interchange areas that minimizes local traffic through the interchanges and on the interchange cross roads.

Action: *As part of the land division and development permit approval process the City will require future development to plan for and develop local roadway connections that are consistent with adopted IAMPs.*

2. Provide safe and efficient operations between the connecting roadways (and the local street network, if applicable) within adopted IAMP management areas in the City and the UGA.

Action: *Within the IAMP overlay, the City and County will approve development proposals only after it is demonstrated that proposed access and local circulation are consistent with the Access Management Plan in the applicable IAMP.*

Action: *Bicycle and pedestrian connections within the IAMP management areas will be required for new development consistent with adopted IAMPs and the City's Transportation System Plan. Connections for non-motorized transportation may be required of development even where street connections are not possible or required.*

3. Ensure that changes to the planned land use system are consistent with the preservation of the long-term transportation function of the interchange and the associated local street system.

Action: *Adopt regulations that require any proposed change to the Comprehensive Plan Map, Zoning Map, or the Development Code that would result in additional trips from what is allowed by the existing comprehensive plan to include a review of transportation impacts consistent with OAR 660-12-0060.*

Action: *Notify affected governmental units, including Hood River County and ODOT, of proposed changes to the adopted land use plan within the IAMP management areas to ensure local, regional and state coordination in planning for adequate transportation facilities.*

4. Recognize the importance of the interchange function to support the City's economic development goals and plans, including providing access to family wage jobs in the downtown, at the waterfront, and in west Hood River.

Action: *Support planned improvements to the interchanges that improve efficient and safe truck circulation and that facilitate the movement of goods to and from the City and within the County by managing access on local roads and monitoring trips generated by new development in the vicinity of interchanges.*

5. Partner with ODOT to ensure that system capacity for regional through trips and the timeliness of freight movements are considered when developing and implementing transportation plans and projects on Hood River area freight routes.

6. Support the design of the Historic Highway that provides a distinctive roadway character that is consistent with the City's vision to preserve the identity of that transportation corridor.

7. Working in conjunction with ODOT, help ensure that the functional capacity and safety of I-84 interchanges in Hood River are preserved and that sufficient revenue is generated to finance necessary improvements.

Action: *The City, in coordination with ODOT and Hood River County, shall participate in monitoring the cumulative peak hour trip generation impact from new development by enacting rules that require traffic studies for development near interchanges to assess the impact on interchange facilities.*

Action: *The City and Hood River County will review development regulations and funding resources, including system development charges, to ensure that new development is providing its fair share of revenue to finance needed local transportation improvements in interchange areas.*

In addition to the above general IAMP policies, which are applicable to all Hood River interchanges, **the following policies are applicable to the Exit 62 interchange**:

8. Support the design of the Historic Highway in the vicinity of Exit 62 as a gateway into the City.

9. Partner with ODOT to ensure that planned improvements to the local roadway system are consistent with the proposed improvements to Exit 62, and also that those local

system improvements enhance safety and reduce turning conflicts in the vicinity of the interchange.

Action: *Determine and implement appropriate funding measures to ensure the construction of the realignment of Country Club Road.*

10. Support safe bicycle and pedestrian facilities in the vicinity of Exit 62 that provide connectivity throughout the area and to destinations along the proposed Historic Columbia River Highway State Trail and the Hood River Valley.

In addition to the IAMP policies that are generally applicable to all of the interchanges within the City of Hood River, **the following policies are applicable to the Exit 63/64 interchange area**:

11. Recognize the strategic importance of Exit 63 as an essential transportation facility that provides access to the City's two major employment districts, the Downtown and the Waterfront, and plays a critical role in the vitality of these two regional employment areas.

12. Support construction of safe and efficient bicycle and pedestrian facilities in the vicinity of Exit 63 that encourage employees to travel to work via alternative modes of transportation and to provide opportunities for residents and visitors alike to access recreational opportunities along the Columbia River.

13. Recognize the vital role Exit 64 has in providing regional connectivity between destinations in Hood River County and the rest of the state, via I-84, and in Washington State via OR 35.

14. Support safe bicycle and pedestrian facilities in the vicinity of Exit 64 that provide recreational access to the Columbia River and to the Historic Columbia River Highway State Trail.

APPENDIX B

City of Hood River Municipal Code Amendments (Hearing Draft) – Exhibits D and E

(To be inserted in **Hood River Municipal Code** Title 17.03.)

Section 17.03.120. Interchange Area Management Plan (IAMP) Overlay Zone

The purpose of the IAMP Overlay Zone is the long-range preservation of operational efficiency and safety of the highway interchanges within the City of Hood River, which provides access from and to Interstate 84 for residents and businesses throughout the city. The interchanges are a vital transportation link for regional travel and freight movement and provide connectivity between the east and west side of the community and to employment and recreational opportunities at the waterfront. Preserving capacity and ensuring the safety of these interchanges and the local transportation systems in their vicinity is essential to visitors, residences, and existing businesses as well as to the continued economic vitality along the Columbia River and to community growth and development in the vicinity of the interchanges.

A. Boundary

The boundary of the IAMP Overlay Zone is shown on the City of Hood River Zoning Map and also is depicted in the respective IAMP documents. The zone's boundary generally corresponds with a 1/2 –mile buffer area around the interstate highway interchanges. The Overlay Zone is applied to two boundary areas - one centered at Exit 62 and the other encompassing both Exit 63 and Exit 64.

B. Applicability

The provisions of this section shall apply to any Administrative, Quasi-judicial, or Legislative land use application pursuant to Section 17.09 that is for a parcel wholly or partially within the IAMP Overlay Zone, as defined by Section 17.03.120.A. Any conflict between the standards of the IAMP Overlay Zone and those contained within other chapters of the Zoning Ordinance shall be resolved in favor of this chapter and the applicable requirements in Chapter 17.20, Transportation Circulation and Access Management.

C. Permitted Land Uses

Uses allowed in the underlying zoning district are allowed subject to other applicable provisions in the Zoning Ordinance and in Title 16, Subdivision Ordinance.

D. Comprehensive Plan and Zoning Map and Text Amendments

This Section applies to all Comprehensive Plan Map and Zoning Map amendments to parcels wholly or partially within the IAMP Overlay Zone and code amendments that affect development within the IAMP Overlay Zone.

In addition to meeting the requirements of Section 17.08.020, applications for Comprehensive Plan amendments, Zoning Map amendments, or development regulation amendments shall meet the requirements of the Transportation Planning Rule, Oregon Administrative Rule (OAR) 660-012-0060, including making a determination whether or not the proposed change will significantly affect an existing or planned transportation facility.

E. IAMP Review and Update

The IAMP document must be reviewed and possibly updated in association with a proposed change to the Hood River Comprehensive Plan, Plan Map, or implementing zoning ordinances that will have a "significant affect" on one or more I-84 Interchanges pursuant to OAR 660-12-0060.

a. An IAMP update is required when the findings and conclusions from an IAMP review demonstrate the need for an update to the plan in order to mitigate identified impacts to interchange facilities. The agency or person(s) proposing the change shall be responsible for reviewing and initiating an update to the applicable IAMP(s), consistent with the procedures outlined in the IAMP.

b. An updated IAMP that results from a City-initiated review process pursuant to Section 17.03.120.E, shall be legislatively adopted, requiring a City Council public hearing, as an amendment to the City of Hood River Transportation System Plan and also will be adopted by the Oregon Transportation Commission as an update to the Oregon Highway Plan.

EXHIBIT E

[Amendments to Hood River Municipal Code; additions are shown underlined and deletions in ~~strike through~~.]

CHAPTER 17.20 TRANSPORTATION CIRCULATION AND ACCESS MANAGEMENT

…

17.20.030 Access Management Standards. This section shall apply to all development on arterials and collectors within the City and UGA and to all properties that abut these roadways as part of site plan review process (Chapter 17.16). Within the Interchange Area Management Plan Overlay Zone's "Access Management Blocks," this section also applies to local streets and roads and abutting properties.

…

D. Access within Interchange Area Management Plan (IAMP) Overlay Zone.

In addition to the standards and requirements of the Transportation Circulation and Access Management section of this ordinance (Section 16.12 and Section 17.20), parcels wholly or partially within an adopted IAMP Overlay Zone are subject to the Access Management Plan in the applicable IAMP (Exit 62 or Exit 63/64). The following applies to land use and development applications for parcels within an adopted IAMP Overlay Zone that are subject to Chapter 17.16 Site Plan Review or Title 16 Subdivisions and, that are shown as part of an "Access Management Block" subject to the recommendations of the Access Management Plan (see Figure 9, Access Management Blocks, in the Exit 62 IAMP and Figures 10 and 11, Access Management Blocks, in the Exit 63 and 64 IAMP).

1. Access Approval.

a. Access to streets and roads within the IAMP Overlay Zone shall be subject to joint review by the City and the Oregon Department of Transportation (ODOT) and, where applicable, by Hood River County. Coordination of this review will occur pursuant to Section 17.03.120.D. and consistent with requirements of Title 16.12, when applicable.

b. Approval of an access permit is an Administrative Action and is based on the standards contained in this Section, the provisions of Sections 17.20.030. B. and C., and the Access Management Plan in the applicable IAMP. Where the recommendations of the Access

Management Plan conflict with other access management and spacing requirements in Section 17.20.030 of the Zoning Ordinance, the applicable IAMP Access Management Plan shall govern.

2. Cross Access Agreement.

a. Prior to approving access for tax lots that are identified in the Access Management Plan of the applicable IAMP, the City shall require that:

i. The applicant demonstrate how cross access can be accomplished for sites contiguous to the subject property or properties, consistent with the circulation and planned local street network shown in the IAMP;

ii. If access across an adjacent parcel or parcels is necessary for the development of the subject site, a signed cross access agreement is submitted with the application; and,

iii. For applications reviewed as part of a subdivision approval process, necessary cross access easements are shown and recorded on the final plat. Access widths shall be consistent with City Public Works standards unless based on a Transportation Impact Study, developed pursuant to Section 17.20.060.C.2 and approved by the City Engineer or his/her designee.

3. Frontage Improvements to Public Streets. Development application approval will require public street frontage improvements pursuant to the Access Management Plan in the applicable IAMP and City requirements for constructing public improvements, including those in Subdivision Ordinance Section 16.12.060, Public Facilities Standards.

17.20.060 Traffic Impact Analysis

A. Purpose. The purpose of this section of the code is to implement Section 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 (TIA) must be submitted with an application in order to determine whether conditions are needed to minimize impacts to and protect transportation facilities; what must be in a TIA; and who is qualified to prepare the analysis.

B. Typical Average Daily Trips and Peak Hour Trips. The latest edition of the *Trip Generation* manual, published by the Institute of Transportation Engineers (ITE) shall be used as standards by which to gauge average daily and peak hour (weekday and/or weekend) vehicle trips, unless a specific trip generation study that is approved by the City Engineer indicates an alternative trip generation rate is appropriate. A trip generation study may be used to determine trip generation for a specific land use which is not well represented in the ITE Trip Generation Manual and for which a similar facility is available to count.

C. Applicability and Consultation. A Traffic Impact Analysis shall be required to be submitted to the city with a land use application when (1) a change in zoning or plan amendment is proposed or (2) a proposed development shall cause one or more of the following effects, which can be determined by field counts, site observation, traffic impact analysis, field measurements, crash history, Institute of Transportation Engineers *Trip Generation*; and information and studies provided by the local reviewing jurisdiction 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. An increase in use of adjacent streets by vehicles exceeding the 20,000 pound gross vehicle weights by 10 vehicles or more per day

c. 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; or

d. The location of the access driveway does not meet the access spacing standard of the roadway on which the driveway is located; or

e. A change in internal traffic patterns that may cause safety problems, such as back up onto public streets or traffic crashes in the approach area.

The applicant shall consult with the City Engineer or his/her designee at the time of a pre-application conference (see Section 17.09.120 Pre-Application Conferences) about whether a TIA is required and, if required, the details of what must be included in the TIA.

D. Traffic Assessment Letter. If a TIA is not required as determined by Section 17.20.060.C, the applicant shall submit a Transportation Assessment Letter (TAL) to the City indicating that TIA requirements do not apply to the proposed action. This letter shall present the trip generation estimates and distribution assumptions for the proposed action and verify that driveways and roadways accessing the site meet the sight distance, spacing, and roadway design standards of the agency with jurisdiction of those roadways. Other information or analysis may be required as determined by the City Engineer. The TAL shall be prepared by an Oregon Registered Professional Engineer who is qualified to perform traffic engineering analysis.

The requirement for a TAL may be waived if the City Engineer determines that the proposed action will not have a significant impact on existing traffic conditions.

E. Traffic Impact Analysis Requirements.

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

2. Transportation Planning Rule Compliance. See Chapter 17.08.050 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.

F. 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. If the proposed site fronts an arterial or collector street, the analysis shall address all intersections and driveways along the site frontage and within the access spacing distances extending out from the boundary of the site frontage.

2. Roads through and adjacent to the site.

3. All intersections that receive site-generated trips that comprise at least 10% or more of the total intersection volume.

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.

6. Those identified in the IAMP Overlay Zone (see Subsection I).

G. When a Traffic Impact Analysis (TIA) is required, the TIA shall address the following minimum requirements:

1. The TIA was prepared by an Oregon Registered Professional Engineer; and

2. If the proposed development shall cause one or more of the effects in Section 17.20.060(C), above, or other traffic hazard or negative impact to a transportation facility, the TIA shall include mitigation measures that are attributable and are proportional to those impacts, meet the City's adopted Level-of-Service standards, 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. Minimize the negative impacts on all applicable transportation facilities; and

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

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

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 Hood River Municipal Code.

4. If the proposed development will increase through traffic volumes on a residential local street by 20 or more vehicles during the weekday p.m. peak hour or 200 or more vehicles per day, the impacts on neighborhood livability shall be assessed and mitigation for negative impacts shall be identified. A negative impact to neighborhood livability will occur where:

a. residential local street volumes increase above 1,200 average daily trips; or

b. the existing 85^{th} percentile speed on residential local streets exceed 28 miles per hour.

H. Conditions of Approval. The city may deny, approve, or approve a development proposal with appropriate conditions needed to meet transportation operations and safety standards and provide the necessary right-of-way and improvements to develop the future planned transportation system. Factors that should be evaluated as part of land division and site development reviews, and which may result in conditions of approval, 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 planned roadway improvements.

4.Street improvements along site frontages that do not have improvements to current standards in place at the time of development.

5. Construction or proportionate contribution toward roadway improvements necessary to address site generated traffic impacts, i.e. construction or modification of turns lanes or traffic signals.

I. Traffic analysis within an IAMP Overlay Zone. All development applications located within an IAMP Overlay Zone that are subject to the provisions of Chapter 17.16 (Site Plan Review) or Chapter 16.08 (Land Divisions) may be required to prepare a Traffic Impact Analysis. City of Hood River Transportation System Plan policies call for the City, in coordination with Hood River County and ODOT, to monitor and evaluate vehicle trip generation impacts at Hood River interchanges and on street systems in interchange areas from development. This requirement will not preclude Oregon Department of Transportation, City of Hood River, or Hood River County from requiring analysis of IAMP study intersections under other conditions. Development approved under this article shall be subject to the following additional requirements.

1. The Traffic Impact Analysis must include an account of weekday p.m. peak hour site generated trips through IAMP study intersections. Intersections impacted by 25 or more weekday p.m. peak hour site generated trips, or weekend peak hour site generated trips, shall be analyzed for level of service and volume to capacity ratio during day of opening conditions.

2. The City shall provide written notification to ODOT and Hood River County when an application concerning property in the IAMP Overlay Zone and subject to Site Plan Review or Title 16 is received. This notice shall include an invitation to ODOT and the County to participate in the City's pre-application conference with the applicant, pursuant to Section 17.09.120.

3. The City shall not deem the land use application complete unless it includes a Traffic Impact Analysis prepared in accordance with the applicable requirements of Section 17.20.060.

4. Pursuant to Section 17.09.030.F, ODOT shall have 14 calendar days from the date a completion notice is mailed to provide written comments to the City. If ODOT does not provide written comments during this 14-day period, the City staff report may be issued without consideration of ODOT comments.

5. Monitoring Responsibilities. The details of monitoring responsibilities will be outlined in the adopted IAMP.

APPENDIX C

Hood River County Goal 12 Amendments – Exhibit C

EXHIBIT C

(To be inserted in **Goal 12 – Transportation** section of the Hood River County Policy Document.)

GOAL J: Interchange Area Management. To protect the function and operation of the interstate highway interchanges consistent with the planned land uses in the vicinity of the interchanges.

1. Policies

a. Provide for an adequate system of local roads and streets for access and circulation within the interchange areas that minimizes local traffic through the interchanges and on the interchange cross roads.

b. Provide safe and efficient operations between the connecting roadways (and the local street network, if applicable) within adopted IAMP management areas in the UGA.

c. Ensure that changes to the planned land use system are consistent with the preservation of the long-term transportation function of the interchange and the associated local street system.

d. Recognize the importance of the interchange function to support the County's economic development goals and plans, including providing access to family wage jobs in the downtown, at the waterfront, and in west Hood River.

e. Partner with ODOT to ensure that system capacity for regional through trips and the timeliness of freight movements are considered when developing and implementing transportation plans and projects on Hood River area freight routes.

f. Support the design of the Historic Highway that provides a distinctive roadway character that is consistent with the goal to preserve the identity of that transportation corridor.

g. Working in conjunction with ODOT, help ensure that the functional capacity and safety of I-84 interchanges in Hood River are preserved and that sufficient revenue is generated to finance necessary improvements.

h. Support the design of the Historic Highway in the vicinity of Exit 62 as a gateway into the City of Hood River.

i. Partner with ODOT to ensure that planned improvements to the local roadway system are consistent with the proposed improvements to Exit 62, and also that those local system improvements enhance safety and reduce turning conflicts in the vicinity of the interchange.

j. Support safe bicycle and pedestrian facilities in the vicinity of Exit 62 that provide connectivity throughout the area and to destinations along the proposed Historic Columbia River Highway State Trail and the Hood River Valley.

k. Recognize the strategic importance of Exit 63 as an essential transportation facility that provides access to two major employment districts, Downtown Hood River and the Waterfront, and plays a critical role in the vitality of these two regional employment areas.

l. Support construction of safe and efficient bicycle and pedestrian facilities in the vicinity of Exit 63 that encourage employees to travel to work via alternative modes of transportation and to provide opportunities for residents and visitors alike to access recreational opportunities along the Columbia River.

m. Recognize the vital role Exit 64 has in providing regional connectivity between destinations in Hood River County and the rest of the state, via I-84, and in Washington State via OR 35.

n. Support safe bicycle and pedestrian facilities in the vicinity of Exit 64 that provide recreational access to the Columbia River and to the Historic Columbia River Highway State Trail.

2. Strategies

a. As part of the land division and development permit approval process the County will require future development to plan for and develop local roadway connections that are consistent with adopted IAMPs.

b. Within the IAMP overlay, the City and County will approve development proposals only after it is demonstrated that proposed access and local circulation are consistent with the Access Management Plan in the applicable IAMP.

c. Bicycle and pedestrian connections within the IAMP management areas will be required for new development consistent with adopted IAMPs and the County's Transportation System Plan. Connections for non-motorized transportation may be required of development even where street connections are not possible or required.

d. Support planned improvements to the interchanges that improve efficient and safe truck circulation and that facilitate the movement of goods to and from the City and within the County by managing access on local roads and monitoring trips generated by new development in the vicinity of interchanges.

e. The County, in coordination with ODOT and the City of Hood River, shall participate in monitoring the cumulative peak hour trip generation impact from new development by enacting rules that require traffic studies for development near interchanges to assess the impact on interchange facilities.

f. The County and the City of Hood River will review development regulations and funding resources, including system development charges, to ensure that new development is providing its fair share of revenue to finance needed local transportation improvements in interchange areas.

g. Determine and implement appropriate funding measures to ensure the construction of the realignment of Country Club Road.

APPENDIX D

Appendix D- Hood River County Code Amendments – Exhibit D

Exhibit D

[Amendments to Hood River County Code; additions are shown underlined and deletions in ~~strike through~~.]

Article 4 (Compliance with Ordinance Provisions, Classification of Zones and Zoning Map) of the County Zoning Ordinance

- Section 4.10 (Classification of Zones and Abbreviated Designation) would be modified to include a reference to the Interchange Area Management Plan Overlay Zone (IAMP).

CHAPTER 16.12 GENERAL DESIGN AND IMPROVEMENT STANDARDS

16.12.020 Vehicular Access and Circulation
D. Traffic ~~Study~~Impact Analysis. The County or other agency with access jurisdiction may require a traffic study prepared by a qualified professional to determine access, circulation and other transportation requirements. The County requires either a Transportation Assessment Letter or a Traffic Impact Analysis pursuant to Section 17.20.060 for proposed land use actions. (See also, Section 16.12.060 - Public Facilities Standards.)

CHAPTER 17.03 LAND USE ZONES

SECTIONS:

17.03.010 Urban Low Density Residential Zone (R-1)
17.03.020 …
17.03.090 Interchange Area Management Plan (IAMP) Overlay Zone
…

17.03.090 Interchange Area Management Plan (IAMP) Overlay Zone
The purpose of the IAMP Overlay Zone is the long-range preservation of operational efficiency and safety of the highway interchanges within the City of Hood River, which provides access from and to Interstate 84 for residents and businesses throughout the City and Hood River County. The interchanges are a vital transportation link for regional travel and freight movement and provide connectivity between the east and west side of the community and to employment and recreational opportunities at the waterfront. Preserving capacity and ensuring the safety of these interchanges and the local transportation systems in their vicinity is essential to visitors, residences, and existing businesses as well as to the continued economic vitality along the Columbia River and to community growth and development in the vicinity of the interchanges.

A. Boundary. The boundary of the IAMP Overlay Zone is shown on the Hood River County Zoning Map. The Overlay Zone is applied in two boundary areas, one centered around Exit 62 and the other encompassing both Exit 63 and Exit 64. These boundary areas apply to land in the city and county.

B. Applicability. The provisions of this section shall apply to any Administrative, Quasi-judicial, or Legislative land use application that is for a parcel wholly or partially within the IAMP Overlay Zone, as defined by Section 17.03.090(A) above. Any conflict between the standards of the

IAMP Overlay Zone and those contained within other chapters of the Zoning Ordinance shall be resolved in favor of this chapter and the applicable requirements in Chapter 17.20, Transportation Circulation and Access Management.

C. Permitted Land Uses. Uses allowed in the underlying zoning district are allowed subject to other applicable provisions in the Zoning Ordinance and in Chapter16, Land Division Ordinance.

D. Comprehensive Plan and Zoning Map and Text Amendments. This Section applies to all Comprehensive Plan Map and Zoning Map amendments to parcels wholly or partially within the IAMP Overlay Zone and code amendments that affect development within the IAMP Overlay Zone. In addition to meeting the requirements of Article 60 (Administrative Procedures) and Article 62 (Legislative Procedures), applications for Comprehensive Plan amendments, Zoning Map amendments, or development regulation amendments shall meet the requirements of the Transportation Planning Rule, Oregon Administrative Rule (OAR) 660-012-0060, including making a determination whether or not the proposed change will significantly affect an existing or planned transportation facility.

E. IAMP Review and Update

The IAMP document must be reviewed and possibly updated in association with a proposed change to the County Comprehensive Plan, Plan Map, or implementing zoning ordinances that will have a "significant effect" on one or more I-84 Interchanges pursuant to OAR 660-12-0060.

a. An IAMP update is required when the findings and conclusions from an IAMP review demonstrate the need for an update to the plan in order to mitigate identified impacts to interchange facilities. The agency or person(s) proposing the change shall be responsible for reviewing and initiating an update to the applicable IAMP(s), consistent with the procedures outlined in the IAMP.

b. An updated IAMP that results from a County-initiated review process pursuant to Section 17.03.090(E) shall be legislatively adopted, requiring a Board of County Commissioners public hearing, as an amendment to the Hood River County Transportation System Plan and will be adopted by the Oregon Transportation Commission as an update to the Oregon Highway Plan.

CHAPTER 17.10 – SITE PLAN REVIEW

SECTIONS:

17.10.040 DECISION CRITERIA:

1. **Natural Features:** Significant natural features shall be protected to the maximum extent feasible. Where existing natural or topographic features are present, they shall be used to enhance the development; the use of small streams in the landscaping design, rather than culvert and fill. Existing trees and large woody plants shall be left standing except where necessary for building placement, sun exposure, safety or other valid purpose. Vegetative buffers should be left along major street or highways, or to separate adjacent uses. The use should have minimal adverse impacts on the land and water quality. Possible impacts to consider may include; pollution, soil contamination, siltation, and habitat degradation or loss.

2. **Air Quality**: The use shall have minimal or no adverse impact on air quality. Possible impacts to consider include smoke, heat, odors, dust, and pollution.

3. **Grading:** Any grading, contouring, on-site surface drainage, and/or construction of on-site surface water storage facilities shall take place so that there is no adverse effect on neighboring properties, public rights-of-way, or the public storm drainage system. Graded areas shall be replanted as soon as possible after construction to prevent erosion. A construction erosion control plan shall be required.

4. **Public Facilities:** Adequate capacity of public facilities for water, sanitary sewers, storm drainage, fire protection, streets, and sidewalks shall be provided to the subject parcel. Development of on-site and off-site public facilities necessary to serve the proposed use shall be consistent with the Comprehensive Plan and any adopted public facilities plan(s). Underground utilities shall be required. Connection to Oregon Department of Transportation (ODOT) storm water facilities will require a permit from ODOT District 2C. On-site detention or treatment of storm water may be required by ODOT.

5. **Traffic:** The following traffic standards shall be applicable to all proposals. When evaluating traffic issues, consideration shall be given to the proposed usage (i.e., employees, customers, freight, and service) and to the potential types of traffic (i.e., vehicles, pedestrians, and bicycles).

   a. On-site traffic circulation shall be designed according to accepted engineering guidelines to be safe and efficient.

   b. The access point(s) between the subject property and the public street shall be reasonably safe. Minimal factors to be considered in evaluating the proposed access points include the average speed of the traffic on the public street(s), the proposed usage of the access points, the distance between existing and proposed access points, vision clearance, and the pre-existing location of the access point(s) on the subject property.

   c. The desired level of service on streets and intersections serving the proposed use is level ~~C~~ D or better, as established in Highway Capacity Manual of the Highway Research Board.

   d. Whenever the level of service is determined to be worse than level ~~C~~ D (with or without the anticipated traffic of the proposed use), development is not permitted unless the developer makes the improvements necessary to obtain level of service ~~C~~ D or better.

   e. If the County Engineer determines that it is unreasonable to require level ~~C~~ D or better, a level of service worse than ~~C~~ D may be allowed.

   f. If the County Engineer determines that the traffic generated by the proposed use will have an insignificant impact on the level of service, the developer may be exempted from some or all of the required improvements.

   g. Traffic Impact ~~Report~~ Analysis - Pursuant to Section 17.20.060, ~~T~~the applicant may be required to provide a ~~traffic impact report~~ Traffic Impact Analysis or a Transportation Assessment Letter prepared by an Oregon licensed traffic engineer. ~~Every effort will be made to inform the applicant within 20 days of receiving a completed application whether a traffic impact report and/or a determination of the level of service will be required. Unforeseen circumstances could result in a delayed request for this information.~~

17.10.050 MULTI-FAMILY AND GROUP RESIDENTIAL DECISION CRITERIA:

1. **Natural Features:** Significant natural features shall be protected to the maximum extent feasible. Where existing natural or topographic features are present, they shall be used to enhance the development; the use of small streams in the landscaping design, rather than culvert and fill. Existing trees and large woody plants shall be left standing except where necessary for building placement, sun exposure, safety or other valid purpose. Vegetative buffers should be left along major street or highways, or to separate adjacent uses.

2. **Grading:** Any grading, contouring, on-site surface drainage, and/or construction of on-site surface water storage facilities shall take place so that there is no adverse effect on neighboring properties, public rights-of-way, or the public storm drainage system. Graded areas shall be replanted as soon as possible after construction to prevent erosion. A construction erosion control plan shall be required.

3. **Public Facilities:** Adequate capacity of public facilities for water, sanitary sewers, storm drainage, fire protection, streets, and sidewalks shall be provided to the subject parcel. Development of on-site and off-site public facilities necessary to serve the proposed use shall be consistent with the Comprehensive Plan and any adopted public facilities plan(s). Underground utilities shall be required. Connection to Oregon Department of Transportation (ODOT) storm water facilities will require a permit from ODOT District 2C. On-site detention or treatment of storm water may be required by ODOT.

4. **Traffic:** The following traffic standards shall be applicable to all proposals. When evaluating traffic issues, consideration shall be given to the proposed usage (i.e., employees, customers, freight, and service) and to the potential types of traffic (i.e., vehicles, pedestrians, and bicycles).

   a. On-site traffic circulation shall be designed according to accepted engineering guidelines to be safe and efficient.

   b. The access point(s) between the subject property and the public street shall be reasonably safe. Minimal factors to be considered in evaluating the proposed access points include the average speed of the traffic on the public street(s), the proposed usage of the access points, the distance between existing and proposed access points, vision clearance, and the pre-existing location of the access point(s) on the subject property.

   c. The desired level of service on streets and intersections serving the proposed use is level ~~C~~ D or better, as established in Highway Capacity Manual of the Highway Research Board.

   d. Whenever the level of service is determined to be worse than level ~~C~~ D (with or without the anticipated traffic of the proposed use), development is not permitted unless the developer makes the improvements necessary to obtain level of service ~~C~~ D or better.

e. If the County Engineer determines that it is unreasonable to require level ~~C~~ D or better, a level of service worse than ~~C~~ D may be allowed.

f. If the County Engineer determines that the traffic generated by the proposed use will have an insignificant impact on the level of service, the developer may be exempted from some or all of the required improvements.

g. Traffic Impact ~~Report~~ Analysis - Pursuant to Section 17.20.060, ~~T~~the applicant may be required to provide a ~~traffic impact report~~ Traffic Impact Analysis or a Transportation Assessment Letter prepared by an Oregon licensed traffic engineer. ~~Every effort will be made to inform the applicant within 20 days of receiving a completed application whether a traffic impact report and/or a determination of the level of service will be required. Unforeseen circumstances could result in a delayed request for this information.~~

5. **Storage:** All outdoor storage areas and garbage collection areas shall be screened through the use of vegetative materials or appropriate fencing.

6. **Equipment Storage:** Design attention shall be given to the placement or storage of mechanical equipment so as to be screened from view and provide a sound buffer that meets the minimum requirements of the noise ordinance.

7. **Design:** Variety of detail, form and siting should be used to provide visual interest. Buildings shall utilize at least three of the following architectural elements to provide architectural variety: massing, offsets, materials, windows, canopies, pitched or terraced roof forms or other architectural elements. A single uninterrupted length of facade shall not exceed 100 feet.

8. **Orientation:** Buildings shall have their orientation toward the street rather than the parking area, whenever physically possible.

9. **Parking:** Parking areas shall be located behind buildings or on one or both sides, whenever physically possible.

CHAPTER 17.20 - TRANSPORTATION CIRCULATION AND ACCESS MANAGEMENT (Adopted July 21, 2003, HRC Ord. #249)

SECTIONS:

17.20.010 APPLICABILITY

~~This chapter implements the County's adopted Transportation System Plan and the requirements of the Transportation Planning Rule (OAR 660-12). The standards of this chapter are applicable to all proposed improvements to the public transportation system and to all development on the public transportation system.~~

This chapter implements the ~~City's~~ adopted Hood River County Transportation System Plan and the requirements of the Transportation Planning Rule (OAR 660-12). It also implements special planning requirements related to Oregon Department of Transportation facilities within the Hood River Urban Growth Area. The standards of this chapter are applicable to all proposed improvements to the public transportation system and to all development on the public transportation system.

17.20.030 ACCESS MANAGEMENT STANDARDS

This section shall apply to all development on arterials and collectors within the UGA and to all properties that abut these roadways as part of ~~17.16~~ Section 17.10 Site Plan Review. Within the Interchange Area Management Plan Overlay Zone's "Access Management Blocks," this section also applies to local streets and roads and abutting properties.

1. **Site Plan Review Procedures and criteria for Access Management**
   A. All site plans are required to be submitted for review pursuant to the provisions of this title and shall show:
      1. Location of existing and proposed access point(s) on both sides of the road where applicable;
      2. Distances to neighboring constructed access points, median openings (where applicable), traffic signals (where applicable), intersections, and other transportation features on both sides of the property;
      3. Number and direction of lanes to be constructed on the driveway plus striping plans;
      4. All planned transportation features (such as sidewalks, bikeways, auxiliary lanes, signals, etc.);
      5. Parking and internal circulation plans including walkways and bikeways;
      6. A detailed description of any requested variance and the reason the variance is requested.

B. All site plans shall comply with the following access criteria:

1. All proposed roads shall follow the natural topography and preserve natural features of the site as much as possible. Alignments shall be planned to minimize grading.
2. Access shall be properly placed in relation to sight distance, driveway spacing, and other related considerations, including opportunities for joint and cross access.
3. The road system shall provide adequate access to buildings for residents, visitors, deliveries, emergency vehicles, and garbage collection.
4. An internal pedestrian system of sidewalks or paths shall provide connections to parking areas, entrances to the development, and open space, recreational, and other community facilities associated with the development. Streets shall have sidewalks on both sides. Pedestrian linkages shall also be provided to the peripheral street system.
5. The access shall be consistent with the access management standards adopted in the Transportation System Plan.

C. Any application that involves access to the State Highway System shall be reviewed by the Oregon Department of Transportation for conformance with state access management standards.

D. <u>Access within Interchange Area Management Plan (IAMP) Overlay Zone</u>.

<u>In addition to all other standards and requirements of this ordinance, parcels wholly or partially within the IAMP Overlay Zone are subject to the Access Management Plan in the applicable IAMP (Exit 62 or Exit 63/64). The following applies to land use and development applications for parcels within an adopted IAMP Overlay Zone that are subject to Chapter 16 (Land Division) or Chapter 17.10 (Site Plan Review) and that are shown as part of an "Access Management Block" subject to the recommendations of the Access Management Plan of the applicable IAMP (see Figure 9, Access Management Blocks, in the Exit 62 IAMP and Figures 10 and 11, Access Management Blocks, in the Exit 63 /64 IAMP).</u>

1. <u>Access Approval.</u>
   a. <u>Access to streets and roads within the IAMP Overlay Zone shall be subject to joint review by the City of Hood River and the Oregon Department of Transportation (ODOT) and, where applicable by Hood River County. This coordinated review will be consistent with requirements of Section 17.03.090 and Chapter 16 (Land Division, General Design and Improvement Standards), when applicable.</u>
   b. <u>Approval of an access permit is an Administrative Action and is based on the standards contained in this Chapter, the provisions of Section 17.20.030(2) and (3) (Access Standards), and the Access Management Plan in the applicable IAMP. Where the recommendations of the Access Management Plan conflict with other access and spacing requirements in Section 17.20.030 of the Zoning Ordinance, the applicable IAMP Access</u>

Management Plan shall govern.

2. Cross Access Agreement.
   a. Prior to approving access for lots that are identified in the Access Management Plan of the applicable IAMP, the County shall require that:
      i. The applicant demonstrate how cross access can be accomplished for sites contiguous to the subject property or properties, consistent with the circulation and planned local street network shown in the IAMP;
      ii. If access across an adjacent parcel or parcels is necessary for the development of the subject site, a signed cross access agreement is submitted with the application; and,
      iii. For applications reviewed as part of a subdivision approval process, necessary cross access easements are shown and recorded on the final plat. Access widths shall be consistent with applicable Public Works standards unless based on a Transportation Impact Study, developed pursuant to Section 17.20.060(C)(2) and approved by the County Engineer or his/her designee.
      iv. If a cross access agreement cannot be acquired from the owner(s) of sites contiguous to the subject property or properties, the applicant must demonstrate that access from the neighboring property will not be granted prior to consideration of an alternative to a cross access agreement.

3. Frontage Improvements to Public Streets. Development application approval will require public street frontage improvements pursuant to the Access Management Plan in the applicable IAMP and County requirements for constructing public improvements, including those in the Land Division Ordinance Section16.12.060, Public Facilities Standards.

17.20.050 STANDARDS FOR TRANSPORTATION IMPROVEMENTS

1. **Permitted Uses Not Subject to Site Plan Review.** Except where otherwise specifically regulated by this ordinance, the following improvements are permitted outright:
   A. Normal operation, maintenance, repair, and preservation activities of existing transportation facilities.
   B. Installation of culverts, pathways, medians, fencing, guardrails, lighting, and similar types of improvements within the existing right-of-way.
   C. Projects specifically identified in the Transportation System Plan as not requiring further land use regulation.
   D. Landscaping as part of a transportation facility.
   E. Emergency measures necessary for the safety and protection of property
   F. Acquisition of right-of-way for public roads, highways, and other transportation improvements designated in the Transportation System Plan except for those that are located in exclusive farm use or forest zones.
   G. Construction of a street or road as part of an approved subdivision or land partition approved consistent with the applicable land division ordinance.

2. **Uses Subject to Site Plan Review**
   A. Construction, reconstruction, or widening of highways, roads, bridges or other transportation projects that are: (1) not improvements designated in the Transportation System Plan or (2) not designed and constructed as part of a subdivision or planned development subject to site plan and/or conditional use review.

   ~~B.~~ An application for ~~site plan review~~ the above improvements is subject to review under Section 17.10 (Site Plan Review), however the decision criteria does not apply. In order to be approved, the site plan permit shall comply with the Transportation System Plan and applicable standards of this title, and shall address the following criteria. For State projects that require an Environmental Impact Statement (EIS) or EA (Environmental Assessment), the draft EIS or EA shall be reviewed and used as the basis for findings to comply with the following criteria:
   1. The project is designed to be compatible with existing land use and social patterns, including noise generation, safety, and zoning.
   2. The project is designed to minimize avoidable environmental impacts to identified wetlands, wildlife habitat, air and water quality, cultural resources, and scenic qualities.
   3. The project preserves or improves the safety and function of the facility through access management, traffic calming, or other design features.
   4. Project includes provision for bicycle and pedestrian circulation as consistent with the comprehensive plan and other requirements of this ordinance.

   B. Street and interchange improvements, including parking removal, access modifications in Access Management Blocks, new lanes, new streets, and signalization modifications. The site plan review shall include findings and solutions addressing the effect of traffic beyond the immediate vicinity of the proposal and how safety, mobility, the pedestrian system, the bike system, parking and economic enterprise will be protected and/or enhanced by the proposal. The following facility(ies) shall be considered in the study area for all traffic analysis unless modified by the County Engineer:
   i. All access points and signalized and un-signalized intersections adjacent to the proposed site, and if the proposed site fronts an arterial or collector street the analysis shall address all intersections and driveways along the site frontage.
   ii. All intersections that receive site generated trips that comprise at least 10% or more of the total intersection volume.
   iii. All intersections needed for signal progression analysis.
   iv. In addition to these requirements, the County Engineer may determine any additional intersections or roadway links that may be adversely affected as a result of the proposed development.

17.20.060 Traffic Impact Analysis

A. Purpose. The purpose of this section of the code is to implement Section 660-012-0045(2)(e) of the State Transportation Planning Rule that requires the County 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 (TIA) must be submitted with an application in order to determine whether conditions are needed to minimize impacts to and protect transportation facilities; what must be in a TIA; and who is qualified to prepare the analysis.

B. Typical Average Daily Trips and Peak Hour Trips. The latest edition of the *Trip Generation* manual, published by the Institute of Transportation Engineers (ITE) shall be used as standards by which to gauge average daily and peak hour (weekday and/or weekend) vehicle trips, unless a specific trip generation study that is approved by the County Engineer indicates an alternative trip generation rate is appropriate. A trip generation study may be used to determine trip generation for a specific land use which is not well represented in the ITE Trip Generation Manual and for which a similar facility is available to count.

C. Applicability and Consultation. A Traffic Impact Analysis shall be required to be submitted to the County with a land use application when (1) a change in zoning or plan amendment is proposed or (2) a proposed development shall cause one or more of the following effects, which can be determined by field counts, site observation, traffic impact analysis, field measurements, crash history, Institute of Transportation Engineers *Trip Generation*; and information and studies provided by the local reviewing jurisdiction 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 County Engineer);

b. An increase in use of adjacent streets by vehicles exceeding the 20,000 pound gross vehicle weights by 10 vehicles or more per day

c. 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; or

d. The location of the access driveway does not meet the access spacing standard of the roadway on which the driveway is located; or

e. A change in internal traffic patterns that may cause safety problems, such as back up onto public streets or traffic crashes in the approach area.

The applicant shall consult with the County Engineer or his/her designee at the time of a pre-application conference about whether a TIA is required and, if required, the details of what must be included in the TIA.

D. Traffic Assessment Letter. If a TIA is not required as determined by Section 17.20.060.C, the applicant shall submit a Transportation Assessment Letter (TAL) to the County indicating that TIA requirements do not apply to the proposed action. This letter shall present the trip generation estimates and distribution assumptions for the proposed action and verify that driveways and roadways accessing the site meet the sight distance, spacing, and roadway design standards of the agency with jurisdiction of those roadways. Other information or analysis may be required as determined by the County Engineer. The TAL shall be prepared by an Oregon Registered Professional Engineer who is qualified to perform traffic engineering analysis.

The requirement for a TAL may be waived if the County Engineer determines that the proposed action will not have a significant impact on existing traffic conditions.

E. Traffic Impact Analysis Requirements.

1. Preparation. A Traffic Impact Analysis shall be prepared by an Oregon Registered Professional Engineer who is qualified to perform traffic engineering analysis and will be paid for by the applicant.
2. Transportation Planning Rule Compliance. Amendments to the comprehensive plan and land use regulations which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan consistent with Section 660-012-0060 of the State Transportation Planning Rule.
3. Pre-application Conference. The applicant will meet with the County Engineer prior to submitting an application that requires a Traffic Impact Analysis. The County has the discretion to determine the required elements of the TIA and the level of analysis expected.

F. Study Area. The following facilities shall be included in the study area for all Traffic Impact Analyses (unless modified by the County Engineer):

1. All site-access points and intersections (signalized and unsignalized) adjacent to the proposed site. If the proposed site fronts an arterial or collector street, the analysis shall address all intersections and driveways along the site frontage and within the access spacing distances extending out from the boundary of the site frontage.
2. Roads through and adjacent to the site.
3. All intersections that receive site-generated trips that comprise at least 10% or more of the total intersection volume.
4. All intersections needed for signal progression analysis.
5. In addition to these requirements, the County Engineer may determine any additional intersections or roadway links that may be adversely affected as a result of the proposed development.
6. Those identified in the IAMP Overlay Zone (see Subsection I).

G. When a Traffic Impact Analysis (TIA) is required, the TIA shall address the following minimum requirements:

1. The TIA was prepared by an Oregon Registered Professional Engineer; and
2. If the proposed development shall cause one or more of the effects in Section 17.20.060(C), above, or other traffic hazard or negative impact to a transportation facility, the TIA shall include mitigation measures that are attributable and are proportional to those impacts, meet the County's adopted Level-of-Service standards, and are satisfactory to the County 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. Minimize the negative impacts on all applicable transportation facilities; and
   b. Accommodate and encourage non-motor vehicular modes of transportation to the extent practicable; and
   c. Make the most efficient use of land and public facilities as practicable; and
   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 Urban Growth Area Zoning Ordinance (Article 17).
4. If the proposed development will increase through traffic volumes on a residential local street by 20 or more vehicles during the weekday p.m. peak hour or 200 or more vehicles per day, the impacts on neighborhood livability shall be assessed and mitigation for negative impacts shall be identified. A negative impact to neighborhood livability will occur where:
   a. residential local street volumes increase above 1,200 average daily trips; or
   b. the existing 85^{th} percentile speed on residential local streets exceed 28 miles per hour.

H. Conditions of Approval. The County may deny, approve, or approve a development proposal with appropriate conditions needed to meet transportation operations and safety standards and provide the necessary right-of-way and improvements to develop the future planned transportation system. Factors that should be evaluated as part of land division and site development reviews, and which may result in conditions of approval, 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 planned roadway improvements.
4. Street improvements along site frontages that do not have improvements to current standards in place at the time of development.
5. Construction or proportionate contribution toward roadway improvements necessary to address site generated traffic impacts, i.e. construction or modification of turns lanes or traffic signals.

I. Traffic analysis within an IAMP Overlay Zone. All development applications located within an IAMP Overlay Zone that are subject to the provisions of Chapter 17.10 Site Plan Review or Chapter 16 Land Division may be required to prepare a Traffic Impact Analysis. Hood River County Transportation System Plan policies call for the County, in coordination with the City Hood River and ODOT, to monitor and evaluate vehicle trip generation impacts at Hood River interchanges and on street systems in interchange areas from development. This requirement will not preclude Oregon Department of Transportation, City of Hood River, or Hood River County from requiring analysis of IAMP study intersections under other conditions. Development approved under this article shall be subject to the following additional requirements.
1. The Traffic Impact Analysis must include an account of weekday p.m. peak hour site generated trips through IAMP study intersections. Intersections impacted by 25 or more

weekday p.m. peak hour site generated trips, or weekend peak hour site generated trips, shall be analyzed for level of service and volume to capacity ratio during day of opening conditions.
2. The County shall provide written notification to ODOT and the City of Hood River when an application concerning property in the IAMP Overlay Zone and subject to Site Plan Review or Title 16 is received. This notice shall include an invitation to ODOT and the City to participate in the County's pre-application conference with the applicant.
3. The County shall not deem the land use application complete unless it includes a Traffic Impact Analysis prepared in accordance with the applicable requirements of Section 17.20.060.
4. ODOT and the City of Hood River shall have 14 calendar days from the date a completion notice is mailed to provide written comments to the County. If ODOT does not provide written comments during this 14-day period, the County staff report may be issued without consideration of ODOT comments.
5. Monitoring Responsibilities. The details of monitoring responsibilities will be outlined in the adopted IAMP.

APPENDIX E

Technical Memorandum #1: Plans and Policies Review and Findings of Compliance

Introduction

IAMP development involves close cooperation between ODOT and local government agencies. Management of the I-84 – Hood River interchanges involves coordination between ODOT and the City of Hood River. The review and incorporation of applicable State and federal policies and rules, as well as local policies and codes; and a public involvement process (see Section 8) play a key part in the development, adoption, and implementation of IAMPs. State and federal policies guide the development and selection of alternative elements and interchange area management strategies; the IAMP must be consistent with federal and state policies. Policies and code language from local documents form a policy framework and serve as provisions to manage transportation and land use in the interchange influence area with the goals of protecting interchange function, providing for safe and efficient operations, and minimizing the need and expense for additional major improvements to the interchange through the 2025 planning horizon.

The review of state and federal plans presents discussion regarding how the Hood River IAMPs are consistent with relevant state and federal planning documents. The review of local planning documents and development codes presents local policies and code provisions that address interchange capacity protections or long-term interchange area management tools and describes how these policies and code provisions effectively support management of the I-84 – Hood River interchanges. It also summarizes the analysis of how the build alternatives proposed in the Hood River Interchanges Project EA comply with federal, state, and local plans, policies, goals, and regulations.

Pursuant to Task 3.1 of the Scope of Work for the Hood River Interchanges - Interchange Area Management Plans (IAMPs) for Exits 62, 63, and 64 the following plans, studies, ordinances, administrative rules, and policies are summarized:

- Federal
  - National Environmental Policy Act
  - Federal Interchange Policy
- State
  - Oregon Transportation Plan (1992)
  - Oregon Highway Plan
    - OHP Policy 1A Highway Classification
    - OHP Policy 1B Land Use and Transportation
    - OHP Policy 1C State Highway Freight System
    - OHP Policy 1F Highway Mobility Standards
    - OHP Policy 1G Major Improvements
    - OHP Policy 2B Off–System Improvements
    - OHP Policy 2F Traffic Safety
    - OHP Policy 3A
    - OHP Policy 3C Interchange Access Management Areas.
    - OHP Policy 3D Access Management Deviations.
    - OHP Policy 4B

- Statewide Planning Goals
  - Statewide Planning Goal 1 (Citizen Involvement)
  - Statewide Planning Goal 2 (Land Use Planning) and OAR 660, Division 4.
  - Statewide Planning Goal 11 (Public Facilities and Services)
  - Statewide Planning Goal 12 (Transportation)
- OAR 660 Division 12 Transportation Planning Rule (TPR)
- ODOT Division 51 Interchange Access Management Area Spacing Standards for Approaches - Oregon Administrative Rule 734-051-155, 285, and Tables 2 thru 8.
- State ODOT Coordination Program, Oregon Administrative Rule 731-015-0005
- Highway Design Manual
- Exit 64 – East Hood River Interchange Study (2005)
- Hood River – Mt. Hood (OR 35) Corridor Plan.
- SR 35 Columbia River Crossing Draft EIS
- Historic Columbia River Highway Master Plan

- Local
  - County of Hood River Transportation System Plans (TSPs).
  - Hood River County Comprehensive plans and zoning ordinances.
  - City of Hood River Transportation System Plans (TSPs).
  - City of Hood River Comprehensive plans and zoning ordinances.
  - Port of Hood River Master Plan.

Federal Plans, Policies, and Regulations

Through the alternative development and screening process of the EA for the Exit 64 project, the proposed project was found to be in compliance with relevant federal and state planning goals and plans, and their implementing administrative rules. These include the National Environmental Policy Act (NEPA), Federal Interchange Policy, Oregon Transportation Commission (OTC) Policy for New Interchanges, the Oregon Transportation Plan (OTP), the OHP, Statewide Planning Goals, State Agency Coordination Program, Western Transportation Trade Network Report, Freight Moves the Oregon Economy, Willamette Valley Transportation Strategy, and the Hood River/I-84 Refinement Plan. Also receiving particular attention was the project's need to comply with provisions of OAR 660-012 (Transportation Planning Rule) and OAR 734-051 relating to interchange area and access management.

National Environmental Policy Act (1969)

NEPA, signed into law in 1969, requires that, to the extent possible, the policies, regulations, and laws of the federal government be interpreted and administered in accordance with the protection goals of the law. For highway projects using federal funds, NEPA requires the examination and consideration of potential impacts on sensitive social and environmental resources when considering the approval of a proposed transportation facility.

Finding: Describe coordination with NEPA. If no NEPA coordination was undertaken, explain why not.

Federal Interchange Policy (1998)

The purpose of the Federal Interchange Policy is to provide guidance to state transportation officials in justifying and documenting requests to add access or revise existing access to the interstate system. This policy defines eight specific requirements for adding a new access to the interstate system:

1. Existing interchanges cannot satisfy design year traffic requirements.
2. All transportation system management (TSM) improvements have been assessed. TSM includes activities that maximize the efficiency of the present system. TSM improvements might include such measures as ramp metering and high-occupancy vehicle (HOV) lanes.
3. The proposed access point does not have a significant adverse impact on the safety and operation of the interstate facility.
4. The proposed access connects to a public road only.
5. The proposed access is consistent with local and regional land use and transportation plans.
6. Where the potential exists for multiple interchange additions, requests for new access are supported by an interstate network study.
7. The revised access demonstrates appropriate coordination with related or required transportation system improvements.
8. The request contains information relative to the planning requirements and the status of the environmental processing of the proposal.

Revised access points must be coordinated with the District Office of the Federal Highway Administration (FHWA) and must be closely coordinated with planning and environmental processes. Major changes in access must be approved through the central office of FHWA in Washington, DC.

Finding: Under this policy, revised access is considered to be a change in the interchange configuration even though the actual number of points of access does not change. Interchange spacing standards are 3 miles in an urban area and 6 miles in a rural area. The project alternatives meet the requirements spelled out in the policy and will accommodate design-year traffic demands as a threshold. Alternatives advanced for the Exit 64 Project meet the requirements of the policy.

State Plans, Policies, and Regulations

Oregon Transportation Plan (1992)

The Oregon Transportation Plan (OTP) was adopted by the Oregon Transportation Commission (OTC) in 1992. The goal of the OTP is to promote a safe, efficient, and convenient transportation system that improves livability and facilitates economic development for residents of the state. It is intended to meet the requirements of ORS 184.618(1), which requires the development of a state transportation policy and a comprehensive long-range plan for a multi-modal transportation system that addresses economic efficiency, orderly economic development, safety, and environmental quality.

The OTP consists of two elements: the Policy Element defines goals, policies, and actions for the state over the next 40 years; and, the System Element identifies a coordinated multi-modal transportation system and a network of facilities and services for different modes of transportation that are to be developed over the next 20 years to implement the goals and policies of the OTP.

Finding: The IAMP would be consistent with the goals and policies of the OTP. The applicable OTP policies to the proposed interchange improvements would be Policy 1B (Efficiency), Policy 1C (Accessibility), Policy 1G (Safety), Policy 2B (Urban Accessibility), and Policy 4G (Management Practices). Policy 4G has the most direct relationship to the development of the IAMP because it identifies access management (Action 4G.2) as one of the management practices to be implemented.

Oregon Highway Plan (1999)

The 1999 OHP is a modal element of the 1992 OTP and defines policies and investment strategies for Oregon's state highway system over the next 20 years. The plan contains three elements: a vision element that describes the broad goal for how the highway system should look in 20 years; a policy element that contains goals, policies, and actions to be followed by state, regional, and local jurisdictions; and a system element that includes an analysis of needs, revenues, and performance measures.

The OHP is a modal element of the OTP. It addresses the following issues:

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

The policy element contains several policies and actions that are relevant to the Hood River IAMPs, described in the following subsections.

Under Goal 1: System Definition, the following policies are applicable:

Policy 1A, Action 1A.1

Action 1A.1 categorizes state highways for planning and management decisions.

- Under this policy, I-84 is classified as an Interstate Highway, which provides connections to major cities and regions within Oregon and facilitates movement to and from other states. The operational objective for Interstate Highways is to provide safe and efficient high-speed travel in urban and rural areas. ODOT's mobility standard requires an operating v/c ratio of no greater than 0.70 for I-84.

- Oregon 35 is classified as a Statewide Highway, which provides inter-urban and inter-regional mobility and provides connections to larger urban areas, ports and major recreational areas not directly served by Interstate highways. It has a mobility standard requiring the highway operate at or below a volume to capacity (v/c) ratio of 0.70. The posted speed on the Mt. Hood Highway south of the Exit 64 interchange is 55 mph.

- The Historic Columbia River Highway (HCRH), which splits off from the freeway at Exit 62, is classified as a District Highway. The operational objective for District Highways is to allow safe and efficient moderate- to low-speed travel in urban and urbanizing areas for traffic flow, as well as bicycle and pedestrian movements. It has a posted speed of 35 mph and a v/c ratio standard of .85 at the interchange ramp terminals and 0.90 away from the interchange. In addition, the HCRH has design and operational requirements not applicable to other highways in the state.
- The Hood River – White Salmon Highway (OR 35 Spur), which is located north of the freeway at Exit 64, and 2nd Street, which crosses the freeway at Exit 63, are local interest roads with v/c standard of .85.

Finding: The IAMPs will support the existing highway classifications and will enhance the ability of I-84, Oregon 35, and the HCRH to serve in their defined functions. Furthermore, by addressing capacity and safety issues, the IAMPs will improve their ability to serve their defined functions and support the operational objective for safe and efficient high-speed travel on I-84 and safe and efficient regional and local travel and access on Oregon 35 and the HCRH.

Policy 1B (Land Use and Transportation)

Policy 1B, recognizes the need for coordination between state and local jurisdictions. Action 1B.7 gives special designations for certain land use patterns off the freeway to foster compact development patterns in communities. The four designations provided are special transportation area, commercial center, urban business area, and urban.

Finding: Coordination with local jurisdictions will occur throughout the preparation of the IAMPs. Three groups have been formed to facilitate this coordination effort:

- The Project Executive Team (PET), which consists of senior level ODOT, City of Hood River, Hood River County, and Port of Hood River staff.
- The Stakeholder Working Group (SWG) which includes representatives from:
  - ODOT Region 1,
  - City of Hood River,
  - Port of Hood River,
  - Hood River County,
  - Columbia River Gorge Commission,
  - The Historic Columbia River Highway Advisory Commission, and
  - Department of Land Conservation and Development.
- The PMT which consists of ODOT staff, staff from Hood River County, the City of Hood River, the Port of Hood River, and Consultant Project Manager

Although the urban business area designation would apply to the Exit 63 interchange area, and the commercial center area would apply to the Exit 62 and Exit 64 areas, no formal designations have been made or requested by the City of Hood River. Because the designations would not change the design or operational parameters of the improvements proposed at these interchanges or along Oregon 35 and the HCRH, the City of Hood River, upon consideration, did not choose to pursue any special designation under Policy 1B.

Policy 1C (State Highway Freight System)

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

Finding: The OHP designates I-84 as part of the National Highway System and as a designated freight route between Portland and points east. Both I-84 and OR 35 are on the State Highway Freight System. As part of the IAMP process stakeholder interviews have been conducted. Stakeholders include representatives from freight/shipping interests, including local agricultural and industrial interests. As proposed, the Hood River Exit 64 Interchange Project will replace the existing access ramps from and to the I-84 mainline with new ramps. This project is expected to reduce delay for vehicles accessing the freeway at this location, including commercial vehicles, and increase safety. Through improved ramp geometry and operations, the likelihood of vehicles queuing onto I-84, as occasionally occurs today, will be eliminated. This would also be a major improvement for through and local freight traffic on I-84 and Oregon 35.

Policy 1F (Highway Mobility Standards)

Policy 1F 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. Action 1F.1 requires that highways operate at a certain level of mobility, depending on their location and classification. Part of this action requires that freeway interchanges be managed to maintain safe and efficient operation of the freeway through the interchange area. The OHP directs that the maximum volume-to-capacity (V/C) ratio for the ramp terminals of interchange ramps be the smaller of the values of the V/C ratio for the crossroad or 0.70.

Finding: The purpose of the IAMPs is to evaluate the operation of Exit 62, 63 and 64 interchanges, assess limitations, identify future long-range needs, and identify recommended improvements in order to ensure consistency with mobility standards. The Exit 64 Project is inside the Hood River UGB, but outside of the boundary of a Municipal Planning Organization (MPO). As such, the V/C ratio that applies to the I-84 mainline is 0.70. As a Statewide Highway with a speed limit of less than 55 mph, the V/C standard for Oregon 35 is 0.80. The V/C ratio for the HCRH is 0.85. This V/C ratio is equal to the OHP prescribed maximum V/C ratio and therefore applies as the threshold V/C ratio for the interchange ramp termini.

Policy 1G (Major Improvements)

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

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

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

Finding: As described below, the Hood River IAMPs and the Exit 64 Interchange Project fall under all four priorities.

- Priority One. Preserving the functionality of the existing system - The Hood River IAMP project will preserve the functionality of the existing system.

- Priority Two. Improve Efficiency and Capacity of Existing Highway Facilities - Capacity improvements to Oregon 35 and to the eastbound and westbound I-84 ramps would fall under priority two, by making minor improvements to existing highway facilities. The proposed improvements would add to the existing roadway to improve safety and mobility along both I-84 and Oregon 35.

- Priority Three. Add Capacity to the Existing System - The project build alternatives would add capacity to the existing system by adding general purpose lanes to Oregon 35 and making alignment corrections to the corridor to better accommodate commercial vehicles. The analysis in the Exit 64 East hood River Interchange Study demonstrated that any lesser measures would not address the project goals or other OHP policies.

- Priority Four. Protect the Existing System - The project build alternatives would preserve the functionality of Oregon 35 by improving the interchange for alternative modes of transportation such as freight, transit, cycling, and walking. Exit 64 rebuild is part of the OTIA III bridge repair and replacement program. The bridge carrying I-84 through the interchange is scheduled to be replaced. This action lends itself well to re-building the interchange to better accommodate all modes of transportation and improve the safety of the interchange over current conditions.

The Hood River Exit 64 Interchange Project and the IAMPs for Exit 64 and Exits 62 and 63 are consistent with Action 1G.2 because the project went through a thorough public alternatives development and evaluation process, as explained below.
Improvements to the I-84/Oregon 35 interchange are recommended in the Hood River TSP and the Hood River Comprehensive Plan. In 2005, the Exit 64 East Hood River Interchange Study was published. This plan documents preliminary alternatives analysis and recommendations for alternatives to advance into the STIP, as well as stakeholder input. The stakeholders agreed that the Modified Tight Diamond option showed the lowest level of impacts and lowest cost and provided good traffic flow.

Under Goal 2: System Management, the following policies are applicable:

Policy 2B (Off–System Improvements)

Policy 2B helps local jurisdictions adopt land use and access management policies.

Finding: The IAMPs will include sections describing existing and future land use patterns, an access management plan, and implementation measures. A component of the IAMPs will be an intergovernmental agreement between ODOT and the local jurisdictions to implement access management solutions.

Policy 2F (Traffic Safety)

Policy 2F identifies the need for projects in the state to improve safety for all users of the state highway system.

Finding: One component of the IAMPs is to identify existing crash patterns and rates and to develop strategies to address safety issues. The Exit 64 Project is consistent with this policy, in particular as it relates to motor vehicle safety. Both the Oregon 35/I-84 eastbound ramp intersection and the Oregon 35/I-84 westbound ramp intersections have been identified as safety concerns in the Hood River TSP. The proposed improvements will reduce the vehicle crash potential at this interchange by eliminating existing operational and geometric problems and will improve bicycle and pedestrian safety by providing upgraded facilities that meet current standards.

Under Goal 3: Access Management, the following policies are applicable:

Policy 3A (Classification and Spacing Standards)

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

Finding: As part of the IAMPs, the Access Management Plan will compare access spacing with adopted access standards. If proposed interchange improvements do not meet access spacing standards, the project would require deviation findings. I-84 is classified as an interstate freeway, and the proposed project complies with stated policies of no driveways, no traffic signals, no parking, and grade-separated crossings. Access and circulation issues are addressed in detail in the IAMP, and major actions are summarized below. Oregon 35 is classified as a Statewide Highway. The project supports the access management directives as follows:

- Discourage Private Access - No access to privately owned roads is provided as part of the build alternatives.

- Appropriately Space Public Road Connection - The build alternative will space access to better comply with state design standards

- Discourage Traffic Signals - While the Exit 64 Project does not discourage signals, the addition of the new signals will help to better facilitate access to and from I-84. The build alternatives would install signals on Oregon 35 with the I-84 eastbound ramp, the I-84 westbound ramp, and Marina Way.

- Provide Non-traversible Medians - The OHP directs that non-traversible medians be considered for roadway projects where a median could improve safety. Non-traversible, raised curb medians, (Will medians be considered for Exits 62 and/or 63?)

- Prohibit Parking - Parking along this segment of Oregon 35 is prohibited. Parking is also prohibited in the interchange areas of Exits 62 and 63.

Although it does not add new access to the interstate highway interchange, the interchanges in Hood River currently do not comply with ODOT and the FHWA minimum spacing standards. The closest interchanges to the west of Exit 62 are Mitchell Point, at MP 58.20; and Viento State Park, at MP 56.04. Mitchell Point falls within the 6-mile spacing standard at 3.86 miles. Mitchell Point only serves eastbound I-84 traffic. The first full interchange to the west of Exit 62 is at Viento State Park. Viento meets the standard at 6-miles. The closest interchanges to Exit 64 are Koberg and Mosier. Koberg, at MP 65.74, is 1.3 miles, well below the standard of 6-miles. However, this interchange only serves WB I-84 traffic. Mosier is the first full interchange east of Exit 64, at MP 69.79. At 5.35 miles east of Exit 64, Mosier is an urban interchange and therefore meets the standard.

For urban interchanges, the spacing standard is 3-miles. None of the interchanges within the City of Hood River meet the urban standard. The distance between Exits 62 and 63 is 1.86 miles; and the distance between Exits 63 and 64 is only ½ a mile.

Due to pre-existing conditions in this already built environment, intersection spacing does not meet the minimum 1/2-mile desired spacing as described in Action 3A.3. Left-turn storage pockets are planned for Oregon 35 at Marina Way, and at the ramp terminals. According to the Traffic Technical Report, study intersections under the build alternatives would operate acceptably in the 2025 forecast year and would meet OHP and

HDM mobility standards. Because mobility standards are met and the access situation is improved, even though the spacing standards are not fully met, this policy is satisfied.

Policy 3C (Interchange Access Management Areas)

Policy 3C sets policy for managing interchange areas by developing an IAMP that identifies and addresses current interchange deficiencies and short, medium and long term solutions. Action 3C.1 requires that an IAMP be developed to protect the function of interchanges and provide safe and efficient operations between connecting roadways. Action 3C.2 addresses spacing, access, and other supporting requirements for an interchange improvement project.

Finding: IAMPs are being developed for the Hood River interchanges. The intent of the IAMPs is to manage the facilities and adjacent land uses to protect the function of the interchanges to ensure safe and efficient operations between Oregon 35, 2nd Street and the HCRH and I-84.

The requirements of Action 3C.2 are discussed below:

- Spacing Standards - As mentioned above, the spacing standard for interstate and non-interstate freeway interchanges is 6 miles in rural areas, and 3-miles within urban areas. The Viento interchange (rural) is 6 miles to the west of the Exit 62; and Mosier (urban) is 5.3 miles to the east of Exit 64.

- Necessary Supporting Improvements - Necessary supporting improvements such as road networks, channelization, medians, and access control in the interchange management area must be identified in the local comprehensive plan and committed with an identified funding source or identified funding must be in place. The Hood River TSP does commit to a network of local road improvements that have been demonstrated to reduce demand for state highway travel in the interchange management area. These facilities will largely be constructed as a requirement of new development.

- Access to Cross Streets - ODOT minimum spacing standards require that full access to cross streets be no closer than 1,320 feet from an interchange ramp when possible. At a minimum, the access conditions associated with a reconstruction project should improve on current conditions by moving in the direction of the spacing standards. The nearest full access cross streets to the I-84/Oregon 35 intersection are Marina Way (260 feet to the north) and Button Road (1,800 feet to the south). These cross streets exist today and are also closer to the I-84 ramps than called for by the ODOT spacing standards. Closing them to meet ODOT spacing standards would negatively affect land use and traffic operations along Oregon 35. These connections are essential to maintain local access and total transportation system circulation in the area. While these access locations do not meet the full spacing standards, they do improve on the current condition, will operate adequately over the 20-year planning horizon.

- Road Classification - The Hood River interchanges connect an Interstate Highway with state-operated statewide and district Highways, which complies with the request that freeways connect with state highways.

- Alternative Transportation Modes - Widening Oregon 35 for this project would create bicycle lanes and sidewalks on both sides to facilitate bicycle and pedestrian movement, including transit users.

Policy 3D (Deviations)

Policy 3D establishes general policies and procedures for deviations from adopted access management standards and policies.

Finding: The Access Management Plans will compare access spacing with adopted access standards. If proposed interchange improvements do not meet access spacing standards, the project would require deviation findings.

Under Goal 4: the following policies are applicable:

Policy 4B, Action 4B.4

Action 4B.4 requires that highway projects encourage the use of alternative passenger modes to reduce local trips.

Finding: The IAMPs will address ways to encourage the use of alternative passenger modes to reduce trips. The portion of the Exit 64 Project that relates to Oregon 35 would add bicycle lanes on both sides of Oregon 35 and 6-foot sidewalks on the east side of the roadway, where bicycle and pedestrian facilities do not exist today. In addition, widening Oregon 35 would improve transit movement along the corridor and would facilitate bicycle and pedestrian movement between the retail development near the interchange and the residential uses to the south.

Oregon's Statewide Planning Goals

The State of Oregon has established 19 statewide planning goals to guide local and regional land use planning. The goals express the state's policies on land use and related topics. In particular, the following goals are relevant to this project:

- Statewide Planning Goal 1 (Citizen Involvement) - Goal 1calls for "the opportunity for citizens to be involved in all phases of the planning process."

- Statewide Planning Goal 2 (Land Use Planning) - Goal 2 requires that land use decisions be made in accordance with a comprehensive plan, and that suitable "implementation ordinances" to put the plan's policies into effect must be adopted. It requires that plans be based on "factual information"; that local plans and ordinances be coordinated with those of other jurisdictions and agencies; and that plans be reviewed periodically and amended as needed. Goal 2 also contains standards for taking exceptions to statewide goals. This section is implemented by OAR 660, Division 4.

- Statewide Planning Goal 11 (Public Facilities and Services) - Goal 11 calls for efficient planning of public services such as sewers, water, law enforcement, and fire protection. The goal's central concept is that public services should to be planned in accordance with a community's needs and capacities rather than be forced to respond to development as it occurs. It is implemented by OAR 660, Division 11.

- Statewide Planning Goal 12 (Transportation) - The goal aims to provide "a safe, convenient and economic transportation system." It asks for communities to address the needs of the "transportation disadvantaged." Goal 12 is implemented by the Transportation Planning Rule which is summarized below.

Finding: The IAMPs are being developed through a comprehensive public involvement process. The Oregon Department of Land Conservation and Development (DLCD) has acknowledged that the Hood River County Comprehensive Plan and the City of Hood River Comprehensive Plan are in compliance with the statewide planning goals. Because the Exit 64 Project is consistent with the City and County comprehensive plans (as discussed in the Local Plans, Policies, and Codes subsection below), the project is thus consistent with the statewide planning goals. No exceptions to statewide planning goals are needed.

Transportation Planning Rule

The Transportation Planning Rule (TPR) implements Oregon Statewide Planning Goal 12, which encourages construction of transportation facilities that are safe and efficient and designed to reduce automobile reliance. The objective of the TPR is to reduce air pollution, congestion, and other livability problems found in urban areas. Its relation to the proposed interchange project is described in the following subsections.

660-012-0010—Transportation Planning

Section 660-012-0010 discusses the two phases of transportation planning: transportation system planning, where land use controls are established, and transportation project development, where specific projects are designed to implement the TSP.

Finding: Improvements to the Hood River interchange are recommended in the 1996 and 2005 Hood River TSPs. The build alternative being refined through the OTIA III process includes reconstructing the interchange with a modified diamond pattern and widening Oregon 35, bringing the interchange closer to state design standards.

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

Section 660-012-0035 describes standards and alternatives available to entities weighing and selecting transportation projects, including benefits to different modes, land use alternatives, and environmental and economic impacts.

Finding: The primary users of the Hood River interchanges are personal and commercial vehicles. Other modes, such as bicyclists and pedestrians, do not use the interstate highway system. The objective of the proposed project is to improve mobility and safety and bring Oregon 35 up to state design standards. A portion of this project would be widening Oregon 35 and adding bicycle and pedestrian facilities where currently there are none.

660-012-0050—Transportation Project Development

Section 660-012-0050 prescribes that transportation projects be reviewed for compliance with local and regional plans and, where applicable, undergo a NEPA process.

Finding: Discuss how this process complies with local and regional plans and if applicable NEPA.

ODOT Access Management Rules OAR 734-051

The intention of ODOT's Access Management Rule is to balance the safety and mobility needs of travelers along state highways with the access needs of property and business owners. ODOT's rule sets guidelines for managing access to the state's highway facilities in order to maintain highway function, operations, safety, and the preservation of public investment consistent with the policies of the 1999 OHP.

Finding: The IAMPs will address access management within the study areas of the Exit 62, 63 and 64 interchanges. By documenting the access strategy developed for Oregon 35 as part of the Hood River Interchange reconstruction and the 2005 Hood River TSP elements that support access management in the interchange area, the IAMPs address this provision of Division 51.

Because it will correct existing geometric conditions that do not meet current standards and provide for improved operations that meet OHP and HDM mobility standards, the proposed Exit 64 interchange reconstruction and Oregon 35 access management elements ensure the safe and efficient operation between connecting highways. The Exit 64 Hood River interchange connects an Interstate Highway to a state-controlled District Highway. Widening Oregon 35 would include adding bicycle and pedestrian facilities where none exist today. Fixed-route transit operations along this stretch of Oregon 35 would benefit from the widening project.

Approaches to cross streets which are not fully consistent with established access management standards require deviations. Deviations to authorize the proposed Exit 64 project to advance with lesser spacing are described in this IAMP and have been approved by the Region 2 Access Management Engineer.

State Agency Coordination Program (December 1990) (OAR 731-015)

State agency coordination programs describe what agencies will do to comply with Oregon's land use planning program. Specifically, they describe how an agency (that is, ODOT) will meet its obligations under ORS 197.180 to carry out its programs affecting land use in compliance with the statewide planning goals and in a manner compatible with acknowledged comprehensive plans. Any needed local agency coordination not already accomplished or underway would occur before or as part of final project design.

Finding: The consistency of the proposed alternatives with local plans documented herein meets the stipulations of the state agency coordination program.

Highway Design Manual

This manual contains standards for the design of state highways and various highway elements. While detailed design drawings will not be created as part of this study, elements such as the general alignments, roadway widths, and criteria for installation of turn lanes will be considered for evaluating the feasibility of construction and determination of right of way needs for the alternatives developed.

Table 10-1 in the *Highway Design Manual* displays the maximum allowable volume to capacity ratios for the 30th highest annual hour of traffic for use in the design of highway projects. These standards are to be applied to conditions forecasted to exist 20 years after completion of the proposed improvement. If the applicable mobility standard can not be met, a design exception should be sought. Sections from that table relevant to the study area are presented in the table below.

Applicable 2003 Highway Design Manual Mobility Standards

Highway Category	Inside Urban Growth Boundary		Outside Urban Growth Boundary
	Non-MPO outside of STAs where non-freeway posted speed <45 mph	Non-MPO where non-freeway posted speed ≥45 mph	Rural Lands
Interstate Highways	0.70	0.65	0.60
Statewide (NHS) Freight Routes	0.70	0.70	0.60
District / Local Interest Road	0.80	0.75	0.70

Finding: Elements of alternatives developed that include the construction or modification of state facilities must be designed in accordance with the requirements of the *Highway Design Manual*. To ensure feasible construction of proposed alternatives, these design standards must be used when laying out roadway alignments, turn lanes, and other roadway elements. Also, the ability of proposed improvements to adequately accommodate future traffic demand will be evaluated through the use of the mobility standards from the *Highway Design Manual*, rather than those from the *Oregon Highway Plan*.

Exit 64 – East Hood River Interchange Study (2005)

ODOT's Exit 64-East Hood River Interchange Study was prepared in 2005 to address the capacity and safety problems at the I-84/Oregon 35 interchange. This work was called for in the 1996 Hood River TSP to determine the best way to address the problems at the existing East Hood River interchange. The study considered a number of alternatives, including a split diamond, with braided ramps, a tight urban diamond, and modified diamond interchanges with roundabouts.

Finding: The study serves as a reference document and does not contain any specific policies relevant to this review. This plan did address other interchange options originally raised in the 1996 TSP and provided guidance for access management and circulation options to consider during interchange project development.

Hood River – Mt Hood (OR 35) Corridor Plan (Volumes 1 and 2)

The OR 35 Corridor Plan (Volume 1) and Supporting Documentation (Volume 2) was adopted by the Oregon Transportation Commission (OTC) as an amendment to the OTP on August 13, 1999. It is the product of a cooperative effort between ODOT, Hood River County, the cities of Hood River and Cascade Locks, ports of Hood River and Cascade Locks, Confederated Tribes of the Warm Springs, transportation service providers, other interest groups, and the general public to develop a long-term, multi-modal program for management of and improvement to the Hood River-Mt. Hood Corridor, a priority corridor identified in the OTP.

The two intersections at the I-84/OR 35 (East Hood River) interchange were identified as having major congestion and capacity deficiencies. The corridor plan indicates that OR 35 has high levels of congestion near its connection with I-84 with V/C ratios ranging between 0.7 and greater than 1.0.

Finding: The Corridor Plan emphasizes management strategies to enhance the Corridor's ability to serve commuter, recreational, and freight travel. In the rural areas, highway improvements should to be limited to passing lanes or intersection improvements to avoid large-scale widening of the highway. The Exit 64 - East Hood River interchange was identified as a safety problem. The safety issue was the left turn movement from the ramp termini to north and southbound OR35. The Corridor Plan specified that further study was needed for the interchange to determine a solution. Refinement planning during the first half of 2005 determined that the best solution was the development of a modified interchange and widening of OR35 at Exit 64 - East Hood River.

SR 35 Columbia River Crossing Draft EIS

The existing Columbia River bridge crossing, which connects White Salmon and Bingen, Washington, and Hood River, Oregon (referred to locally as the Hood River Bridge), was built in 1924. The bridge is a steel structure with a narrow roadway deck width of approximately 18 feet 9 inches and has no pedestrian or bicycle facilities. Pedestrians and bicycles are prohibited from using the bridge. The purpose of the project is to improve multi-modal transportation of people and goods across the Columbia River between the Bingen/White Salmon, Washington and Hood River, Oregon communities. The overall need for the project is to rectify current and future transportation inadequacies and deficiencies associated with the existing Hood River Bridge. Specific needs addressed by the project are related to capacity, system linkage, transportation demand, social demands, economic development, modal interrelationships, safety, and existing bridge and bridge roadway deficiencies. The proposed action is to build a new bridge that would cross the Columbia River between Hood River, Oregon, and White Salmon, Washington. Three alternative alignments are under consideration in the Draft Environmental Impact Statement (DEIS). The existing Hood River Bridge would be removed.

Finding: The No Action Alternative assumes that the existing bridge would remain a lift-span bridge owned by the Port of Hood River and that it would continue to be structurally limited (weight restricted) and functionally limited in terms of height and width restrictions. Based on the Port of Hood River's current maintenance and capital improvements program, this alternative assumes that the serviceable life of the existing bridge will be about 30 years, after which the bridge will be closed to cross-river vehicular traffic. In the interim, several short-term (within the next five years) improvements are planned or recommended. These improvements are considered to be part of the No Action Alternative.
The short-term improvements include:

- Replace the existing grated steel bridge deck with a new grated steel deck that is quieter
- Install roundabout or traffic signal at the I-84 eastbound ramps and OR-35/Hood River Bridge approach road
- Convert the tollbooth to one-way tolls southbound
- Establish a bridge replacement fund through increased tolls

All of the build alternatives include the short-term improvements that would occur under the No Action Alternative within the next five years.
The build alternatives would also include the mid-term improvements that would be implemented over the next 6 to 10 years, if a long-term build alternative is not scheduled to be constructed for at least ten years. These improvements include:

- Signalize the I-84 westbound ramps at the Hood River Bridge approach road or convert to a roundabout
- Convert the four-way stop at Marina Way and Hood River Bridge approach road to a roundabout or traffic signal. Due to the proximity of this intersection with the

I-84 westbound ramp intersection, these two intersections may be combined into a composite roundabout.

- Restrict or close the private driveway onto the Hood River Bridge approach road
- Replace the tollbooth and establish an automated toll collection system
- Signalize SR-14 at the Hood River Bridge approach road

All build alternatives tie into the existing bridge access road on the south end of the corridor at a point between the tollbooth and the four-way stop.

Historic Columbia River Highway Master Plan

The 2006 Revised Master Plan for the Historic Columbia River Highway (HCRH) provides direction for the rehabilitation of the highway and construction of connecting trails along the abandoned sections. The revised HCRH Master Plan updates the 1996 Master Plan, including all the policy recommendations that have been made by the Historic Columbia River Highway Advisory Committee.

The highway, constructed from 1914 to 1922, originally ran from Portland to The Dalles. Much of the original highway in Hood River County was abandoned or destroyed when I-84 was built. Many short, discontinuous segments still remain parallel to I-84 in various stages of disrepair. The HCRH exists as city streets through Cascade Locks and Hood River. The only long, contiguous segment of HCRH in the county is east of Hood River connecting OR 35 to Mosier. This segment of the HCRH, through the twin tunnels between Hood River and Mosier is an active recreation corridor for bicyclists and pedestrians. Managed by the Oregon Parks and Recreation Department, it is closed to motor vehicles traffic and is part of the State Trail System. In the summer of 2002, it was designated as a National Recreation Trail by the US Department of the Interior. This and other portions of the highway have high recreational potential and are slated for development of hiking, biking, and wheelchair trails.

Finding: The IAMPs will need to address the recommendations and outstanding issues from the 2006 Revised Master Plan including:

1) Restore the Historic Columbia River Highway to its 1920s appearance, using the 1924 Mile Post Log and historic photos for guidance. Repair and maintain all contributing historic structures.
2) Reconnect the extant segments of the Historic Columbia River Highway to form a continuous visitor attraction.
3) Maintain existing pavement, but do not widen, except in the Urban Areas under provisions included in Programmatic Agreements. Future paving will maintain the exposure of curb and drop to gutter as designed and constructed in the HCRH Gutter Restoration project (2006).
4) Provide visitor information through interpretive signs, brochures, web site and personal contact.
5) Where guardrail protection is needed use two-rail, wooden guardrail, painted white. On sections open to motor vehicle traffic, use steel-backed wooden guardrail. On State Trail sections, use historically accurate guard fence.
6) Install triangular, concrete mile posts, as indicated in the 1924 log.

7) Where the local street name is other than "Historic Columbia River Highway", add the Historic Columbia River Highway cap above the street name sign.
8) Seek expansion of the All- American Road designation to include all sections of the Highway in Hood River County, for a continuous route.
9) Continue collaboration and partnerships with cities, counties, agencies, non-profits and the general public to achieve restoration, reconnection and maintenance of the highway, including implementation of the Programmatic Agreements.
10) Provide and enhance visitor facilities at parks and trailheads along the HCRH.

The Updated Master Plan identified the intersection of the Historic Columbia River Highway and Oregon 35, just east of Hood River, which is currently a four-way stop, as a remaining issue. A 2005 study indicated that this intersection is operating at Level of Service F during peak hours. Two options for improvement were discussed – a single-lane roundabout and a signalized intersection. The signalized intersection appears to have fewer impacts on the HCRH. The roundabout would require removal of a portion of the HCRH pavement and would eliminate some of the landscaping and parking area in the southeast quadrant. Whenever this project is funded, additional discussion of the effect of these options on the HCRH historic district will need to occur.

Local Plans, Policies, and Ordinances

Hood River County Transportation System Plan (2003)

The Hood River County Transportation System Plan was adopted in July 2003. The TSP includes a number of goals, policies and strategies that are related to the three interchanges, including the following:

- 2.4.1 Goal A. Transportation Balance – Design a balanced transportation system that maximizes the efficiency of the existing system, provides transportation options at appropriate minimum service standards, reduces reliance on the single occupant automobile where other modes or choices can be made available, and takes advantage of the inherent efficiencies of each mode, while providing a safe, convenient, and economic transportation system to serve area needs that is in harmony with the County's land uses.
    - Policy A1 – Provide a county road system that meets the needs for travel between and tough the county, recognizing the needs for both local and through travel, with OR 35 and the Hood River Highway (281) as the primary through routes.
    - Policy A5 – Ensure accommodation of truck freight to serve the farming and forestry sectors of the county's economy.
    - Strategy – Participate in efforts to explore the need for and feasibility of long-term improvement to the bridge between Hood River and White Salmon/Bingen, Washington.

- 2.4.2 Goal B. Connectivity – Provide a transportation system with connectivity among modes within and between the County's urban areas and rural service centers,

with ease of transfer among modes and between local and state transportation systems.
  - Policy – In lieu of major capacity expansions, strive to maintain existing travel times for both autos and freight through high levels of facility management (acceleration/deceleration lanes, turn refuges, coordinated signals, and access management).
  - Strategy – Investigate the need for improvements to the Highway 35/I-84 interchange. Participate in other studies that are exploring changes to this intersection.

- 2.4.3 Goal C. – Highway and Roadway Congestion – Define minimum levels of service and assure balanced, multi-modal accessibility to existing and new development to achieve the goal of compact, highly livable urban areas and rural community centers.
  - Strategy – Ensure coordination between the County and the State to effectively implement access management requirements as mandated for state highways in OAR 734-051 and to balance state requirements with the needs of specific land uses and property owners.

- Goal 2.4.7 Goal G. Social and Land Use Impacts – Develop a transportation system that supports planned land uses and balances the expansion of transportation facilities with the protection of social, cultural and environmental resources.
  - Strategy – Promote cooperation between ODOT and local governments in planning and project development.
  - Work with ODOT to ensure that the needs and input of local property owners in the County are balanced with mobility objectives and state requirements in approving or controlling access to properties located adjacent to state highways.
  - Consider the findings of ODOT's draft Environmental Impact Statements and Environmental Assessments as integral parts of the land use decision-making procedures.

- Goal 2.4.8 Goal H. Economic Impacts – Expand and diversify the County's economy through the efficient movement of goods, services and passengers in a safe, energy-efficient and environmental sound manner.
  - Promote I-84/OR 35 as an alternate route from Portland to Mt Hood recreation areas. Specific strategies could include signage on I-84 near Troutdale and Hood River identifying OR35 as an alternative route.

Finding: Hood River County has limited jurisdiction in the IAMP study areas. There is a small extent of County roads and Urban Growth Area – land inside the City of Hood River's UGB that is not yet annexed to the City and is jointly managed by the City and County – in the study areas, specifically in the Exit 62 study area. The two main County roads within the IAMP study area are Country Club Road and May Drive in the Exit 62 study area.

Hood River County Comprehensive Plan

As noted above, Hood River County has limited jurisdiction in the IAMP study areas. However, excerpts of pertinent goals, policies, and strategies for Goals 2 and 14 are provided below.

Goal 2 – Land Use Planning

A. Goals

1. Governmental agency management plans shall be consistent with Hood River County's Comprehensive Plan.
2. To establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions. City, County, State, and Federal agency and special district actions related to land use shall be consistent with this Comprehensive Plan.

B. Policies

3. Review and comment on various management plans and policies developed and adopted by governmental agencies in Hood River County.

C. Strategies

1. Affected governmental agencies shall seek and enter into special district cooperative agreements with Hood River County.
9. Promote cooperation between the Oregon Department of Transportation (ODOT) and local governments in planning and project development.
11. Utilize access management to limit the impacts of new development on highway congestion.
12. Maintain standards for setbacks adjacent to state rights-of-way.

Goal 14 – Urbanization: Urban Growth Area Management Policies and Procedures

I. Purpose. It is the purpose of the Urban Growth Policies for the Hood River UGA to:

A. Contain urban development within areas planned for future expansion where basic urban services such as sewer, water facilities, police and fire protection can be efficiently and economically provided.
B. Conserve resources through orderly development of land.
C. Preserve farm land and open space outside the UGB.
D. Make more efficient use of local tax dollars in locating facilities and providing services within the UGA.
E. Provide property owners greater security in long-range planning and investments.
F. Make it possible for utility extensions, and transportation facilities to be designed and located so as to more closely match population growth. G. Preserve and enhance the livability of the area.

II. Policies

C. Roads: As part of the process to adopt the County Transportation System Plan in July 2003, the Board of County Commissioners adopted the City of Hood River's Transportation System Plan to apply to the Hood River Urban Growth Area. On July

28, 2003, the City of Hood River and the Board of County Commissioners also adopted a revised version of the Urban Growth Area Management Agreement (UGAMA). Section "L" of the Hood River UGAMA states, in part, that, "All new streets shall be built to City standards at the initial land division where a street is required."

Finding: Basic goals, policies, and strategies addressing land use planning (Goal 2), transportation planning (Goal 12), and urbanization (14) should be taken into consideration in developing the IAMP for Exit 62. Transportation planning goals and policies are elaborated in the County's TSP, reviewed in the prior section of this report.

Hood River County Development Ordinance

The County's Development Ordinance is a unified document that includes its zoning regulations and subdivision regulations. The following subsections give an overview of transportation-related elements of the Development Ordinance.

Street Improvement Standards

Section 18.32 of the subdivision regulations provides street improvement standards, including urban and rural local road cross-sections and requirements for connectivity within the development and to surrounding development. Otherwise street standards are addressed by the County's TSP.

Article 17 of the County's Development Ordinance addresses zoning and land use regulation in the Hood River Urban Growth Area, the area inside the City's UGB not yet annexed into the City. The Urban Growth Area is jointly managed by the City and County. Supplementary Provisions in Article 17 regulate access, parking, vision clearance, and other transportation-related elements in this area.

Access Management

The Development Ordinance recognizes that state access management and spacing standards will be applied to state roads. For County roads, the standards in the table below apply.

County Access Management Standards

Classification of Intersecting Road	Minimum Spacing Between Public Roads	Minimum Spacing Between Private Driveways
Collector	300 feet	100 feet
Local	150 feet	50 feet from public road

Land Use

County zoning only applies in the Exit 62 IAMP study area, which includes Urban Growth Area that is inside the City of Hood River's UGB but not yet annexed to the City. As reported by County planning staff, the County zones that apply in the Urban Growth Area in the vicinity of Exit 62 include the following zones, found in the following zoning ordinance sections:

- Urban Low Density Residential Zone (R-1) – Section 17.03.010
- Urban Standard Density Residential Zone (R-2) – Section 17.03.020
- Urban Medium Density Residential Zone (R-3) – Section 17.03.030
- General Commercial Zone (C-2) – Section 17.03.050.

Findings: These regulations may apply to land inside the IAMP study areas that is jointly managed by the County and City of Hood River, and to County roads within the IAMP study areas. The two main County roads within the IAMP study area are Country Club Road and May Drive in the Exit 62 study area. The Development Ordinance regulates uses and development standards (e.g. setbacks) in these zones as they are found in the IAMP study areas. The IAMPs may propose modifications to zoning or zone provisions as part of their land use plans.

City of Hood River Transportation System Plan (1996, updated 2005)

A variety of goals, policies, standards, and projects from the City of Hood River's Transportation System Plan (TSP) relate to the IAMP study areas including the following:

> *GOAL 1: A balanced transportation system.*
> *POLICIES:*
> *1. Develop and implement public street standards that recognize the multi-purpose and shared nature of the street right-of-way for utility, pedestrian, bicycle, transit, truck, and auto use and recognize these streets as important to community identity as well as providing a needed service.*
>
> *GOAL 2: Transportation facilities designed and constructed in a manner that enhances Hood River's livability.*
> *POLICIES:*
> *1. Maintain the livability of Hood River through proper location and design of transportation facilities.*
> *3. Meet the applicable requirements of state and federal resource agencies for wetlands or stream corridors in development of City transportation facilities.*
>
> *GOAL 3: A safe transportation system.*
> *POLICIES:*
> *2. Design streets to serve the anticipated function and intended uses as determined by the comprehensive plan.*

Action: Develop a functional classification system for Hood River, which meets the City's needs and respects needs of other agencies including Hood River County and ODOT.
3. Enhance safety by prioritizing and mitigating high accident locations within the City.
8. Maintain access management standards for arterial and collector roadways consistent with City, County and State requirements to reduce conflicts between vehicles and trucks, as well as conflicts between vehicles, bicycles, and pedestrians.

GOAL 6: Transportation facilities, which provide efficient movement of goods.
POLICIES:
1. Designated arterial routes and freeway access areas in Hood River are essential for efficient movement of goods; design these facilities and adjacent land uses to reflect this need.
2. Consider existing water, railroad and air transportation facilities to be City resources and reflect the needs of these facilities in land use decisions.

GOAL 7: Implement the transportation plan by working cooperatively with federal, state, regional and local governments, private sector and residents, and by creating a stable, flexible financial system.
POLICIES:
1. Coordinate transportation projects, policy issues, and development actions with all affected governmental units in the area; Hood River County, CAT, Port of Hood River and ODOT.

Standards. Hood River's TSP proposes street design standards for the public right-of-way depending on the street's function classification. Below are the main roads found in the IAMP study areas and their City functional classifications.

Exit 62
- West Cliff Drive – collector
- Cascade Avenue (HCRH) – arterial
- Country Club Road – arterial (directly west of Cascade Avenue)
- Mt. Adams Avenue – local

Exit 63
- Oak Avenue (HCRH) – arterial
- 2nd Street – arterial, local (north of I-84)
- Riverside Drive – local

Exit 64
- Highway 35 (OR 35) – arterial
- East Marina Way – local

The street design standards for this set of functional classifications, including the HCRH between I-84 and 13 Street, are as follows:

Arterial with 74-foot right-of-way
- Two six-foot sidewalks
- Two seven-and-a-half-foot planting strips
- Two five-foot bike lanes
- Two 12-foot travel lanes
- One 12-foot center turn lane/median

Arterial with 62-foot right-of-way
- Two six-foot sidewalks
- Two seven-and-a-half-foot planting strips
- Two five-foot bike lanes
- Two 12-foot travel lanes

Arterial/HCRH with 60-foot right-of-way
- Two four-foot sidewalks
- Two four-foot planting strips
- Two five-foot bike lanes
- Two 11-foot travel lanes
- One 12-foot center turn lane
- Street lighting standards also apply

Collector with 58-foot right-of-way
- Two six-foot sidewalks
- Two six-and-a-half-foot planting strips
- Two seven-foot on-street parking lanes
- Two 10-foot travel lanes

Collector with 56-foot right-of-way
- Two six-foot sidewalks
- Two six-foot planter strips
- Two six-foot bike lanes
- Two 10-foot travel lanes

Local with 58-foot right-of-way
- Two six-foot sidewalks
- Two six-foot planting strips
- Two seven-foot on-street parking lanes
- Two 10-foot travel lanes

Local with 50-foot right-of-way
- Two six-foot sidewalks
- Two six-foot planting strips
- Two seven-foot on-street parking lanes
- One 14-foot travel lane

Local with 40-foot right-of-way
- Two five-foot sidewalks
- Two five-foot planting strips
- Two 10-foot travel lanes

The City also has authority to manage access (driveways and approach streets) along its roads. The access management guidelines in table below are those followed by the City according to its TSP.

City of Hood River TSP Access Management Guidelines

Functional Classification	Minimum Posted Speed	Minimum Spacing Between Driveways or Street	Minimum/Maximum Spacing Between Intersections
Arterial	35-45 mph	300 feet	660-1,000 feet
Collector	25-35 mph	300 feet	220-440 feet
Local	25 mph	Access permitted to each lot	200 feet

Projects. Pedestrian, bicycle, and roadway deficiencies found in the IAMP study areas are addressed by the following projects in the City's TSP. Cost estimates, when provided, are given in 1997$.

Pedestrian Projects
Short range:
- Cascade Avenue (HCRH) at Rand Road: striped crosswalks; $500.

Intermediate range
- West Cliff from Jaymar Road to Ruthton Park: multi-use path.
- Oak Avenue/Front Street from 1st Street to State Avenue (north side): sidewalks as part of reconstruction; 500 feet; $15,000.
- Oak Avenue from Cascade Avenue to 10th Street (north side): sidewalks (two segments); 900 feet; $27,000.
- Rand Road: sidewalks; $84,000.

Bicycle Projects
Short range:
- Cascade Avenue (HCRH) from I-84 (Exit 62) to 13th Street: two (one on either side of the road) five-foot striped bike lanes where width allows.
- 2nd Street (arterial and local) from Riverside Drive to State Avenue: two six-foot striped bike lanes plus two seven-foot parking lanes and two 12-foot travel lanes (no parking over bridge); $1,4501,500.

Intermediate range:
- West cliff from Jaymar Road to Ruthton Park: multi-use path.

- Long range
- Rand Road from Cascade Avenue (HCRH) to May Avenue: striped bike lanes at the north and south ends of Rand Rd and four-foot paved shoulder bikeways for the approximately 1,200 feet of the road between. $2,40032,400

Roadway Projects

Short range

- Cascade Avenue and Rand Road: new signal.
- OR 35 south of I-84 and OR 35 at US 30: comprehensive traffic studies to determine problems; $50,000.

Intermediate range

- Cascade Avenue (HCRH) from Country Club Road to 13th Street: develop a streetscape plan for the HCRH that complies with the HCRH street plan, which should entail traffic studies, designs of critical intersections and an access management plan; evaluate need for traffic light at Cascade and 20th; $50,000.
- Mt Adams and Cascade Avenue (HCRH): new signal and intersection improvements, possibly including turn lanes; $600,000.
- I-84 and OR 35: new traffic signals at I-84 ramps and OR 35 (signalized when warranted); may require some re-channelization or intersection revision; $300,000.
- Rand Road: widening to meet collector standards and extend south to Belmont; $2,500,000.

Long range

- OR 35 south of I-84: implement findings from traffic study; $500,000.
- OR 35 at US 30: implement finds from traffic study; $75,000.
- Historic Columbia River Highway (HCRH): construct two interpretive sites and sign projects; potentially located at HCRH and OR 35 and at HCRH and Country Club Road; $130,000.

Port of Hood River

Short range

- Hood River Bridge: lift span renovation; $5,000,000.
- Hood River Bridge: automated toll collection; $650,000.

Intermediate range

- Hood River Bridge: re-decking; $4,000,000.

Finding: The above goals, policies, standards and projects are relevant to the Hood River IAMPs in that they address issues that should be incorporated into the IAMPs including transportation options, livability, safety, movement of goods, land use, and agency coordination. State public policy applies in Hood River to the Historic Columbia River Highway (HCRH) as it is included in the IAMP study areas, for example, along Cascade Avenue and Oak Avenue. Oregon Revised Statute (ORS) 366.550 calls for the preservation and restoration of the historic character of the highway.

City of Hood River Comprehensive Plan (1978, amendments through 2005)

The City of Hood River's Comprehensive Plan provides goals, policies, and implementation strategies related to a long-term vision of managing growth in the City. These goals, policies, and strategies must be consistent with County and State goals and policies. Goals, policies, and strategies addressing the following issues apply to developing IAMPs in Hood River:

- citizen involvement
- land use planning
- cultural and natural resources
- air, water, and land resources
- park and recreation
- economic development
- public facilities
- transportation
- energy
- urbanization.

Finding: The Hood River IAMPs will need to provide opportunities for public involvement in the development of the IAMPs. A combination of forming advisory committees and holding public meeting and open houses may serve to provide most of these opportunities.

Policies under the land use planning goal describe legislative and quasi-judicial land use procedures that are used in the City for objective and effective land use decision making. Legislative procedures, which are detailed in the City's Development Ordinance, will be needed to adopt and implement the IAMPs and any associated changes to the Comprehensive Plan map and text.

There are designated Goal 5 resources within the IAMPs study areas. One historic resource found within the IAMP study areas is the Historic Columbia River Highway. Plans and standards found in the City's Development Ordinance and the Historic Columbia River Highway Master Plan should provide guidance about preservation and development related to the highway. Otherwise, policies and implementation strategies should be applied to the IAMP study areas if historic buildings and other areas are located within the study areas.

Policies and implementation strategies under Goal 5 call for providing open space and natural areas in conjunction with public facilities when possible. This should be considered for any new roadways and public facilities planned and constructed in association with the IAMPs. Goal 5 policies and strategies also call for the protection and enhancement of wetland and riparian areas. These policies and strategies apply to Phelps Creek as it is found within the IAMP study areas.

Goal 6 policies and implementation strategies will apply to the IAMPs, particularly if any federal or state air quality management areas or sites of environmental concern are located within the IAMP study areas. Otherwise, the IAMPs can serve to protect Goal 6 resource quality by providing bicycle and pedestrian facilities and supporting transportation options.

Goal 8 will affect the IAMPs insofar as any planned parks, open spaces, or recreational facilities are planned within the study areas. A City Parks and Recreation Master Plan should provide guidance on planned facilities. Pedestrian and biking facilities that are planned for the IAMP study area are outlined in the memo section addressing the City's TSP. These facilities can serve both transportation and recreation needs as well as provide connections to existing and planned recreational facilities in the City.

Pursuant to Goal 9, Economic Development, the new Exit 64 interchange, its IAMP, and the IAMPs for Exits 62 and 63 are all intended to improve truck circulation and the movement of goods at these key access points in the City. Access management plans and land use plans developed as part of the IAMP should also serve this objective. In particular, economic development policies and implementation strategies call for a master plan for the waterfront north of I-84 and west of the Hood River Bridge, which falls within IAMP study areas.

Goal 11 policies and implementation strategies emphasize the coordination of urban development with provision of public facilities including water, sewer, and transportation. Plans and projects developed for the IAMPs should be coordinated with the City's Public Facilities Master Plans, including its TSP.

The Transportation goals, policies, and implementation strategies of the Comprehensive Plan are articulated in the City's TSP.

The IAMPs can serve the City's energy conservation goals, policies, and strategies in both its transportation and land use elements outlined in Goal 13. The IAMPs should encourage transportation options and include facilities for walking and biking. Land use plans should be designed to maximize the use of existing and planned public facilities, including transportation facilities.

Goal 14 addresses urbanization. The IAMP study areas are within the City's Urban Growth Boundary (UGB). However, a boundary of the Exit 62 study area, in particular, coincides with the western edge of the City's UGB, and not all the land in the IAMP study areas is incorporated into the City limits yet. The IAMPs must coordinate with other City Public Facilities Master Plans (including the TSP) and formulate land use plans that are careful not to create development pressure on areas that are not in the City's long-range plans and have not undergone necessary planning.

City of Hood River Development Ordinance

The City's Development Ordinance is comprised of a subdivision ordinance (Title 16) and a zoning ordinance (Title 17). The following subsections focus on transportation-related elements of the Development Ordinance.

Street Improvement Standards. Title 16 addresses transportation standards, requiring that streets within or adjacent to a proposed development be improved to the provisions of the TSP and the subdivision provisions of Title 16. *Section 16.12.060 (Public Facility Standards)* includes street design standards for the following functional classifications of streets in Hood River:

- cul-de-sacs
- neighborhood infill streets
- local residential streets
- collectors
- arterials
- industrial and commercial downtown streets.

The standards are based on those in the TSP with finer differentiation of arterial streets into urban minor arterials that are either two-lane (one-way), two-lane (two-way), or three-lane (two-way), and of local residential streets into four designs (Options "A" through "D") . Title 16 recognizes that street design is influenced by factors other than functional classification, including the following:

a. Street classification in the Transportation System Plan;
b. Anticipated traffic generation;
c. On-street parking needs;
d. Sidewalk and bikeway requirements based on anticipated level of use;
e. Requirements for placement of utilities;
f. Street lighting;
g. Minimize drainage, slope, and sensitive lands impacts ;
h. Street tree location, as provided for in Section 16.12.050;
i. Protection of significant vegetation, as provided for in Section 16.12.040;
j. Safety and comfort for motorists, bicyclists, and pedestrians;
k. Street furnishings (e.g., benches, lighting, bus shelters, etc.), when provided;
l. Access needs for emergency vehicles; and
m. Transition between different street widths (i.e., existing streets and new streets), as applicable.

Access Management. Motor vehicle access to public streets is addressed in Section 16.12.020 (Vehicular Access and Circulation). Access to public streets requires permits and may also require traffic studies or fulfilling conditions of approval in order to be granted access. Requirements for a proposed Future Street Plan are established in this code section. The following access options are provided:

- Option 1: access from an existing or proposed alley or mid-block lane

- Option 2: access from a private street (in a planned unit development) or driveway connected to an adjacent property that has access to a public street (i.e. shared driveway).
- Option 3: access from an adjacent public street, with encouragement to close or consolidate existing access points.
- Residential land division on an arterial street: access from an alley, local or collector, street, and consolidated driveways serving two or more lots when access from an alley, local, or collector street access not practicable.
- Double-frontage lots: access from the street with the lowest functional classification.

Access spacing requirements in the code refer to the guidelines in the TSP. Code provisions, however, are more specific about driveway and street spacing on local streets (22 feet) compared to the more general guidance in the TSP. Allowances for restricting direct access and potentially requiring access consolidation, shared access, or greater access spacing are established for cases in which the City, County, or ODOT deem them necessary to protect the function, safety, and operation of the public street being accessed.

Connectivity. Section 16.12.020 (Vehicular Access and Circulation), Subsection I addresses connectivity and block standards, including the following standards, according to land use designation/zoning:

a. Four Hundred (400) feet length and 1,200 feet perimeter in the in the Central Business District;
b. Six Hundred (600) feet length and 1,600 feet perimeter in residential zones (R-1, R-2, and R-3);
c. Not applicable to the Industrial zone (I); and
d. Eight Hundred (800) feet length and 2,000 feet perimeter in all other zones.

Design standards and general connectivity provisions for pedestrian and bicycle facilities are provided in Section 16.12.030 (Pedestrian Access and Circulation).

Land Use. Title 17 regulates land use in the City and implements the land use designations and goals and policies established in the Comprehensive Plan. The follow zones implement the City's Comprehensive Plan designations.

- Urban Low Density Residential Zone (R-1)
- Urban Standard Density Residential Zone (R-2)
- Urban High Density Residential Zone (R-3)
- Office/Residential Zone (C-1)
- General Commercial Zone (C-2)
- Light Industrial Zone (LI)
- Industrial Zone (I)
- Open Space/Public Facility Zone (OS/PF)
- Environmental Hazard Zone (EH)

- Columbia River Recreational/Commercial Zone (RC)

Findings: Existing zoning in the IAMP study areas include the following Low Density Residential (R-1), General Commercial (C-2), Light Industrial (LI), and Industrial (I). The zoning regulations specify the types of uses allowed and restricted, and the development standards for each zone (e.g. setbacks). Specific standards apply to Planned Developments (Chapter 17.07). The land use plans developed for the IAMPs will either draw on existing land use regulations, propose Comprehensive Plan or Zone amendments, or some combination of the two. Procedures for the quasi-judicial and legislative actions that may be involved in adopting the land use plan and the IAMPs themselves are established in Chapters 17.08 (Zone Changes and Plan Amendments) and Chapter 17.09 (Review Procedures) of the City's code.

Port of Hood River Strategic Plan

The Port of Hood River completed a Strategic Plan in March 2006 that sets out goals and strategies for managing its resources. In particular, it addresses strategies and actions for managing the Hood River Bridge, the Waterfront Business Park, and Marina, all of which are inside or adjacent to the IAMP study areas.

Developing a Master Plan for the Waterfront Business Park was the primary objective for that asset in the Strategic Plan. The objective and action items give direction to the Master Plan to do the following:

- build upon the existing Light Industrial zoning in the area;
- incorporate elements of prior planning efforts;
- include a new alignment for 2nd Street and pedestrian trail system; and
- recommend alternative uses for the Expo Center and alternative sites for events currently held at the Expo Center.

Finding: In terms of the bridge, the Strategic Plan commits to working with ODOT and the Washington Department of Transportation (WSDOT) to assess replacing the bridge and measures for maximizing the life of the existing bridge. The Strategic Plan's objective for the Marina entails updating the Marina Park Plan to support recreational and commercial uses, incorporating elements of the 1997 Marina Landscape Plan and the 2001 Marina River Walk Plan.

APPENDIX F

Technical Memorandum #2: Study Area Boundaries and Preliminary Goals and Objectives

Technical Memorandum

Date: July 30, 2007

To: Hood River IAMP Stakeholder Working Group (SWG) &
Project Executive Team (PET)

From: Cathy Corliss
John Bosket (DKS Associates)

cc: Hood River IAMP Project Team

Re: Hood River Interchange Area Management Plan (IAMP)
Technical Memorandum #2: Draft Study Area Boundaries and Preliminary Goals and Objectives (Tasks 4.1 and 4.2)

Technical Memorandum #2 is intended to describe the draft study area boundaries and suggest some initial goals and objectives for the Hood River Interchange Area Management Plans (IAMPs). The study area boundaries and the goals and objectives presented in this memorandum reflect the comments received from the Hood River IAMP Stakeholder Working Group (SWG) during its June 27th meeting, as well as those provided by the Project Executive Team (PET) during its July 24, 2007 meeting. It is our expectation that both the study area boundaries and the goals and objectives will continue to evolve over the course of this project as we hear from stakeholders and the general public about the focus of the IAMPs.

Project Background

The Exit 64 - East Hood River Interchange project was identified as a high priority construction project by Hood River County, the City of Hood River, and the Port of Hood River. It is listed in the draft 2006-09 Statewide Transportation Improvement Program (STIP) and is being funded through OTIA III, with construction anticipated in 2011.

In accordance with Agency policies and State Administrative Rules, the reconstruction of the Exit 64 interchange will require the Oregon Department of Transportation (ODOT) to prepare an IAMP for the proposed Exit 64 - East Hood River Interchange project. Because of the proximity and nature of use of the interchange immediately to the west, both the Exit 63 and Exit 64 interchange areas will be included in the same IAMP. In addition, while no improvements are currently planned for the Exit 62 interchange at the west end of the City, a separate IAMP will be prepared for that area as a part of this process to provide the City and County with a comprehensive plan to facilitate freeway access.

Typically, an IAMP must be completed and adopted by the Oregon Transportation Commission (OTC), with appropriate comprehensive plan and/or code amendments adopted by the local jurisdictions, before construction on the subject interchange can begin. However, to allow sufficient time to adequately consider area needs, the Oregon Department of Transportation, the City of Hood River, Hood River County, and the Port of Hood River are participating in an Intergovernmental

Agreement to allow for IAMP adoption on a timeline that is independent from the Exit 64 construction project.

The IAMPs must be developed in accordance with the Oregon Highway Plan (Oregon Highway Plan), Oregon Administrative Rules, the ODOT Interchange Access Management Spacing Standards for Approaches, the State Agency Coordination Program (SAC) Procedures for Adopting Final Facility Plans, and the Statewide Planning Goals. The IAMPs define how the land use and transportation systems within the interchange study areas (ISAs) of the three interchanges will function over the planning horizon (20+ years).

Draft Study Area Boundaries

IAMP study areas should reflect the general area where the interchange would potentially influence land use and traffic patterns. The boundary should be a large enough area to include land use patterns affected by the interchange and the affecting roadway network. As general rule of thumb, lands located within approximately ½-mile from the interchange are considered. However, the boundary is further refined by consideration of existing and planned land uses in the vicinity that will impact the interchange, transportation facilities and traffic operations, and natural and cultural resources.

For the purposes of initiating the analysis, the Project Team has identified draft Study Area Boundaries as shown on the attached Figure 2-1 (Exit 63/64) and Figure 2-2 (Exit 62). The Study Areas will likely continue to be revisited and refined at later stages in the project once future deficiencies and necessary preferred improvement alternatives for each interchange have been identified.

For the Exit 63/64 Study Area, boundaries have been set at State Street and the Urban Growth Boundary (UGB) to the south, the UGB to the east and north, and 13th Street to the west. While the southern boundary at State Street is significantly closer to the interchanges than the standard ½-mile, this limit was deemed appropriate for this area given the changes in topography and existing residential neighborhoods to the south that are unlikely to be redeveloped within the planning horizon.

For the Exit 62 Study Area, boundaries include a combination of the UGB and Sherman Avenue to the south, 30th Street and Rand Road to the east, and the UGB to the north and west. While Rand Road is slightly beyond the ½-mile radius from the interchange, it was included as a study boundary because it represents a significant link in the transportation system. In addition, the area between May Drive, Frankton Road, 30th Street and the UGB was included because of its high development potential over the next 20 years and its anticipated reliance on the Exit 62 interchange for access to areas beyond Hood River. It should also be noted that small pocket of existing residential development in the southwest and southeast corners of the study area were excluded as their potential for redevelopment within the planning horizon was considered to negligible.

In addition to mapping study area boundaries, Figures 2-1 and 2-2 also identify study intersections and access management areas. Study intersections are key locations where safe and efficient operation is essential for adequate operation of the interchanges. These intersections will be analyzed as part of the study to identify any safety or operational deficiencies through the planning horizon.

Needed improvements to address deficiencies will be developed and recommended for inclusion in State and local capital improvement plans.

Access management areas are corridors along the interchange crossroads where turning movements related to driveways and public street intersections can influence interchange operations. As a general practice, this corridor includes the length of the interchange crossroad within ¼-mile of the interchange ramp terminals, which would be consistent with ODOT's access management spacing standards for interchanges areas. As part of the IAMPs, access management plans will be developed that will provide short, medium, and long-range actions to modify access to the crossroads within the access management areas to provide conformance with ODOT's access management spacing standards where feasible.

Interchange Function

Below are descriptions of the three interchanges in terms of their function and relationship to the community and broader transportation system. These descriptions are preliminary and are expected to be refined through the course of the IAMP process.

- **Exit 62** serves the residential areas of Hood River and Hood River County on the west. The interchange is an important access point for freight movement from Hood River County to the interstate system and markets outside of the county. The interchange provides access to the Heights residential area, as well large undeveloped commercial and future residential lands at the west end of the city of Hood River. As the west end of the city continues to develop Exit 62 will become an important gateway.

- **Exit 63** serves as the primary entrance into the commercial heart of the City of Hood River. The interchange also serves as the primary entrance into the Port of Hood River property north of the interstate. This area is currently underdeveloped, but is planned to support light industrial, recreational, commercial and residential uses in the future. This interchange serves as a link between downtown and the Columbia River Bridge and is the primary pedestrian connection between downtown and the waterfront.

- **Exit 64** serves as a vital connection between the states of Washington and Oregon connecting the central Gorge area and facilitating the local and interstate movement of freight. The interchange also serves to facilitate the movement of recreational traffic from the interstate system to the numerous recreational areas in both Oregon and Washington states. A third function of the interchange is the facilitation of movement of commuters and consumers between Washington and Oregon. Highway commercial development at the interchange provides interstate travelers with convenient gas, food and lodging.

Preliminary Goals and Objectives

The goals and objectives should reflect the intentions and interests of ODOT, the local government and other key stakeholders for the interchange and transportation operations in the area. The goals and objectives should be guided by, but not re-statements of, OHP policies and OAR language. The objectives need to be concrete statements that relate what the plan is trying to accomplish and should be achievable and measurable. The objectives serve as the basis for data collection and research and as alternative evaluation criteria to guide alternatives analysis and selection of the preferred alternative, and to guide management decisions.

As written, the preliminary goals and objectives below could be applied to each of the three interchanges. However, individual goals and objectives could also be tailored for each interchange.

Goal 1: Protect the function and operation of the interchanges and the state highways as follows:

- I-84 is classified as an Interstate Highway. It is part of the National Highway System and is a designated freight route between Portland and points east. The operational objective for Interstate Highways is to provide safe and efficient high-speed travel in urban and rural areas.

- Oregon 35 is classified as a Statewide Highway, which provides inter-urban and inter-regional mobility and provides connections to larger urban areas, ports and major recreational areas not directly served by Interstate highways.

- The Historic Columbia River Highway (HCRH) is classified as a District Highway. The operational objective for District Highways is to allow safe and efficient moderate- to low-speed travel in urban and urbanizing areas for traffic flow, as well as bicycle and pedestrian movements. In addition, the HCRH has design and operational requirements not applicable to other highways in the state.

- The Hood River Bridge over the Columbia River is a privately owned facility, but is part of the National Highway System and provides an important link between Oregon and Washington. The area around the Exit 64 interchange should be managed to facilitate safe and efficient travel through the interchange and Hood River Bridge.

Objective 1a: The project alternatives meet the requirements of the Federal Interchange Policy and will accommodate design-year (2030) traffic demands as a threshold.

Objective 1b: The project alternatives are consistent with the OHP requirement that the maximum volume-to-capacity (V/C) ratio for the ramp terminals of interchange ramps be the smaller of the values of the V/C ratio for the crossroad or .70

Objective 1c: Meet or move in the direction of ODOT access management spacing standards for access along interchange crossroads.

Objective 1d: The project alternatives are consistent with the intent of the Programmatic Agreement for the HCRH.

Objective 1e: The project alternatives are consistent with the intent of the I-84 Corridor Strategy.

Goal 2: Provide for an adequate system of local roads and streets for access and circulation within the interchange area that minimizes local traffic through the interchange and on the interchange cross road.

> **Objective 2a:** Any necessary supporting improvements to the surface street system have been (or will be) identified in the local comprehensive plan and funding or a funding source for these improvements has been identified.
>
> **Objective 2b:** While recognizing the urban fabric of Hood River, the project alternatives propose surface street improvements that either meet the ODOT established access management standards or improve on the current conditions.
>
> **Objective 2c:** The project alternatives propose surface street improvements that will operate adequately over the 20-year planning horizon.

Goal 3: Provide safe and efficient multi-modal travel between the connecting roadways (and the surface street network, if applicable).

> **Objective 3a:** While recognizing existing capacity constraints and consistent with the Programmatic Agreement for the HCRH, the project alternatives will improve safety by adding capacity to reduce congestion and/or correcting geometric conditions that do not meet current standards.
>
> **Objective 3b:** The project alternatives will improve bicycle and pedestrian safety by providing upgraded bikeways and walkways that meet current standards and include facility infill and extensions where needed to provide a continuous network while respecting the historic streetscape.

Goal 4: Ensure future changes to the planned land use system are consistent with protecting the long-term function of the interchange and the surface street system and the integration of future transportation projects and land use changes.

> **Objective 4a:** The project alternatives were developed in partnership with affected property owners in the interchange area, the City of Hood River, Hood River County, and the Oregon Department of Transportation (ODOT), and other stakeholders, including interchange users.
>
> **Objective 4b:** The City and County Comprehensive Plans and/or Transportation System Plans are consistent, or will be made consistent, with the project alternatives.
>
> **Objective 4c:** The project alternatives are consistent with the county's Bike Plan, which is currently under development.

Goal 5: Recognize the importance of the interchange function to support local and regional economic development goals and plans.

> **Objective 5a:** The project alternatives are expected to reduce delay for vehicles, including commercial vehicles, accessing the freeway and increase safety.

Objective 5b: The project alternatives would facilitate access to, through, and from businesses in Hood River, while protecting the function and livability of downtown Hood River.

Objective 5c: The project alternatives recognize the importance of recreation and tourism to the regional economy.

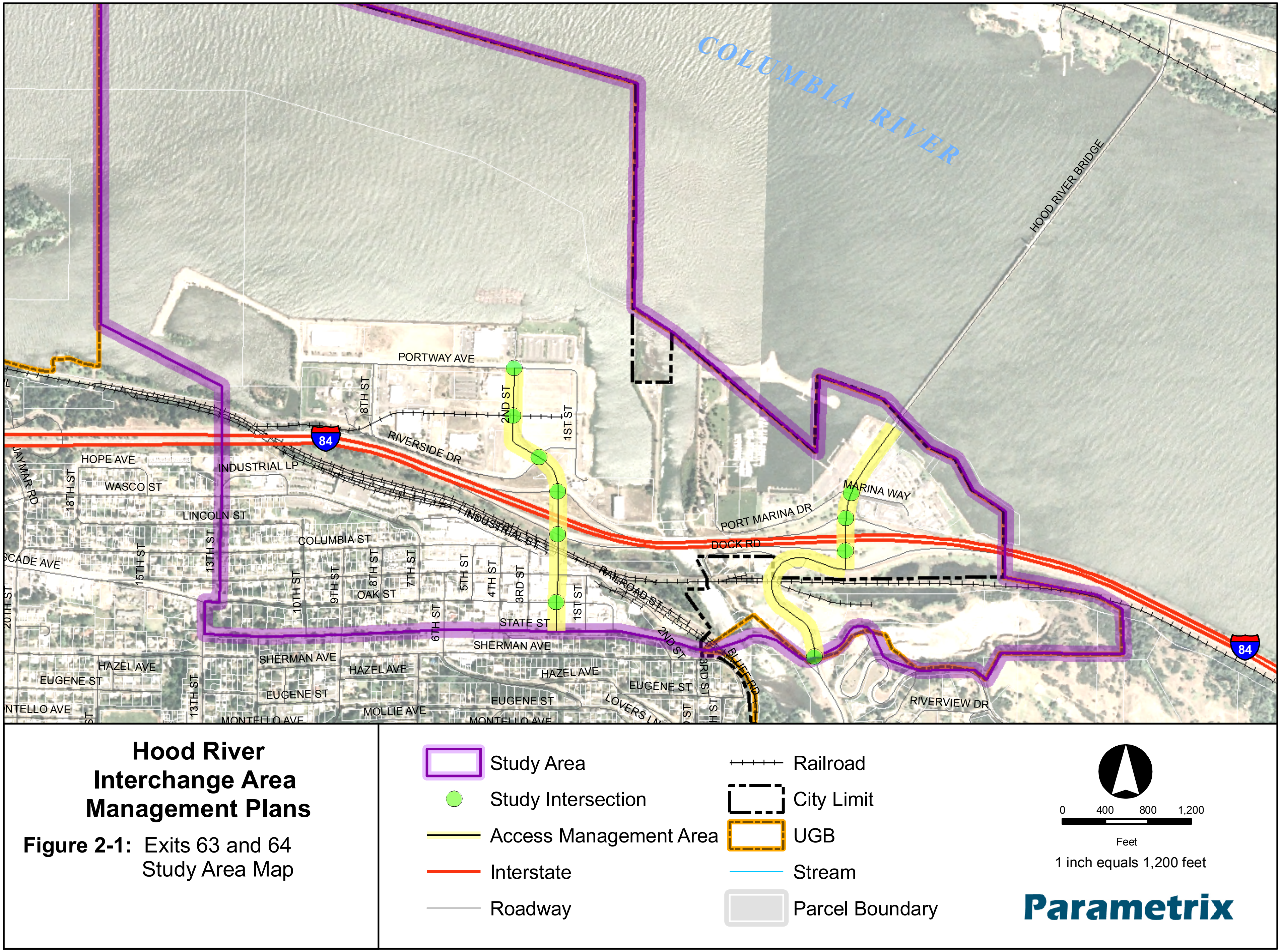
Objective 5d: The project alternatives will recognize the local interest in supporting employment growth on the Port waterfront property north of the Exit 63 interchange.

Goal 6: Ensure that the needs of regional, through trips and the timeliness of freight movements are considered when developing and implementing plans and projects on freight routes.

Objective 6a: The project alternatives would facilitate freight access to and from the many industrial, agricultural, and forest products freight destinations in the interchange area.

Objective 6b: The project alternatives recognize the importance of interstate travel and freight mobility within the corridor by improving mobility and access to the bridge.

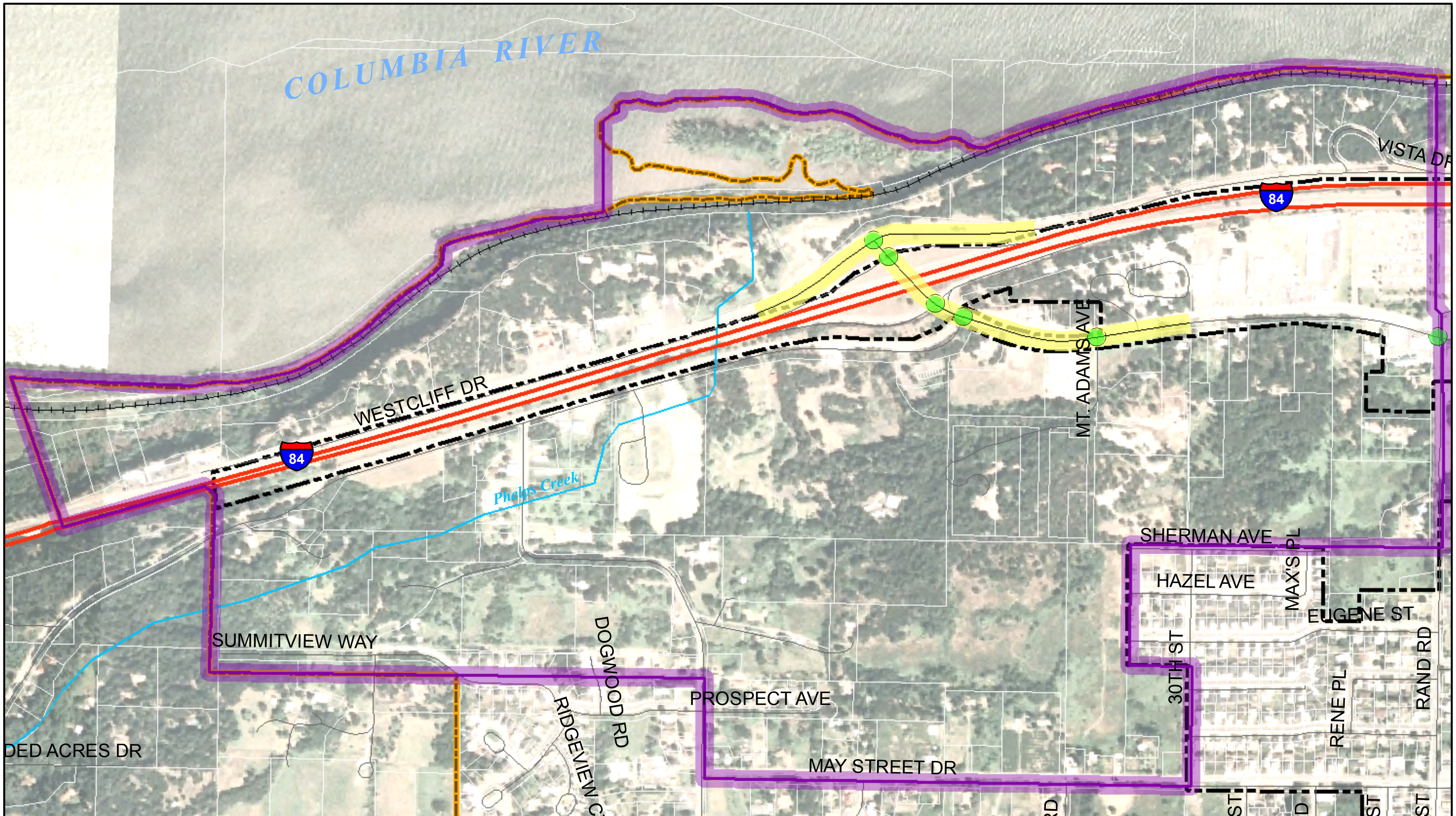
SWG Action: Review and discuss the preliminary goals and objectives and identify any appropriate changes or additions.



Hood River Interchange Area Management Plans

Figure 2-1: Exits 63 and 64 Study Area Map

Analysis by C. Hainey; Analysis Date: June 2007; Plot Date: June 2007; File Name: HoodRiver_2.2.mxd



Hood River Interchange Area Management Plans

Figure 2-2: Exit 62 Study Area Map

Study Area
Study Intersection
Access Management Area
Interstate
Roadway
Railroad
City Limit
UGB
Stream
Parcel Boundary

0 400 800 1,200
Feet
1 inch equals 800 feet

Parametrix

Analysis by C. Hainey; Analysis Date: June 2007; Plot Date: June 2007; File Name: HoodRiver_2.2.mxd

APPENDIX G

Technical Memoranda #3: Existing Conditions

- Land Use Inventory and Analysis
- Environmental Analysis
- Transportation Conditions

Memorandum

Date:	September 24, 2007
To:	Hood River Interchange Area Management Plan Stakeholder Work Group (SWG)
From:	DJ Heffernan, Planner
cc:	John Bosket, DKS Associates
Re:	Land Use Inventory and Existing Condition Analysis

I. Introduction

The purpose of this memorandum is to document existing land use conditions in the Interchange Area Management Plan (IAMP) study areas surrounding three interchanges in Hood River, Oregon. The first interchange is near mile-post 62 on Interstate Highway 84 (I-84) at the western edge of Hood River. Part of this study area is outside the City of Hood River in Hood River County. Some of the area in the county is outside the Hood River City Urban Growth Boundary. If any properties currently outside the Hood River UGB are added to the boundary, planned land uses would intensify for those properties.

The other two interchanges are in close proximity to one another near mile-posts 63 and 64. These two interchanges are in the same study area. Almost all of the land in this study area is within the City of Hood River. This study area includes part of the Hood River downtown and a large area owned by the Port of Hood River that borders the Columbia River and the mouth of the Hood River. The Port has a redevelopment plan for some properties in this area that is/is not consistent with the existing comprehensive land use plan. Modification of the comprehensive plan consistent with the Port's master Plan for this area would allow an intensification of land uses in this area over what is depicted in the existing land use plan.

II. Existing Zoning

Existing zoning in the Interchange Study Areas is a combination of Hood River County and City of Hood River zoning. (See Appendix A and Appendix B for zoning in the Interchange Study Areas.) In the Interchange 62 Study Area, a majority of the area (59%) is designated with County zoning. Conversely, the Interchange 63/64 Study Area includes a small portion of County zoning and is mostly designated with City zoning (82%). In both study areas, low density residential and general commercial zones are predominant.

County zoning is differentiated by the following prefixes and general land use categories:

1. U – Urban Growth Area: zoning adopted for the City of Hood River Urban Growth Area; regulated by Article 17 of the County's Zoning Ordinance. All of the study area for interchanges 63/64 and most of the study area for interchange 62 fall within an urban growth area.
2. GMA – General Management Area: This is a reference to the Columbia River Gorge National Scenic Area Management Plan. The Scenic Area plan addresses scenic as well as natural and cultural resources. Local zoning implements the Scenic Area plan using special land use review criteria. In the GMA, allowed uses include agriculture and forestland, open space, rural residential, and recreation; regulated by Article 75 of Hood River County's Zoning Ordinance. That part of the interchange 62 study area outside the Hood River Urban Growth Boundary is within the GMA overlay district.
3. SMA – Special Management Area: SMA contain the most significant scenic resources in the Columbia River Gorge and, therefore, development restrictions are highest in these areas. None of the land in the interchange study areas is designated a SMA (Scenic Area Management Plan map, p. 15).

These prefixes and categories are included in the legends for the zoning maps shown in Appendices A and B.

Interchange 62 Study Area

City and County zoning in the Interchange 62 Study Area is mostly residential (approximately 58%). This is to be expected as this study area forms the border between the City and County land and between urban and rural development. A significant portion of the study area is also zoned commercial (approximately 30%), which reflects the area's strategic position near a freeway interchange. Table 1 summarizes zoning acreage for the study area.

Table 1: Zoning Acreage in the Interchange 62 Study Area

City of Hood River Zoning	**Acres**	**% of Study Area**
C-2 – General Commercial	71.9	14.8%
LI – Light Industrial	6.4	1.3%
R-1 – Urban Low Density Residential	102.3	21.1%
R-2 – Urban Standard Density Residential	0.4	0.1%
R-3 – Urban High Density Residential	19.2	4.0%
Sub-total	*200.2*	*41.3%*
Hood River County Zoning	**Acres**	**% of Study Area**
G-AG-1 – General Management Area Large-Scale Agriculture	1.3	0.3%
G-RR-10 – General Management Area Rural Residential 10 ac	2.3	0.5%
G-RR-2 – General Management Area Rural Residential 2 ac	2.1	0.4%
G-RR-5 – General Management Area Rural Residential 5 ac	5.4	1.1%
S-OS – Special Management Area Open Space	17.6	3.6%
U-C-2 – Urban Growth Area General Commercial	72.8	15.0%
U-OS – Urban Growth Area Open Space	2.7	0.6%
UR-1 – Urban Growth Area Low Density Residential	180.6	37.2%
Sub-total	*284.7*	*58.7%*
TOTAL	**484.9**	**100.0%**

Source: Hood River County

Interchange 63/64 Study Area

The Interchange 63/64 Study Area is mostly land within the City and is more urban than the Interchange 62 Study Area. Residential and commercial zoning is still significant in this study area although the primary residential zoning is higher density than in the Interchange 62 Study Area. There is also a significant amount of land zoned for industrial and open space uses (approximately 31% and 13% respectively). This can be attributed to the study area's proximity to the Hood River Bridge, Port of Hood River property, and the Columbia River. Table 2 summarizes zoning acreage for the study area.

Table 2: Zoning Acreage in the Interchange 63/64 Study Area

City of Hood River Zoning	Acres	% of Study Area
C-1 – Office/Residential	3.5	1.4%
C-2 – General Commercial	49.7	20.4%
I – Industrial	17.9	7.3%
LI – Light Industrial	54.0	22.1%
OS – Open Space	31.3	12.8%
R-2 – Urban Standard Density Residential	27.2	11.1%
RC – Columbia River Recreational/Commercial	17.4	7.1%
Sub-total	*201.1*	*82.4%*

Hood River County Zoning	Acres	% of Study Area
G-F-3 – General Management Area Small Woodland	0.3	0.1%
G-OS – General Management Area Open Space	1.5	0.6%
G-PR – General Management Area Public Recreation	0.3	0.1%
U-C-2 – Urban Growth Area General Commercial	13.3	5.4%
U-LI – Urban Growth Area Light Industrial	27.7	11.3%
Sub-total	*43.1*	*17.6%*
TOTAL	**244.2**	**100.0%**

Source: Hood River County

III. Measure 37 Claims

There currently are four Measure 37 claims filed with Hood River County within the Interchange Study Areas. The nature of the claims is not included in the mapping files managed by the County, but the locations, size of the claims, and property owners are included and are shown in Figure 1 and Table 3. The claims are located at both edges of the Hood River urban area. On the west, there is a cluster of three claims straddling I-84 on land with low density residential and commercial County zoning. On the east is a single claim adjacent to I-84 on land zoned light industrial by the County.

Figure 1: Measure 37 Claims in the Interchange Study Areas

Table 3: Measure 37 Claims in the Interchange Study Areas

Item	Parcel #	Property Owner	Acres
1	03N10E27C 801	GRIFFIN, CLAIRE A	1.0
2	03N10E27C 1100	CUSHMAN, ANNA J TR U-3 ET AL	5.7
3	03N10E34B 1000	CUSHMAN, ANNA J TR U-3 ET AL	1.0
4	03N11E30 1001	HOUSTON, HOWARD W., JR	8.9
		TOTAL	16.6

Source: Hood River County

IV. Proposed Transportation Improvements

In addition to the proposed improvements to the interchange ramps, bridges, and connecting roadways, there are a number of planned transportation improvements outlined in adopted local transportation system plans (TSP) and other area plans. Planned improvements are listed for each study area.

Interchange 62 Study Area

Hood River County TSP

Implementation is expected within a 20 year time horizon.

Access Control
The County TSP does not call for any specific access control improvements but does establish access spacing standards for public roads and driveways within ¼ mile of the interchange that are consistent with ODOT access standards in the Oregon Highway Plan (Hood River County TSP, Section 6.3.2 – Special Access Management Areas, November, 2002).

City of Hood River TSP
Implementation is expected within a 20 year time horizon.

Vehicular System Improvements (most also include bike and pedestrian improvements)
- V1 – Signal at intersection of Cascade and Rand Avenue
- V6 – Streetscape improvement plan for the Old Columbia River Highway (US 30) from Country Club to Rand (and beyond but outside the IAMP study area).
- V 15 – Widen Rand Road to collector standard from US 30 south (and outside the study area).
- V 23 – Interpretive site and signs at US 30 and Country Club Road

Bicycle System Improvements
- B2 – US 30 bike lanes from I-84 Interchange east (and beyond the study area)
- B 8 – West Cliff multi-use pathway from Ruthton Park east (to Jay Mar beyond the study area).

Pedestrian System Improvements
- P 7 – West Cliff multi-use pathway from Ruthton Park east (to Jay Mar beyond the study area).

Interchange 63/64 Study Area

Hood River County TSP
Implementation is expected within a 20 year time horizon.

Access Control
The County TSP does not call for any specific access control improvements but does establish access spacing standards for public roads and driveways within ¼ mile of the interchange that are consistent with ODOT access standards in the Oregon Highway Plan (Hood River County TSP, Section 6.3.2 – Special Access Management Areas, November, 2002).

City of Hood River TSP
Implementation is expected within a 20 year time horizon.

Vehicular System Improvements (most also include bike and pedestrian improvements)
- V 3 – Signal at intersection of Front Street and State Street
- V 4 – OR 35, I-84, US 30 vicinity traffic study
- V 11 – I-84/OR 35 traffic signals at ramp terminals and rechannelization
- V 17 – I-84/OR 35 implementation of traffic study findings
- V 18 – OR 35/US 30 implementation of traffic study findings
- V 23 – Historic Highway interpretive site and signage near intersection of US 30 and OR 35
- V 24-26 – Hood River Bridge deck and lift-span repairs and toll system improvements

Bicycle System Improvements
- B3 – 2nd Street bike lanes from Riverside Drive to State Street
- B 6 – State Street bike lanes from 9^{th} to Front Street.
- B 18 – Bike/Ped crossing over Union Pacific Rail Road tracks and connection to Westcliff trail (at Jaymar).

Pedestrian System Improvements

- P 6 – Downtown Hood River pedestrian system improvements (urban renewal plan)
- P 13 – Sidewalks on Cascade Avenue from 5th Street to 6th Street
- P 16 – Sidewalks on Oak Avenue and Front Street from 1st Street to State Street
- P 21 – Downtown curb extensions and cut-out improvements (around 50 locations)

State Route 35 Columbia River Bridge Replacement
Multiple alternatives have been studied. The preferred alternative would replace the existing bridge in approximately the same location as the existing bridge but with access reconfigured for approaches to the new structure. The timing for this project is uncertain and will require significant contributions from both states and federal assistance.

V. Existing Land Use

Interchange 62 Study Area
The study area which encompasses Interchange 62 has significant potential for future development, particularly in the area south of Interstate 84. Although subdivisions and commercial lots have been developed in parts of this study area, there is opportunity to greatly increase residential and commercial density.

The following table is based on data from the County Assessor's Office. The table separates the lots in the Interchange 62 Study Area by use class. It shows the acres of vacant land in each use class and the percentage of the study area that is vacant. It does not address those lots that are improved but underdeveloped. Underdevelopment is addressed in the paragraphs following the table, and is based on field surveys.

Table 4: Vacant and Unimproved Land in the Interchange 62 Study Area

Property Use Class	Acres in Study Area	% of Study Area	% of Use Class
Vacant State, County, City owned, or EFU			
COUNTY OWNED - VACANT	1.2	0.2%	22.0%
DESIGNATED FORESTLAND - VACANT	0.8	0.2%	15.1%
EFU ZONED FARM/RANGE - VACANT	2.0	0.4%	36.3%
PORT/OTHER MUNICIPAL - VACANT	0.2	0.0%	2.8%
TRACT IN EFU ZONE - VACANT	1.3	0.3%	23.7%
SUB-TOTAL	*5.4%*	*1.1%*	*100.0%*
Vacant Residential			
UNIMPROVED RESIDENTIAL LAND	9.8	2.0%	100.0%
SUB-TOTAL	*9.8*	*2.0%*	*100.0%*
Vacant Commercial			
COMMERCIAL-INDUST ZONE-VACANT	6.4	1.3%	16.8%
TRACT-COMMERCIAL ZONE-VACANT	1.0	0.2%	2.6%

Property Use Class	Acres in Study Area	% of Study Area	% of Use Class
UNIMPROVED COMMERCIAL LAND	30.5	6.3%	80.5%
SUB-TOTAL	*37.9*	*7.8%*	*100.0%*
Vacant Industrial	n/a	n/a	n/a
Vacant Other			
CEMETERY OWNED - VACANT	1.1	0.2%	0.9%
FARM/RANGE LAND-VACANT NON-EFU	6.6	1.4%	5.7%
TRACT LAND - VACANT	37.5	7.8%	32.2%
TRACT LAND POT DEV - VACANT	71.3	14.7%	61.2%
SUB-TOTAL	*116.5*	*24.1%*	*100.0%*
TOTAL	**169.6**	**35.0%**	**100.0%**

Source: Hood River County

Most of the large lots on the south side of Country Club road are sparsely developed, wooded or vacant. Uses along Country Club road include a mobile home park, a small vineyard field and various rundown or underdeveloped commercial lots. The lots on either side of Frankton Road, north of the intersection with Summitview Way, are primarily large, low density, single-family residential lots. Development or redevelopment potential appears to be high on both sides of Frankton road. There is a small school on the eastern side of Frankton, as the road bends to the south. The subdivisions that lie southwest of the intersection of Frankton road and Summitview Way are developed to their full potential. However, as Summitview Way leaves the existing subdivision to the east, large buildable lots exist on either side of the road. Development potential is also high on both sides of May Street Drive, between 30th and Frankton. This corridor is predominantly large lot, low density, single-family residential. There is one small subdivision on the south side of May Street Drive between Frankton Road and Rocky Road. Roughly half of the homes in this subdivision are complete. This corridor on May Street Drive is abutted to the east and west by subdivisions. Further subdivisions in this area appear likely and could add 500-700 new residential lots to the study area. These new residence would rely heavily on May Street Drive, Frankton Road, Country Club Road, Wasco St., and Cascade Avenue, for local commuting, and Interchange 62 for access to Interstate 84.

To the southeast of Interchange 62, Cascade Avenue has fully developed commercial lots at the intersection with Wasco St., at the eastern edge of the Study Area. As Cascade moves west toward Interchange 62, the lots on the north side support auto related commercial uses, a mobile home park, and a gas station. The lots are not densely developed. The lots on the south side of Cascade Avenue are less developed than on the north side and could support significantly increased density. Further development along Cascade Avenue would increase pressure on that road and on Interchange 62.

The lots north of Interchange 62, along Westcliff Drive are developed at a low density, with some vacancies. To the west of the interchange, Westcliff Drive is approximately 60% developed commercial, including a hotel, a motel, and two restaurants. The remaining 40% is vacant residential or very low density residential. To the east of the interchange on Westcliff Drive, the lots are developed as very low density single family residential. There is infill potential on Westcliff Drive in either direction from the interchange. Although Westcliffe Drive could support increased traffic pressure, new development on Westcliff would rely on Interchange 62 not only for Interstate access, but also to cross the Interstate and access Cascade Avenue and those areas to the south.

Interchange 63/64 Study Area

The Interchange 63/64 Study Area includes the historic Hood River downtown, the industrial lots north of I84, and the lots clustered around Interchange 64. This Study Area is more densely developed and has less potential for future redevelopment than the Interchange 62 Study Area.

The following table is based on data from the County Assessor's Office. The table separates the lots in the Interchange 62 Study Area by use class. It shows the acres of vacant land in each use class and the percentage of the study area that is vacant. It does not address those lots that are improved but underdeveloped. Underdevelopment is addressed in the paragraphs following the table, and is based on field surveys.

Table 5: Vacant and Unimproved Land in the Interchange 63 and 64 Study Area

Property Use - Classification	Acres in Study Area	% of Study Area	% of Use Class
Vacant State, County, City owned, or EFU			
CITY OWNED - VACANT	2.6	0.7%	3.6%
COUNTY OWNED - VACANT	0.0	0.0%	0.1%
DESIGNATED FORESTLAND - VACANT	17.1	4.5%	23.8%
PORT/OTHER MUNICIPAL - VACANT	52.0	13.6%	72.2%
STATE OWNED - VACANT	0.3	0.1%	0.4%
SUB-TOTAL	*72.0*	*18.9%*	*100.0%*
Vacant Residential			
RES INDUSTRIAL ZONE - VACANT	0.2	0.1%	13.9%
UNIMPROVED RESIDENTIAL LAND	1.5	0.4%	86.1%
SUB-TOTAL	*1.7*	*0.5%*	*100.0%*
Vacant Commercial			
UNIMPROVED COMMERCIAL LAND	6.7	1.7%	100.0%
SUB-TOTAL	*6.7*	*1.7%*	*100.0%*
Vacant Industrial			
INDUSTRIAL LAND - VACANT	15.1	4.0%	100.0%
SUB-TOTAL	*15.1*	*4.0%*	*100.0%*
Vacant Other			
TRACT LAND - VACANT	0.3	0.1%	100.0%
SUB-TOTAL	*0.3*	*0.1%*	*100.0%*
TOTAL	**95.8**	**25.1%**	**100.0%**

Source: Hood River County

The area to the south of Interchange 63 is the historic Hood River downtown. It appears most of the commercial lots in this area are fully utilized, with the exception of several surface parking lots on Columbia St. and Cascade St. Similarly, the residential lots west of downtown are fully developed as single family housing. Without redevelopment or infill, the density of downtown commercial and residential use is not expected to increase significantly.

The area to the north of Interchange 63 and north of Riverside Drive is divided between an industrial park, the Hood River Port, and 6.5 acres of waterfront that was transferred from the Port to the City for the purpose of building Hood River Waterfront Park. Industrial lots in this area are partly developed and there is redevelopment potential for some lots. Much of the municipal land that will become the waterfront park is currently used for surface parking to facilitate water-sports. The city operates a water treatment plant at the western edge of the study area, on Riverside Drive.

The area to the south of Interchange 64, along Highway 35, is constrained by steep slopes and limited access. The lots that are appropriate for development are occupied by light industrial and commercial businesses. As Highway 35 begins to traverse uphill to the southeast, there is one buildable lot occupied by a sand or gravel company. After that industrial lot, the land becomes too steep for development. This area is not expected to increase in density or in local traffic due to new development.

The lots to the north of Interchange 64 are clustered around the Hood River Bridge access road, which leads north from Interchange 64 across the bridge. The east side of the access road is fully developed along Marina Way. Commercial lots on Marina Way host a hotel, two gas stations and another commercial building. There is little room for further development on the east side of the access road. The west side of the access road, along Port Marina Drive, is municipal land with a marina, a museum, and a park. Further development on the north side of Interchange 64 is unlikely without the sale or development of municipal land.

Natural and Historic Resources
(Note: This section will include a summary of information developed by Parametrix, Inc regarding natural resource areas including mapped Goal 5 resource sites.)

Areas Subject to Natural Hazards
(Note: This section will be expanded to include information developed by Parametrix, Inc. that show areas subject to development.)

The following section of Hood River's development code provides very general guidance for regulating development in areas prone to natural hazards. Over time, it is possible that more specific development requirements may be imposed on land subject to hazards, but even in its preset form, the regulation implies that areas subject to natural hazards can have restrictions imposed that would preclude the level of development otherwise allowed by any underlying city zone.

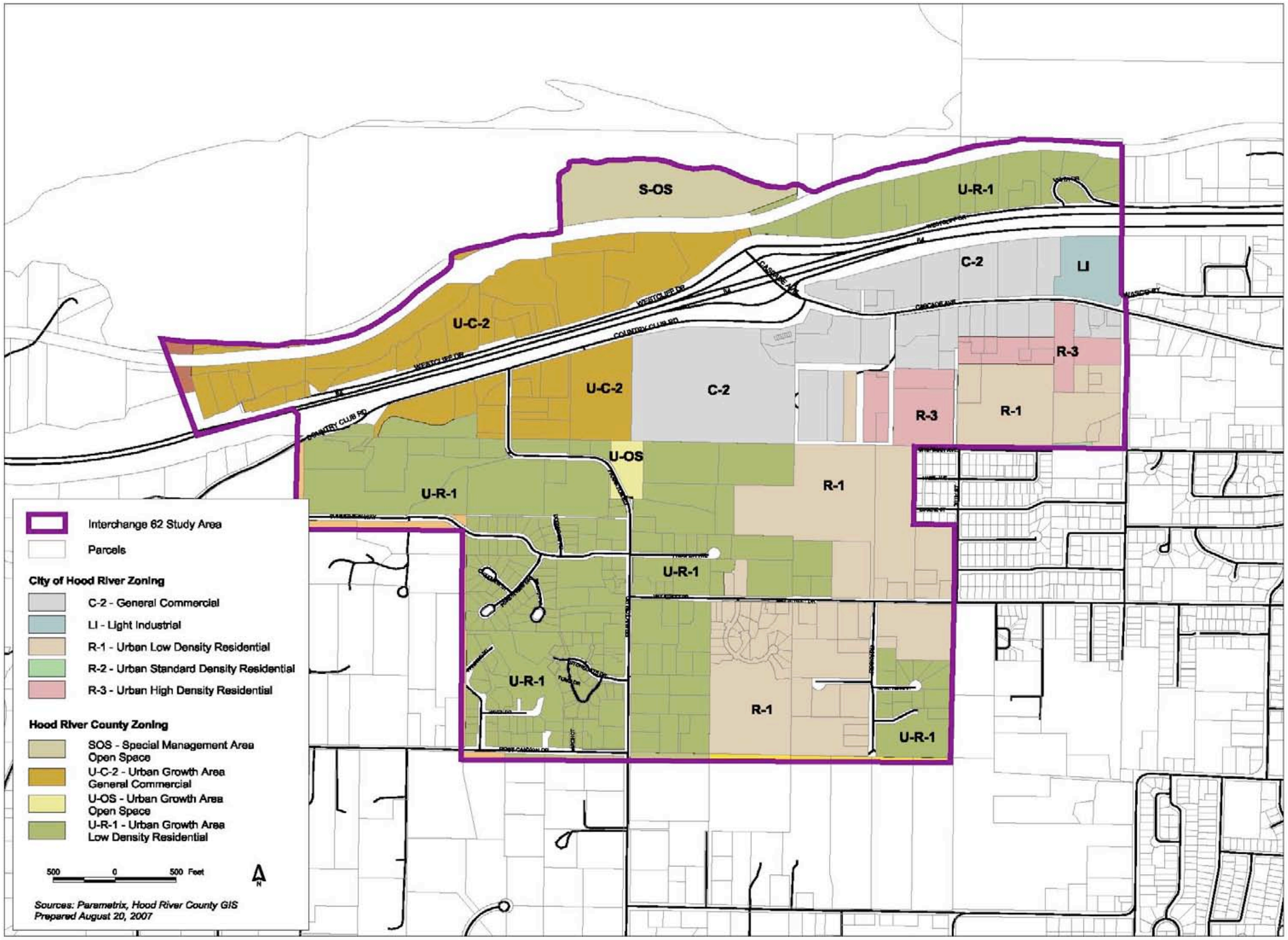
City of Hood River's Environmental Hazard (EH) Zone:

17.03.090 Environmental Hazard Zone (EH)
The Environmental Hazard Zone is an overlay zone that designates areas that may be hazardous to develop.
A. ***Permitted Uses****.*
1. Those which are allowed in the underlying zone designation provided the proposed development has been reviewed and stamped by a competent registered professional engineer or architect. All requirements and standards for the underlying zone designation shall be met. In addition, lands that are determined to be unsuitable to develop may be used for computation of density allowances.
2. Areas designated as flood hazard areas by the Federal Emergency Management Agency (FEMA) may be developed only in accord with the U.S. Department of Housing and Urban Development standards for flood hazard areas.

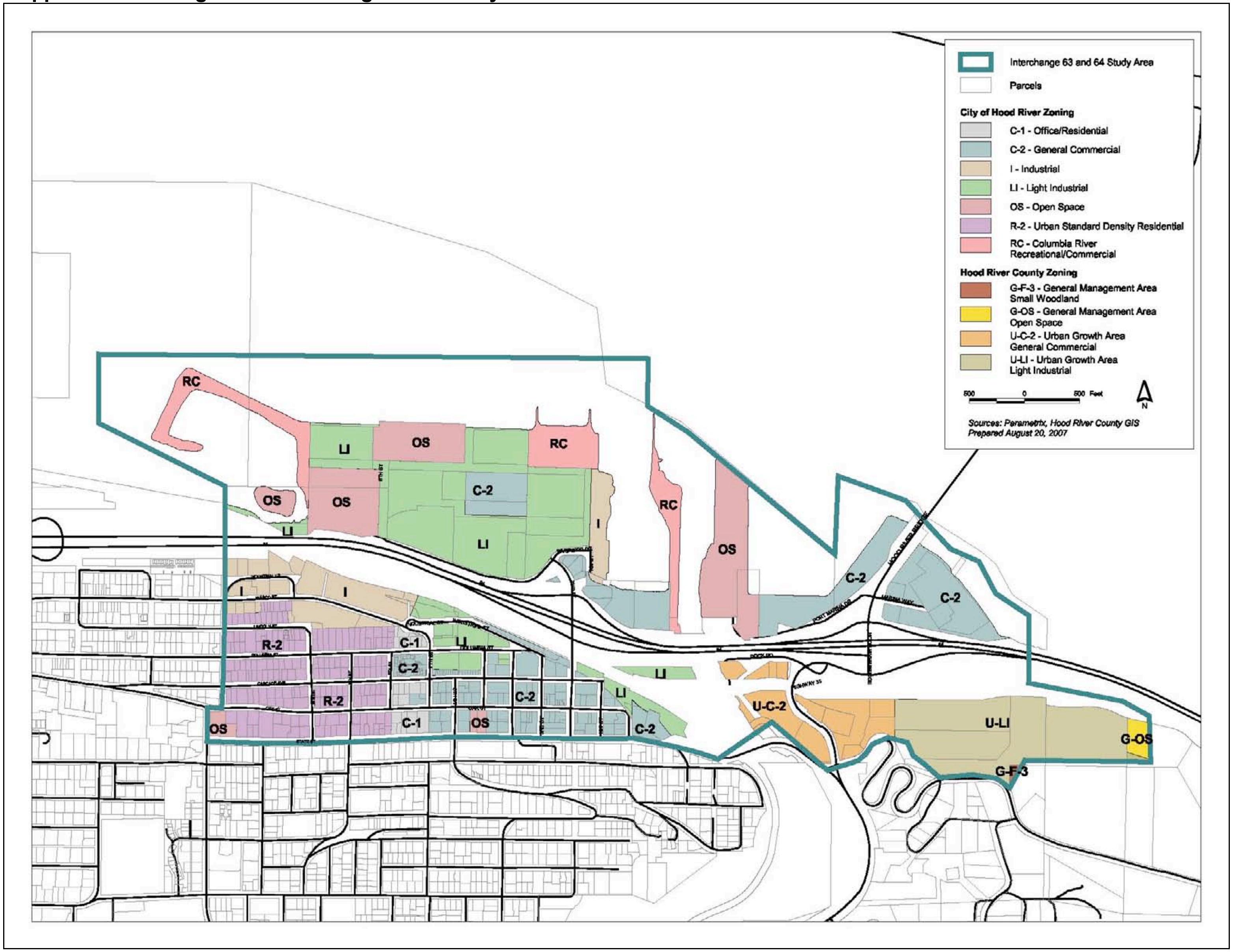
VI. Future Land Use

This section will include a discussion about potential changes to existing land use plans, such as the proposed intensification of uses to Port properties in the vicinity of Interchange 63/64. It also will assess the possibility that the Hood River UGB could be expanded near Interchange 62 and possible consequences. The discussion will need to be consistent with land use assumptions that are influencing the traffic forecasts for the interchanges.

Appendix A: Zoning in the Interchange 62 Study Area



Appendix B: Zoning in the Interchange 63/64 Study Area



Parametrix ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

700 NE MULTNOMAH, SUITE 1000
PORTLAND, OREGON 97232-2131
T. 503 . 233 . 2400 T. 360 . 694 . 5020 F. 503 . 233 . 4825
www.parametrix.com

M E M O R A N D U M

Date: **August 30, 2007**

To: **Hood River IAMP PMT**

From: **Chris Collins**

Subject: **Hood River IAMP Technical Memorandum #3 – Existing Environmental Analysis**

cc:

Summary

Parametrix scientists conducted a natural resources inventory to document wetlands, streams, steep slopes, and other resources that may pose environmental constraints for the Hood River Interchange Area Management Plans (IAMP). To execute this analysis, Parametrix reviewed available data and conducted a site visit on August 10, 2007.

The Area of Potential Effect (APE) for the Exit 63 and 64 IAMPs are located in the City of Hood River and primarily are composed of urban/developed land (Figure 1). Despite its level of development, the Exit 63/64 APE includes two rivers (Hood River and the Columbia River) and all or portions of nine wetland/open water habitats. Within this APE, the Columbia River and Hood River shorelines are highly developed. The Federal Emergency Management Agency (FEMA) 100-year floodplain for Hood River and the Columbia River does not extend outside of the respective channels due to channelization and natural topography. No Hazard Overlay areas are identified in City GIS data.

Within Exit 62's APE, the Columbia River is less developed and has forested riparian/cliff habitat along its shoreline (Figure 2). Spring Creek, a small perennial stream, is the only other mapped stream in the APE. The only Hazard Overlay area identified in City GIS data is a buffer along the portion of Spring Creek located upstream of Interstate-84.

The APEs for all three interchanges contain significant areas of steep slopes. Spring Creek, Hood River, and the Columbia River are the only Goal 5 resources in the APEs. Data regarding potential landslide areas were not available.

Methodology

In order to identify natural resources that pose potential constraints for improving Exits 62, 63, and 64, Parametrix reviewed the following data sources:

- StreamNet Interactive Mapper;
- ODOT Environmental Baseline Report for Bridge 07398;
- ODOT Environmental Baseline Report for Bridge 08662;
- ODOT Environmental Baseline Report for Bridge 07496A;
- City of Hood River GIS Data (Goal 5, Hazard Overlay, and Slopes Shapefiles);
- OTIA III Bridges TransGIS (includes National Wetlands Inventory and Federal Emergency Management Agency data);
- Oregon Department of Environmental Quality 303(d) list; and,
- Washington Department of Ecology 303(d) list.

Additionally, a Parametrix biologist conducted a site visit on August 10, 2007. The evaluation that follows is based on this site visit, review of data sources specified above, and professional judgment. Results of this analysis are presented for Exits 63 and 64 jointly, while Exit 62's findings will be discussed separately.

Findings – Exits 63 and 64

Exit 63 and 64's APE primarily is composed of urban/developed land. Natural resources located in the APE that pose environmental constraints for transportation development include two perennial streams, steep topography, and all or a portion of approximately nine wetland/open water features (Figure 1). Each of these features is detailed below.

Hood River: Hood River flows north through the APE approximately 1,500 feet west of Exit 64 and 1,000 feet east of Exit 63. Within the APE, its riparian area is highly developed. Adjacent land uses include a lumber yard, Port Marina Park, and various commercial, recreation, and transportation facilities. Hood River is identified by the City as a Goal 5 resource (City of Hood River 2007).

Hood River is a tributary to the Columbia River that supports three species of salmonids listed as threatened under the Endangered Species Act. These species include the Lower Columbia River Chinook Salmon Evolutionarily Significant Unit (ESU), the Lower Columbia River Steelhead ESU, and the Lower Columbia River Coho Salmon ESU. The National Marine Fisheries Service also has designated the portion of Hood River located within the APE as Critical Habitat for two of these species (Chinook salmon and steelhead) (StreamNet 2007).

Due to natural topography and alteration of the stream channel, Hood River's FEMA-designated 100-year floodplain is located within its banks (ODOT 2007). Consequently, impacts to its floodplain likely will not be a consideration for the project. However, Hood River is 303(d)-listed for three parameters (beryllium, copper, and iron); consequently, runoff from any proposed developments will have to meet applicable water quality regulations (Oregon Department of Environmental Quality [DEQ] 2007).

Columbia River: Portions of the Columbia River and its shoreline are located along the northern border of the Exit 63/64 APE. Within the APE, the shoreline is highly developed; a marina, hotels, restaurants, a county park, wind surfing areas, the Port of Hood River, and a boat basin comprise some of the waterfront land uses. The Columbia River is identified by the City as a Goal 5 resource (City of Hood River 2007).

The Columbia River is a tributary to the Pacific Ocean that supports ten species of salmonids listed as threatened or endangered under the Endangered Species Act. These species include both resident species from Lower Columbia River Chinook Salmon ESUs and upriver ESUs that migrate through this portion of the Columbia River. The National Marine Fisheries Service has designated the portion of the Columbia River located within the APE as Critical Habitat (StreamNet 2007).

Due to natural topography and alteration of the stream channel, the Columbia River's FEMA-designated 100-year floodplain is located within its banks (ODOT 2007). Consequently, impacts to its floodplain likely will not be a consideration for the project. However, the portion of the Columbia River located in the APE is 303(d)-listed for numerous parameters including arsenic, PCBs, PAHs, and temperature (DEQ 2007; Washington Department of Ecology [Ecology] 2007). Additionally, the Environmental Protection Agency has approved Total Maximum Daily Loads (TMDLs) for dioxin and total dissolved gas (DEQ 2007). Consequently, runoff from any proposed developments will have to meet TMDL requirements as well as standard water quality regulations.

Wetlands and Other Open Water Features:

Parametrix (2004a; 2004b) reports four wetlands within the Areas of Potential Impact (API) for bridges surveyed for Oregon Department of Transportation (ODOT) - OTIA III Environmental Baseline Reports (EBR)[1]. Two of these wetlands are located in the eastern portion of the APE, immediately to the north of, and adjacent to, the Union Pacific Railroad and were delineated (Figure 1). The remaining two wetlands are located along I-84 in ODOT right-of-way at the western end of the APE. Portions of these wetlands were delineated during EBR field data collection.

---

[1] Accessible wetlands were delineated as part of the OTIA III Environmental Baseline Reports. Non-accessible wetlands were observed only.

In addition to these wetlands, Parametrix staff identified three additional wetlands/open water features during the site visit and review of aerial photos. Due to access restrictions, the exact locations of these wetlands were not recorded. Two of the wetlands are adjacent to the Union Pacific Railroad, immediately south of the two delineated wetlands. The third is located between I-84 and the railroad, at the far eastern end of the APE.

National Wetlands Inventory (NWI) and City data also identify several wetlands in the API (City of Hood River 2007; ODOT 2007). The NWI wetlands primarily are below the ordinary high water elevation of the Columbia River and Hood River and therefore are unlikely to pose constraints to potential improvements; however, several are located immediately southwest of the I-84/Hood River crossing. City data also report two wetlands in the southwest corner of the I-84/Hood River crossing (City of Hood River 2007). Due to traffic, access restrictions, and visibility from accessible points, Parametrix staff could not review the I-84/Hood River crossing area thoroughly. Further investigation is recommended as the two reported wetlands likely will pose constraints for the Exit 63 IAMP.

The City has not identified any of the aforementioned wetlands as Goal 5 resources (City of Hood River 2007). Jurisdiction will need to be determined individually.

<u>Terrestrial Habitat</u>:

No terrestrial habitats of significance were reported in available data sources or observed during the field visit (Parametrix 2004a; Parametrix 2004b). Additionally, ORNHIC (2003, as reported in Parametrix 2004a and Parametrix 2004b) does not report any federal or state listed, proposed, or candidate terrestrial species within two miles of the project area. Although bald eagles and other species may forage along the Columbia River, terrestrial wildlife habitat is unlikely to pose a significant environmental constraint to this project.

<u>Steep Slopes:</u>

The City provided GIS shapefiles of steep slopes located in the APE. Slopes greater than fifteen percent primarily are associated with river banks or hillslopes in the southeast portion of the APE (City of Hood River 2007).

Findings – Exits 62

Exit 62's APE primarily is composed of low to moderate density residential development with some remnant forest cover. Natural resources located in the APE that pose environmental constraints for transportation development include one perennial stream (Spring Creek) and areas of steep topography (Figure 2). Each of these features is detailed below.

<u>Spring Creek</u>: Spring Creek, a small perennial tributary to the Columbia River, flows northeast through the APE, crossing beneath I-84 approximately 1,000 feet west of Exit 62. Within the APE, its riparian area is moderately developed and is designated by the City as a Hazard Overlay (City of Hood River 2007). The City also has identified Spring Creek as a Goal 5 resource (City of Hood River 2007).

Spring Creek does not support any state or federally listed fish species and is not designated as Critical Habitat (StreamNet 2007). Due to its small size, FEMA has not mapped its 100-year floodplain, and it is not 303(d)-listed for any parameters (DEQ does not monitor it due to its small size) (ODOT 2007; DEQ 2007).

<u>Columbia River</u>: Portions of the Columbia River and its shoreline are located along the northern border of Exit 62's APE. Along this portion of the river, the shoreline/riparian area is composed of steep cliffs that preclude development. Numerous residences, businesses, and one county park are located throughout the APE on the top of the cliff; however, the Union Pacific Railroad, located immediately adjacent to the river, is the only development along the shoreline. The Columbia River is identified by the City as a Goal 5 resource (City of Hood River 2007).

The Columbia River is a tributary to the Pacific Ocean that supports ten species of salmonids listed as threatened or endangered under the Endangered Species Act. These species include both resident species from Lower Columbia River Chinook Salmon ESUs and upriver ESUs that migrate through this portion of the Columbia River. The National Marine Fisheries Service has designated the portion of the Columbia River located within the APE as Critical Habitat (StreamNet 2007).

Due to natural topography and alteration of the stream channel, the Columbia River's FEMA-designated 100-year floodplain is located within its banks (ODOT 2007). Consequently, impacts to its floodplain likely will not be a consideration for the project. However, the portion of the Columbia River located in the APE is 303(d)-listed for numerous parameters including arsenic, PCBs, PAHs, and temperature (DEQ 2007; Ecology 2007). Additionally, the Environmental Protection Agency has approved TMDLs for dioxin and total dissolved gas (DEQ 2007). Consequently, runoff from any proposed developments will have to meet TMDL requirements as well as standard water quality regulations.

Wetlands and Other Open Water Features:

NWI reports several wetlands in the APE, all of which are located within the Columbia River's OHW elevation. The City also reports several wetlands; however, with the exception of one small linear wetland located to the east of Exit 62 along Cascade Drive, these wetlands are located on private property well away from the Exit 62 interchange and are unlikely to pose constraints for the IAMP. Parametrix staff did not identify any wetlands during the August 10, 2007 site visit, and the City has not identified any wetlands as Goal 5 resources (City of Hood River 2007).

Terrestrial Habitat:

No terrestrial habitats of significance were reported in available data sources or observed during the field visit. ORNHIC (2003, as reported in Parametrix 2004c) reports two recently delisted species as being present within two miles of the project area. The peregrine falcon (*Falco peregrinus*) was delisted by the State of Oregon in 2007, and federally in 1999. The bald eagle (*Haliaeetus leucocephalus*) was delisted federally in 2007, but is still listed as threatened by the State of Oregon. Although these two species may forage along the Columbia River, no nests are recorded in the APE. These and other terrestrial wildlife species and their habitats are unlikely to pose a significant environmental constraint to this project.

Steep Slopes:

The City provided GIS shapefiles of steep slopes located in the APE. Slopes greater than fifteen percent primarily are associated with river banks and cliffs along the Columbia River (City of Hood River 2007).

References

City of Hood River. 2007. GIS data provided to Parametrix on August 22, 2007. Hood River, Oregon.

DEQ. 2007. Oregon's 2004/2006 Integrated Report Database. Accessed on August 13, 2007 at http://www.deq.state.or.us/wq/assessment/rpt0406/search.asp

ODOT. 2007. OTIA III Bridges TransGIS. Accessed on August 13, 2007 at http://www.bridgesims.org/bridges_login.cfm

Parametrix. 2004a. Environmental Baseline Report for Bridge 07398. Prepared for ODOT – OTIA III Statewide Bridge Delivery Program. Salem, Oregon.

Parametrix. 2004b. Environmental Baseline Report for Bridge 08662. Prepared for ODOT – OTIA III Statewide Bridge Delivery Program. Salem, Oregon.

Parametrix. 2004c. Environmental Baseline Report for Bridge 07496A. Prepared for ODOT – OTIA III Statewide Bridge Delivery Program. Salem, Oregon.

StreamNet. 2007. Pacific Northwest Interactive Mapper. Accessed on August 13, 2007 at http://map.streamnet.org/snetmapper/viewer.htm

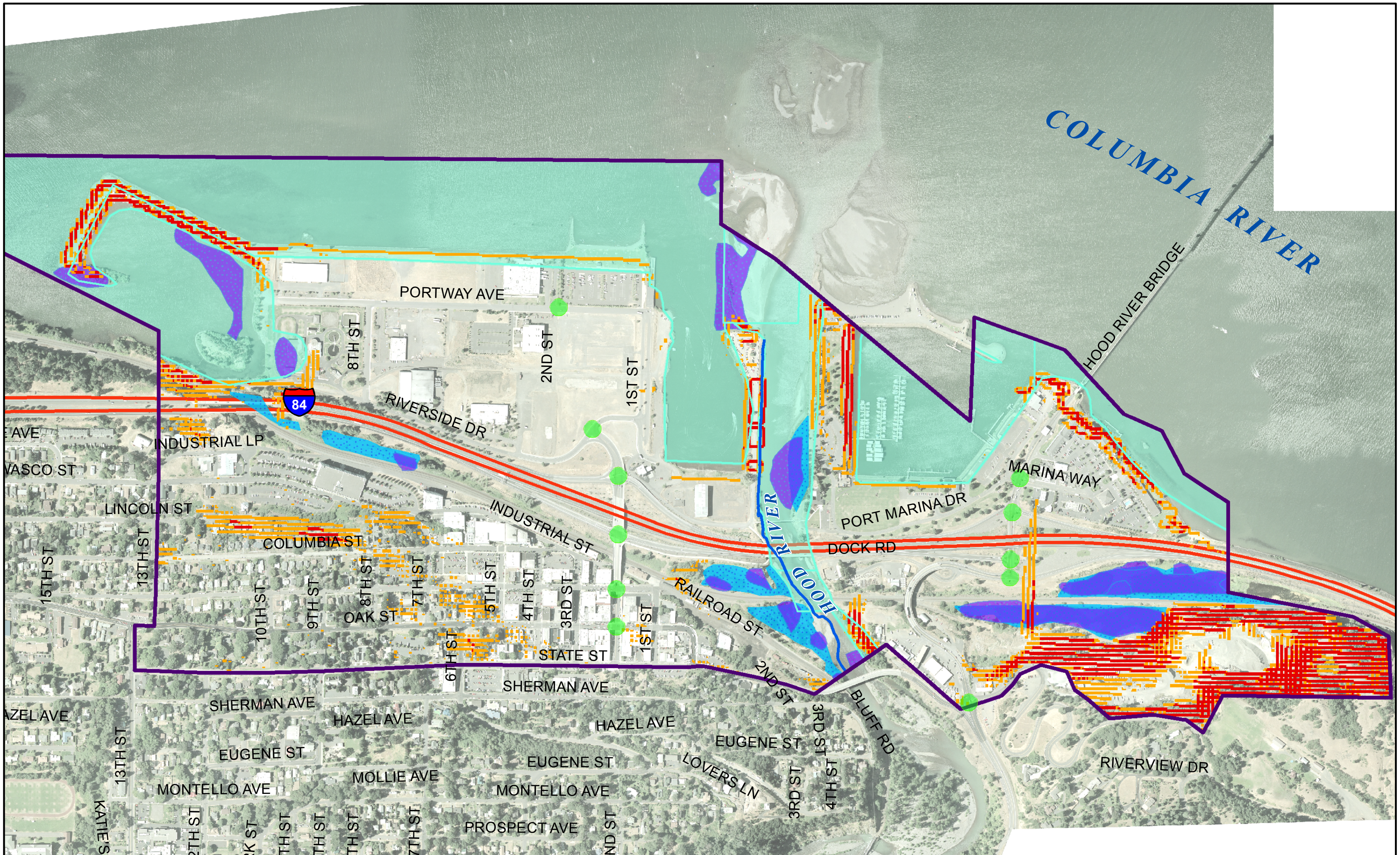


Figure 1: Existing Environmental Analysis: Natural Features and Hazard Areas

Exits 63 & 64

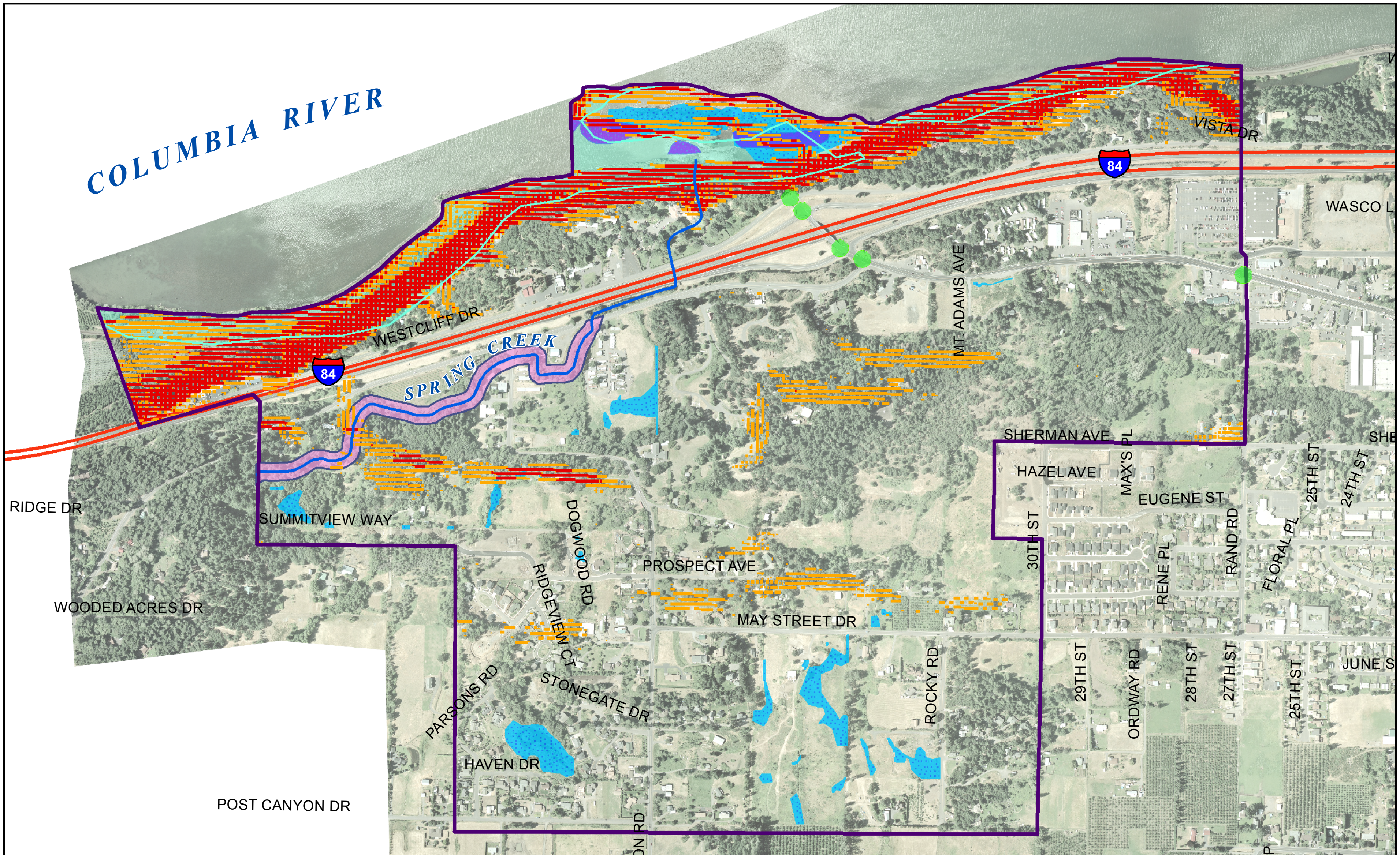


Figure 2:
Existing Environmental Analysis: Natural Features and Hazard Areas
Exit 62

FEMA 100 Yr. Floodplain
NWI Wetlands
Delineated / Verified Wetlands
Goal 5 Streams
Hazard Overlay

Slope
15-25%
25%+

Study Intersection
StudyArea

0 400 800 1,200
Feet

Parametrix

DKS Associates
TRANSPORTATION SOLUTIONS

Technical Memorandum

DATE: October 10, 2008

TO: Hood River IAMPs Project Team

FROM: John Bosket, PE
Carl Springer, PE, PTOE

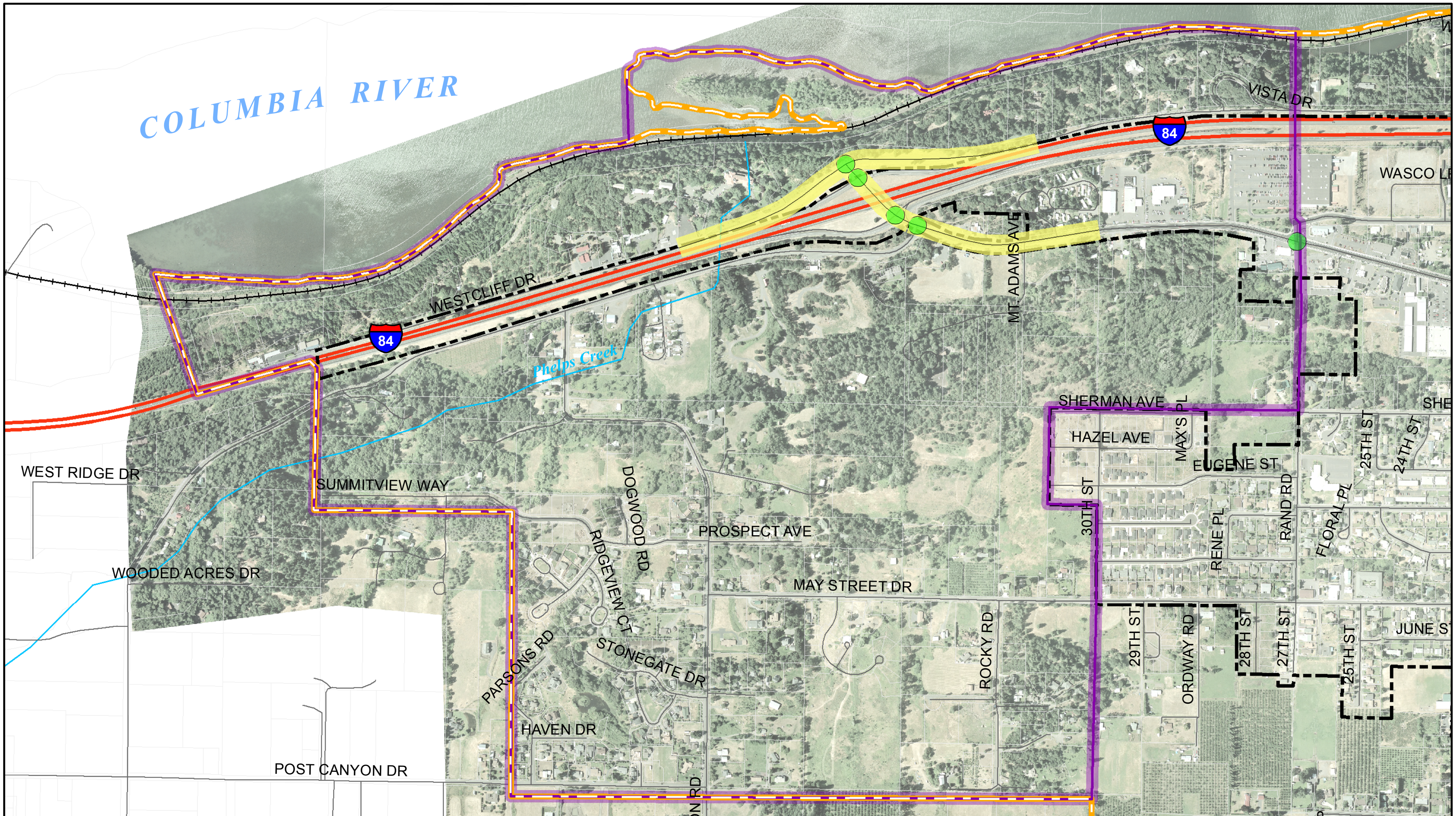
SUBJECT: **Hood River Interchange Area Management Plans (IAMPs) Existing Transportation Conditions** P05001-011

This technical memorandum provides an inventory and evaluation of existing transportation facilities within the study areas of the I-84 interchanges in Hood River and identifies areas needing improvement to act as a baseline for assessment of future conditions. This includes identification and description of study area street networks, traffic controls, pedestrian facilities, bicycle facilities, and property access, as well as an analysis of the crash history, access management deficiencies, and intersection capacity.

Study Areas

Interstate 84 (I-84) runs east and west through the City of Hood River while providing a continuous interstate route from Portland to Idaho. Within the City, there are three interchanges on I-84 at Cascade Avenue (Exit 62), 2nd Street (Exit 63), and Button Bridge Road (Exit 64). Due to the proximity of these interchanges to each other and their functional areas, the Interchange Area Management Plans are focused on two study areas: one surrounding Exit 62 and another encompassing Exits 63 and 64. These study areas may be revisited and refined at later stages in the project once future deficiencies and necessary preferred improvement alternatives for each interchange have been identified.

For the Exit 62 study area, boundaries include a combination of the urban growth boundary (UGB) and Sherman Avenue to the south, 30th Street and Rand Road to the east, and the UGB to the north and west. For the Exit 63/64 study area, boundaries have been set at State Street and the UGB to the south, the UGB to the east and north, and 13th Street to the west. The geographic boundaries of the two study areas are illustrated in Figures 1-1 and 1-2.



Hood River Interchange Area Management Plans

Figure 1-1: Exit 62 Study Area Map

Study Area
Study Intersection
Access Management Area
Interstate
Roadway
Railroad
City Limit
UGB
Stream
Parcel Boundary

0 400 800 1,200
Feet
1 inch equals 1,000 feet

Parametrix

Analysis by C. Hainey; Analysis Date: August 2007; Plot Date: August 2007; File Name: HoodRiver.mxd

Hood River Interchange Area Management Plans

Figure 1-2: Exits 63 and 64 Study Area Map

Study Area
Study Intersection
Access Management Area
Interstate
Roadway
Railroad
City Limit
UGB
Parcel Boundary

0 400 800 1,200
Feet
1 inch equals 1,000 feet

Parametrix

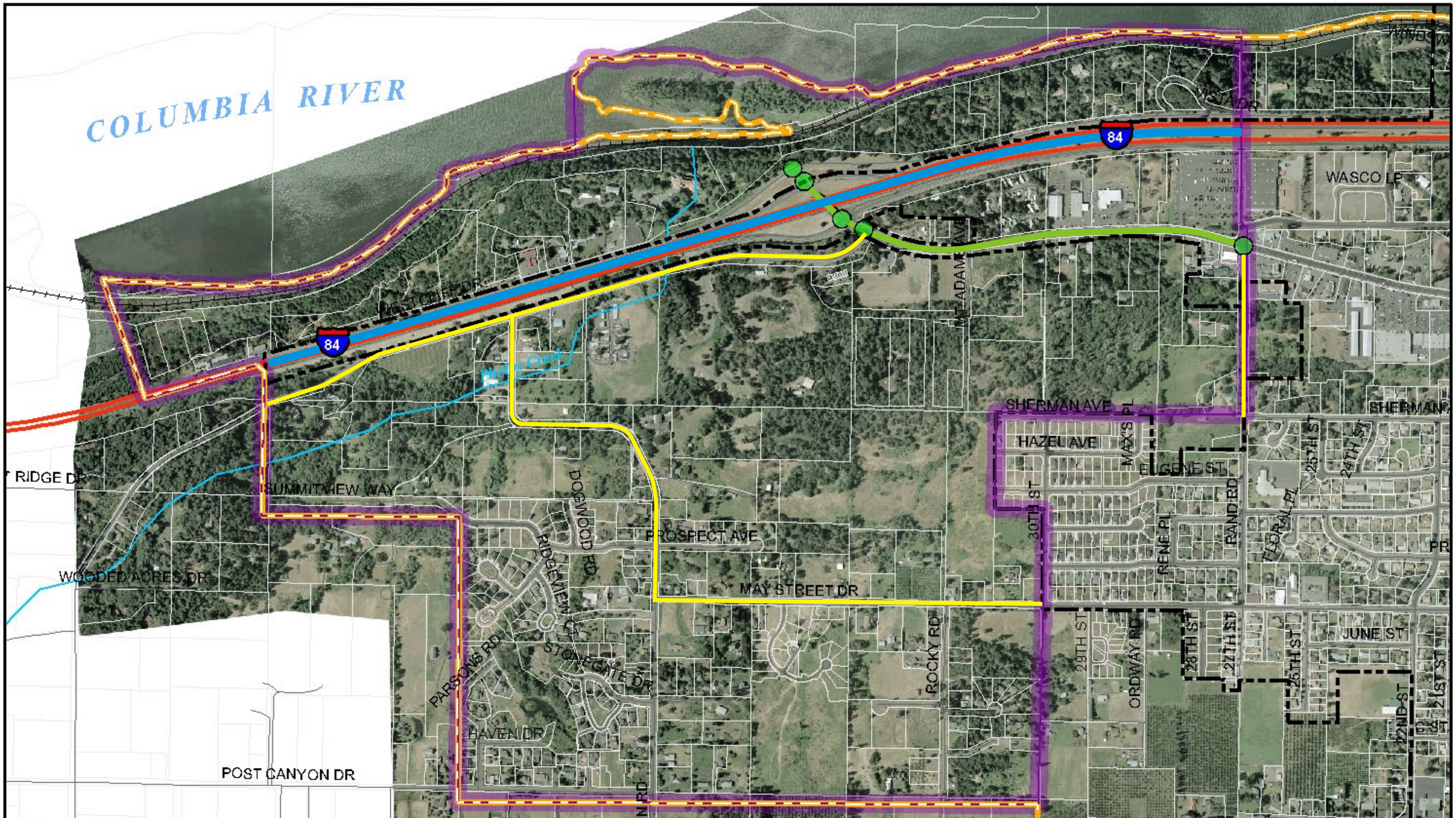
Analysis by C. Hainey; Analysis Date: August 2007; Plot Date: August 2007; File Name: HoodRiver.mxd

Study Area Street Network

Within each study area, there is an existing street network surrounding the I-84 interchanges that is relied upon to provide safe and efficient travel for all modes of transportation. These networks include roadways within the jurisdiction of the Oregon Department of Transportation (ODOT), Hood River County, the City of Hood River, and the Port of Hood River. For the purposes of the IAMPs, the operations on streets within the study areas with functional classifications of collector or higher are of primary interest, as local streets are generally managed to provide access to adjacent properties and typically serve low volumes of traffic at low speeds. Figures 2-1 and 2-2 display the street networks within each study area and identify the assigned functional classification of roadways with classifications of collector or higher. Additional information related to each roadway, identifying agency of jurisdiction and the number of existing travel lanes, is provided in Table 1.

Table 1: Study Area Roadways

Roadway	Limits within Study Area	Functional Classification	Number of Lanes	Lane Widths
ODOT Facilities				
I-84	M.P. 61.1 - M.P. 65.0	Interstate Hwy	4	12'
Historic Columbia River Highway (US 30) / Cascade Ave.	I-84 Exit 62 WB Ramp - Rand Rd.	District Hwy	2	12’
Oak St./State St.	13th St - Hood River City Limits	District	2	12’
Button Bridge Rd.	Marina Way – US 30	Statewide Hwy	2	12’
2nd St.	Riverside Dr. – Cascade Ave.	Local Interest Rd.	2	15’
Hood River County Facilities				
May Drive	Frankton Rd – 200’ west of Nina Ln.	Collector	2	12’
Frankton Rd.	Country Club Rd. – May Dr.	Collector	2	10’
Country Club Rd.	West Hood River UGB – 1000’ east of Frankton Rd.	Collector	2	10’
City of Hood River Facilities				
State St.	13th St. – Front St.	Collector	2	12’
Cascade Ave.	13th St. – 2nd St.	Collector	2	10’
13th St.	Oak St. – State St.	Collector	2	16’
13th St.	7th St. – Oak St.	Collector	2	10’
7th St.	13th St. – Oak St.	Collector	2	12’
2nd St.	Cascade Ave. – State St.	Collector	2	15’
May Dr.	200’ west of Nina Ln. - 30th St.	Collector	2	12’
Country Club Rd.	1010’ east of Frankton Rd. – US 30	Collector	2	10’
Rand Rd.	US 30 – Sherman Ave.	Collector	2	12’
Port of Hood River Facilities				
Button Bridge Rd.	Hood River Toll Bridge – Marina Way	Minor Arterial	2	12’



Hood River Interchange Area Management Plans

Figure 2-1 Study Area Roadway Classification (Exit 62 Study Area)

Legend

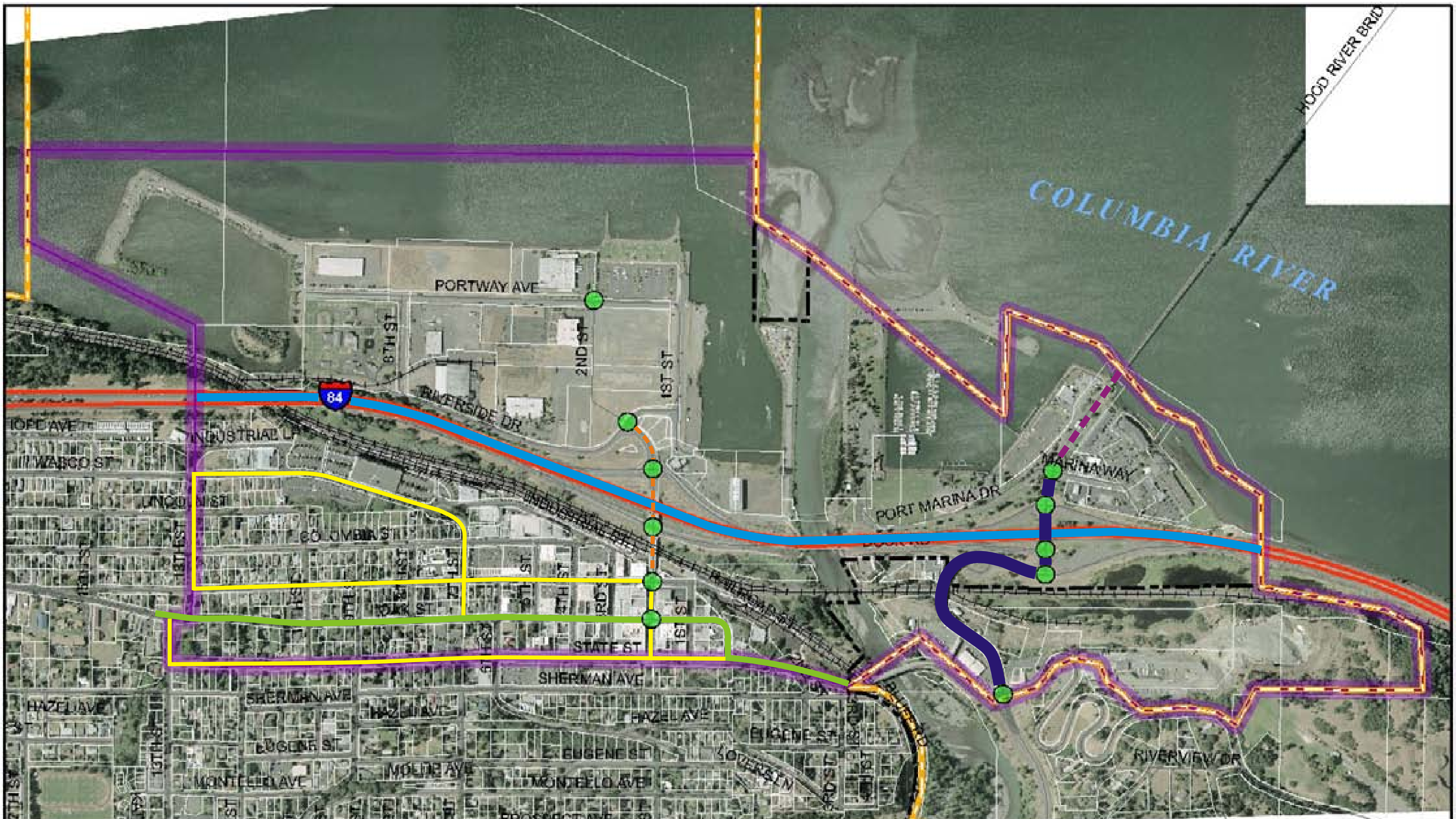
- Study Area
- Study Intersection
- Interstate
- Roadway
- Railroad
- Stream
- City Limit
- UGB
- Parcel Boundary

Roadway Classification

- Interstate Highway
- District Highway
- Collector

0 400 800 1,200
Feet
1 inch equals 1,000 feet

DKS Associates
TRANSPORTATION SOLUTIONS



Hood River Interchange Area Management Plans

Figure 2-2 Study Area Roadway Classification (Exit 63-64 Study Area)

Legend

- Study Area
- Study Intersection
- Interstate
- Roadway
- Railroad
- Stream

Roadway Classification

- Interstate Highway
- District Highway
- Collector
- Statewide Highway
- Minor Arterial
- Local Interest Road
- City Limit
- UGB
- Parcel Boundary

0 400 800 1,200
Feet
1 inch equals 1,000 feet

DKS Associates
TRANSPORTATION SOLUTIONS

Within each study area, key intersections affecting the ability of traffic to move to and from the interchanges on I-84 were identified for detailed analysis. Because roadway intersections typically represent the bottlenecks within the transportation system, the ability of these intersections to operate adequately through the planning horizon (the year 2030) will be important for the long-term provision of safe and efficient travel through the interchanges. The study intersections have been identified in Figures 1-1 and 1-2, with further detail, showing existing lane configurations and traffic controls, provided in Figures 3-1 and 3-2. From these figures, it can be seen that there are currently only two signalized intersections within the study area at the Exit 63 ramp terminals on 2nd Street. All other intersections are controlled by stop signs on one or more approaches.

Pedestrian Facilities

Within urban areas, pedestrian travel is typically accommodated on a combination of sidewalks and multiuse trails. To assess the adequacy of pedestrian facilities within the study area, an inventory of sidewalks and trails was conducted, with existing facilities mapped in Figures 4-1 and 4-2. The inventory of sidewalks was limited to facilities classified as collectors or higher.

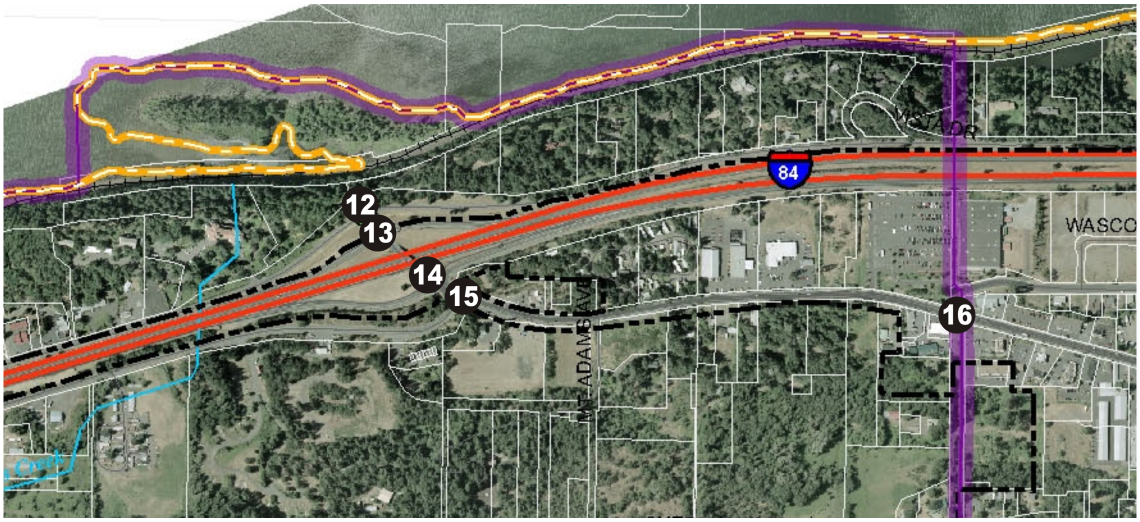
Around Exit 62, there are few existing sidewalks, with only sections on the north side of Cascade Avenue and the south side of May Drive currently available for pedestrian use. However, given the amount of undeveloped land and land with redevelopment potential adjacent to roadways within this study area, there may be many opportunities in the future for sidewalk infill as part of new development.

The area surrounding Exit 63 has an extensive sidewalk and trail system already in place, with sidewalks present over the interchange connecting a continuous grid of sidewalks in the downtown area south of the freeway to additional facilities within the Port property north of the freeway, including connections to recreational opportunities at Port Marina Park and the waterfront. However, as future development occurs within the Port property, additional sidewalk infill will be needed on streets such as 1st Street, Portway Avenue, Riverside Drive, and 8th Street.

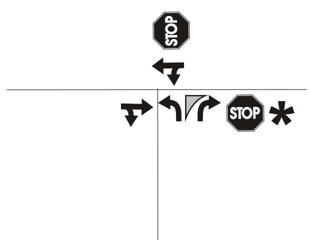
Around Exit 64, most sidewalks are limited to areas within private developments and within Port Marina Park. Sidewalk is available along the north side of State Street (Historic Columbia River Highway) from downtown to OR 35, but no sidewalks are available on OR 35 or Button Bridge Road.

Another key issue for pedestrian travel is the ability to cross barriers, such as freeways, railroad tracks, and rivers. In the Exit 62 study area, I-84 represents the most significant pedestrian barrier where the Exit 62 interchange provides the only opportunity to cross the freeway. As no pedestrian amenities are currently provided through this interchange, additional improvements will be needed in the future to facilitate pedestrian travel between the north and south sides of the freeway.

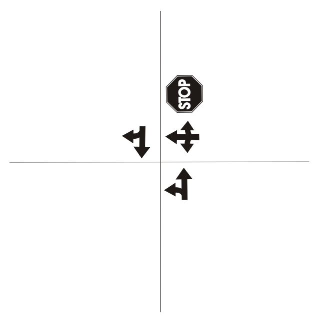
Within the Exit 63/63 study area, pedestrian barriers are created by I-84, the railroad tracks, and Hood River. Crossing opportunities are currently provided through sidewalks on 2nd Street that pass over the interchange and through a multiuse trail that crosses under I-84 and includes a bridge over Hood River at Port Marina Park.



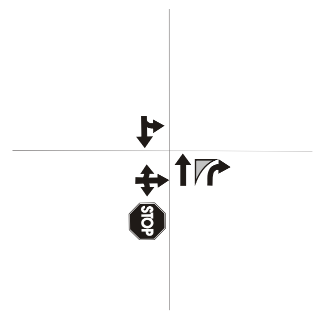
12 Westcliff Dr. @ Cascade Ave.



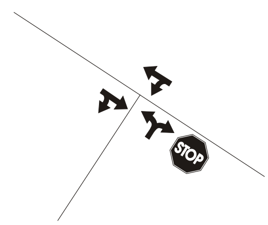
13 I-84 WB On/Off Ramps @ Cascade Ave.



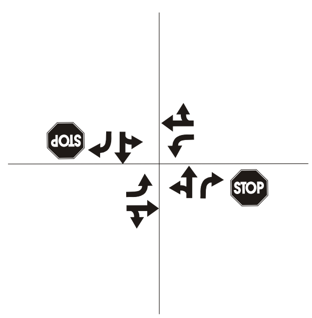
14 I-84 EB On/Off Ramps @ Cascade Ave.



15 Country Club Rd. @ Cascade Ave.



16 Cascade Ave. @ Rand Rd.



* Stop control applied to right turn only.

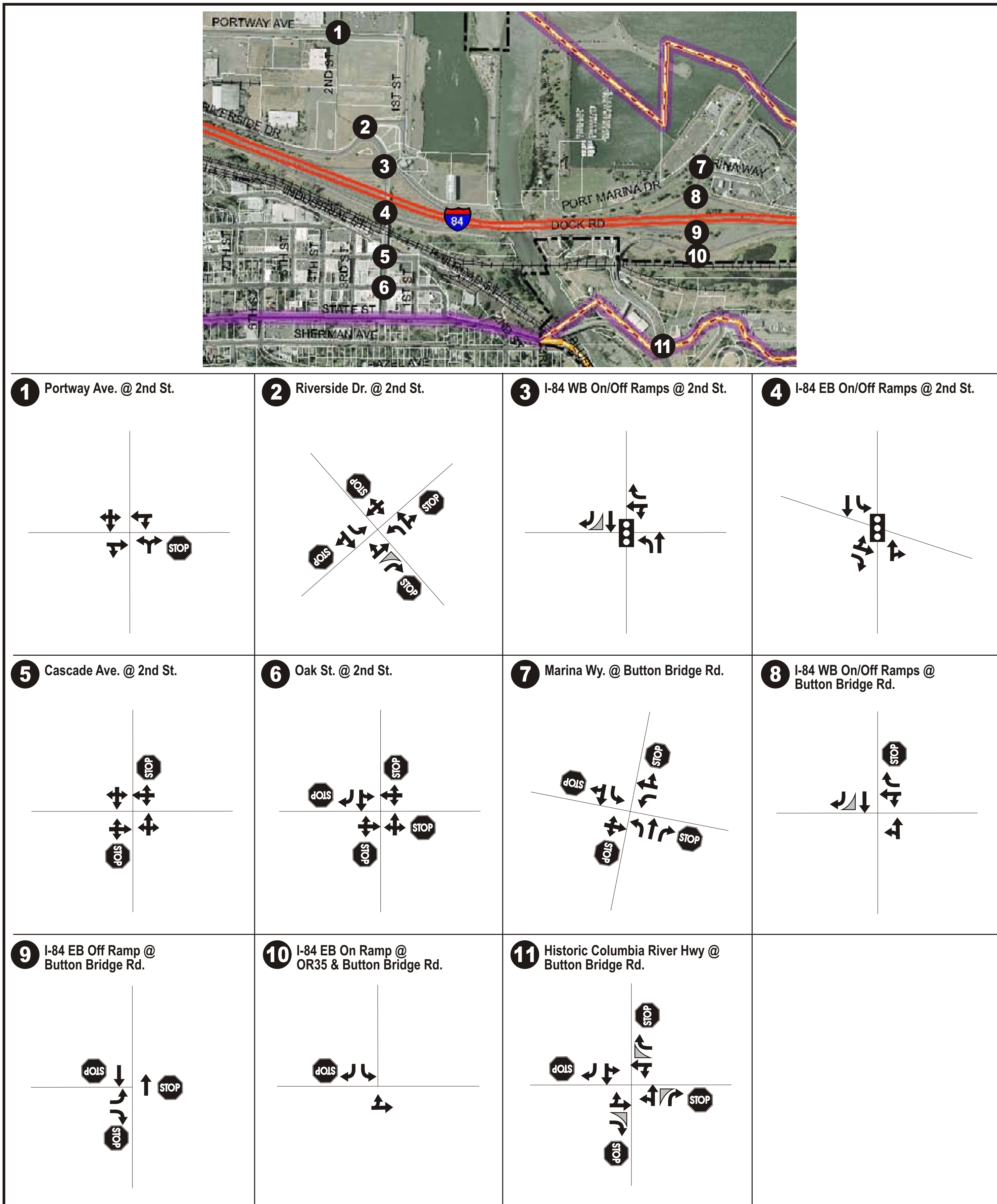
Hood River Interchange Area Management Plans

Figure 3-1 Existing Geometry (Exit 62 Study Area)

LEGEND

- 0 - Study Intersection & Number
- Lane Configuration
- Traffic Signal
- STOP - Stop Sign

DKS Associates
TRANSPORTATION SOLUTIONS



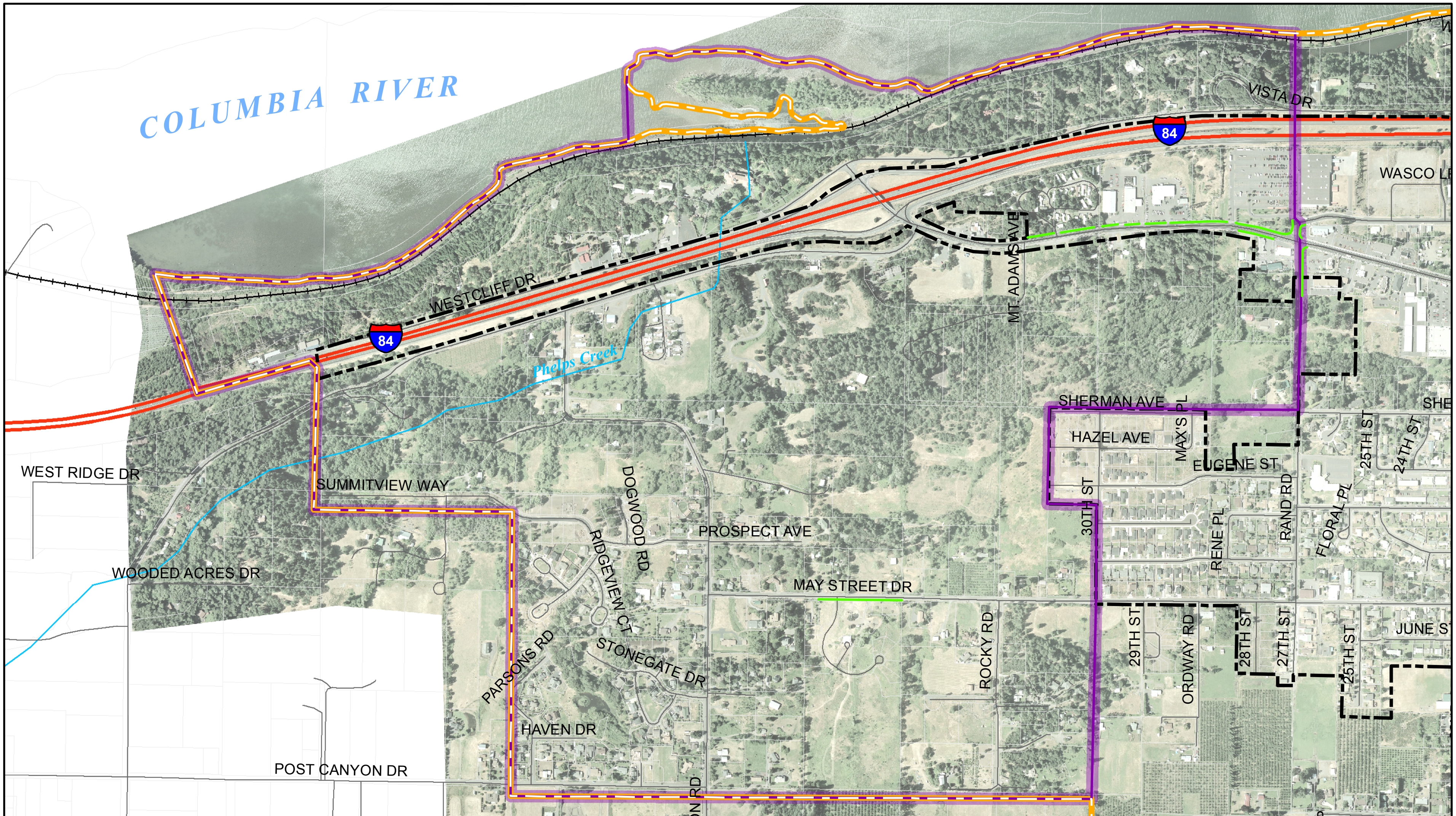
Hood River
Interchange Area
Management Plans

Figure 3-2 Existing Geometry (Exits 63-64 Study Area)

LEGEND

- 0 - Study Intersection & Number
- ← - Lane Configuration
- Traffic Signal
- STOP - Stop Sign

DKS *Associates*
TRANSPORTATION SOLUTIONS



Hood River Interchange Area Management Plans

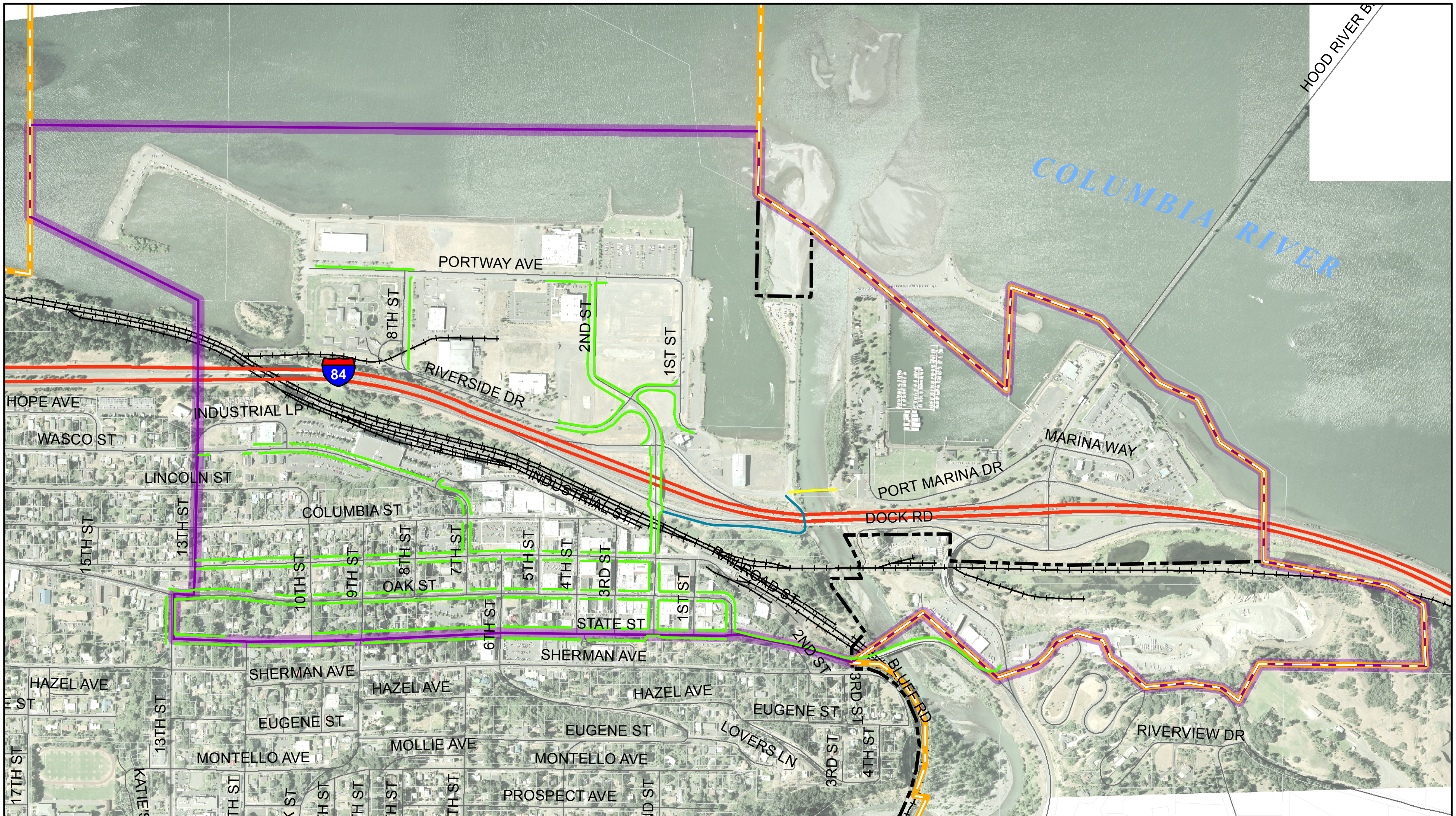
Figure 4-1: Existing Pedestrian Facilities (Exit 62 Study Area)

Sidewalk
Study Area
City Limit
UGB
Parcel Boundary
Railroad
Stream

0 400 800 1,200
Feet
1 inch equals 1,000 feet

Parametrix

Analysis by C. Hainey; Analysis Date: August 2007; Plot Date: August 2007; File Name: HoodRiver.mxd



Hood River Interchange Area Management Plans

Figure 4-2: Existing Pedestrian Facilities (Exit 63-64 Study Area)

Sidewalk
Multi-Use Path
Pedestrian Bridge
Study Area
City Limit
UGB
Parcel Boundary
Railroad

0 400 800 1,200
Feet
1 inch equals 1,000 feet

Parametrix

Analysis by C. Hainey; Analysis Date: August 2007; Plot Date: August 2007; File Name: HoodRiver.mxd

Bicycle Facilities

Bicycle travel can be accommodated in a variety of ways. On low volume (less than 3,000 vehicles per day), low speed (25 mph or less) roadways, bicycles can share the travel lanes with motor vehicles. However, as speeds and volumes increase, separate bicycle facilities should be provided.

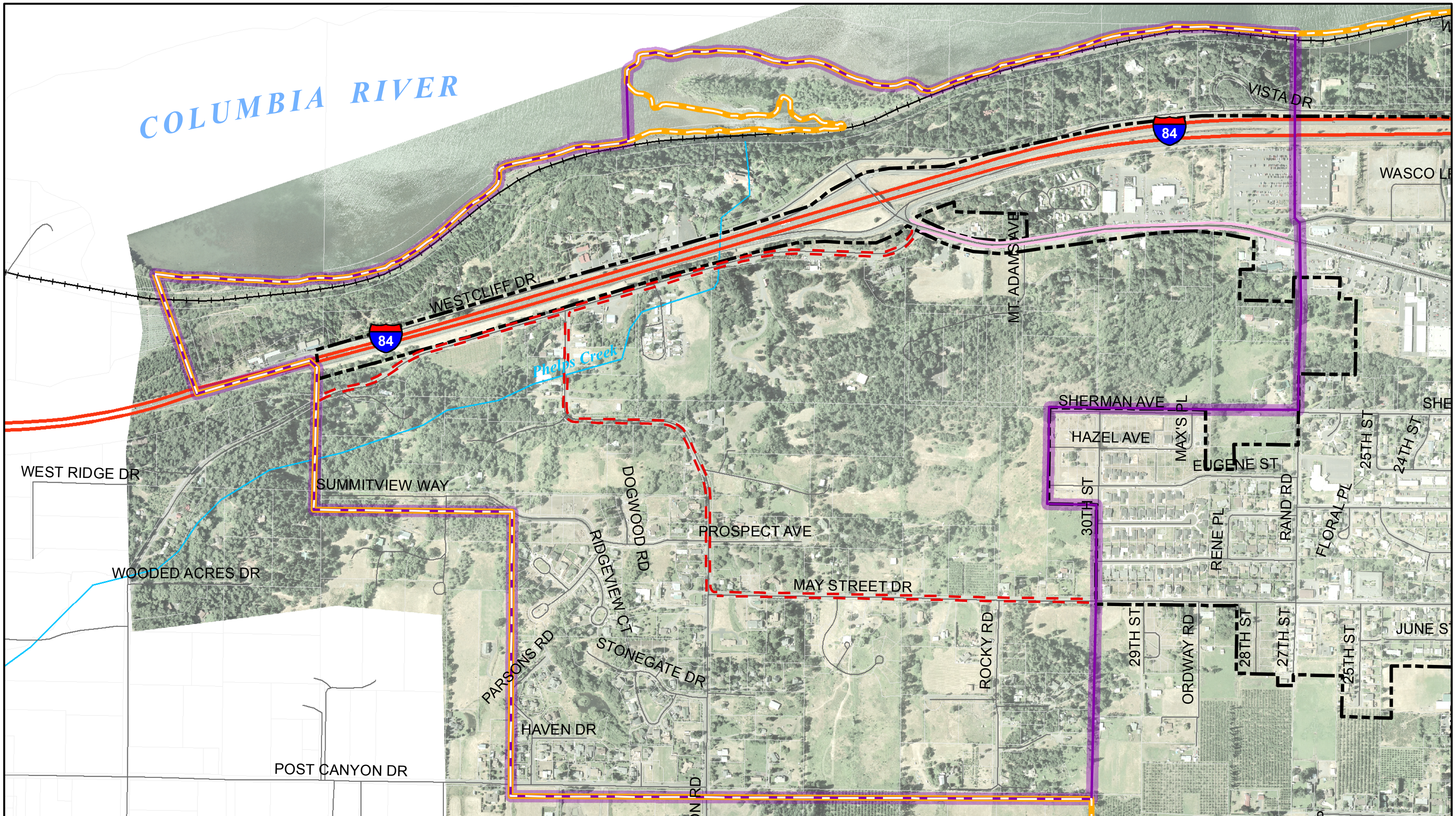
Common bicycle facilities include bike lanes, shoulder bikeways, and trails. Shoulder bikeways generally consist of paved shoulders of at least four feet wide. However, six feet of width is preferred and in areas with steep grades or adjacent to roadside barriers, such as curbs or guardrail, a minimum width of five feet should be provided. Bike lanes are specifically designated for bicycle use through pavement markings (bicycle stencil) and are typically five to six feet wide. Bike lanes as narrow as four feet wide can be used on open shoulders. Sidewalks should be reserved for pedestrian travel only and should not be used to accommodate bicycle travel as well.

To assess the adequacy of bicycle facilities within the study areas, an inventory of designated bike lanes and shoulder bikeways on arterials and collectors was conducted, in addition to identification of off-street trails. The findings of the inventory are mapped in Figures 5-1 and 5-2.

Within the Exit 62 study area, bike lanes are designated on Cascade Avenue from the I-84 interchange to the east through Rand Road. However, in the remainder of the area, bicycle facilities are limited, with only paved shoulders of varying widths along the collector roadways. Therefore, in many cases, bicyclists must share the roadway with motor vehicles to travel through the area.

While there are no dedicated bike lanes within the Exit 63/64 study area, there are shoulder bikeways present in some areas that are adequate for bicycle travel, including existing connections between the downtown area and the two interchanges with I-84. As an example, 2nd Street maintains shoulder bikeways across the Exit 63 interchange from Riverside Drive to Cascade Avenue. Also, shoulder bikeways are available along State Street and Button Bridge Road to provide for travel between the downtown and Exit 64. This route is further supplemented by a multiuse trail between Exit 63 and Port Marina Park that passes under I-84. In the downtown area where travel speeds are low, separate bicycle facilities are not necessary.

In addition, ODOT has published a Columbia River Gorge Bike Map highlighting bikeable corridors through the gorge from Portland to The Dalles. On these maps, the route from Exit 62 along Cascade Avenue/Oak Street/State Street to OR 35 is identified as having shoulders of varying widths, while 2nd Street from Portway Avenue to Oak Street and OR 35 from Exit 64 to the south are identified as "Preferred Bike Routes".



Hood River Interchange Area Management Plans

Figure 5-1: Existing Bikeway Facilities (Exit 62 Study Area)

Dedicated Bikelane

Partial Shoulder Bikeway

Study Area

City Limit

UGB

Parcel Boundary

Railroad

Stream

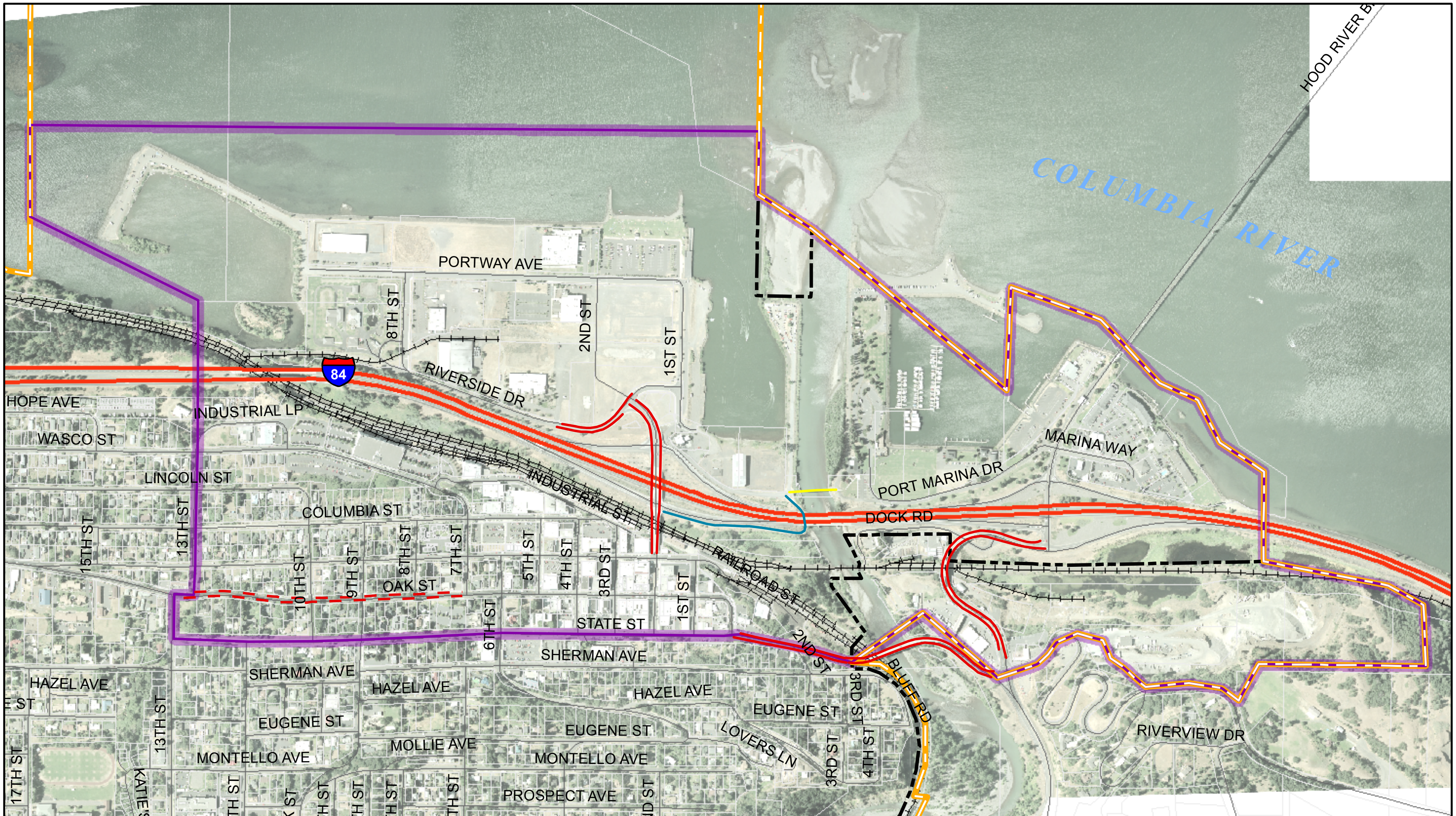
0 400 800 1,200

Feet

1 inch equals 1,000 feet

Parametrix

Analysis by C. Hainey; Analysis Date: August 2007; Plot Date: August 2007; File Name: HoodRiver.mxd



Hood River Interchange Area Management Plans

Figure 5-2: Existing Bikeway Facilities (Exit 63-64 Study Area)

Shoulder Bikeway
Partial Shoulder Bikeway
Multi-Use Path
Pedestrian Bridge
Study Area
City Limit
UGB
Parcel Boundary
Railroad

0 400 800 1,200
Feet
1 inch equals 1,000 feet

Parametrix

Analysis by C. Hainey; Analysis Date: August 2007; Plot Date: August 2007; File Name: HoodRiver.mxd

Transit Facilities

Public transit service within Hood River County is provided by Columbia Area Transit (CAT). This is a demand responsive, door-to-door service that serves the communities of Hood River, Odell, Cascade Locks, and Parkdale. During the ski season (November through March), CAT also operates a snow shuttle along OR 35, traveling from Hood River to the Mt.Hood Ski area on weekends. In addition, CAT makes a monthly trip to Portland, leaving at 9:00 a.m. and returning at 3:00 p.m. This trip is typically destined to Clackamas Towne Center and reservations are required.

Intercity bus service is provided by Greyhound bus lines. Greyhound bus lines provide four buses daily in each direction along I-84 connecting Hood River to Portland and Hood River to The Dalles and through to Idaho.

Existing Access Conditions

Because access points introduce a number of potential vehicular conflicts on a roadway and are frequently the causes of slowing or stopping vehicles, they can significantly degrade the flow of traffic and reduce the efficiency of the transportation system. However, by reducing the overall number of access points and providing greater separation between them, the impacts of these conflicts can be minimized. To facilitate safe and efficient operations through the interchange areas, the IAMPs will include access management plans that will be focused on removing direct access points to the interchange crossroads within the influence area of the ramp terminals.

The management areas along each crossroad corridor, marking the limits of the access management plans, were established using ODOT's access management spacing standards for interchange areas, which require the removal of direct access to crossroads within 1,320 feet of the ramp terminals (the spacing standards also allow for an access on the side of the crossroad approaching the interchange no closer than 990 feet from a ramp terminal where that approach is restricted to right-in and right-out movements only). Using this distance as a starting point, the management areas for each crossroad were adjusted to terminate at logical points, such as at property boundaries or the next public street intersection. The management areas selected for each interchange are illustrated in Figures 6-1 and 6-2.

To provide background information for the access management plans, physical inventories of existing approaches along the three access management corridors were collected, with descriptive information recorded for each approach indicating the approach's location, how the approach has been constructed and how it is currently being used. This physical inventory was compiled into Table A.1, which is included in the appendix. To help identify each approach's location within the management area, approaches have been displayed in Figures 6-1 and 6-2 using a numbering system for cross-referencing with Table A.1.

While some segments of the interchange crossroads within the designated access management areas are not under ODOT jurisdiction, for the purposes of these IAMPs, ODOT's access management spacing standards shall be applied. For segments within 1,320 feet of an interchange ramp terminal, ODOT's spacing standards for freeway interchanges shall be applied. For segments beyond 1,320 from an interchange ramp terminal, the appropriate ODOT spacing standard for the given highway classification shall be applied where the segment is under ODOT jurisdiction and the spacing standards for District Highways/ Local Interest Roads shall be applied where the segment is not under ODOT jurisdiction.

By comparing these access spacing standards to the approach inventory collected in the field, a comparison of existing conditions to the access spacing standards was made to evaluate areas needing improvement. Tables 2, 3, and 4 provide the results of this investigation, displaying the number of approaches found within the access management areas on each crossroad and comparing the average approach spacing per section to the applicable access spacing standard. While this level of analysis can not be used to identify potential improvements to approach spacing, it does reflect the degree to which the spacing standards are being met and provides an indication of the extent of improvements needed. The rightmost column in the table indicates the approximate number of driveway or public street approaches that would be allowed to fully comply with access spacing standards.

Table 2: Existing Approach Spacing on Exit 62 Access Management Corridor

Roadway			Average Approach Spacing		Number of approaches allowed by standard
	Number of Approaches	Segment Length	Actual	Standard	
North Side of Crossroad					
Cascade Ave: I-84 EB ramp terminal to east limit of access management area	5	1,420’	284’	1,320’	1
Westcliff Dr: East of Cascade Ave.	2	1,450’	725’	1,320’	1
Westcliff Dr: West of Cascade Ave.	5	1,425’	285’	1,320’	1
South Side of Crossroad					
Cascade Ave: I-84 EB ramp terminal to east limit of access management area	8	1,420’	178’	1,320’	1

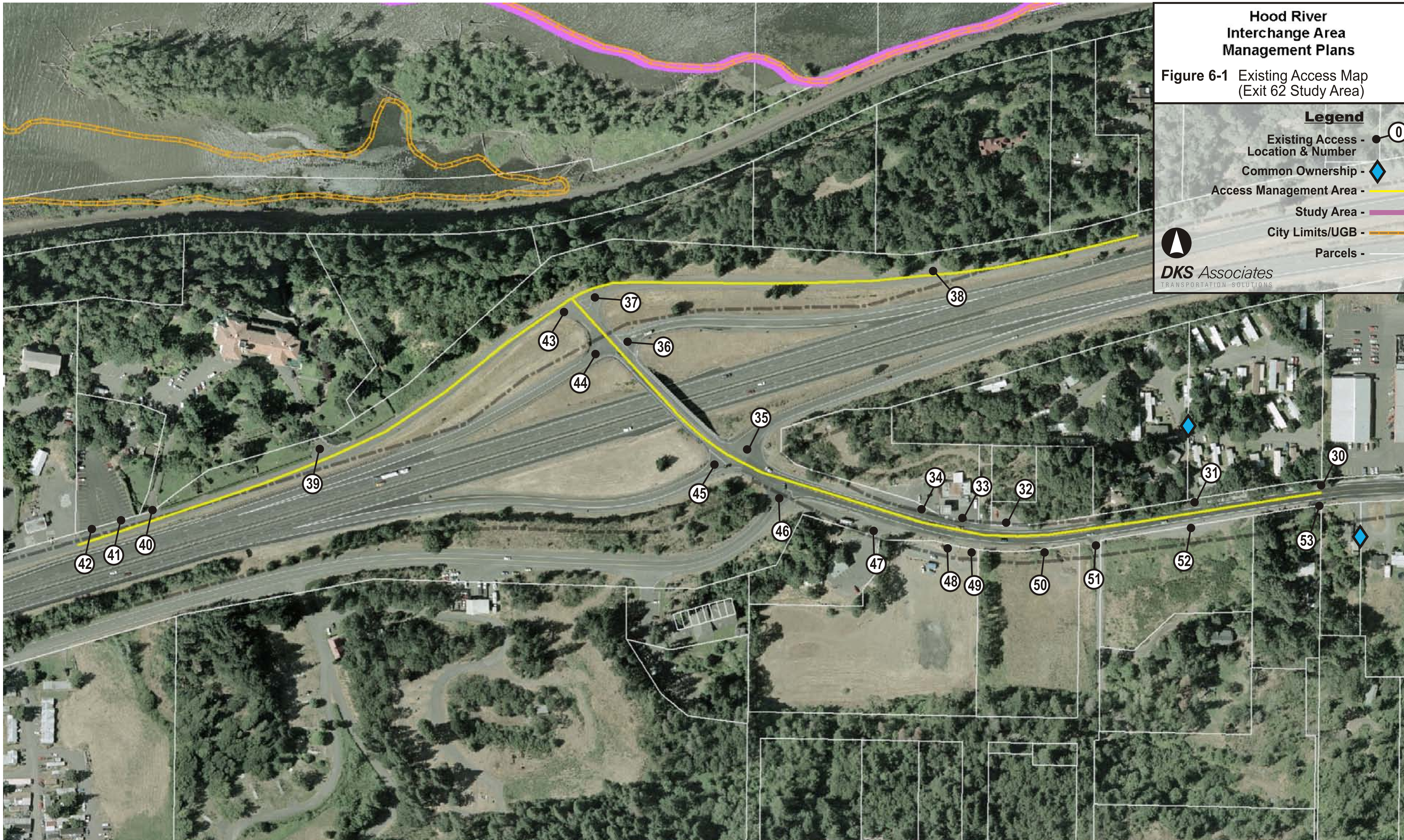
Table 3: Existing Approach Spacing on Exit 63 Access Management Corridor

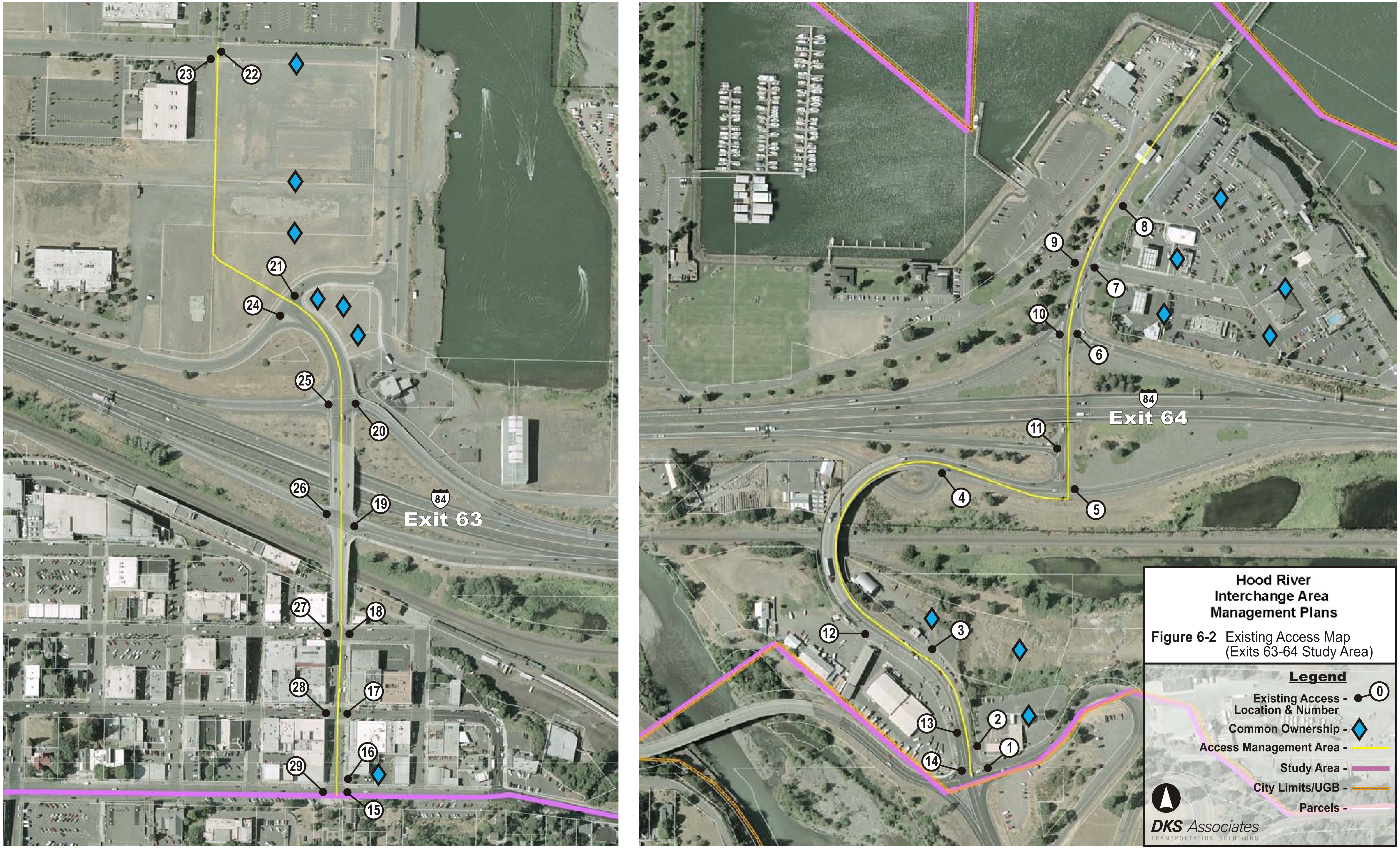
Roadway	Number of Approaches	Segment Length	Average Approach Spacing: Actual	Average Approach Spacing: Standard	Number of approaches allowed by standard
East Side of Crossroad					
2nd Street: I-84 EB Ramp terminal – State St.	4	880’	220’	1,320’	1
2nd Street: I-84 WB Ramp terminal – Portway Ave.	2	1,370’	685’	1,320’	1
West Side of Crossroad					
2nd Street: I-84 EB Ramp terminal – State St.	3	880’	560’	1,320’	1
2nd Street: I-84 WB Ramp terminal – Portway Ave.	2	1,370’	685’	1,320’	1

Table 4: Existing Approach Spacing on Exit 64 Access Management Corridor

Roadway	Number of Approaches	Segment Length	Average Approach Spacing: Actual	Average Approach Spacing: Standard	Number of approaches allowed by standard
East Side of Crossroad					
Button Bridge Rd.: I-84 EB Ramp terminal – US 30	4	1,680’	420’	1,320’	1
Button Bridge Rd.: I-84 WB Ramp terminal – Start of Hood River Bridge	2	980’	490’	1,320’	1
West Side of Crossroad					
Button Bridge Rd.: I-84 EB Ramp terminal – US 30	3	1,680’	560’	1,320’	1
Button Bridge Rd.: I-84 WB Ramp terminal – Start of Hood River Bridge	1	980’	980’	1,320’	1

The above tables show that the average approach spacing existing on the interchange crossroads is much shorter than would be allowed by the proposed spacing standards, indicating that improvements would be necessary if the standards were to be met. It should be recognized that most of the approaches along the Exit 63 crossroad are public street intersections.


Hood River
Interchange Area
Management Plans
Figure 6-1 Existing Access Map
(Exit 62 Study Area)
Legend
Existing Access - Location & Number
Common Ownership -
Access Management Area -
Study Area -
City Limits/UGB -
Parcels -
DKS Associates
TRANSPORTATION SOLUTIONS
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53


Exit 63
Exit 64
84
Hood River
Interchange Area
Management Plans
Figure 6-2 Existing Access Map
(Exits 63-64 Study Area)
Legend
Existing Access Location & Number
Common Ownership
Access Management Area
Study Area
City Limits/UGB
Parcels
DKS Associates
TRANSPORTATION SOLUTIONS

Crash Analysis

The last five years (2002–2006) of available crash data for I-84 and the surface streets within the study areas was obtained from the ODOT Crash Analysis and Reporting Unit to identify any areas of traffic safety concern. This data was examined for trends in the types or locations of crashes so that potential mitigation could be identified and was compared to similar facilities around the state to indicate whether the number of crashes occurring is typical or if further investigation is needed.

Interstate 84

While the study areas for the IAMPs only include limited segments of I-84, for the purposes of the crash analysis, the entire length of I-84 through the City of Hood River was examined. Table 5 summarizes the total number of crashes that occurred during the last five years and provides details related to the types and severity of collisions.

Table 5: Crash Data for I-84 through Hood River (Year 2002 – Year 2006)

Roadway Segment	Crash Severity			Type of Collision				Total Crashes
	Fatal	Injury	PDO	Rear-End	Side-Swipe	Fixed-object	Other	
I-84 (M.P 61.1-65.0)	1	6	20	9	7	10	1	27

Through an examination of the individual crashes over the last five years, it was noted that there were not any significant trends relating to accident location and type. Out of the 27 reported crashes, the two most prevalent types of crashes were rear-end crashes and fixed object crashes. The primary cause for most of these crashes relates to motorists driving too fast for the prevailing conditions. One fatality was also reported during this period involving a head-on collision approximately ¼-mile east of the Exit 64 interchange in the westbound direction. However, it is unclear as to how a head-on collision occurred on a freeway with barrier in the median.

For comparison purposes, crash rates identifying the number of crashes per million vehicle-miles (MVM) traveled for the section of I-84 through Hood River, as well as statewide average crash rates for other Interstate Freeways, were obtained from ODOT's *2006 State Highway Crash Rate Tables*. Highway sections analyzed in these tables are categorized by area type and functional classification to provide a basis for comparison between various facilities. For this analysis, I-84 through the City Limits was classified by ODOT as an Interstate Freeway and categorized as an "Urban Area". As shown in Table 6, the average crash rate experienced over this corridor has been consistently lower than the statewide average rate for similar facilities over the last five years. In fact, the crash rates appear to be more comparable with freeways in rural areas, which may be more appropriate for comparison given the scenic nature of the area.

Table 6: I-84 5-year Crash Rate Comparison for Interstate Freeways through Urban Cities

Section Limits (Milepoints)	Section Description	Crashes per Million Vehicle-Miles by Year 2006	2005	2004	2003	2002
	Statewide Average Rate	**0.52**	**0.53**	**0.53**	**0.64**	**0.55**
61.30 – 64.70	I-84: Between West and East Hood River City Limits	0.21	0.08	0.00	.04	0.31

To supplement this analysis, ODOT's Safety Priority Index System (SPIS) ratings for I-84 through the study area were also examined to identify any areas in need of mitigation. The Safety Priority Index System is a method developed by ODOT for identifying hazardous locations on state highways. The SPIS score is based on three years of crash data and considers crash frequency, crash rate, and crash severity. In general, locations ranking within the State's top 10% of SPIS scores should be considered for potential mitigation. After studying this data, no SPIS ratings within the top 10% were found on I-84 within the study area.

Surface Streets

In addition to the analysis conducted along I-84, another set of crash data (2002-2006) covering the study area intersections and arterial and collector roadways within the study areas was obtained from the ODOT Crash Analysis and Reporting Unit and categorized based on the types and severity of crashes. The results are displayed in Tables 7 and 8, with crashes occurring at intersections separated into Table 7 and all crashes along specified roadways shown in Table 8. The crash data is included in the appendix.

From examining Tables 7 and 8, it can be seen that the majority of the study area intersections experienced few or no crashes during the five-year analysis period and that the occurrences of crashes on arterial and collector roads have been relatively low.

Note that four out of the nine crashes occurring on Rand Road and four out of the five crashes occurring on Cascade Avenue were located at the Cascade Avenue/Rand Road intersection, which is currently unsignalized. Also of note is that five out of eleven crashes on 2nd Street occurred at the intersections with Cascade Avenue and Oak Street. With planned improvements including signalization of the Cascade Avenue/Rand Road and 2nd Street/Oak Street intersections, as well as implementation of right-in/right-out only turn restrictions at the 2nd Street/Cascade Avenue intersection, the causes of many of these crashes may be mitigated.

On the surface street system, most crashes occur at intersections. Such is the case along State Street, which experienced the most crashes of any study roadway. The majority of these crashes occurred at several intersections, with no one intersection experiencing more than four crashes over the five-year period.

Overall, the number of crashes found to have occurred on the surface street system is fairly low, with planned improvements addressing many of them. Also, given the low travel speeds, the severity of crashes that occur on surface streets is typically low.

Table 7: Crash data for Study Area Intersections (2002-2006)

Intersection	Crash Severity			Type of Collision				Total Crashes
	Fatal	Injury	PDO	Turning	Angle	Rear-end	Fixed/ other	
Exit 62								
Westcliff Dr/Cascade Ave	0	0	0	0	0	0	0	0
I-84 Exit 62 WB ramp/Cascade Ave	0	0	0	0	0	0	0	0
I-84 Exit 62 EB ramp/Cascade Ave	0	0	0	0	0	0	0	0
Country Club Rd/Cascade Ave	0	0	0	0	0	0	0	0
Cascade Ave/Rand Rd	0	1	3	0	4	0	0	4
Exit 63								
Portway Ave/2nd St	0	0	0	0	0	0	0	0
Riverside Dr/2nd St	0	0	0	0	0	0	0	0
I-84 Exit 63 WB ramp/2nd St	0	0	0	0	0	0	0	0
I-84 Exit 63 EB ramp/2nd St	0	0	3	2	0	1	0	3
Cascade Ave/2nd St	0	0	2	2	0	0	0	2
Oak St/2nd St	0	0	3	0	0	0	0	3
Exit 64								
Marina Way/Button Bridge Rd	0	0	1	0	0	1	0	1
I-84 Exit 64 WB ramp/Button Bridge Rd	0	0	0	0	0	1	0	1
I-84 Exit 64 EB off-ramp/Button Bridge Rd	0	0	0	0	0	0	0	0
I-84 Exit 64 EB on-ramp/Button Bridge Rd	0	0	0	0	0	0	0	0
Cascade Ave/Button Bridge Rd	0	0	0	0	0	0	0	0

Table 8 Crash data for Study Area Roadways (2002-2006)

Roadway	Crash Severity			Type of Collision				Total Crashes
	Fatal	Injury	PDO	Turning	Angle	Rear-end	Fixed/ other	
Exit 62 Study Area								
Cascade Ave I-84 Exit 62 WB Ramp - Rand Rd	0	2	7	4	4	1	0	9
Rand Rd: Cascade Ave - Sherman Ave	0	1	4	1	4	0	0	5
Frankton Road: Country Club Rd – May St	0	1	0	0	0	0	1	1
May St Frankton Rd-30th St	0	0	0	0	0	0	0	0
Country Club Rd Westridge Dr-Cascade Ave	0	0	0	0	0	0	0	0
Exit 63-64 Study Area								
2nd St: I-84 Exit 63 WB ramp - State St	0	0	11	5	1	5	0	11
Cascade Ave: 13th Street - 2nd Street	0	1	10	3	3	2	3	11
Button Bridge Rd South end of Hood River Bridge – Historic Columbia River hwy	0	0	1	0	0	1	0	1
7th St: 13th St - Oak St	0	0	8	4	1	0	3	8
13th Street: Wasco Ave - Cascade Ave	0	0	2	0	2	0	0	2
13th Street: Oak St - State St	0	0	1	1	0	0	0	1
Oak St: 13th St – Button Bridge Rd	0	0	4	2	0	1	1	4
State St: 13th St – Front St	0	4	14	4	5	5	4	18

Operational Analysis

Traffic Volumes

While traffic volumes through the study areas will vary with time of day and time of year, the time period commonly used for the purposes of transportation planning and design is representative of the 30th highest hour of the year. As such, ODOT has identified this hour as the time period of reference in mobility standards for both planning and design. Therefore, the analysis of conditions under this hour will be assumed for the IAMPs.

From previous studies in the area, data obtained from Automatic Traffic Recorders (ATRs) near Troutdale and Rowena has indicated that the 30th highest annual hour (30 HV) of traffic volumes on I-84 occurs on a Sunday afternoon in the month of August. Traffic volume data at study intersections collected during Sunday afternoons in June of 2006 was provided by ODOT for use in this analysis and was supplemented with new counts taken on Sunday afternoons in August of 2007.

Traffic Operations during the weekday PM peak were also analyzed to better understand traffic. Traffic volumes during weekday PM peak periods in 2007 at Exits 63 and 64 were obtained from the Hood River Frontage Road Feasibility Study by HNTB. Traffic counts were conducted at the remaining intersections at Exit 62 in September 2008.

Prior to using the volume data for analysis, consistent sets of volumes for each study area were created to represent volumes that would be present during a Sunday PM peak hour in August of 2007 and a weekday PM peak hour in August of 2008. This required adjustments to some count data to correct for the year and month that is was collected. Also, to provide a consistent snapshot of volumes during the peak hour, a common hour of analysis was chosen for each study area, with volumes between study intersections balanced to reflect reasonable gains and losses between intersections related to the degree of opportunities to enter or leave the roadway between those intersections. Based on an evaluation of the count data, the Sunday PM peak hour for the operational analysis was determined to be 3:30-4:30 PM for Exit 62 study area intersections and 4:00-5:00 PM for the Exits 63/64 study area intersections. For the Weekday PM peak hour operational analysis, count data from 4:15-5:15 PM was used for Exit 62 and 4:45-5:45 PM for Exits 63/64.

To adjust older counts taken in 2006 so that they reflected volumes in 2007 for the Sunday analysis and to adjust 2007 volumes to 2008 volumes for the weekday analysis at Exits 63/64, an annual growth rate of 2.6% was applied. This growth rate is consistent with the following recent planning studies:

- *Cascade Locks Resort and Casino EIS: Hood River Alternative Transportation Technical Report* (Kittelson & Associates, Inc., July 2006);
- *Exit 64 East Hood River Interchange Study* (Parsons Brinckerhoff Quade & Douglas, Inc., June 2005); and
- *City of Hood River Transportation System Plan* (David Evans & Associates, June 1999, Kittelson & Associates, Inc., Amended August 2003).

It should be noted that the key assumptions underlying the use of the 2.6% growth rate are that area lands will develop consistently with the acknowledged comprehensive plan and that the rate of traffic growth over the next 20 years will be the same as that over the past 20 years.

Because traffic volumes vary during different times of year, especially in areas that experience significant volumes of recreational traffic, any counts that were not collected in the month of August were adjusted by applying a seasonal factor. The seasonal factor was calculated[1] by combining the results of the ODOT Automatic Traffic Recorder (ATR) data and the ODOT *2007*

[1] ODOT *Analysis Procedures Manual* Chapter 4-Developing Design Hour Volumes.

Seasonal Trend Table[2] methodologies. The ATRs considered were on I-84 at Rowena (ATR 33-001) and on OR 35 south of Hood River (ATR 14-003), with the Rowena ATR representing functional classification and traffic characteristics for the freeway and the OR 35 ATR representing variations in local and recreational traffic in the vicinity of Hood River. A comparison of five count years (2001-2005) of ATR data from June (count month) and August (peak month) resulted in the calculation of a seasonal factor of 1.07 for the Rowena ATR and 1.26 for the OR 35 ATR.

In calculating the seasonal factor using the Seasonal Trend Table, two categories were considered: Recreational Summer and Recreational Summer/Winter. For the Recreational Summer category, the seasonal factor was 1.15 and for the Recreational Summer/Winter category, the seasonal factor was 1.23. When combing the results of ATR and Seasonal Trend Table methodologies, a seasonal adjustment factor of 1.25 was calculated and applied to all June traffic volumes, increasing those volumes by 25% to represent those taken in the peak month of August.

Upon completing all adjustments, the resulting 2007 Sunday 30 HV traffic volumes at study area intersections were illustrated in Figures 7-1 and 7-2 and used in the operational analysis. The 2008 Weekday PM peak hour traffic volumes used in the operational analysis are shown in Figures 7-3 and 7-4. The raw traffic count sheets are attached in the appendix.

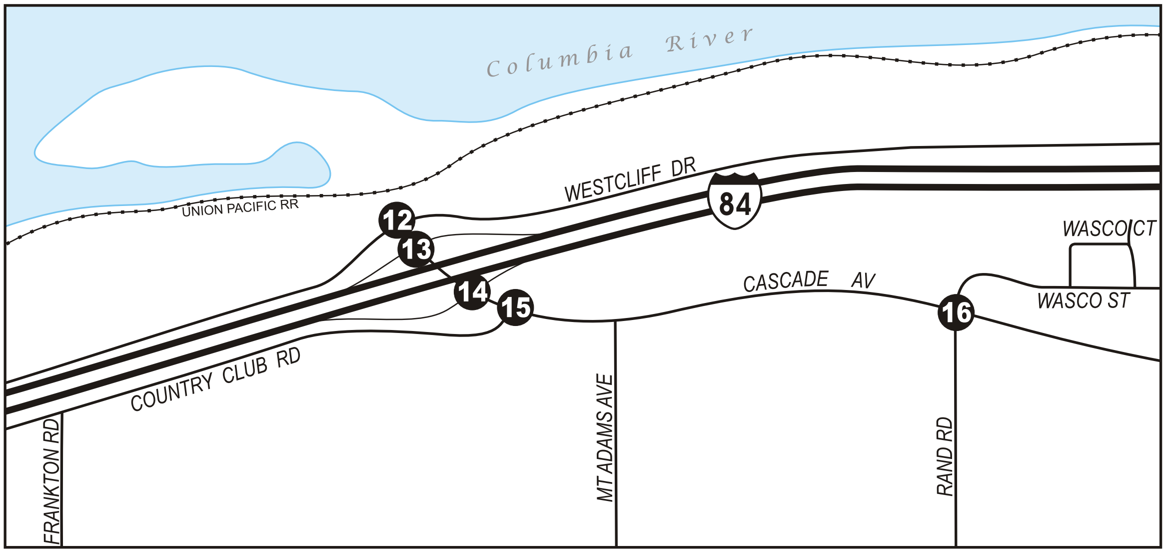
Along I-84, count data previously collected in Cascade Locks was used, applying the same seasonal factors and growth rates described above. Adjustments to the mainline volumes were made to account for additions and subtractions occurring at each ramp connection from Cascade Locks through Hood River. Figures 8-1 and 8-2 show the resulting 2007 30 HV freeway volumes through the Exit 62 and Exit 63/64 study areas, respectively. From these figures, it can be seen that westbound traffic volumes on I-84 are considerably higher than those in the eastbound direction during an August Sunday afternoon peak hour.

Intersection Operations

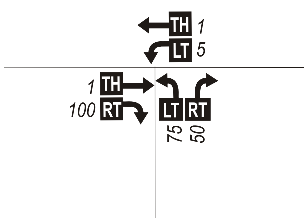
To evaluate the ability of study area intersections to adequately serve traffic demand, an analysis was performed to identify existing operating conditions for comparison to adopted mobility standards. ODOT's adopted mobility standards, which are based on intersection volume to capacity (v/c) ratios, are documented in the *1999 Oregon Highway Plan* (and amendments) and vary with highway classification, environment, and posted speed. Mobility standards applicable to the IAMP study areas are referenced in Table 9.

---

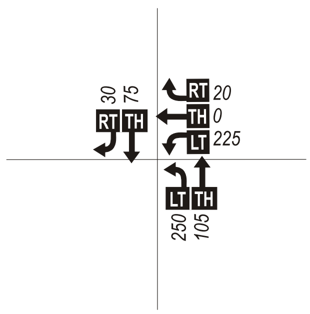
[2] 2007 Seasonal Trend Table, ODOT Transportation Planning Analysis Unit, http://www.oregon.gov/ODOT/TD/TP/TADR.shtml



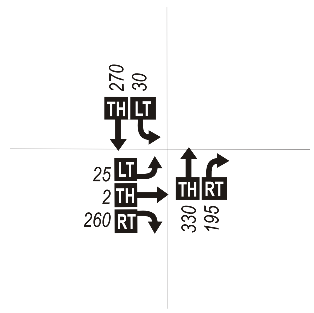
12 Westcliff Dr. @ Cascade Ave.



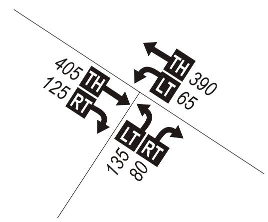
13 I-84 WB On/Off Ramps @ Cascade Ave.



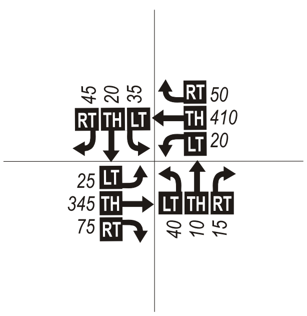
14 I-84 EB On/Off Ramps @ Cascade Ave.



15 Country Club Rd. @ Cascade Ave.



16 Cascade Ave. @ Rand Rd.



Hood River Interchange Area Management Plans

Figure 7-1 2008 30th Highest Hour PM Peak Hour Traffic Volumes (Exit 62 Study Area)

LEGEND

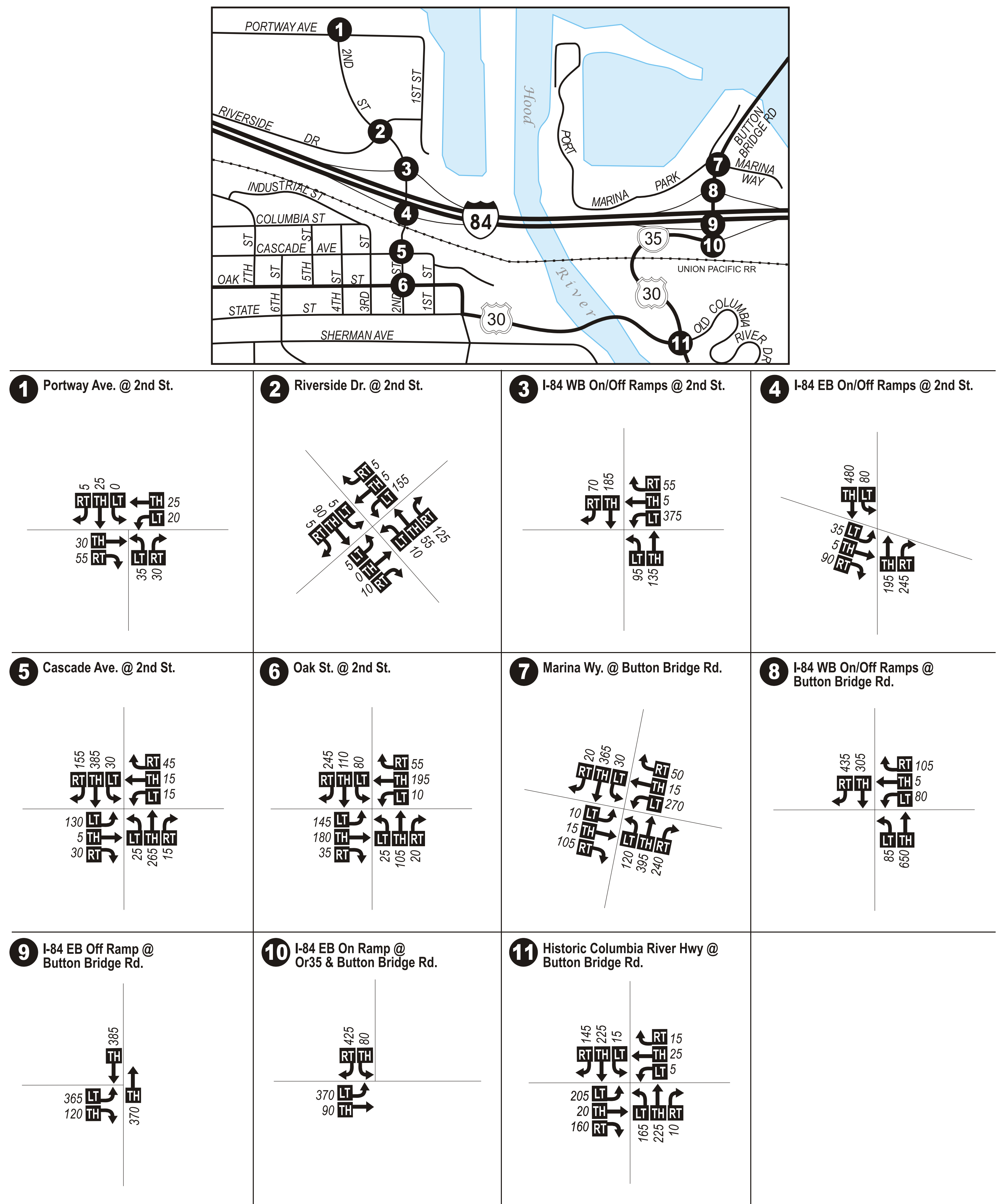
0 - Study Intersection & Number

RT 00 - Right Turn Movement Traffic Volume

TH 00 - Through Movement Traffic Volume

LT 00 - Left Turn Movement Traffic Volume

DKS Associates
TRANSPORTATION SOLUTIONS



Hood River Interchange Area Management Plans

LEGEND

0 - Study Intersection & Number

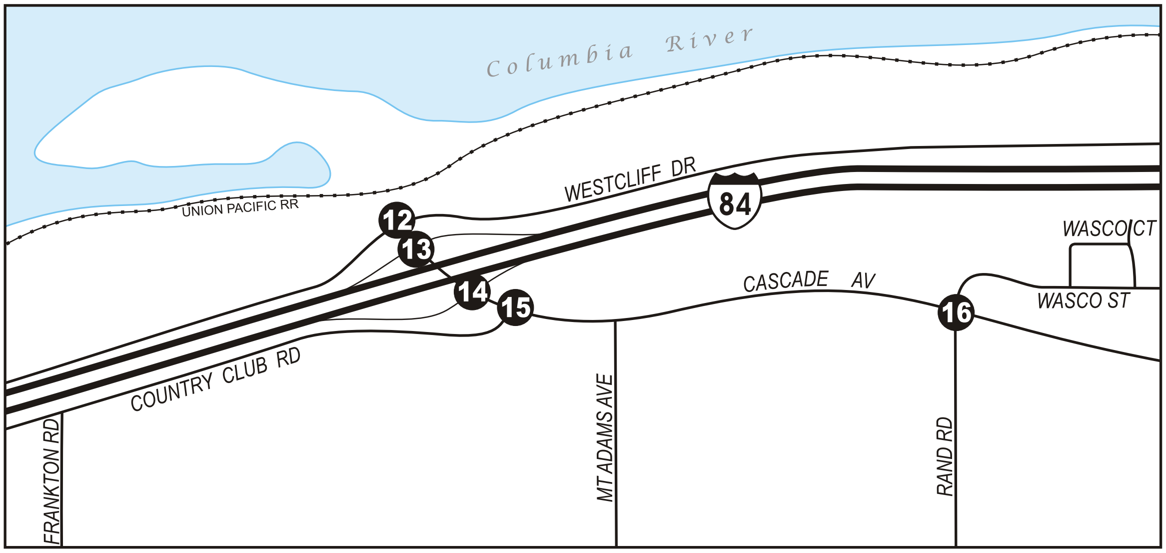
RT 00 - Right Turn Movement Traffic Volume

TH 00 - Through Movement Traffic Volume

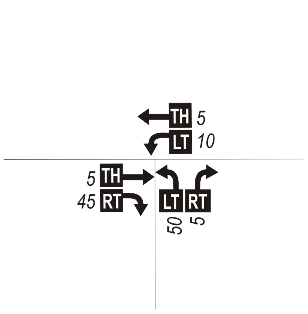
LT 00 - Left Turn Movement Traffic Volume

DKS Associates
TRANSPORTATION SOLUTIONS

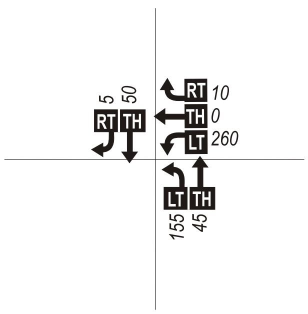
Figure 7-2 2008 30th Highest Hour PM Peak Hour Traffic Volumes (Exit 63-64 Study Area)



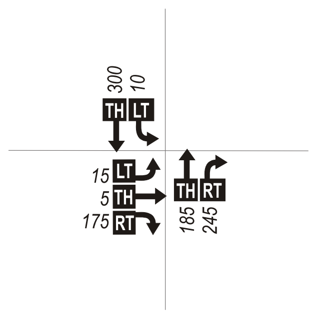
12 Westcliff Dr. @ Cascade Ave.



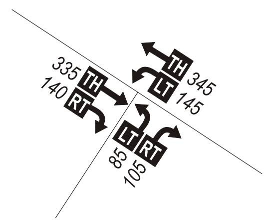
13 I-84 WB On/Off Ramps @ Cascade Ave.



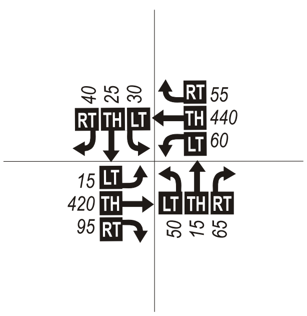
14 I-84 EB On/Off Ramps @ Cascade Ave.



15 Country Club Rd. @ Cascade Ave.



16 Cascade Ave. @ Rand Rd.



Hood River Interchange Area Management Plans

Figure 7-3 2008 Weekday PM Peak Hour Traffic Volumes (Exit 62 Study Area)

LEGEND

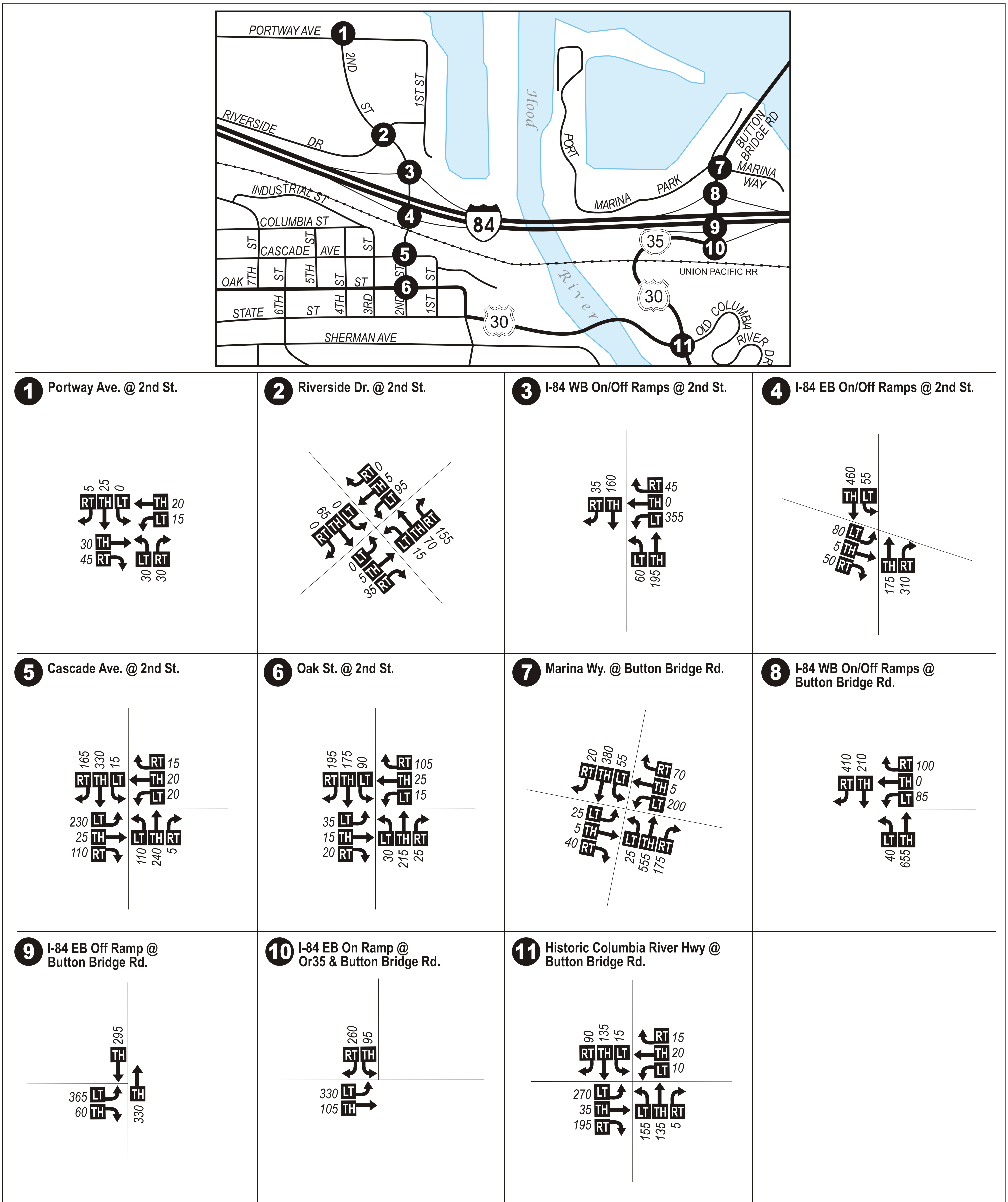
0 - Study Intersection & Number

RT 00 - Right Turn Movement Traffic Volume

TH 00 - Through Movement Traffic Volume

LT 00 - Left Turn Movement Traffic Volume

DKS Associates
TRANSPORTATION SOLUTIONS



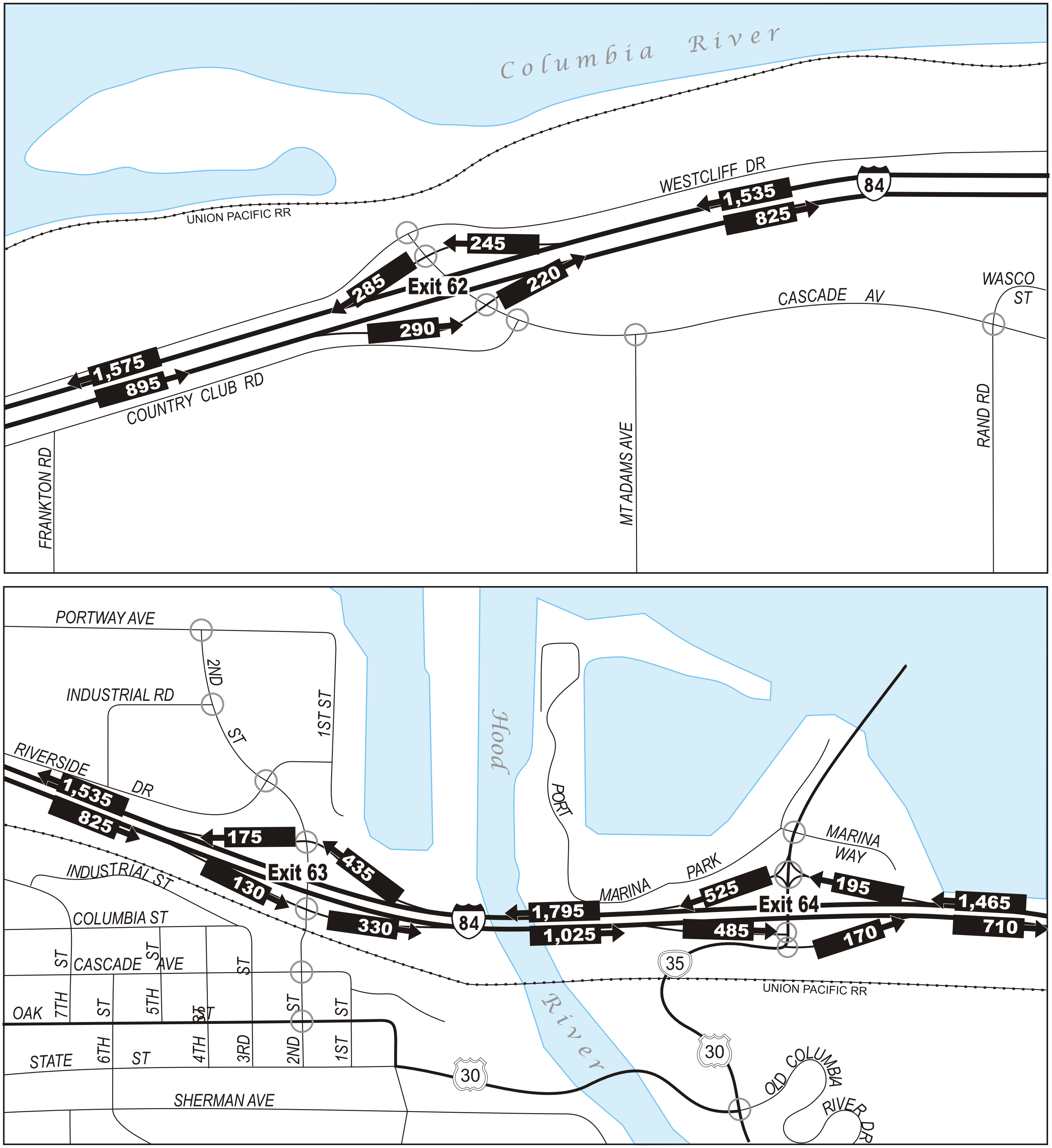
Hood River Interchange Area Management Plans

Figure 7-4 2008 Weekday PM Peak Hour Traffic Volumes (Exit 63-64 Study Area)

LEGEND

- 0 - Study Intersection & Number
- RT 00 - Right Turn Movement Traffic Volume
- TH 00 - Through Movement Traffic Volume
- LT 00 - Left Turn Movement Traffic Volume

DKS Associates
TRANSPORTATION SOLUTIONS



Hood River Interchange Area Management Plans

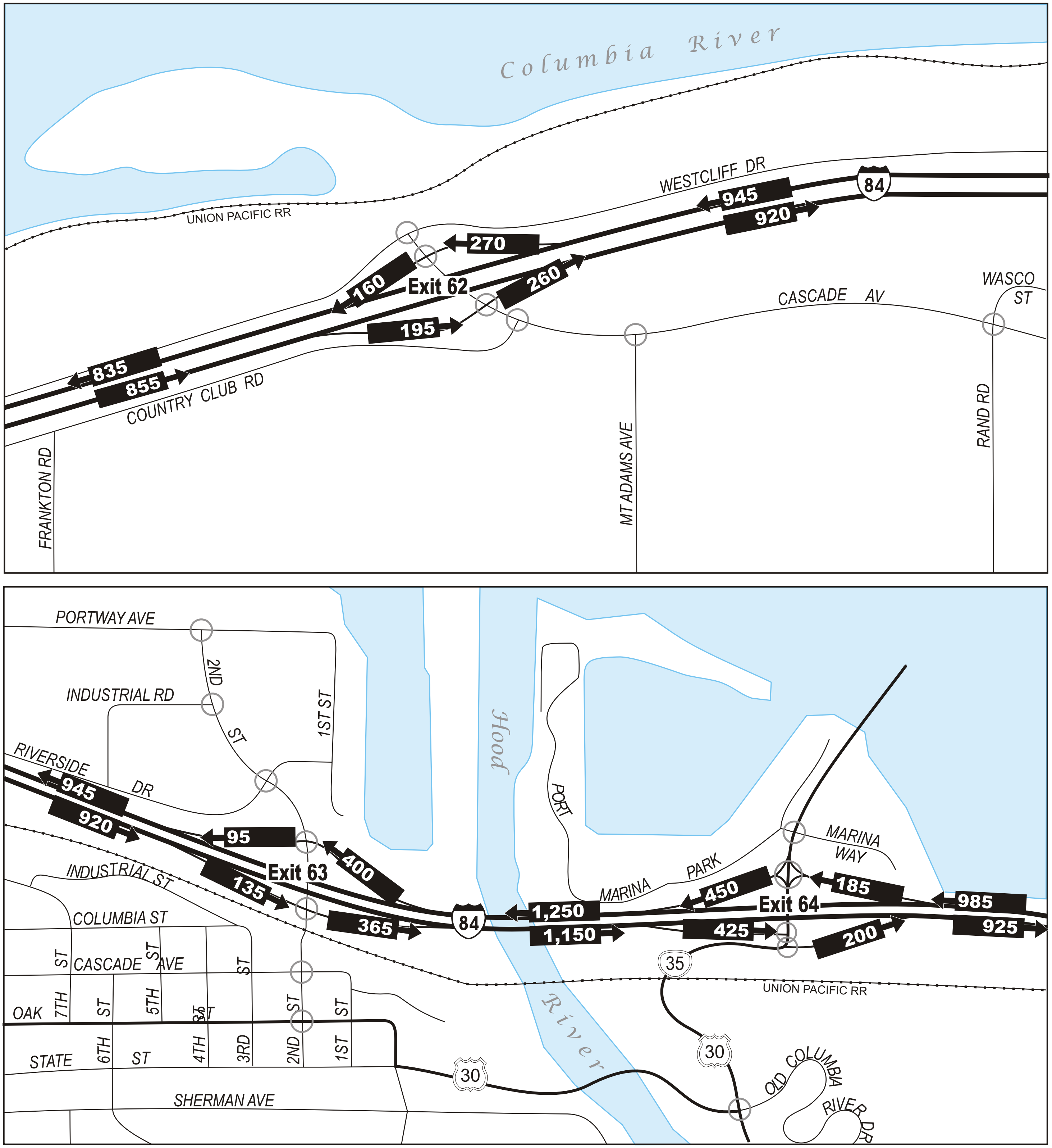
Figure 8-1 I-84 2008 30th Highest Hour PM Peak Hour Traffic Volumes (Exits 62 & 63-64 Study Areas)

LEGEND

0,000 - I-84 2008 Existing Conditions 30th Highest Hour Volumes

DKS *Associates*
TRANSPORTATION SOLUTIONS

0 **feet** 400 800 1200



Hood River Interchange Area Management Plans

Figure 8-2 I-84 2008 Weekday PM Peak Hour Traffic Volumes (Exits 62 & 63-64 Study Areas)

LEGEND

0,000 - I-84 2008 Weekday PM Peak Hour Volume

DKS Associates
TRANSPORTATION SOLUTIONS

0 feet 400 800 1200

Table 9: Applicable ODOT Mobility Standards (v/c ratios)

Highway Category	Inside Urban Growth Boundary		Outside Urban Growth Boundary
	Non-MPO outside of STA's where non-freeway speed ≤ 35 mph	Non-MPO where non-freeway speed limit ≥ 45mph	Rural Lands
Interstate Highways	-	0.70	-
Freight Route on a Statewide Highway	0.80	0.70	0.70
District/ Local Interest Roads	0.90	0.80	0.75

It should be noted that at unsignalized intersections, these standards are applicable only to movements that are not required to stop. For other movements at unsignalized intersections that are required to stop or otherwise yield the right of way, the standards for District/Local Interest Roads shall be applied for areas within urban growth boundaries. For interchange ramp terminals, the v/c ratio shall be the smaller of the values of the standard for the crossroad or 0.85.

The City of Hood River also maintains standards for mobility that require a minimum level of service C for intersection operations during the peak hour. As all other intersections are under ODOT jurisdiction, this standard will only be applied to the Cascade Avenue/Westcliff Drive intersection. However, levels of service for all intersections will be reported for informational purposes.

Study area intersections were analyzed through the use of a Synchro model that was created using field inventory data, aerial photos, signal timing sheets obtained from ODOT, and the traffic volume data shown in Figures 7-1 through 7-4. From this analysis, intersection levels of service (LOS), delay, and v/c ratios were calculated using Highway Capacity Manual[3] methodologies for signalized and unsignalized intersections. Table 10 summarizes the results of the Sunday 30 HV operational analysis for the study intersections under existing conditions and compares them to the applicable mobility standards. Table 11 summarizes the results of the Weekday PM peak hour operational analysis under existing conditions. Note that the results shown for unsignalized intersections represent the critical movement (usually a stop-controlled movement, such as a side-street left turn or crossing movement). The operational analysis worksheets are included in the appendix.

As shown, most of the study intersections are currently operating within adopted mobility standards during the Sunday and weekday PM peak periods. However, results from the Sunday 30 HV analysis shows that the westbound interchange ramp terminal on Exit 62 at Cascade Avenue and the intersections of Cascade Avenue at 2nd Street and Marina Way at Button Bridge Road are experiencing longer delays and are not meeting mobility standards. In the weekday PM peak period analysis, the intersections of Cascade Avenue at 2nd Street and Marina Way at Button Bridge Road are experiencing longer delays and are not meeting mobility standards. The Planned projects to signalize the intersection of Marina Way at Button Bridge Road and convert the intersection of Cascade Avenue at 2nd Street to allow right-in and right-out turn movements

[3] *Highway Capacity Manual*, Transportation Research Board, Washington, D.C., 2000.

only are expected to improve conditions in the future, but no projects are currently planned for the I-84 westbound ramp terminal at Cascade Avenue.

Table 10: Existing (2007) 30 HV Intersection Operational Analysis

Intersection	Traffic Control	Operations			Mobility Standard (v/c)
		LOS	Delay (sec)	v/c	
Exit 62					
Westcliff Dr/Cascade Ave	Unsignalized	A/A	9.4	0.01	C*
I-84 Exit 62 WB ramp/Cascade Ave	Unsignalized	A/F	>50.0	**0.87 (WB)**	0.85
I-84 Exit 62 EB ramp/Cascade Ave	Unsignalized	A/B	14.6	0.45 (EB)	0.85
Country Club Rd/Cascade Ave	Unsignalized	A/D	29.0	0.57 (NB)	0.90
Cascade Ave/Rand Rd	Unsignalized	A/C	23.8	0.26 (SB)	0.90
Exit 63					
Portway Ave/2nd St	Unsignalized	A/B	10.0	0.08 (NB)	NA
Riverside Dr/2nd St	Unsignalized-AWSC	A	8.4	0.25	0.90
I-84 Exit 63 WB ramp/2nd St	Signalized	C	20.5	0.43	0.85
I-84 Exit 63 EB ramp/2nd St	Signalized	A	7.5	0.39	0.85
Cascade Ave/2nd St	Unsignalized	A/F	>50.0	**1.00 (EB)**	0.90
Oak St/2nd St	Unsignalized-AWSC	C	15.4	0.65	0.90
Exit 64					
Marina Way/Button Bridge Rd	Unsignalized-AWSC	D	33.2	**0.92 (NB)**	0.80
I-84 Exit 64 WB ramp/Button Bridge Rd	Unsignalized	A/E	46.5	0.71 (WB)	0.80
I-84 Exit 64 EB off-ramp/Button Bridge Rd	Unsignalized-AWSC	C	22.5	0.76 (EB)	0.85
I-84 Exit 64 EB on-ramp/Button Bridge Rd	Unsignalized	A/D	27.0	0.41 (SB)	0.80
State St/Button Bridge Rd	Unsignalized-AWSC	B	12.6	0.62	0.80

** City Mobility Standards use level of service, not v/c ratios.*
Highlighted values do not meet mobility standards.
LOS = Level of Service
(xx) = Critical Movement
Delay = Average vehicle delay (sec)
v/c = Volume to Capacity Ratio
A/A = Major Street turn LOS / Minor street turn LOS
NA = Not applicable
AWSC = All-Way Stop Control

Table 11: Existing (2008) Weekday PM Peak Intersection Operational Analysis

Intersection	Traffic Control	Operations			Mobility Standard (v/c)
		LOS	Delay (sec)	v/c	
Exit 62					
Westcliff Dr/Cascade Ave	Unsignalized	A/A	9.1	0.02	C*
I-84 Exit 62 WB ramp/Cascade Ave	Unsignalized	A/D	30.6	0.71 (WB)	0.85
I-84 Exit 62 EB ramp/Cascade Ave	Unsignalized	A/B	12.8	0.31 (EB)	0.85
Country Club Rd/Cascade Ave	Unsignalized	A/D	33.8	0.63 (NB)	0.90
Cascade Ave/Rand Rd	Unsignalized	A/D	29.6	0.45 (NB)	0.90
Exit 63					
Portway Ave/2nd St	Unsignalized	A/A	9.8	0.08 (NB)	NA
Riverside Dr/2nd St	Unsignalized-AWSC	A	8.2	0.31	0.90
I-84 Exit 63 WB ramp/2nd St	Signalized	B	19.8	0.39	0.85
I-84 Exit 63 EB ramp/2nd St	Signalized	A	9.2	0.49	0.85
Cascade Ave/2nd St	Unsignalized	A/F	>50.0	**>1.00 (EB)**	0.90
Oak St/2nd St	Unsignalized-AWSC	B	11.1	0.47	0.90
Exit 64					
Marina Way/Button Bridge Rd	Unsignalized-AWSC	D	>50.0	**>1.00 (NB)**	0.80
I-84 Exit 64 WB ramp/Button Bridge Rd	Unsignalized	A/E	40.4	0.66 (WB)	0.80
I-84 Exit 64 EB off-ramp/Button Bridge Rd	Unsignalized-AWSC	C	18.8	0.73 (EB)	0.85
I-84 Exit 64 EB on-ramp/Button Bridge Rd	Unsignalized	A/D	31.2	0.44 (SB)	0.80
State St/Button Bridge Rd	Unsignalized-AWSC	B	11.6	0.51	0.80

** City Mobility Standards use level of service, not v/c ratios.*
Highlighted values do not meet mobility standards.
LOS = Level of Service
(xx) = Critical Movement
Delay = Average vehicle delay (sec)
v/c = Volume to Capacity Ratio
A/A = Major Street turn LOS / Minor street turn LOS
NA = Not applicable
AWSC = All-Way Stop Control

Freeway Operations

Additional analysis for the I-84 mainline was conducted around the Hood River interchanges to identify potential operational problems related to the entrance and exiting of traffic from the freeway and the close proximity of ramp connections. The movements analyzed included the impacts of merging, diverging, and weaving, as well as an assessment of the general capacity of the freeway to accommodate peak hour demand. All analysis was conducted in accordance with *Highway Capacity Manual* (HCM) methodologies using the peak hour volumes displayed in Figures 8-1 and 8-2. Analysis worksheets are included in the appendix.

To assess the general capacity of the freeway, a segment of I-84 free from the influences of merging, diverging, and weaving movements was analyzed using the basic freeway section methodology from the HCM. Within the study areas, the westbound segment of I-84 west of the Exit 62 on-ramp was selected, as it maintains the highest traffic volume per lane outside of a weaving area. As shown in Table 11, I-84 is operating well under capacity during the 30 HV in 2007 and meets ODOT's mobility standard, which requires operation at a v/c ratio no greater than 0.70.

The proximity of the Exit 63 and Exit 64 ramp connections on I-84 creates a weaving section where traffic entering the freeway and traffic exiting the freeway must cross each other's path while changing lanes at least one time. According to the Highway Capacity Manual, this is known as a type "A" weaving configuration. [4] Weaving can have significant effects on freeway operation and safety, as traffic in the right lanes often slow down to maneuver across each other. This condition is generally most severe under high volumes of weaving traffic and in areas where the weaving distance is short (less than ¼-mile).

The existing weaving sections between Exit 63 and Exit 64 have approximate weaving lengths[5] of 1,200 feet in westbound direction and 1,150 feet in eastbound direction. They are also characterized as having a high volume of local traffic using the auxiliary lanes to travel between interchanges. According to the findings of a previous study in the area, approximately 40% of the traffic entering at either of these interchanges is exiting at the downstream interchange.[6] These parameters were incorporated into the analysis, with the results shown in Table 11. While the operations for both weaving sections are shown to meet mobility standards, it should be recognized that the eastbound weaving section experiences a higher percentage of weaving traffic than is recommended for application of the HCM weaving analysis methodology. Therefore, while the v/c ratio appears to be low, actual operations may not be as good as indicated.

The entrance and departure of vehicles to and from the flow of mainline traffic can also have adverse impacts on freeway operation. Therefore, the merging and diverging movements at the three interchanges were also analyzed for operational performance under existing conditions. As shown in Table 11, all movements operate well within adopted mobility standards. Note that merging and diverging movements between the Exit 63 and 64 interchanges were not analyzed, as it was assumed that the weaving movements would have a more significant impact on operations.

---

[4] Type of weaving section based on *the Highway Capacity Manual 2000* Methodology, Page 24-5
[5] Length of weaving section based on the ODOT *Analysis Procedure Manual April 2006*, Section 6.2.3
[6] *Exit 64 East Hood River Interchange Study,* Parsons Brinckerhoff Quade & Douglas, Inc., June 2005.

Table 12: Existing (2007) 30 HV I-84 Operational Analysis

Location	Direction	LOS	v/c	Mobility Standard (v/c)
Basic Freeway Analysis				
West of Exit 62	WB	B	0.43	0.70
Weaving Analysis				
Exit 63-64	WB	B	0.40	0.70
	EB	A	0.29	0.70
Merging & Diverging Analysis				
Exit 62	EB Off-ramp Diverge	B	0.27	0.70
	EB On-ramp Merge	A	0.22	0.70
	WB Off-ramp Diverge	B	0.45	0.70
	WB On-ramp Merge	B	0.44	0.70
Exit 63	WB On-ramp Merge	B	0.43	0.70
	EB Off-ramp Diverge	B	0.22	0.70
Exit 64	WB Off-ramp Diverge	B	0.43	0.70
	EB On-ramp Merge	A	0.20	0.70

Appendix

- Existing Approach Inventory (Table A.1)
- Crash Data
- Traffic Volume Data
- Intersection Operational Analysis Worksheets
- Freeway Analysis Worksheets

Existing Approach Inventory (Table A.1)

Table A.1 Existing Approach Inventory

Approach #	Side of Hwy	Width	Material	Public/Private	Tax Lot #	Property owner(s)	Address	Business Name	Use
Exit 62 Access Management Area									
30	East	20'	A	Private	600	Regos, Laszlo Et Al			Commercial
31	East	20'	A	Private	600	Regos, Laszlo Et Al			Commercial
32	East	50'	G	Private	800	Jd & Ac Properties, Llc			Vacant
33	East	40'	A	Private	1000	Hattenhauer, John D & Mary L			Commercial
34	East	80'	A	Private	1000	Hattenhauer, John D & Mary L			Commercial
35	East	30'	A	Public	-	-	-	-	-
36	East	20'	A	Public	-	-	-	-	-
37	East	25'	A	Public	-	-	-	-	-
38	East	20'	A	Private	300	Pate, James H			Commercial
39	West	20'	A	Private	101	Cgh, Llc.			Commercial
40	West	20'	A	Private	101	Cgh, Llc.			
41	West	25'	A	Private	100	Cgh-W, Llc.			Commercial
42	West	30'	A	Private	100	Cgh-W, Llc.			Commercial
43	West	25'	A	Public	-	-	-	-	-
44	West	20'	A	Public	-	-	-	-	-
45	West	20'	A	Public	-	-	-	-	-
46	West	25'	A	Public	-	-	-	-	-
47	West	25'	A	Private	1300	Sweek, Dana & Linda			Commercial
48	West	15'	A	Private	1500	Gill, Willis Howard & Elizabeth Ann			
49	West	15'	A	Private	1500	Gill, Willis Howard & Elizabeth Ann			
50	West	15'	G	Private	800	Jd & Ac Properties, Llc			Commercial
51	West	20'	A	Public	-	-	-	-	-
52	West		G	Private	2202	Columbia Landshares, Llc			Vacant
53	West	15'	A	Private	2300	Hannah & Bill, Llc			Residential

Table A.1 Existing Approach Inventory

Approach #	Side of Hwy	Width	Material	Public/Private	Tax Lot #	Property owner(s)	Address	Business Name	Use
Exit 63 Access Management Area									
15	East	30'	A	Public	-	-	-	-	-
16	East	15'	A	Private	3800	City of Hood River			Commercial
17	East	35'	A	Public	-	-	-	-	-
18	East	35'	A	Public	-	-	-	-	-
19	East	30'	A	Public	-	-	-	-	-
20	East	30'	A	Public	-	-	-	-	-
21	East	30'	A	Public	-	-	-	-	-
22	East	40'	A	Public	-	-	-	-	-
23	West	40'	A	Public	-	-	-	-	-
24	West	25'	A	Public	-	-	-	-	-
25	West	25'	A	Public	-	-	-	-	-
26	West	30'	A	Public	-	-	-	-	-
27	West	35'	A	Public	-	-	-	-	-
28	West	35'	A	Public	-	-	-	-	-
29	West	30'	A	Public	-	-	-	-	-
Exit 64 Access Management Area									
1	East	40'	A	Public	-	-	-	-	-
2	East	25'	A	Private	300	Su, Kok Djen & Grace Pwee Tjen			Commercial
3	East	30'	A	Private	800	Su, Kok Djen & Grace			Commercial
4	East	30'	A	Public	-	-	-	-	-
5	East	20'	A	Public	-	-	-	-	-
6	East	25'	A	Public	-	-	-	-	-
7	East	40'	A	Public	-	-	-	-	-
8	East	20'	A	Public	-	-	-	-	-
9	West	45'	A	Public	-	-	-	-	-
10	West	20'	A	Public	-	-	-	-	-
11	West	25'	A	Public	-	-	-	-	-
12	West	40'	A	Private	900	Carlstrom, Brian & Lorraine			Commercial
13	West	40'	A	Private	901	Tum-A-Lum Lumber Company			Commercial
14	West	35'	A	Public	-	-	-	-	-

Crash Data

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

I-84 (Hwy #2, Route I-84) from mile point 61.10 to mile point 65.00 in/near Hood River
1-1-2002 through 12-31-2006

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														
FIXED / OTHER OBJECT	0	2	2	4	0	3	1	2	2	2	2	0	0	4
REAR-END	0	0	3	3	0	0	0	3	0	3	0	2	0	0
SIDESWIPE - OVERTAKING	0	0	1	1	0	0	0	1	0	1	0	0	0	1
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2006 TOTAL	0	2	7	9	0	3	1	7	2	7	2	3	0	5
YEAR: 2005														
HEAD-ON	1	0	0	1	1	1	0	0	1	0	1	0	0	0
REAR-END	0	1	2	3	0	1	0	2	1	1	2	0	0	0
2005 TOTAL	1	1	2	4	1	2	0	2	2	1	3	0	0	0
YEAR: 2004														
SIDESWIPE - OVERTAKING	0	0	3	3	0	0	0	2	1	1	2	0	0	1
2004 TOTAL	0	0	3	3	0	0	0	2	1	1	2	0	0	1
YEAR: 2003														
FIXED / OTHER OBJECT	0	2	2	4	0	2	1	1	3	3	1	0	0	3
REAR-END	0	0	1	1	0	0	0	1	0	1	0	0	0	0
SIDESWIPE - OVERTAKING	0	0	1	1	0	0	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	2	2	0	0	0	2	0	2	0	2	0	0
2003 TOTAL	0	2	6	8	0	2	1	5	3	7	1	2	0	3
YEAR: 2002														
FIXED / OTHER OBJECT	0	0	2	2	0	0	0	1	1	1	1	0	0	2
REAR-END	0	1	5	6	0	2	2	5	1	6	0	1	0	0
SIDESWIPE - OVERTAKING	0	0	2	2	0	0	0	2	0	2	0	0	0	0
TURNING MOVEMENTS	0	0	2	2	0	0	0	1	1	2	0	2	0	0
2002 TOTAL	0	1	11	12	0	2	2	9	3	11	1	3	0	2
FINAL TOTAL	1	6	29	36	1	9	4	25	11	27	9	8	0	11

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

002 COLUMBIA RIVER

I-84 (Hwy #2, Route I-84) from mile point 61.10 to mile point 65.00 in/near Hood River
1-1-2002 through 12-31-2006

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	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00359	N N N	12/30/2003	HOOD RIVER	1 01		STRGHT		N	N	SNOW	FIX OBJ	01	NONE 1	STRGHT										067	12
STATE		Tue		0 0		UN	(DIVMD)	UNKNOWN	N	ICE	FIX		PRVTE	W E									000	067	00
		11P		61.10		04			N	DARK	INJ		SEMI TOW		01	DRVR	INJC	35	M	OR-Y		000	000		12
							(04)													OR>25					
00222	N N N	08/09/2003	HOOD RIVER	1 01		STRGHT		N	N	CLR	S-STRGHT	01	NONE 0	STRGHT											06
NONE		Sat		0 0		UN	(NONE)	UNKNOWN	N	DRY	SS-O		PRVTE	E W									000		00
		2P		61.13		06			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	56	M	OR-Y		045	000		06
							(04)													OR>25					
												02	NONE 0	STRGHT											
													PRVTE	E W									000		00
													PSNGR CAR		01	DRVR	NONE	56	M	OR-Y		000	000		00
																				OR>25					
00299	N N N	11/24/2004	HOOD RIVER	1 11		CURVE		N	N	CLR	S-STRGHT	01	NONE 0	STRGHT											06
NONE		Wed		0 0		UN	(DIVMD)	UNKNOWN	N	DRY	SS-O		PRVTE	W E									000		00
		7P	HOOD RIVER UA	61.25		04			N	DARK	PDO		PSNGR CAR		01	DRVR	NONE	00	M	OR-Y		045	000		06
							(04)													OR<25					
												02	NONE 0	STRGHT											
													PRVTE	W E									000		00
													PSNGR CAR		01	DRVR	NONE	17	M	OR-Y		000	000		00
																				OR>25					
00021	N N N	01/18/2003	HOOD RIVER	2 01		STRGHT		N	Y	CLR	FIX OBJ	01	NONE 0	STRGHT										043	01
NONE		Sat		0 0		UN	(RSDMD)	UNKNOWN	N	ICE	FIX		PRVTE	E W									000	043	00
		9A		61.25		08			N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	36	F	OR-Y		047,081	017		01
							(04)													OR<25					
00290	N N N N N	08/12/2002	HOOD RIVER	1 02		STRGHT		N	N	CLR	S-STRGHT	01	NONE 0	STRGHT											06
NONE		Mon		0 0		UN	(DIVMD)	UNKNOWN	N	DRY	SS-O		PRVTE	W E									000		
		1P		62.00		04	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	30	M	OTH-Y		045	017		06
							(02)													N-RES					
												02	NONE 0	STRGHT											
													PRVTE	W E									000		
													PSNGR CAR		01	DRVR	NONE	00	U	UNK		000			
																				UNK					
00336	N N N N N	09/22/2002	HOOD RIVER	2 01		STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT											01
NO RPT		Sun		0 0		UN	(DIVMD)	UNKNOWN	N	DRY	REAR		PRVTE	E W									000		01
		8A		62.00		04	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	15	M	OR-Y		026			01
							(02)													OR<25					
												02	NONE 0	STOP											
													PRVTE	E W									011		
													TRUCK		01	DRVR	NONE	28	M	OR-Y		000			
																				OR<25					
00301	Y N N N N	08/26/2002	HOOD RIVER	2 02		STRGHT		N	Y	CLR	FIX OBJ	01	NONE 1	STRGHT										079	01
COUNTY		Mon		0 0		UN	(DIVMD)	UNKNOWN	N	DRY	FIX		PRVTE	E W									000	079	01
		10A		62.00		06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	78	M	OR-Y		047	017		01
							(02)													OR>25					

002 COLUMBIA RIVER

I-84 (Hwy #2, Route I-84) from mile point 61.10 to mile point 65.00 in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E A U C O / D R S W / 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	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00117 NONE	N N N N N	04/17/2002 Wed 6A	HOOD RIVER	1 01 0 0 62.80		STRGHT UN 03	(DIVMD) 0 (02)	N UNKNOWN	N N N	CLR DRY DAY	S-STRGHT REAR PDO	01	NONE 1 PRVTE SEMI TOW	STRGHT W E	01	DRVR	NONE	60	M	OR-Y OR<25		042	000		01 01 01
												02	NONE 1 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	45	M	OR-Y OR<25		000	006		
00131 NO RPT	N N N N N	04/17/2002 Wed 6A	HOOD RIVER	1 01 0 0 63.00		STRGHT UN 03	(DIVMD) 0 (02)	N UNKNOWN	N N N	RAIN WET DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	29	M	OTH-Y N-RES		026	000		01 01 01
												02	NONE 0 PRVTE PSNGR CAR	STOP W E	01	DRVR	NONE	54	M	OR-Y OR<25		000	011		
00309 STATE	N N N N N	09/06/2002 Fri 12P	HOOD RIVER	1 02 0 0 63.00		STRGHT UN 03	(NONE) 0 (02)	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	INJC	61	F	OR-Y OR<25		026	000	013	01 01 01
												02	NONE 0 PRVTE PSNGR CAR	STOP W E	01	DRVR	INJC	67	F	OTH-Y N-RES		000	011	013	
												03	NONE 0 PRVTE PSNGR CAR	STOP W E	01	DRVR	NONE	47	M	OTH-Y N-RES		000	011		
00315 STATE	N N N N N	09/16/2002 Mon 2P	HOOD RIVER	1 02 0 0 63.00		STRGHT UN 03	(NONE) 0 (03)	N UNKNOWN	N N N	CLD DRY DAY	S-STRGHT SS-O PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	21	M	OR-Y OR<25		045	000		06 06
												02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	34	F	OTH-Y N-RES		000	000		
00200 STATE	N N N N N	07/23/2006 Sun 5P	HOOD RIVER HOOD RIVER HOOD RIVER UA	2 11 0 0 63.00	00404 00408	STRGHT W 05	(RSDMD) (04)	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR PDO	01	NONE 1 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	61	M	OR-Y OR>25		026	000 000		10 00 10
												02	NONE 0 PRVTE PSNGR CAR	STOP E W	01	DRVR	NONE	30	F	OR-Y OR<25		000	012 000		00 00

002 COLUMBIA RIVER

I-84 (Hwy #2, Route I-84) from mile point 61.10 to mile point 65.00 in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E D C R A U G S U H C S O L W R K (SPEC. / EAUCO / ELGHR / DCSLK)	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
00315	N N N N N	11/27/2006	HOOD RIVER	1 11		CURVE		N	Y	CLD	FIX OBJ	01	NONE 0	STRGHT										062	01
STATE		Mon	HOOD RIVER	0 0	00404	W	(RSDMD)	UNKNOWN	N	ICE	FIX		PRVTE	W E									000	062	00
		5A	HOOD RIVER UA	63.20	00408	06			N	DARK	INJ		PSNGR CAR		01	DRVR	INJB	47	M	OTH-Y		047,081	000		01
							(04)													N-RES					
															02	PSNG	INJB	52	F			000	000		00
00356	Y N N	12/22/2006	HOOD RIVER	1 11		BRIDGE		N	Y	CLR	FIX OBJ	01	NONE 1	STRGHT										124,046,020	01
STATE		Fri	HOOD RIVER	0 0	00404	W	(RSDMD)	ONE-WAY	N	ICE	FIX		PRVTE	W E									000	124,046,020	00
		5A	HOOD RIVER UA	63.37	00408	04			N	DLIT	PDO		SEMI TOW		01	DRVR	NONE	36	M	OTH-Y		047,083	017		01
							(04)													N-RES					
00142	N N N	05/30/2006	HOOD RIVER	1 11		STRGHT		N	Y	CLR	PRKD MV	01	NONE 0	STRGHT											01
		Tue	HOOD RIVER	0 0	00404	E	(RSDMD)	UNKNOWN	N	DRY	SS-O		PRVTE	W E									000		00
		1P	HOOD RIVER UA	63.73	00408	02			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	21	F	OR-Y		026	000		01
							(04)													OR<25					
												02	NONE 0	PRKD-P											
													PRVTE	W E									008		00
													PSNGR CAR												
00235	N N N N N	09/20/2006	HOOD RIVER	2 11		STRGHT		N	Y	CLR	FIX OBJ	01	NONE 0	STRGHT										047	16
STATE		Wed	HOOD RIVER	0 0	00404	W	(RSDMD)	UNKNOWN	N	DRY	FIX		PRVTE	E W									000	047	00
		7A	HOOD RIVER UA	63.82	00406	07			N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	25	M	OR-Y		000	025		16
							(04)													OR>25					
00211	N N N	09/23/2005	HOOD RIVER	1 11		STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT											07
NONE		Fri	HOOD RIVER	0 0		UN	(NONE)	STOP SIGN	N	DRY	REAR		PRVTE	W E									000		00
		1P	HOOD RIVER UA	64.00		03			N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	00	M	OTH-Y		026	000		07
							(02)													N-RES					
												02	NONE 0	STOP											
													PRVTE	W E									012		00
													PSNGR CAR		01	DRVR	INJC	58	F	OR-Y		000	000		00
																				OR<25					
00327	N N N N N	09/06/2002	HOOD RIVER	1 01		STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT											01
NONE		Fri		0 0		UN	(NONE)	UNKNOWN	N	DRY	REAR		PRVTE	E W									000		01
		12P		64.00		04	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	60	M	OR-Y		026			01
							(02)													OR<25					
												02	NONE 0	STOP											
													PRVTE	E W									011		
													PSNGR CAR		01	DRVR	NONE	64	F	OR-Y		000			
																				OR<25					
00128	N N N N N	05/30/2006	HOOD RIVER	1 11		STRGHT		N	Y	CLR	FIX OBJ	01	NONE 0	STRGHT										043	01
STATE		Tue	HOOD RIVER	0 0	00404	W	(RSDMD)	UNKNOWN	N	DRY	FIX		PRVTE	W E									000	043	00
		12P	HOOD RIVER UA	64.00	00406	01			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	61	M	OR-Y		047,081	000		01
							(04)													OR<25					
00228	N N N	08/13/2003	HOOD RIVER	1 01		STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT											01
NONE		Wed	HOOD RIVER	0 0	00404	W	(RSDMD)	UNKNOWN	N	DRY	REAR		PRVTE	W E									000		00
		3P		64.10	00407	03			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	75	F	OR-Y		026	000		01
							(04)													OR<25					

002 COLUMBIA RIVER

I-84 (Hwy #2, Route I-84) from mile point 61.10 to mile point 65.00 in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E / D A L / R U G / S C H / W O 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	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
												02	NONE 0 PRVTE PSNGR CAR	STOP W E	01	DRVR	NONE	24	F	OR-Y OR<25		000	011 000		00 00
00232 NONE	N N N	09/30/2005 Fri 9P	HOOD RIVER HOOD RIVER HOOD RIVER UA	1 11 0 0 64.11		STRGHT UN 03	(NONE) (03)	N UNKNOWN	N N N	RAIN WET DLIT	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	52	M	OR-Y OR<25		026	000 000		01,07,27 00 01,07,27
												02	NONE 0 PRVTE PSNGR CAR	STOP W E	01	DRVR	NONE	23	F	OTH-Y N-RES		000	011 000		00 00
00019 NONE	N N N	01/08/2003 Wed 9A	HOOD RIVER	1 01 0 0 64.80		STRGHT UN 01	(RSDMD) (04)	N UNKNOWN	Y N N	CLR ICE DAY	FIX OBJ FIX PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	40	M	OR-Y OR>25		047,081	000 017	043,013 043,013	01 00 01
												02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	53	M	OTH-Y N-RES		000	000 000		00 00
00276 NONE	N N N	10/05/2004 Tue 7A	HOOD RIVER	1 01 0 0 64.80		STRGHT UN 02	(DIVMD) (04)	N UNKNOWN	Y N N	CLR DRY DAY	PRKD MV SS-O PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	51	F	OR-Y OR>25		026	000 000		01 00 01
												02	NONE 0 PRVTE PSNGR CAR	PRKD-P W E									008		00
00035 STATE	N N N	02/05/2005 Sat 6P	HOOD RIVER	1 01 0 0 64.80		STRGHT UN 03	(RSDMD) (04)	N UNKNOWN	N N N	RAIN WET DARK	O-STRGHT HEAD FAT	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	KILL	68	F	OTH-Y N-RES		046	000 000	044 044	05 00 05
												02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	INJC	26	M	OR-Y OR>25		000	000 000		00 00
00441 STATE	Y N N N N	12/26/2002 Thu 4P	HOOD RIVER	1 02 0 0 64.88		STRGHT UN 01	(DIVMD) 0 (02)	N UNKNOWN	Y N N	RAIN WET DUSK	FIX OBJ FIX PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	20	F	OR-Y OR<25		047	000 017	043 043	01 01 01
00033 NONE	N N N	01/25/2003 Sat 10A	HOOD RIVER	1 01 0 0 64.90		STRGHT UN 01	(RSDMD) (04)	N UNKNOWN	Y N N	CLR DRY DAY	FIX OBJ FIX PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	33	F	OR-Y OR<25		047,081	000 017	079,088 079,088	01 00 01

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

002 COLUMBIA RIVER

I-84 (Hwy #2, Route I-84) from mile point 61.10 to mile point 65.00 in/near Hood River
1-1-2002 through 12-31-2006

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
00333 NONE	N N N	12/09/2004 Thu 5P	HOOD RIVER	1 01 0 0 65.00		STRGHT UN 03	(NONE) (04)	N UNKNOWN	N N N	RAIN WET DLIT	S-STRGHT SS-O PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	00	U	UNK UNK		045	000 000	06 00 06
												02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	21	F	OR-Y OR>25		000	000 000	00 00
00157 NONE	N N N	06/23/2003 Mon 11A	HOOD RIVER HOOD RIVER	1 09 3 0 64.02	CASCADE AVE 2ND ST	INTER CN 02	CROSS 99	N UNKNOWN	N N N	CLR DRY DAY	O-1TURN TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	36	M	OR-Y OR<25		000	000 000	02 00 00
												02	NONE 1 PRVTE PSNGR CAR	TURN-L W N	01	DRVR	NONE	65	M	OTH-Y N-RES		004	000 000	00 02
00069 NO RPT	N N N N N	02/08/2002 Fri 12P	HOOD RIVER HOOD RIVER	1 02 3 0 64.02	CASCADE AVE 2ND ST	INTER CN 03	CROSS 0	N UNKNOWN	N N N	RAIN WET DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	17	F	OR-Y OR<25		000	000	02
												02	NONE 0 PRVTE PSNGR CAR	TURN-L W N	01	DRVR	NONE	49	M	OR-Y OR<25		028	000	02
00326 NONE	N N N	12/16/2005 Fri 4P	HOOD RIVER HOOD RIVER HOOD RIVER UA	1 16 3 0 64.03	08002 00402	STRGHT S 03	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DUSK	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	72	F	OR-Y OR<25		026	000 000	01 00 01
												02	NONE 0 PRVTE PSNGR CAR	STOP N S	01	DRVR	NONE	00	M	OTH-Y N-RES		000	011 000	00 00
00136 NO RPT	N N N N N	04/24/2002 Wed 12P	HOOD RIVER HOOD RIVER	1 02 3 0 64.07	OAK ST 2ND ST	INTER CN 01	CROSS 0	N UNKNOWN	N N N	CLR DRY DAY	O-1TURN TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	77	M	OR-Y OR<25		000	000	02
												02	NONE 0 PRVTE PSNGR CAR	TURN-L S W	01	DRVR	NONE	24	M	OR-Y OR<25		004	000	02
00159	N N N	06/15/2006 Thu 5P	HOOD RIVER HOOD RIVER HOOD RIVER UA	1 19 6 0 63.02	3 COLUMBIA RIVER HY EB EX 2ND ST	INTER CN 03	3-LEG 0	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	62	M	OTH-Y N-RES		000	000 000	02 00 00

002 COLUMBIA RIVER

I-84 (Hwy #2, Route I-84) from mile point 61.10 to mile point 65.00 in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E / A L / D R U C G S / S 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
												02	NONE 0	TURN-L										
													PRVTE	W N									000	00
													PSNGR CAR		01	DRVR	NONE	58	F	OR-Y		028	000	02
																				OR<25				
00188	N N N	07/09/2006	HOOD RIVER	1 19	1	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										10
		Sun	HOOD RIVER	6 0	EB EF 2ND ST	NE		TRF SIGNAL	N	DRY	REAR		PRVTE	NE SW									000	00
		5P	HOOD RIVER UA	63.93	2ND ST	06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	32	F	OR-Y		026	000	10
																				OR<25				
												02	NONE 0	STOP										
													PRVTE	NE SW									012	00
													PSNGR CAR		01	DRVR	NONE	41	F	OR-Y		000	000	00
																				OR>25				
00297	N N N	10/24/2003	HOOD RIVER	1 09	1	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										04
CITY		Fri	HOOD RIVER	6 0	EB EX 2ND ST	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	N S									000	00
		1P		63.93	2ND ST	03	99		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	47	M	OTH-Y		020	000	04
																				N-RES				
												02	NONE 0	TURN-L										
													PRVTE	NW N									000	00
													PSNGR CAR		01	DRVR	NONE	56	M	OTH-Y		000	000	00
																				N-RES				
00274	N N N	10/21/2006	HOOD RIVER	1 19	4	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										10
		Sat	HOOD RIVER	6 0	WB EXTO TOLL RD	SE		TRF SIGNAL	N	DRY	REAR		PRVTE	SE NW									000	00
		11A	HOOD RIVER UA	64.48	EB EXTO TOLL RD	06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	40	M	OTH-Y		026	000	10
																				N-RES				
															02	PSNG	NO<5	02	F			000	000	00
															03	PSNG	NO<5	02	F			000	000	00
												02	NONE 0	STOP										
													PRVTE	SE NW									012	00
													PSNGR CAR		01	DRVR	NONE	51	M	OR-Y		000	000	00
																				OR>25				
00194	N N N N N	06/21/2002	HOOD RIVER	1 02	2	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										01
NONE		Fri	HOOD RIVER	6 0	MUSEUM RD	S		UNKNOWN	N	DRY	REAR		PRVTE	S N									000	01
		5P		64.52	TOLL RD	06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	17	M	OR-Y		026		01
																				OR<25				
												02	NONE 0	STOP										
													PRVTE	S N									011	
													PSNGR CAR		01	DRVR	NONE	18	M	OR-Y		000		
																				OR<25				

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

State Street from 13th Street to Front Street in Hood River
1-1-2002 through 12-31-2006

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														
ANGLE	0	0	2	2	0	0	0	2	0	0	2	2	0	0
PARKING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	0	0	1
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2006 TOTAL	0	0	4	4	0	0	0	4	0	2	2	3	0	1
YEAR: 2005														
ANGLE	0	0	1	1	0	0	0	1	0	0	1	1	0	0
REAR-END	0	1	0	1	0	2	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	0	0	0
2005 TOTAL	0	1	2	3	0	2	0	3	0	2	1	1	0	0
YEAR: 2004														
ANGLE	0	0	2	2	0	0	0	1	1	2	0	2	0	0
FIXED / OTHER OBJECT	0	1	0	1	0	1	0	0	1	1	0	1	0	1
REAR-END	0	0	2	2	0	0	0	2	0	1	1	0	0	0
SIDESWIPE - MEETING	0	1	0	1	0	1	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	0	0	0
2004 TOTAL	0	2	5	7	0	2	0	5	2	6	1	3	0	1
YEAR: 2003														
REAR-END	0	1	0	1	0	1	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	0	1	1	0	0
2003 TOTAL	0	1	1	2	0	1	0	1	1	1	1	1	0	0
YEAR: 2002														
FIXED / OTHER OBJECT	0	0	1	1	0	0	0	1	0	1	0	0	0	1
REAR-END	0	0	1	1	0	0	0	1	0	1	0	0	0	0
2002 TOTAL	0	0	2	2	0	0	0	2	0	2	0	0	0	1
FINAL TOTAL	0	4	14	18	0	5	0	15	3	13	5	8	0	3

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 HOOD RIVER, HOOD RIVER COUNTY

State Street from 13th Street to Front Street in Hood River
1-1-2002 through 12-31-2006

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	CLASS DIST FROM	CITY STREET 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	A G E	S E X	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
90287 NONE	N N N	10/13/2004 Wed 6P	16 20	STATE ST 1ST ST	STRGHT E 05	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	O-STRGHT SS-M INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	52	F	OR-Y OR<25		039	000 000		05 00 05
											02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	INJB	50	M	OR-Y OR<25		000	000 000		00 00
00132	N N N	05/10/2006 Wed 4P	19 100	STATE ST 1ST ST	STRGHT W 07	(NONE) (02)	N UNKNOWN	Y N N	CLR DRY DAY	PRKD MV PARK PDO	01	NONE 0 PRVTE PSNGR CAR	PARKNG E W	01	DRVR	NONE	51	F	OR-Y OR<25		018	008 000		10 00 10
											02	NONE 0 PRVTE PSNGR CAR	PRKD-P E W									008		00
00151 NONE	N N N	07/08/2005 Fri 2P	19 100	STATE ST 2ND ST	ALLEY E 07	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	O-1TURN TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	18	M	OR-Y OR<25		000	000 000		02 00 00
											02	NONE 0 PRVTE PSNGR CAR	TURN-L E S	01	DRVR	NONE	64	F	OR-Y OR<25		004	019 000		00 02
00257 NONE	N N N	09/21/2004 Tue 5P	16 0	STATE ST 3RD ST	INTER CN 01	CROSS 99	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	45	F	OR-Y OR<25		028	000 000		02 00 02
											02	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	53	F	OR-Y OR<25		000	000 000		00 00
00114 CITY	N N N	04/26/2006 Wed 11A	16 0	STATE ST 3RD ST	INTER CN 02	CROSS 99	N STOP SIGN	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	TURN-L S W	01	DRVR	NONE	43	F	OR-Y OR<25		028	015 000		02 00 02
											02	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	81	M	OR-Y OR<25		000	000 000		00 00
00085 NONE	N N N	04/05/2004 Mon 2P	07 100	STATE ST 6TH ST	ALLEY W 08	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	53	F	OR-Y OR<25		000	000 000		02 00 00

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF HOOD RIVER, HOOD RIVER COUNTY

State Street from 13th Street to Front Street in Hood River
1-1-2002 through 12-31-2006

SER# INVEST	SPEED ALC DRUGS 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- 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
											02	NONE 0 PRVTE PSNGR CAR	TURN-L S W	01	DRVR	NONE	28	F	OR-Y OR<25		028	018 000		00 02
00288 COUNTY	N N N	11/17/2005 Thu 10P	16 0	STATE ST 6TH ST	INTER CN 03	CROSS 99	N STOP SIGN	N N N	CLR DRY DLIT	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	51	F	OTH-Y N-RES		028	015 000		02 00 02
											02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	32	M	OR-Y OR>25		000	000 000		00 00
00002 NONE	N N N	01/01/2004 Thu 1P	09 0	STATE ST 6TH ST	INTER CN 04	CROSS 99	N UNKNOWN	N N N	SNOW ICE DAY	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	48	M	OR-Y OR<25		000	000 000		02 00 00
											02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	58	F	OR-Y OR<25		028	000 000		00 02
00018 CITY	N N N	01/01/2004 Thu 10A	07 0	STATE ST 9TH ST	INTER N 05	CROSS 99	N STOP SIGN	Y N N	SNOW ICE DAY	FIX OBJ FIX INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	61	M	OR-Y OR<25		047,081	000 017	079,013,005 079,013	01 00 01
											02	NONE 0 PRVTE PSNGR CAR	PRKD-P S N									008		00
													UNK UN UN	01	PED	INJC	52	M		18	000	022	005	00
00397 NONE	N N N	12/31/2003 Wed 6P	07 0	STATE ST 9TH ST	INTER E 06	CROSS 99	N STOP SIGN	N N N	SNOW ICE DLIT	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	TURN-R S E	01	DRVR	NONE	51	F	OR-Y OR<25		001,047	000 017		08,01 00 08,01
											02	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	38	M	OR-Y OR<25		000	000 000		00 00
00187 NONE	N N N	07/25/2004 Sun 2P	06 100	STATE ST 9TH ST	STRGHT W 08	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	19	M	OR-Y OR<25		026	000 000		01 00 01
											02	NONE 0 PRVTE PSNGR CAR	STOP W E	01	DRVR	NONE	36	F	OR-Y OR<25		000	011 000		00 00

CITY OF HOOD RIVER, HOOD RIVER COUNTY

State Street from 13th Street to Front Street in Hood River
1-1-2002 through 12-31-2006

SER# INVEST	SPED / ALC / DRUGS / 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-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
00043	N N N	02/07/2006	19	STATE ST	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											02
		Tue	0	9TH ST	CN		UNKNOWN	N	DRY	ANGL		PRVTE	S N									000		00
		6P			02	99		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	42	M	OR-Y		028	000		02
																			OR<25					
											02	NONE 0	STRGHT											
												PRVTE	E W									000		00
												PSNGR CAR		01	DRVR	NONE	64	M	OR-Y		000	000		00
																			OR<25					
00285	N N N	10/30/2006	17	STATE ST	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											02
CITY		Mon	0	9TH ST	CN		STOP SIGN	N	DRY	ANGL		PRVTE	W E									000		00
		7P			02	0		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	41	M	OR-Y		000	000		00
																			OR<25					
											02	NONE 0	STRGHT											
												PRVTE	N S									000		00
												PSNGR CAR		01	DRVR	NONE	52	M	OR-Y		028	000		02
																			OR<25					
00148	N N N N N	05/01/2002	09	STATE ST	STRGHT		N	Y	CLR	FIX OBJ	01	NONE 0	BACK										040,088	01
NO RPT		Wed	10	4TH ST	E	(NONE)	UNKNOWN	N	DRY	FIX		PRVTE	N S									000	040,088	01
		2P			05	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	39	F	OR-Y		040	017		01
						(02)													OR<25					
00188	N N N N N	06/13/2002	09	STATE ST	STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT											01
NO RPT		Thu		6TH ST	E	(NONE)	UNKNOWN	N	DRY	REAR		PRVTE	E W									000		01
		3P			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	43	M	OR-Y		026			01
						(02)													OR<25					
											02	NONE 0	STOP											
												PRVTE	E W									011		
												PSNGR CAR		01	DRVR	NONE	31	F	OR-Y		000			
																			OR<25					
00108	N N N	05/13/2003	09	STATE ST	STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT											01
NONE		Tue	300	9TH ST	E	(NONE)	UNKNOWN	N	DRY	REAR		PRVTE	E W									000		00
		5P			08			N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	29	F	OR-Y		026	000		01
						(02)													OR<25					
											02	NONE 0	STOP											
												PRVTE	E W									011		00
												PSNGR CAR		01	DRVR	INJC	45	F	OR-Y		000	000		00
																			OR<25					
00180	N N N	08/18/2005	16	STATE ST	STRGHT		N	N	CLR	S-1STOP	01	NONE 0	STRGHT											01,07,27
NONE		Thu	50	FRONT ST	W	(NONE)	STOP SIGN	N	DRY	REAR		PRVTE	W E									000		00
		12P			06			N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	23	F	OR-Y		026	000		01,07,27
						(02)													OR>25					
											02	NONE 0	STOP											
												PRVTE	W E									011		00
												PSNGR CAR		01	DRVR	INJC	57	M	OTH-Y		000	000		00
																			N-RES					
														02	PSNG	INJC	56	F			000	000		00

CITY OF HOOD RIVER, HOOD RIVER COUNTY

State Street from 13th Street to Front Street in Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S E D / P A C / E L S / D R U G / R S C H / S W O R L 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-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
00184 NONE	N N N	07/23/2004 Fri 9P	09 100	STATE ST FRONT ST	STRGHT W 08	 (NONE) (02)	N UNKNOWN	N N N	CLR DRY DLIT	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	 01	 DRVR	 NONE	 22	 M	 OR-Y OR<25		 026	 000 000		01 00 01
											02	NONE 0 PRVTE PSNGR CAR	STOP W E	 01	 DRVR	 NONE	 20	 M	 OR-Y OR<25		 000	 011 000		 00 00

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Oak Street/Historic Columbia River Hwy (Hwy 100, Route 100) from 13th Street to Mt Hood Hwy (Hwy 26, Route/US 35) in Hood River
1-1-2002 through 12-31-2006

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														
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
2006 TOTAL	0	0	2	2	0	0	0	1	1	2	0	2	0	0
YEAR: 2002														
BACKING	0	0	1	1	0	0	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	0	1	1	0	0
2002 TOTAL	0	0	2	2	0	0	0	2	0	1	1	1	0	0
FINAL TOTAL	0	0	4	4	0	0	0	3	1	3	1	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

100 HISTORIC COLUMBIA RIVER

Oak Street/Historic Columbia River Hwy (Hwy 100, Route 100) from 13th Street to Mt Hood Hwy (Hwy 26, Route/US 35) in Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E D C (SPEC/E L/A U G C/D S R C U H S S R L 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
00307	N N N	11/21/2006 Tue 3P	HOOD RIVER HOOD RIVER HOOD RIVER UA	1 16 0 0 50.12	 OAK ST 13TH ST	INTER E 06	3-LEG 0	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	00	M	UNK UNK		026	 000 000		10 00 10
												02	NONE 0 PRVTE PSNGR CAR	STOP E W	01	DRVR	NONE	17	F	OR-Y OR<25		000	012 000		00 00
00393 COUNTY	N N N N N	11/05/2002 Tue 4P	HOOD RIVER HOOD RIVER	1 06 0 0 50.12	 OAK ST 13TH ST	INTER CN 03	3-LEG 0	N UNKNOWN	N N N	CLR DRY DUSK	O-1TURN TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	27	M	OR-Y OR>25		000	 000		02
												02	NONE 0 PRVTE PSNGR CAR	TURN-L E S	01	DRVR	NONE	42	F	OTH-Y N-RES		004	 000		 02
00321 NO RPT	N N N	11/28/2006 Tue 10A	HOOD RIVER HOOD RIVER HOOD RIVER UA	1 16 0 0 50.12	 OAK ST 13TH ST	INTER CN 03	3-LEG 0	N UNKNOWN	N N N	SNOW ICE DAY	ANGL-STP TURN PDO	01	NONE 0 PRVTE PSNGR CAR	TURN-R N W	01	DRVR	NONE	66	F	OR-Y OR<25		007,047	 000 000	 124	01,08 00 01,08
												02	NONE 0 PUBLC SCHL BUS	STOP W E	01	DRVR	NONE	35	M	OR-Y OR<25		000	011 000		00 00
00303 NONE	N N N N N	08/28/2002 Wed 10A	HOOD RIVER HOOD RIVER	1 06 0 0 50.21	 01801 08013	ALLEY E 03	 (NONE) 0 (02)	N UNKNOWN	N N Y	CLR DRY DAY	ANGL-OTH BACK PDO	01	NONE 0 PRVTE PSNGR CAR	BACK S N	01	DRVR	NONE	80	M	OR-Y OR<25		011	 018		10 10
												02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	70	F	OR-Y OR<25		000	 000		

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Historic Columbia River Hwy (Hwy 100, Route 30) from I-84 exit 62 WB off-ramp at Hwy 100 (Hwy 2, Route I-84) to Rand Road
1-1-2002 through 12-31-2006 in/near Hood River

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: 2005														
ANGLE	0	0	1	1	0	0	0	0	1	1	0	1	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	0	1	0	0	0
2005 TOTAL	0	0	2	2	0	0	0	1	1	1	1	1	0	0
YEAR: 2004														
ANGLE	0	1	0	1	0	1	0	1	0	1	0	1	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	0	0	0
2004 TOTAL	0	1	1	2	0	1	0	2	0	2	0	1	0	0
YEAR: 2003														
ANGLE	0	0	2	2	0	0	0	2	0	2	0	2	0	0
REAR-END	0	1	0	1	0	1	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	1	0	0	0	0
2003 TOTAL	0	1	3	4	0	1	0	3	1	4	0	2	0	0
YEAR: 2002														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	0	0	0
2002 TOTAL	0	0	1	1	0	0	0	1	0	1	0	0	0	0
FINAL TOTAL	0	2	7	9	0	2	0	7	2	8	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.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

100 HISTORIC COLUMBIA RIVER

Historic Columbia River Hwy (Hwy 100, Route 30) from I-84 exit 62 WB off-ramp at Hwy 100 (Hwy 2, Route I-84) to Rand Road
1-1-2002 through 12-31-2006 in/near Hood River

SER# INVEST	S P E A U C O R S W D 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	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00011 NONE	N N N	01/02/2003 Thu 1P	HOOD RIVER HOOD RIVER	1 06 0 0 49.34	 00402 02102	ALLEY W 03	 (NONE) (02)	N UNKNOWN	N N N	CLD WET DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	21	F	OR-Y OR<25		000	000 000		02 00 00
												02	NONE 0 PRVTE PSNGR CAR	TURN-L S W	01	DRVR	NONE	32	F	OR-Y OR<25		028	018 000		00 02
00178 NO RPT	N N N	08/18/2005 Thu 1A	HOOD RIVER HOOD RIVER HOOD RIVER UA	1 16 0 0 49.35	 00402 02102	ALLEY W 04	 (NONE) (02)	N UNKNOWN	N N N	CLR DRY DARK	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	82	M	OR-Y OR<25		000	000 000		02 00 00
												02	NONE 0 PRVTE PSNGR CAR	TURN-L N E	01	DRVR	NONE	40	M	OR-Y OR<25		028	018 000		00 02
00190 NONE	N N N N N	06/16/2002 Sun 4P	HOOD RIVER HOOD RIVER	1 06 0 0 49.43	 00402 02102	ALLEY W 03	 (NONE) 0 (02)	N UNKNOWN	N N Y	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	80	M	OR-Y OR<25		000	000		02
												02	NONE 0 PRVTE PSNGR CAR	TURN-L S W	01	DRVR	NONE	60	F	OR-Y OR<25		028	018		02
00211 NONE	N N N	08/06/2003 Wed 1P	HOOD RIVER HOOD RIVER	1 06 0 0 49.43	 00402 02102	STRGHT W 03	 (NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	43	F	OR-Y OR<25		026	000 000		01 00 01
												02	NONE 0 PRVTE PSNGR CAR	STOP W E	01	DRVR	INJC	27	F	OR-Y OR<25		000	011 000		00 00
00338 NONE	N N N	12/19/2004 Sun 12P	HOOD RIVER HOOD RIVER HOOD RIVER UA	1 16 0 0 49.43	 00402 02102	ALLEY W 04	 (NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	O-1TURN TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	37	F	OR-Y OR<25		000	000 000		02 00 00
												02	NONE 0 PRVTE PSNGR CAR	TURN-L W N	01	DRVR	NONE	57	M	OR-Y OR>25		004	019 000		00 02
00383 NONE	N N N	12/23/2003 Tue 12P	HOOD RIVER HOOD RIVER	1 06 0 0 49.44	 CASCADE AVE RAND RD	INTER CN 02	CROSS 99	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	28	M	OR-Y OR<25		028	000 000		02 00 02

100 HISTORIC COLUMBIA RIVER

Historic Columbia River Hwy (Hwy 100, Route 30) from I-84 exit 62 WB off-ramp at Hwy 100 (Hwy 2, Route I-84) to Rand Road
1-1-2002 through 12-31-2006 in/near Hood River

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	E W									000	00
													PSNGR CAR		01	DRVR	NONE	47	F	OR-Y		000	000	00
																				OR<25				
00079	N N N	03/28/2005	HOOD RIVER	1 16		INTER	CROSS	N	N	RAIN	ANGL-OTH	01	NONE 0	STRGHT										02
NONE		Mon	HOOD RIVER	0 0	CASCADE AVE	CN		UNKNOWN	N	WET	ANGL		PRVTE	S N									000	00
		8A	HOOD RIVER UA	49.44	RAND RD	02	99		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	73	F	OR-Y		028	000	02
																				OR<25				
												02	NONE 0	STRGHT										
													PRVTE	E W									000	00
													PSNGR CAR		01	DRVR	NONE	47	M	OR-Y		000	000	00
																				OR<25				
00253	N N N	09/09/2003	HOOD RIVER	1 06		INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										03
NONE		Tue	HOOD RIVER	0 0	CASCADE AVE	CN		STOP SIGN	N	DRY	ANGL		PRVTE	W E									000	00
		12P		49.44	RAND RD	03	99		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	67	M	OR-Y		000	000	00
																				OR<25				
												02	NONE 0	STRGHT										
													PRVTE	N S									000	00
													PSNGR CAR		01	DRVR	NONE	64	M	OR-Y		021	000	03
																				OR>25				
00262	N N N	09/28/2004	HOOD RIVER	1 06		INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										02
NONE		Tue	HOOD RIVER	0 0	CASCADE AVE	CN		STOP SIGN	N	DRY	ANGL		PRVTE	W E									000	00
		4P		49.44	RAND RD	04	99		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	31	F	OR-Y		000	000	00
																				OR<25				
												02	NONE 0	STRGHT										
													PRVTE	S N									015	00
													PSNGR CAR		01	DRVR	INJC	67	F	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

Mount Hood Hwy (Hwy 25, OR & Rt 35) from south end of Hood River Bridge to Historic Columbia River Hwy (Hwy 100)
1-1-2002 through 12-31-2006 in/near Hood River

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: 2002														
REAR-END	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2002 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
CONTINUOUS SYSTEM CRASH LISTING

002 COLUMBIA RIVER

Mount Hood Hwy (Hwy 25, OR & Rt 35) from south end of Hood River Bridge to Historic Columbia River Hwy (Hwy 100)
1-1-2002 through 12-31-2006 in/near Hood River

SER# INVEST	S P E E D A L C U G S C H L O R K S W	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
00194 NONE	N N N N N	06/21/2002 Fri 5P	HOOD RIVER HOOD RIVER	1 02 6 0 64.52	2 MUSEUM RD TOLL RD	INTER S 06	CROSS 0	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	17	M	OR-Y OR<25		026	000	01 01 01
												02	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	NONE	18	M	OR-Y OR<25		000	011	

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

13th Street from Wasco Avenue to Cascade Avenue in/near Hood River
1-1-2002 through 12-31-2006

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: 2005														
ANGLE	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2005 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
YEAR: 2004														
ANGLE	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2004 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.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF HOOD RIVER, HOOD RIVER COUNTY

13th Street from Wasco Avenue to Cascade Avenue in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	SPEED	ALC	DRUGS	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- 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
00206	N	N	N			08/09/2004	08	COLUMBIA ST	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											02
NONE						Mon	0	13TH ST	CN		STOP SIGN	N	DRY	ANGL		PRVTE	W E									015		00
						12P			03	99		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	52	F	OR-Y		028	000		02
																							OR<25					
															02	NONE 0	STRGHT											
																PRVTE	N S									000		00
																PSNGR CAR		01	DRVR	NONE	29	F	OR-Y		000	000		00
																							OR<25					
00092	N	N	N			04/16/2005	19	COLUMBIA ST	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											03
NONE						Sat	0	13TH ST	CN		STOP SIGN	N	DRY	ANGL		PRVTE	W E									000		00
						9A			03	99		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	66	M	OR-Y		021	000		03
																							OR<25					
															02	NONE 0	STRGHT											
																PRVTE	N S									000		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

13th Street from Historic Columbia River Hwy (Hwy 100, Route 30) to State Street in/near Hood River
1-1-2002 through 12-31-2006

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: 2002														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2002 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.

281 HOOD RIVER

13th Street from Historic Columbia River Hwy (Hwy 100, Route 30) to State Street in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E D (SPEC/PAV/ALC/...) 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	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN EVENT	CAUSE
00330 NO RPT	N N N N N	09/12/2002 Thu 5P	HOOD RIVER HOOD RIVER	1 06 0 0 0.06	 STATE ST 13TH ST	INTER CN 03	3-LEG 0	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	TURN-L E S	01	DRVR	NONE	24	M	OR-Y OR<25		028	000	02 02
												02	NONE 0 PRVTE PSNGR CAR	TURN-L N E	01	DRVR	NONE	50	F	OR-Y OR<25		000	000	

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

2nd Street from I-84 exit 63 WB off ramp (Hwy 2, Route I-84) to State Street in/near Hood River
1-1-2002 through 12-31-2006

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: 2005														
ANGLE	0	0	1	1	0	0	0	1	0	0	1	1	0	0
REAR-END	0	0	1	1	0	0	0	1	0	0	1	0	0	0
2005 TOTAL	0	0	2	2	0	0	0	2	0	0	2	1	0	0
YEAR: 2004														
REAR-END	0	0	3	3	0	0	0	3	0	3	0	0	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	0	0	0
2004 TOTAL	0	0	4	4	0	0	0	4	0	4	0	0	0	0
YEAR: 2003														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2003 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
YEAR: 2002														
REAR-END	0	0	1	1	0	0	0	1	0	0	1	0	0	0
TURNING MOVEMENTS	0	0	3	3	0	0	0	2	1	3	0	3	0	0
2002 TOTAL	0	0	4	4	0	0	0	3	1	3	1	3	0	0
FINAL TOTAL	0	0	11	11	0	0	0	10	1	8	3	5	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 7/30/2007

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

002 COLUMBIA RIVER

2nd Street from I-84 exit 63 WB off ramp (Hwy 2, Route I-84) to State Street in/near Hood River
1-1-2002 through 12-31-2006

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
00157 NONE	N N N	06/23/2003 Mon 11A	HOOD RIVER HOOD RIVER	1 09 3 0 64.02	 CASCADE AVE 2ND ST	INTER CN 02	CROSS 99	N UNKNOWN	N N N	CLR DRY DAY	O-1TURN TURN PDO													02
												01	NONE 0 PRVTE PSNGR CAR	STRGHT E W									000	00
															01	DRVR	NONE	36	M	OR-Y OR<25		000	000	00
												02	NONE 1 PRVTE PSNGR CAR	TURN-L W N									000	00
															01	DRVR	NONE	65	M	OTH-Y N-RES		004	000	02
00069 NO RPT	N N N N N	02/08/2002 Fri 12P	HOOD RIVER HOOD RIVER	1 02 3 0 64.02	 CASCADE AVE 2ND ST	INTER CN 03	CROSS 0	N UNKNOWN	N N N	RAIN WET DAY	ANGL-OTH TURN PDO													02
												01	NONE 0 PRVTE PSNGR CAR	STRGHT N S									000	
															01	DRVR	NONE	17	F	OR-Y OR<25		000		
												02	NONE 0 PRVTE PSNGR CAR	TURN-L W N									000	
															01	DRVR	NONE	49	M	OR-Y OR<25		028		02
00326 NONE	N N N	12/16/2005 Fri 4P	HOOD RIVER HOOD RIVER HOOD RIVER UA	1 16 3 0 64.03	 08002 00402	STRGHT S 03	 (NONE) (02)	N UNKNOWN	N N N	CLR DRY DUSK	S-1STOP REAR PDO													01
												01	NONE 0 PRVTE PSNGR CAR	STRGHT N S									000	00
															01	DRVR	NONE	72	F	OR-Y OR<25		026	000	01
												02	NONE 0 PRVTE PSNGR CAR	STOP N S									011	00
															01	DRVR	NONE	00	M	OTH-Y N-RES		000	000	00
00136 NO RPT	N N N N N	04/24/2002 Wed 12P	HOOD RIVER HOOD RIVER	1 02 3 0 64.07	 OAK ST 2ND ST	INTER CN 01	CROSS 0	N UNKNOWN	N N N	CLR DRY DAY	O-1TURN TURN PDO													02
												01	NONE 0 PRVTE PSNGR CAR	STRGHT N S									000	
															01	DRVR	NONE	77	M	OR-Y OR<25		000		
												02	NONE 0 PRVTE PSNGR CAR	TURN-L S W									000	
															01	DRVR	NONE	24	M	OR-Y OR<25		004		02

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

100 HISTORIC COLUMBIA RIVER

2nd Street from I-84 exit 63 WB off ramp (Hwy 2, Route I-84) to State Street in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E D / D E L C / R A U G S / S U C H L / W C 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
00236 NONE	N N N N N	07/20/2002 Sat 1P	HOOD RIVER HOOD RIVER	1 06 3 0 50.07	 OAK ST 2ND ST	INTER CN 02	CROSS 0	N STOP SIGN	N N N	CLR DRY DAY	O-1TURN TURN PDO														02
												01	NONE 0 PRVTE PSNGR CAR	TURN-L W N	01	DRVR	NONE	37	M	OR-Y OR<25		028	015		02
												02	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	58	M	OR-Y OR<25		000	015		

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF HOOD RIVER, HOOD RIVER COUNTY

2nd Street from I-84 exit 63 WB off ramp (Hwy 2, Route I-84) to State Street in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E / A L / D R U C G S / S W C O H R L K (SPEC / DRUG / ALCH / SPD / WRK / HR etc.)	DATE DAY TIME	CLASS DIST FROM	CITY STREET 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
00157 NONE	N N N	06/15/2004 Tue 7A	09 100	2ND ST OAK ST	ALLEY N 08	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	44	F	OR-Y OR<25		000	000 000		02 00 00
											02	NONE 0 PRVTE PSNGR CAR	TURN-L W N	01	DRVR	NONE	30	M	OR-Y OR<25		028	018 000		00 02
00165 NONE	N N N	06/23/2004 Wed 5P	09 100	2ND ST OAK ST	STRGHT N 08	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	48	M	OR-Y OR<25		026	000 000		01 00 01
											02	NONE 0 PRVTE PSNGR CAR	STOP N S	01	DRVR	NONE	49	M	OR-Y OR<25		000	011 000		00 00
00180 NONE	N N N	07/18/2004 Sun 2P	09 100	2ND ST STATE ST	STRGHT N 08	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	30	M	OR-Y OR<25		026	000 000		01 00 01
											02	NONE 0 PRVTE PSNGR CAR	STOP N S	01	DRVR	NONE	28	M	OTH-Y N-RES		000	011 000		00 00
00191 NONE	N N N	07/28/2004 Wed 11A	09 100	2ND ST STATE ST	STRGHT N 08	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	55	M	OR-Y OR<25		026	000 000		01 00 01
											02	NONE 0 PRVTE PSNGR CAR	STOP N S									011		00
00053 NONE	N N N N N	01/29/2002 Tue 4P	09 10	2ND ST OAK ST	STRGHT N 06	(NONE) 0 (02)	N UNKNOWN	N N N	CLR DRY DUSK	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	33	M	OR-Y OR<25		026	000		01 01 01
											02	NONE 0 PRVTE PSNGR CAR	STOP N S	01	DRVR	NONE	00	M	UNK UNK		000	011		
00225 NO RPT	N N N	09/23/2005 Fri 11P	16 0	OAK ST 2ND ST	INTER CN 03	3-LEG 0	N STOP SIGN	N N N	CLR DRY DARK	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	79	M	OR-Y OR<25		028	000 000		02 00 02

CDS380 7/30/2007

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF HOOD RIVER, HOOD RIVER COUNTY

2nd Street from I-84 exit 63 WB off ramp (Hwy 2, Route I-84) to State Street in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E D A L C	D R U G S	S W C O H R L 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- 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
													02	NONE 0	STRGHT											
														PRVTE	N S									000		00
														PSNGR CAR		01	DRVR	NONE	17	M	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

Rand Road from Historic Columbia River Hwy (Hwy 100, Route 30) to Sherman Avenue in/near Hood River
1-1-2002 through 12-31-2006

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	1	0	1	0	0	0	0
2006 TOTAL	0	0	1	1	0	0	0	1	0	1	0	0	0	0
YEAR: 2005														
ANGLE	0	0	1	1	0	0	0	0	1	1	0	1	0	0
2005 TOTAL	0	0	1	1	0	0	0	0	1	1	0	1	0	0
YEAR: 2004														
ANGLE	0	1	0	1	0	1	0	1	0	1	0	1	0	0
2004 TOTAL	0	1	0	1	0	1	0	1	0	1	0	1	0	0
YEAR: 2003														
ANGLE	0	0	2	2	0	0	0	2	0	2	0	2	0	0
2003 TOTAL	0	0	2	2	0	0	0	2	0	2	0	2	0	0
FINAL TOTAL	0	1	4	5	0	1	0	4	1	5	0	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.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

100 HISTORIC COLUMBIA RIVER

Rand Road from Historic Columbia River Hwy (Hwy 100, Route 30) to Sherman Avenue in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E A U C O E L G H R D C S L K (SPCL/D/R/S/W)	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
00383 NONE	N N N	12/23/2003 Tue 12P	HOOD RIVER HOOD RIVER	1 06 0 0 49.44	CASCADE AVE RAND RD	INTER CN 02	CROSS 99	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	28	M	OR-Y OR<25		028	000 000		02 00 02
												02	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	47	F	OR-Y OR<25		000	000 000		00 00
00079 NONE	N N N	03/28/2005 Mon 8A	HOOD RIVER HOOD RIVER HOOD RIVER UA	1 16 0 0 49.44	CASCADE AVE RAND RD	INTER CN 02	CROSS 99	N UNKNOWN	N N N	RAIN WET DAY	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	73	F	OR-Y OR<25		028	000 000		02 00 02
												02	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	47	M	OR-Y OR<25		000	000 000		00 00
00253 NONE	N N N	09/09/2003 Tue 12P	HOOD RIVER HOOD RIVER	1 06 0 0 49.44	CASCADE AVE RAND RD	INTER CN 03	CROSS 99	N STOP SIGN	N N N	CLR DRY DAY	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	67	M	OR-Y OR<25		000	000 000		03 00 00
												02	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	64	M	OR-Y OR>25		021	000 000		00 03
00262 NONE	N N N	09/28/2004 Tue 4P	HOOD RIVER HOOD RIVER	1 06 0 0 49.44	CASCADE AVE RAND RD	INTER CN 04	CROSS 99	N STOP SIGN	N N N	CLR DRY DAY	ANGL-OTH ANGL INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	31	F	OR-Y OR<25		000	000 000		02 00 00
												02	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	INJC	67	F	OR-Y OR<25		028	015 000		00 02

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF HOOD RIVER, HOOD RIVER COUNTY

Rand Road from Historic Columbia River Hwy (Hwy 100, Route 30) to Sherman Avenue in/near Hood River
1-1-2002 through 12-31-2006

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	CLASS DIST FROM	CITY STREET 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	A G E	S E X	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00110	N N N	04/19/2006	16	RAND RD	ALLEY		N	N	CLR	ANGL-OTH	01	NONE 0	TURN-L											02
		Wed	500	CASCADE AVE	S	(NONE)	UNKNOWN	N	DRY	TURN		PRVTE	E S									018		00
		2P			07			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	94	F	OR-Y		028	000		02
						(02)													OR<25					
											02	NONE 0	STRGHT											
												PRVTE	N S									000		00
												PSNGR CAR		01	DRVR	NONE	43	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

Frankton Road from Country Club Road to May Street in/near Hood River
1-1-2002 through 12-31-2006

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														
FIXED / OTHER OBJECT	0	1	0	1	0	1	0	1	0	1	0	0	0	1
2006 TOTAL	0	1	0	1	0	1	0	1	0	1	0	0	0	1
FINAL TOTAL	0	1	0	1	0	1	0	1	0	1	0	0	0	1

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
COUNTY ROAD CRASH LISTING

HOOD RIVER COUNTY

Frankton Road from Country Club Road to May Street in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	E SPEC DC	AL	U DRUG GS	CHSL	WRK	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
00284 COUNTY	N	N	N	N	N	10/29/2006 Sun 2P	0.10	00104	CURVE UN 01	 (NONE) (02)	N NONE	Y N N	CLR DRY DAY	FIX OBJ FIX INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	 01	 DRVR	 INJC	 18	 M	 OR-Y OR<25		 018	 000 000	079 079	26 26 26

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

I-84 (Hwy #2, Route I-84) exit #64 WB off ramp in/near Hood River
1-1-2002 through 12-31-2006

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														
REAR-END	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.

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

002 COLUMBIA RIVER

I-84 (Hwy #2, Route I-84) exit #64 WB off ramp in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E D / D R A L C / S U G S / R C H L / S O R K (P E A U C O / R S W)	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
00274	N N N	10/21/2006	HOOD RIVER	1 19	4	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										10
		Sat	HOOD RIVER	6 0	WB EXTO TOLL RD	SE		TRF SIGNAL	N	DRY	REAR		PRVTE	SE NW									000	00
		11A	HOOD RIVER UA	64.48	EB EXTO TOLL RD	06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	40	M	OTH-Y		026	000	10
																				N-RES				
															02	PSNG	NO<5	02	F			000	000	00
															03	PSNG	NO<5	02	F			000	000	00
												02	NONE 0	STOP										
													PRVTE	SE NW									012	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
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Cascade Avenue from 13th Street to 2nd Street in/near Hood River
1-1-2002 through 12-31-2006

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: 2005														
ANGLE	0	0	1	1	0	0	0	1	0	1	0	1	0	0
REAR-END	0	0	1	1	0	0	0	1	0	1	0	0	0	0
2005 TOTAL	0	0	2	2	0	0	0	2	0	2	0	1	0	0
YEAR: 2004														
ANGLE	0	1	1	2	0	1	0	1	1	2	0	2	0	0
REAR-END	0	0	1	1	0	0	0	0	1	1	0	0	0	0
SIDESWIPE - OVERTAKING	0	0	1	1	0	0	0	1	0	0	1	0	0	1
2004 TOTAL	0	1	3	4	0	1	0	2	2	3	1	2	0	1
YEAR: 2003														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2003 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
YEAR: 2002														
PARKING MOVEMENTS	0	0	1	1	0	0	0	1	0	0	1	0	0	1
SIDESWIPE - OVERTAKING	0	0	1	1	0	0	1	1	0	1	0	0	0	1
TURNING MOVEMENTS	0	0	2	2	0	0	0	1	1	2	0	2	0	0
2002 TOTAL	0	0	4	4	0	0	1	3	1	3	1	2	0	2
FINAL TOTAL	0	1	10	11	0	1	1	8	3	9	2	6	0	3

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 7/27/2007

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

002 COLUMBIA RIVER

Cascade Avenue from 13th Street to 2nd Street in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E A L U G C H S L D R S W O R E (flags)	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
00157 NONE	N N N	06/23/2003 Mon 11A	HOOD RIVER HOOD RIVER	1 09 3 0 64.02	 CASCADE AVE 2ND ST	INTER CN 02	CROSS 99	N UNKNOWN	N N N	CLR DRY DAY	O-1TURN TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	36	M	OR-Y OR<25		000	 000 000		02 00 00
												02	NONE 1 PRVTE PSNGR CAR	TURN-L W N	01	DRVR	NONE	65	M	OTH-Y N-RES		004	000 000		00 02
00069 NO RPT	N N N N N	02/08/2002 Fri 12P	HOOD RIVER HOOD RIVER	1 02 3 0 64.02	 CASCADE AVE 2ND ST	INTER CN 03	CROSS 0	N UNKNOWN	N N N	RAIN WET DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	17	F	OR-Y OR<25		000	000		02
												02	NONE 0 PRVTE PSNGR CAR	TURN-L W N	01	DRVR	NONE	49	M	OR-Y OR<25		028	000		02

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF HOOD RIVER, HOOD RIVER COUNTY

Cascade Avenue from 13th Street to 2nd Street in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E D C D R A L U G C S S W C O H R L 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- 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
00014 NONE	N N N	01/22/2004 Thu 3P	09 100	CASCADE AVE 2ND ST	STRGHT W 08	(NONE) (02)	N UNKNOWN	N N N	RAIN WET DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	37	M	OR-Y OR<25		026	000 000		01 00 01
											02	NONE 0 PRVTE PSNGR CAR	STOP W E	01	DRVR	NONE	16	M	OTH-Y N-RES		000	011 000		00 00
00188 NONE	N N N	07/25/2004 Sun 1A	07 200	CASCADE AVE 2ND ST	CURVE W 08	(NONE) (02)	N UNKNOWN	Y N N	CLR DRY DLIT	PRKD MV SS-O PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	19	M	OR-Y OR<25		026	000 000		01 00 01
											02	NONE 0 PRVTE PSNGR CAR	PRKD-P W E									008		00
00139 NONE	N N N	05/28/2004 Fri 10A	07 0	CASCADE AVE 5TH ST	INTER CN 01	CROSS 99	N STOP SIGN	N N N	RAIN WET DAY	ANGL-OTH ANGL INJ	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	INJC	59	M	OR-Y OR<25		000	000 000		02 00 00
											02	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	17	F	OR-Y OR<25		028	015 000		00 02
00205 NONE	N N N	08/08/2004 Sun 1P	07 0	CASCADE AVE 7TH ST	INTER CN 01	CROSS 99	N STOP SIGN	N N N	CLR DRY DAY	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	64	M	OR-Y OR<25		000	000 000		02 00 00
											02	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	52	F	OR-Y OR<25		028	015 000		00 02
00152 NONE	N N N	07/08/2005 Fri 1P	19 0	CASCADE AVE 9TH ST	INTER CN 02	CROSS 99	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT S N	01	DRVR	NONE	73	F	OR-Y OR<25		028	000 000		02 00 02
											02	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	57	M	OR-Y OR<25		000	000 000		00 00
00057 NONE	N N N	02/14/2005 Mon 12P	16 10	CASCADE AVE 13TH ST	STRGHT E 06	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	S-1STOP REAR PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	56	F	OR-Y OR<25		026	000 000		01 00 01

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF HOOD RIVER, HOOD RIVER COUNTY

Cascade Avenue from 13th Street to 2nd Street in/near Hood River
1-1-2002 through 12-31-2006

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	CLASS DIST FROM	CITY STREET 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
															02	NONE 0 PRVTE PSNGR CAR	STOP E W	01	DRVR	NONE	29	M	OR-Y OR<25		000	011 000		00 00
00195 NO RPT	N	N	N	N	N	06/21/2002 Fri 1P	09 40	CASCADE AVE 2ND ST	STRGHT W 06	(NONE) 0 (02)	N UNKNOWN	Y N N	CLR DRY DAY	PRKD MV SS-O PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	43	M	OR-Y OR<25		026	000		01 01 01
															02	NONE 0 PRVTE TRUCK	PRKD-P W E									008		
00060 NONE	N	N	N	N	N	02/05/2002 Tue 6P	09 100	CASCADE AVE 2ND ST	STRGHT W 08	(NONE) 0 (02)	N UNKNOWN	Y N N	CLR DRY DLIT	PRKD MV PARK PDO	01	NONE 0 PRVTE PSNGR CAR	PARKNG E W	01	DRVR	NONE	52	F	OR-Y OR<25		018	008		10 10
															02	NONE 0 PRVTE PSNGR CAR	PRKD-P W E									008		
00331 NONE	N	N	N	N	N	09/12/2002 Thu 12P	09 0	CASCADE AVE 7TH ST	INTER CN 01	CROSS 0	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	30	M	OR-Y OR<25		000	000		02
															02	NONE 0 PRVTE PSNGR CAR	TURN-L N E	01	DRVR	NONE	23	F	OR-Y OR<25		028	000		02

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

7th St or Wasco Ave from 13th St to Historic Columbia River Hwy (Hwy 100, Rt 30) in/near Hood River
1-1-2002 through 12-31-2006

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: 2005														
BACKING	0	0	1	1	0	0	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	1	1	0	1	0	1	0	0
2005 TOTAL	0	0	2	2	0	0	1	2	0	2	0	1	0	0
YEAR: 2004														
ANGLE	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FIXED / OTHER OBJECT	0	0	1	1	0	0	0	1	0	0	1	0	0	1
2004 TOTAL	0	0	2	2	0	0	0	2	0	1	1	1	0	1
YEAR: 2003														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2003 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
YEAR: 2002														
BACKING	0	0	1	1	0	0	0	1	0	1	0	0	0	0
TURNING MOVEMENTS	0	0	2	2	0	0	0	2	0	2	0	2	0	0
2002 TOTAL	0	0	3	3	0	0	0	3	0	3	0	2	0	0
FINAL TOTAL	0	0	8	8	0	0	1	8	0	7	1	5	0	1

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 HOOD RIVER, HOOD RIVER COUNTY

7th St or Wasco Ave from 13th St to Historic Columbia River Hwy (Hwy 100, Rt 30) in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E E / A L D / R U G C / S C H S / W O R L 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- 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
00171 NONE	N N N	07/28/2005 Thu 8P	19 100	7TH ST COLUMBIA ST	STRGHT S 08	(NONE) (02)	N UNKNOWN	N N N	CLR DRY DAY	O-1STOP BACK PDO	01	NONE 0 PRVTE PSNGR CAR	BACK N S	01	DRVR	NONE	26	M	OR-Y OR<25		011	000 000		10 00 10
											02	NONE 0 PRVTE PSNGR CAR	STOP S N	01	DRVR	NONE	27	F	OR-Y OR<25		000	011 000		00 00
00205 NONE	N N N	08/08/2004 Sun 1P	07 0	CASCADE AVE 7TH ST	INTER CN 01	CROSS 99	N STOP SIGN	N N N	CLR DRY DAY	ANGL-OTH ANGL PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	64	M	OR-Y OR<25		000	000 000		02 00 00
											02	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	52	F	OR-Y OR<25		028	015 000		00 02
00331 NONE	N N N N N	09/12/2002 Thu 12P	09 0	CASCADE AVE 7TH ST	INTER CN 01	CROSS 0	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	30	M	OR-Y OR<25		000	000		02
											02	NONE 0 PRVTE PSNGR CAR	TURN-L N E	01	DRVR	NONE	23	F	OR-Y OR<25		028	000		02
00109 NONE	N N N	05/20/2003 Tue 6P	09 0	COLUMBIA ST 7TH ST	INTER CN 01	CROSS 99	N UNKNOWN	N N N	CLR DRY DAY	O-1TURN TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT N S	01	DRVR	NONE	38	M	OR-Y OR<25		000	000 000		02 00 00
											02	NONE 0 PRVTE PSNGR CAR	TURN-L S W	01	DRVR	NONE	22	M	OTH-Y N-RES		004	000 000		00 02
00248 NONE	N N N	10/04/2005 Tue 8A	19 0	INDUSTRIAL AVE WASCO AVE	INTER CN 04	3-LEG 99	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 1 PRVTE SEMI TOW	TURN-L NE SE	01	DRVR	NONE	34	M	OTH-Y N-RES		028	000 000		02 00 02
											02	NONE 0 PRVTE PSNGR CAR	TURN-L NW NE	01	DRVR	NONE	51	F	OR-Y OR<25		000	000 000		00 00
00173 NONE	N N N	07/01/2004 Thu 11P	09 100	WASCO AVE 13TH ST	CURVE E 07	(NONE) (02)	N UNKNOWN	Y N N	CLR DRY DARK	FIX OBJ FIX PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	17	M	OR-Y OR<25		047,081	000 017	040,088 040,088	01 00 01

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF HOOD RIVER, HOOD RIVER COUNTY

7th St or Wasco Ave from 13th St to Historic Columbia River Hwy (Hwy 100, Rt 30) in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E D	E A L C	D R U G S	R C H S	S W O L 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- 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
00248 NONE	N	N	N	N	N	07/31/2002 Wed 4P	09	WASCO AVE 13TH ST	STRGHT E 06	(NONE) 0 (02)	N UNKNOWN	N N N	CLR DRY DAY	O-STRGHT BACK PDO														10
															01	NONE 0 PRVTE PSNGR CAR	BACK W E	01	DRVR	NONE	19	F	OR-Y OR<25		018	000		10
															02	NONE 0 PRVTE PSNGR CAR	STRGHT W E	01	DRVR	NONE	00	M	UNK UNK		000	000		

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CONTINUOUS SYSTEM CRASH LISTING

100 HISTORIC COLUMBIA RIVER

7th St or Wasco Ave from 13th St to Historic Columbia River Hwy (Hwy 100, Rt 30) in/near Hood River
1-1-2002 through 12-31-2006

SER# INVEST	S P E D 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	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN EVENT	CAUSE
00363 NONE	N N N N N	10/23/2002 Wed 10A	HOOD RIVER HOOD RIVER	1 06 0 0 50.50	OAK ST 7TH ST	INTER CN 01	3-LEG 0	N UNKNOWN	N N N	CLR DRY DAY	ANGL-OTH TURN PDO	01	NONE 0 PRVTE PSNGR CAR	STRGHT E W	01	DRVR	NONE	51	M	OR-Y OR<25		000	000	02
												02	NONE 0 PRVTE PSNGR CAR	TURN-L N E	01	DRVR	NONE	64	F	OR-Y OR<25		028	000	02

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Country Club Road from Westridge Drive to Historic Columbia River Hwy (Hwy 100, Route 30) in/near Hood River
1-1-2002 through 12-31-2006

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

May Street from Frankton Road to 30th Street in/near Hood River
1-1-2002 through 12-31-2006

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

Riverside Drive at 2nd Street in Hood River
1-1-2002 through 12-31-2006

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

Historic Columbia River Hwy (Hwy 100, Route 30) at Westcliff Drive in/near Hood River
1-1-2002 through 12-31-2006

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.

Traffic Volume Data

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location WESTCLIFF DRIVE AT CASCADE AVENUE
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
15:30 - 15:45	30	1	0	0	1	0	1	0	16	0	0	0	49
15:45 - 16:00	18	0	0	0	0	2	2	0	13	0	0	0	35
16:00 - 16:15	15	0	0	0	0	2	2	0	17	0	0	0	36
16:15 - 16:30	13	0	0	0	0	0	5	0	16	0	0	0	34
16:30 - 16:45	18	1	0	0	0	2	1	0	21	0	0	0	43
16:45 - 17:00	13	2	0	0	1	1	4	0	15	0	0	0	36
17:00 - 17:15	15	2	0	0	1	2	5	0	15	0	0	0	40
17:15 - 17:30	13	0	0	0	0	2	2	0	21	0	0	0	38
Movement Totals	135	6	0	0	3	11	22	0	134	0	0	0	311
Enter Totals	141			14			156			0			
Exit Totals	28			137			0			146			

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	1	0	0	0	0	0	0	0	0	0	0	0	1
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0.7%	0.0%	NA	NA	0.0%	0.0%	0.0%	NA	0.0%	NA	NA	NA	0.3%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	2	0	0	0	0	0	2	0	1	0	0	0	5

	South	West	East	North	
Pedestrians	0	0	1	0	1

Peak Hour Information

Peak Hour 16:30 17:30

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	59	5	0	0	2	7	12	0	72	0	0	0	157
Peak Hour Factor	0.82	0.63	NA	NA	0.50	0.88	0.60	NA	0.86	NA	NA	NA	0.91
Enter Totals	64			0			84			9			
Peak Hour Factor	0.84			NA			0.91			0.75			
Exit Totals	17			66			0			74			
Peak Hour Factor	0.61			0.83			NA			0.88			
Light Trucks	1	0	0	0	0	0	0	0	0	0	0	0	1
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	1.7%	0.0%	NA	NA	0.0%	0.0%	0.0%	NA	0.0%	NA	NA	NA	0.6%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	2	0	1	0	0	0	3

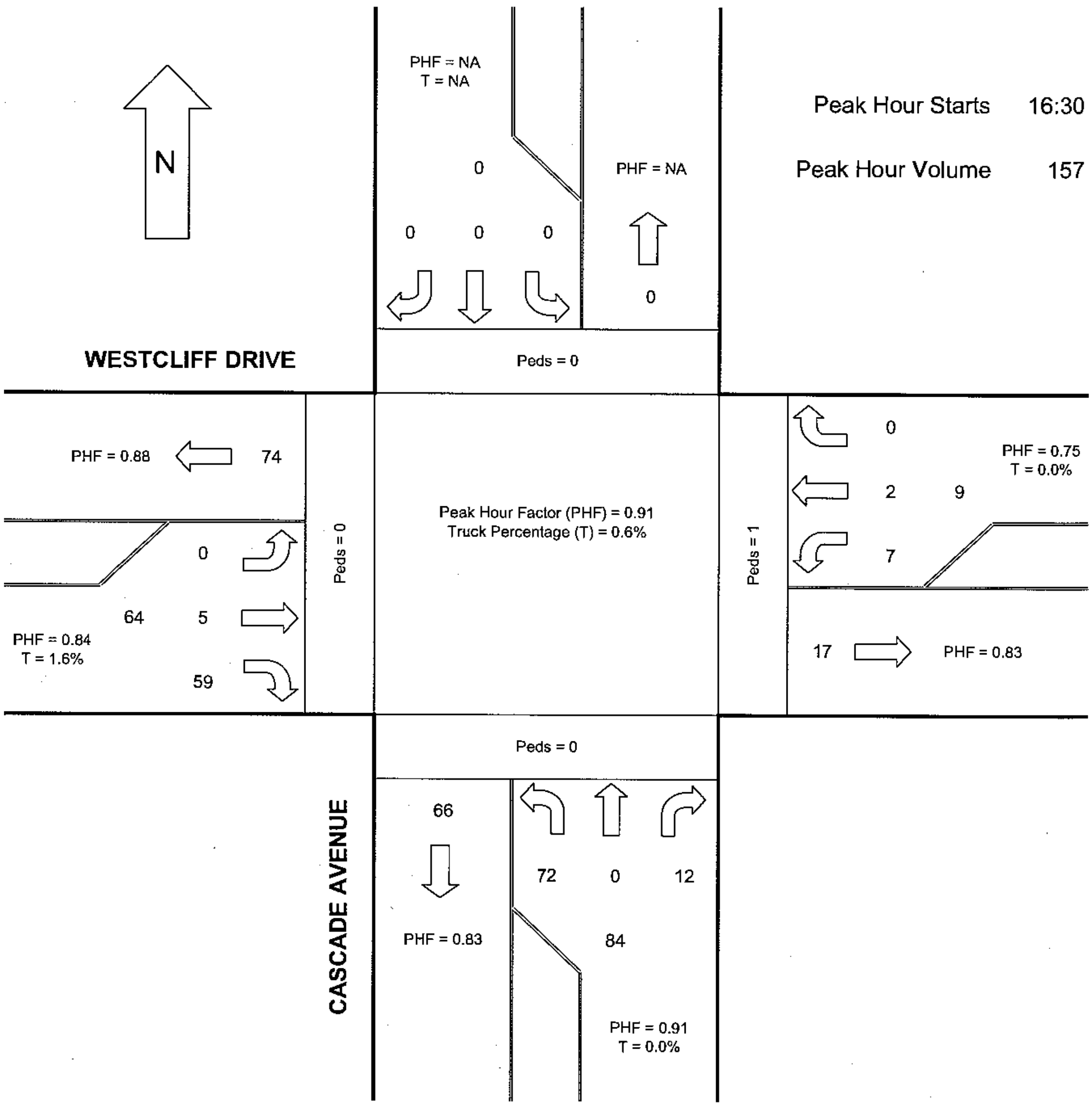
	South	West	East	North	
Pedestrians	0	0	1	0	1

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location WESTCLIFF DRIVE AT CASCADE AVENUE
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: BV



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 WB RAMPS AT CASCADE AVENUE
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
15:30 - 15:45	0	0	0	2	0	51	0	17	62	11	22	0	165
15:45 - 16:00	0	0	0	5	0	43	0	12	51	6	16	0	133
16:00 - 16:15	0	0	0	5	0	53	0	15	65	10	8	0	156
16:15 - 16:30	0	0	0	4	0	40	0	18	60	3	12	0	137
16:30 - 16:45	0	0	0	5	0	35	0	20	70	6	17	0	153
16:45 - 17:00	0	0	0	2	0	48	0	18	47	5	10	0	130
17:00 - 17:15	0	0	0	6	0	53	0	15	58	5	12	0	149
17:15 - 17:30	0	0	0	6	0	45	0	17	50	6	9	0	133
Movement Totals	0	0	0	35	0	368	0	132	463	52	106	0	1156
Enter Totals	0			403			595			158			
Exit Totals	0			515			167			474			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	0	0	2	0	0	3	0	0	0	5
Medium Trucks	0	0	0	0	0	1	0	0	1	0	0	0	2
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	NA	NA	NA	0.0%	NA	0.8%	NA	0.0%	0.9%	0.0%	0.0%	NA	0.6%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	3	0	3	11	2	0	0	19

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 15:30 16:30

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	0	0	16	0	187	0	62	238	30	58	0	591
Peak Hour Factor	NA	NA	NA	0.80	NA	0.88	NA	0.86	0.92	0.68	0.66	NA	0.90

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	0	88	300	203
Peak Hour Factor	NA	0.67	0.94	0.88

	Eastbound	Westbound	Northbound	Southbound
Exit Totals	0	245	78	268
Peak Hour Factor	NA	0.84	0.89	0.89

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	0	0	0	0	0	2	0	0	0	2
Medium Trucks	0	0	0	0	0	1	0	0	1	0	0	0	2
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	NA	NA	NA	0.0%	NA	0.5%	NA	0.0%	1.3%	0.0%	0.0%	NA	0.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	1	0	0	4	2	0	0	7

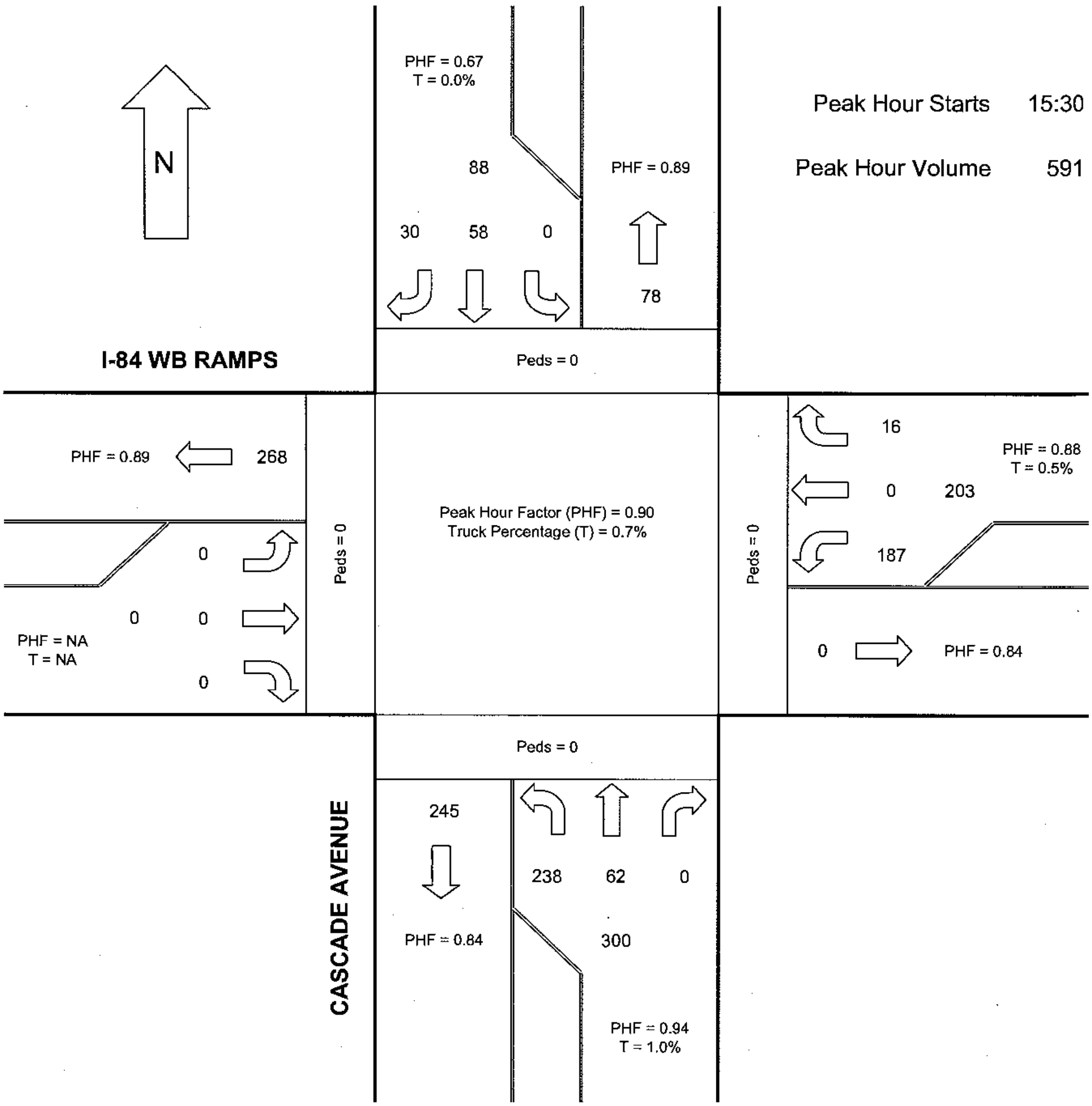
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Peak Hour Diagram

Location I-84 WB RAMPS AT CASCADE AVENUE
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: BV

Peak Hour Starts 15:30
Peak Hour Volume 591



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB RAMPS AT CASCADE AVENUE
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
15:30 - 15:45	61	0	10	0	0	0	46	78	1	0	74	9	279
15:45 - 16:00	72	0	2	0	0	0	43	67	2	1	61	6	254
16:00 - 16:15	46	0	5	0	0	0	32	83	1	0	62	3	232
16:15 - 16:30	71	2	8	0	0	0	50	79	0	0	49	6	265
16:30 - 16:45	49	0	6	0	0	0	53	88	0	0	50	8	254
16:45 - 17:00	57	2	8	0	0	0	39	53	1	0	56	4	220
17:00 - 17:15	51	0	6	0	0	0	43	72	0	0	58	3	233
17:15 - 17:30	56	0	6	0	0	0	36	65	0	0	55	3	221
Movement Totals	463	4	51	0	0	0	342	585	5	1	465	42	1958
Enter Totals	518			0			932			508			
Exit Totals	388			6			636			928			

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	10	0	0	0	0	0	7	10	0	0	7	0	34
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	2	0	0	0	1	0	3
% Trucks	2.2%	0.0%	0.0%	NA	NA	NA	2.6%	1.7%	0.0%	0.0%	1.7%	0.0%	1.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	5	0	1	0	0	0	3	14	0	0	4	0	27

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 15:30 16:30

	Eastbound			Westbound			Northbound			Southbound			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Movement Total	250	2	25	0	0	0	171	307	4	1	246	24	1030
Peak Hour Factor	0.87	0.25	0.63	NA	NA	NA	0.86	0.92	0.50	0.25	0.83	0.67	0.92

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	277	271	482	0
Peak Hour Factor	0.85	0.82	0.93	NA
Exit Totals	197	496	332	5
Peak Hour Factor	0.85	0.92	0.94	0.42

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	4	0	0	0	0	0	2	6	0	0	3	0	15
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	2	0	0	0	1	0	3
% Trucks	1.6%	0.0%	0.0%	NA	NA	NA	2.3%	2.0%	0.0%	0.0%	1.6%	0.0%	1.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	3	0	0	0	0	0	2	4	0	0	1	0	10

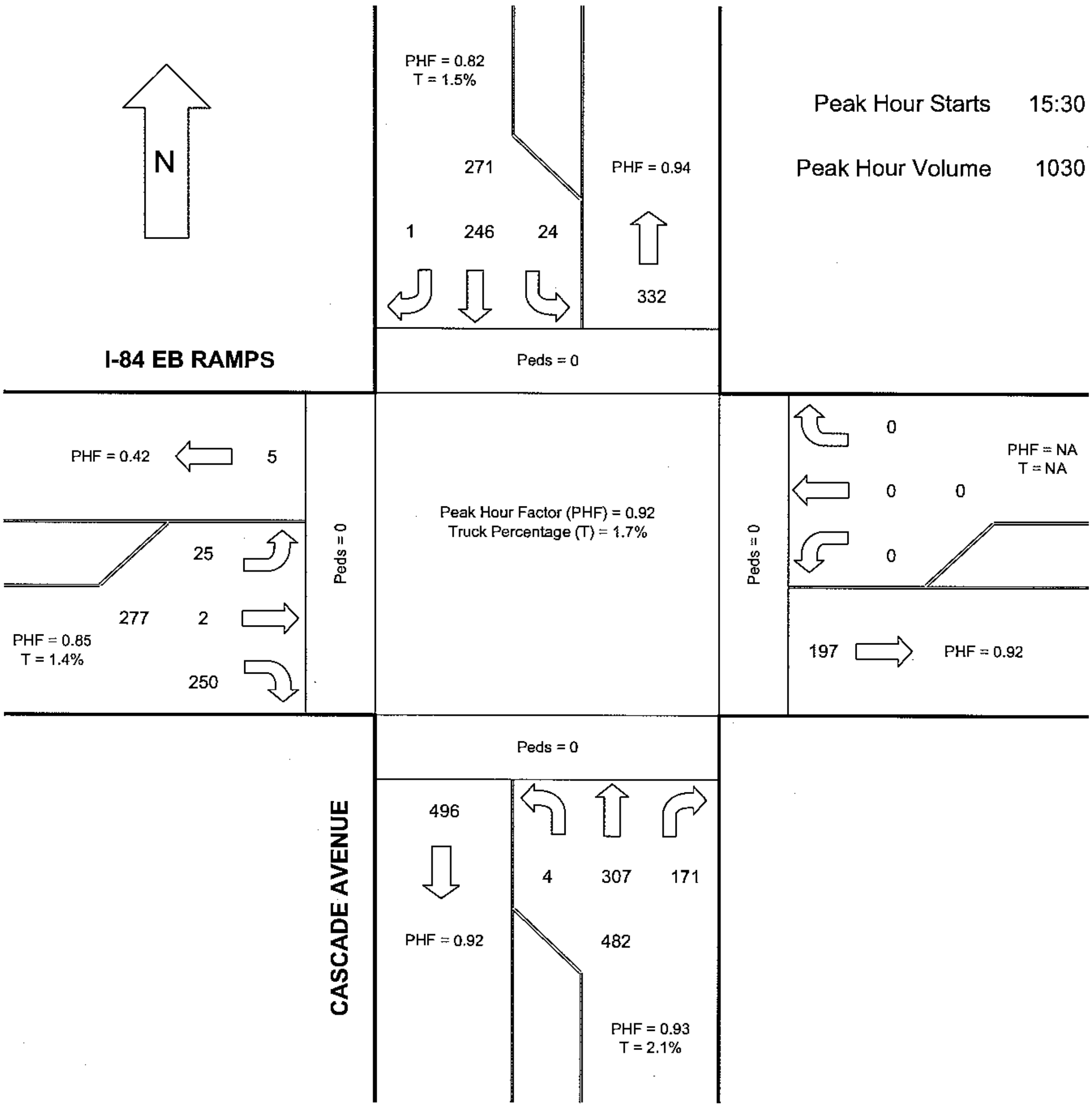
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB RAMPS AT CASCADE AVENUE
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: DH



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Summary Report

Location COUNTRY CLUB AT CASCADE AVENUE
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: DH

Time Period	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
15:30 - 15:45	14	0	17	0	0	0	0	103	13	22	107	0	276
15:45 - 16:00	20	0	27	0	0	0	0	80	19	32	98	0	276
16:00 - 16:15	17	0	29	0	0	0	0	87	16	23	82	0	254
16:15 - 16:30	22	0	36	0	0	0	0	96	9	22	89	0	274
16:30 - 16:45	25	0	24	0	0	0	0	118	16	19	85	0	287
16:45 - 17:00	22	0	14	0	0	0	0	85	18	23	89	0	251
17:00 - 17:15	23	0	19	0	0	0	0	95	20	29	74	0	260
17:15 - 17:30	17	0	26	0	0	0	1	77	21	20	85	0	247
Movement Totals	160	0	192	0	0	0	1	741	132	190	709	0	2125
Enter Totals	352			0			874			899			
Exit Totals	1			322			933			869			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	3	0	4	0	0	0	0	16	1	6	10	0	40
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	1	0	0	0	0	1	0	1	0	0	3
% Trucks	1.9%	NA	2.6%	NA	NA	NA	0.0%	2.3%	0.8%	3.7%	1.4%	NA	2.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	2	0	3	0	0	0	0	13	2	3	5	0	28

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 15:45 16:45

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Movement Total	84	0	116	0	0	0	0	381	60	96	354	0	1091
Peak Hour Factor	0.84	NA	0.81	NA	NA	NA	NA	0.81	0.79	0.75	0.90	NA	0.95

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	200	450	441	0
Peak Hour Factor	0.86	0.87	0.82	NA
Exit Totals	0	438	497	156
Peak Hour Factor	NA	0.93	0.88	0.76

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	3	0	3	0	0	0	0	9	1	3	4	0	23
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	1	0	0	0	0	0	0	1	0	0	2
% Trucks	3.6%	NA	3.4%	NA	NA	NA	NA	2.4%	1.7%	4.2%	1.1%	NA	2.3%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	2	0	2	0	0	0	0	4	0	2	1	0	11

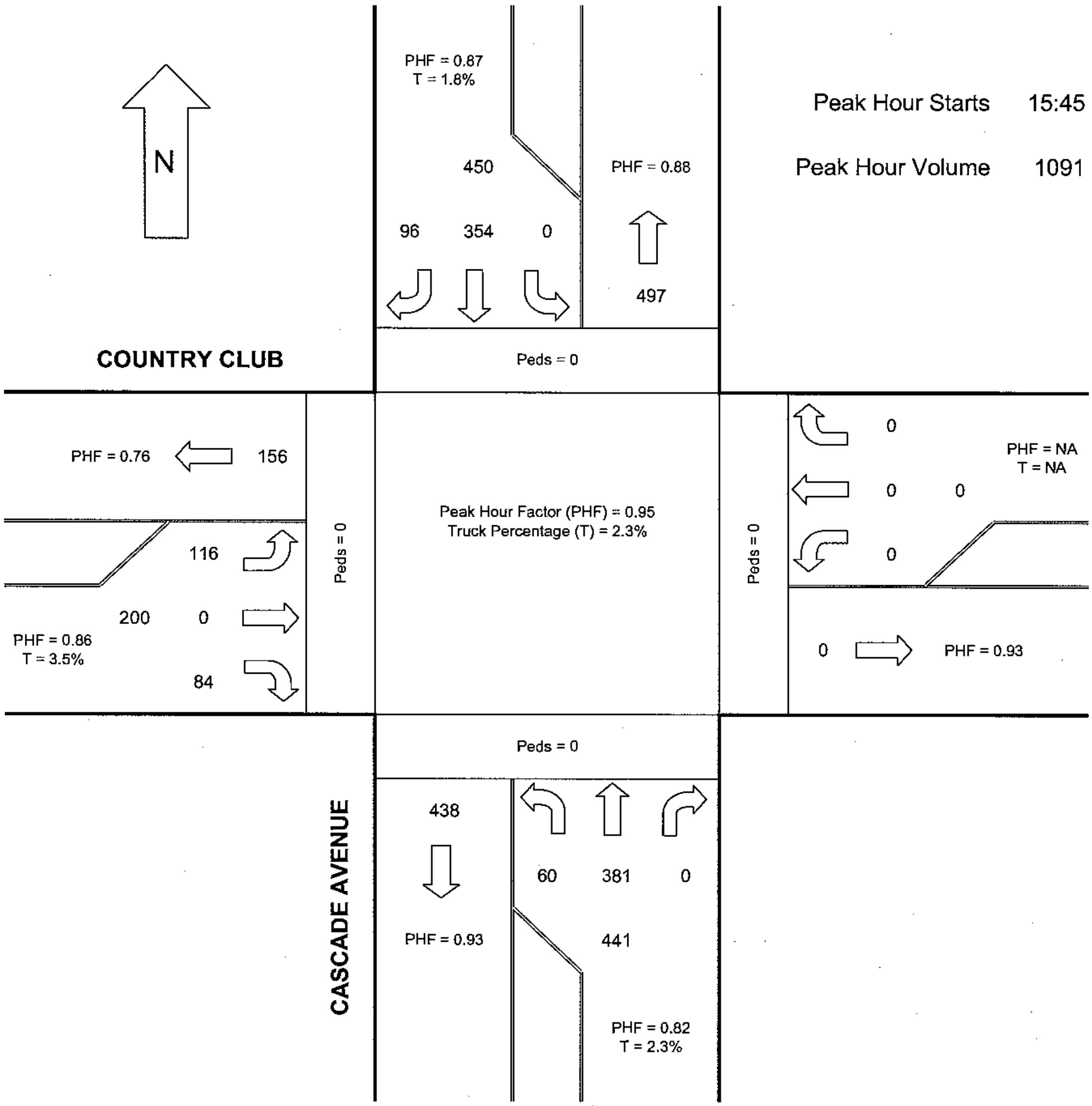
	South	West	East	North	
Pedestrians	0	0	0	0	0

TRAFSTATS

Intersection Turning Movement

Peak Hour Diagram

Location COUNTRY CLUB AT CASCADE AVENUE
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: DH



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location CASCADE AVENUE AT RAND ROAD (WASCO AVE)
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
15:30 - 15:45	24	82	6	19	102	3	5	2	10	11	5	7	276
15:45 - 16:00	10	70	4	10	107	4	2	2	8	8	3	11	239
16:00 - 16:15	14	90	6	11	85	1	4	3	8	11	2	9	244
16:15 - 16:30	21	91	9	9	103	5	0	2	5	12	8	6	271
16:30 - 16:45	13	97	9	19	97	2	5	5	4	11	6	7	275
16:45 - 17:00	7	88	8	18	91	3	2	3	6	8	1	5	240
17:00 - 17:15	10	94	11	11	87	1	2	1	3	13	2	7	242
17:15 - 17:30	14	77	13	20	83	0	0	2	4	11	5	9	238
Movement Totals	113	689	66	117	755	19	20	20	48	85	32	61	2025
Enter Totals	868			891			88			178			
Exit Totals	770			888			203			164			

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	1	4	1	1	1	0	0	0	0	4	0	1	13
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	1	0	0	0	0	0	1
% Trucks	0.9%	0.6%	1.5%	0.9%	0.1%	0.0%	5.0%	0.0%	0.0%	4.7%	0.0%	1.6%	0.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	1	0	0	1

	South	West	East	North	
Pedestrians	2	0	0	1	3

Peak Hour Information

Peak Hour 15:30 16:30

	Eastbound			Westbound			Northbound			Southbound			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Movement Total	69	333	25	49	397	13	11	9	31	42	18	33	1030
Peak Hour Factor	0.72	0.91	0.69	0.64	0.93	0.65	0.55	0.75	0.78	0.88	0.56	0.75	0.93
Enter Totals	427			93			51			459			
Peak Hour Factor	0.88			0.89			0.75			0.93			
Exit Totals	377			100			83			470			
Peak Hour Factor	0.92			0.74			0.77			0.96			
Light Trucks	0	2	1	1	1	0	0	0	0	3	0	0	8
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	1	0	0	0	0	0	1
% Trucks	0.0%	0.6%	4.0%	2.0%	0.3%	0.0%	9.1%	0.0%	0.0%	7.1%	0.0%	0.0%	0.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	1	0	0	1

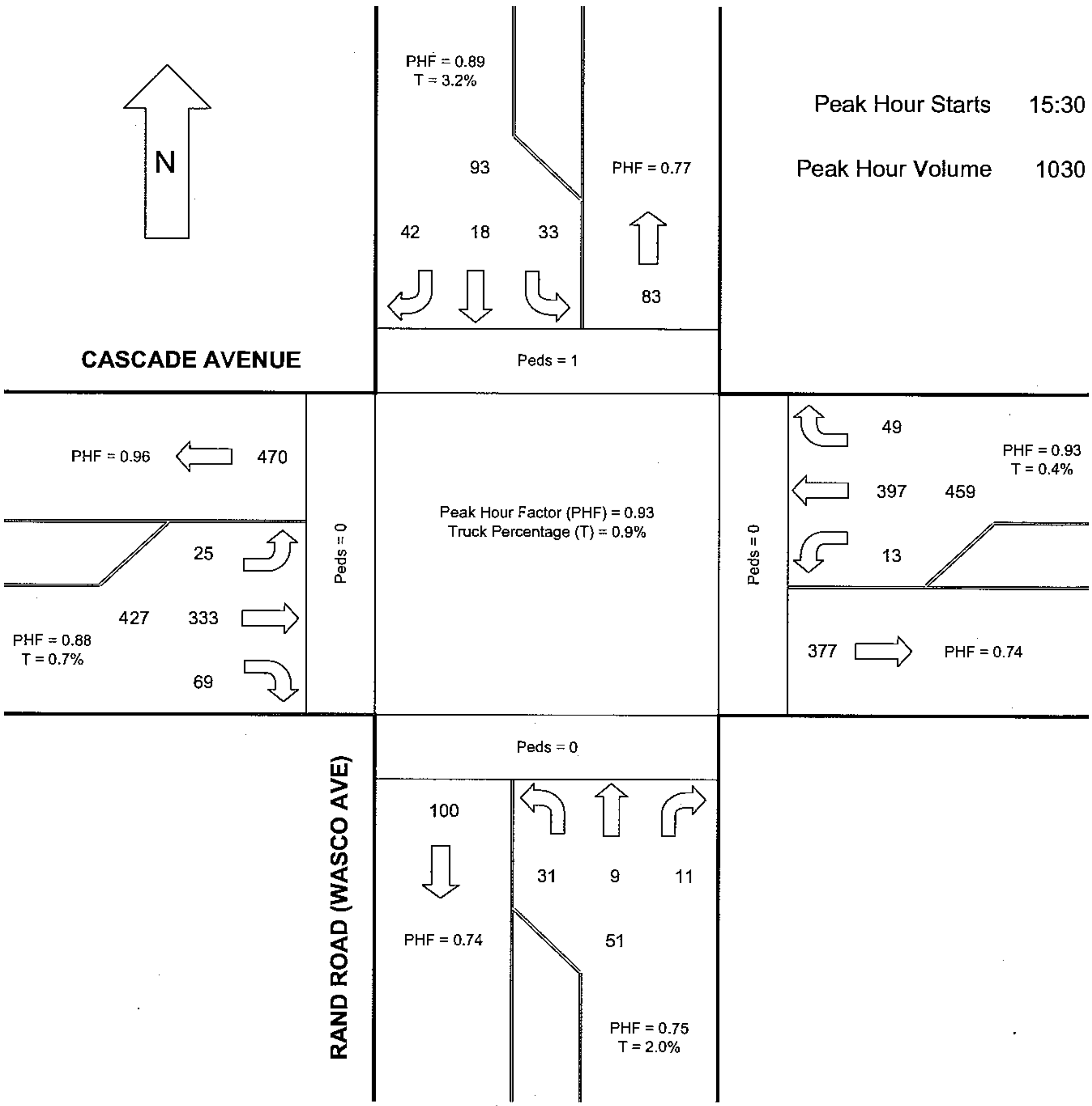
	South	West	East	North	
Pedestrians	0	0	0	1	1

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

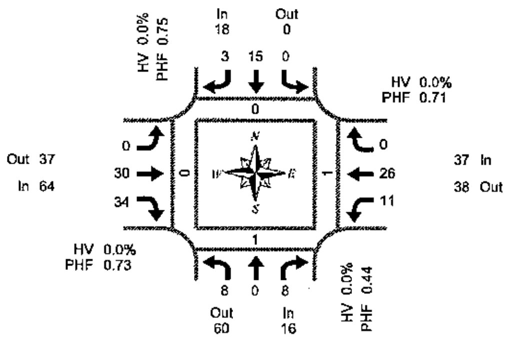
Peak Hour Diagram

Location CASCADE AVENUE AT RAND ROAD (WASCO AVE)
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: BV



Total Vehicle Summary

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



Peak Hour Summary
4:05 PM to 5:05 PM

N 2nd St & N Portway Ave

Sunday, August 19, 2007
3:30 PM to 5:30 PM

5-Minute Interval Summary
3:30 PM to 5:30 PM

Interval Start Time	Northbound N 2nd St				Southbound N 2nd St				Eastbound N Portway Ave				Westbound N Portway Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
3:30 PM	2	0	4	0	0	3	0	0	0	4	1	0	1	4	0	0	19	1	0	1	2
3:35 PM	2	0	3	0	0	3	0	0	0	0	2	0	1	2	0	1	13	0	0	0	1
3:40 PM	2	0	1	0	0	0	1	0	0	1	0	0	1	1	0	0	7	0	0	0	0
3:45 PM	1	0	1	0	0	4	0	0	0	1	1	0	0	0	0	0	8	5	0	0	0
3:50 PM	0	0	0	0	0	0	0	0	0	1	3	0	3	0	0	0	7	0	1	1	0
3:55 PM	0	0	1	0	0	0	0	0	0	2	1	0	1	2	0	0	7	0	0	0	0
4:00 PM	1	0	2	0	0	3	0	0	0	2	1	0	0	2	0	0	11	0	0	0	0
4:05 PM	0	0	1	0	0	2	1	0	0	6	0	0	0	2	0	1	12	0	0	0	0
4:10 PM	0	0	0	0	0	1	0	0	0	1	2	0	1	2	0	0	7	0	0	0	0
4:15 PM	0	0	2	1	0	1	0	0	0	4	0	0	0	4	0	0	11	0	0	0	0
4:20 PM	1	0	0	0	0	4	0	0	0	2	4	0	1	2	0	0	14	0	0	0	0
4:25 PM	0	0	0	0	0	0	0	0	0	2	1	0	0	1	0	0	4	0	0	0	0
4:30 PM	2	0	0	0	0	0	1	0	0	1	1	2	1	2	0	0	8	0	0	0	0
4:35 PM	0	0	0	0	0	1	0	0	0	4	3	0	3	3	0	0	14	0	0	0	0
4:40 PM	2	0	3	0	0	1	1	0	0	3	2	0	0	4	0	0	16	0	0	0	0
4:45 PM	2	0	0	1	0	1	0	0	0	1	5	0	0	1	0	0	10	0	0	0	0
4:50 PM	1	0	1	0	0	1	0	0	0	1	5	0	2	2	0	0	13	0	0	0	0
4:55 PM	0	0	1	0	0	2	0	0	0	2	6	0	1	1	0	0	13	0	0	0	0
5:00 PM	0	0	0	1	0	1	0	0	0	3	5	0	2	2	0	0	13	0	1	1	0
5:05 PM	0	0	0	0	0	1	0	0	0	3	4	1	0	1	0	0	9	0	0	0	0
5:10 PM	2	0	1	0	0	1	0	0	0	1	4	0	0	0	0	0	9	0	0	0	0
5:15 PM	2	0	1	0	0	0	0	0	0	3	4	0	0	2	0	0	12	0	0	0	0
5:20 PM	2	0	0	0	0	3	0	0	0	1	1	0	3	0	0	0	10	1	0	0	0
5:25 PM	1	0	0	0	0	1	0	0	0	2	1	0	1	1	0	0	7	0	0	0	0
Total Survey	23	0	22	3	0	34	4	0	0	51	57	3	22	41	0	2	254	7	2	3	3

15-Minute Interval Summary
3:30 PM to 5:30 PM

Interval Start Time	Northbound N 2nd St				Southbound N 2nd St				Eastbound N Portway Ave				Westbound N Portway Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
3:30 PM	6	0	8	0	0	6	1	0	0	5	3	0	3	7	0	1	39	1	0	1	3
3:45 PM	1	0	2	0	0	4	0	0	0	4	5	0	4	2	0	0	22	5	1	1	0
4:00 PM	1	0	3	0	0	6	1	0	0	9	3	0	1	6	0	1	30	0	0	0	0
4:15 PM	1	0	2	1	0	5	0	0	0	8	5	0	1	7	0	0	29	0	0	0	0
4:30 PM	4	0	3	0	0	2	2	0	0	8	6	2	4	9	0	0	38	0	0	0	0
4:45 PM	3	0	2	1	0	4	0	0	0	4	16	0	3	4	0	0	36	0	0	0	0
5:00 PM	2	0	1	1	0	3	0	0	0	7	13	1	2	3	0	0	31	0	1	1	0
5:15 PM	5	0	1	0	0	4	0	0	0	6	6	0	4	3	0	0	29	1	0	0	0
Total Survey	23	0	22	3	0	34	4	0	0	51	57	3	22	41	0	2	254	7	2	3	3

Peak Hour Summary
4:05 PM to 5:05 PM

By Approach	Northbound N 2nd St				Southbound N 2nd St				Eastbound N Portway Ave				Westbound N Portway Ave				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	16	60	76	3	18	0	18	0	64	37	101	2	37	38	75	1	135
%HV	0.0%				0.0%				0.0%				0.0%				0.0%
PHF	0.44				0.75				0.73				0.71				0.84

Pedestrians Crosswalk			
North	South	East	West
0	1	1	0

By Movement	Northbound N 2nd St				Southbound N 2nd St				Eastbound N Portway Ave				Westbound N Portway Ave				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	8	0	8	16	0	15	3	18	0	30	34	64	11	26	0	37	135
%HV	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PHF	0.40	0.00	0.50	0.44	0.00	0.63	0.38	0.75	0.00	0.68	0.53	0.73	0.55	0.72	0.00	0.71	0.84

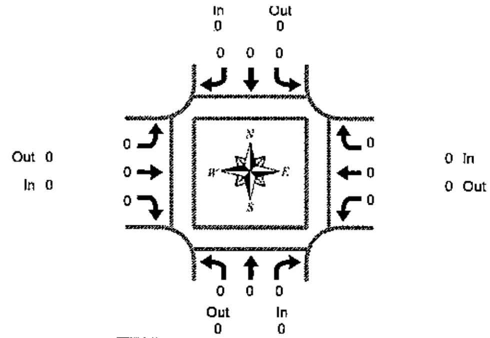
Rolling Hour Summary
3:30 PM to 5:30 PM

Interval Start Time	Northbound N 2nd St				Southbound N 2nd St				Eastbound N Portway Ave				Westbound N Portway Ave				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
3:30 PM	9	0	15	1	0	21	2	0	0	26	16	0	9	22	0	2	120	6	1	2	3
3:45 PM	7	0	10	1	0	17	3	0	0	29	19	2	10	24	0	1	119	5	1	1	0
4:00 PM	9	0	10	2	0	17	3	0	0	29	30	2	9	26	0	1	133	0	0	0	0
4:15 PM	10	0	8	3	0	14	2	0	0	27	40	3	10	23	0	0	134	0	1	1	0
4:30 PM	14	0	7	2	0	13	2	0	0	25	41	3	13	19	0	0	134	1	1	1	0

Heavy Vehicle Summary

All Traffic Data
Services Inc.

Clay Carney
(503) 833-2740



N 2nd St & N Portway Ave

Sunday, August 19, 2007
3:30 PM to 5:30 PM

Peak Hour Summary
4:05 PM to 5:05 PM

Heavy Vehicle 5-Minute Interval Summary
3:30 PM to 5:30 PM

Interval Start Time	Northbound N 2nd St				Southbound N 2nd St				Eastbound N Portway Ave				Westbound N Portway Ave				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Heavy Vehicle 15-Minute Interval Summary
3:30 PM to 5:30 PM

Interval Start Time	Northbound N 2nd St				Southbound N 2nd St				Eastbound N Portway Ave				Westbound N Portway Ave				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Heavy Vehicle Peak Hour Summary
4:05 PM to 5:05 PM

By Approach	Northbound N 2nd St			Southbound N 2nd St			Eastbound N Portway Ave			Westbound N Portway Ave			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.00			0.00			0.00			0.00			0.00

By Movement	Northbound N 2nd St				Southbound N 2nd St				Eastbound N Portway Ave				Westbound N Portway Ave				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Heavy Vehicle Rolling Hour Summary
3:30 PM to 5:30 PM

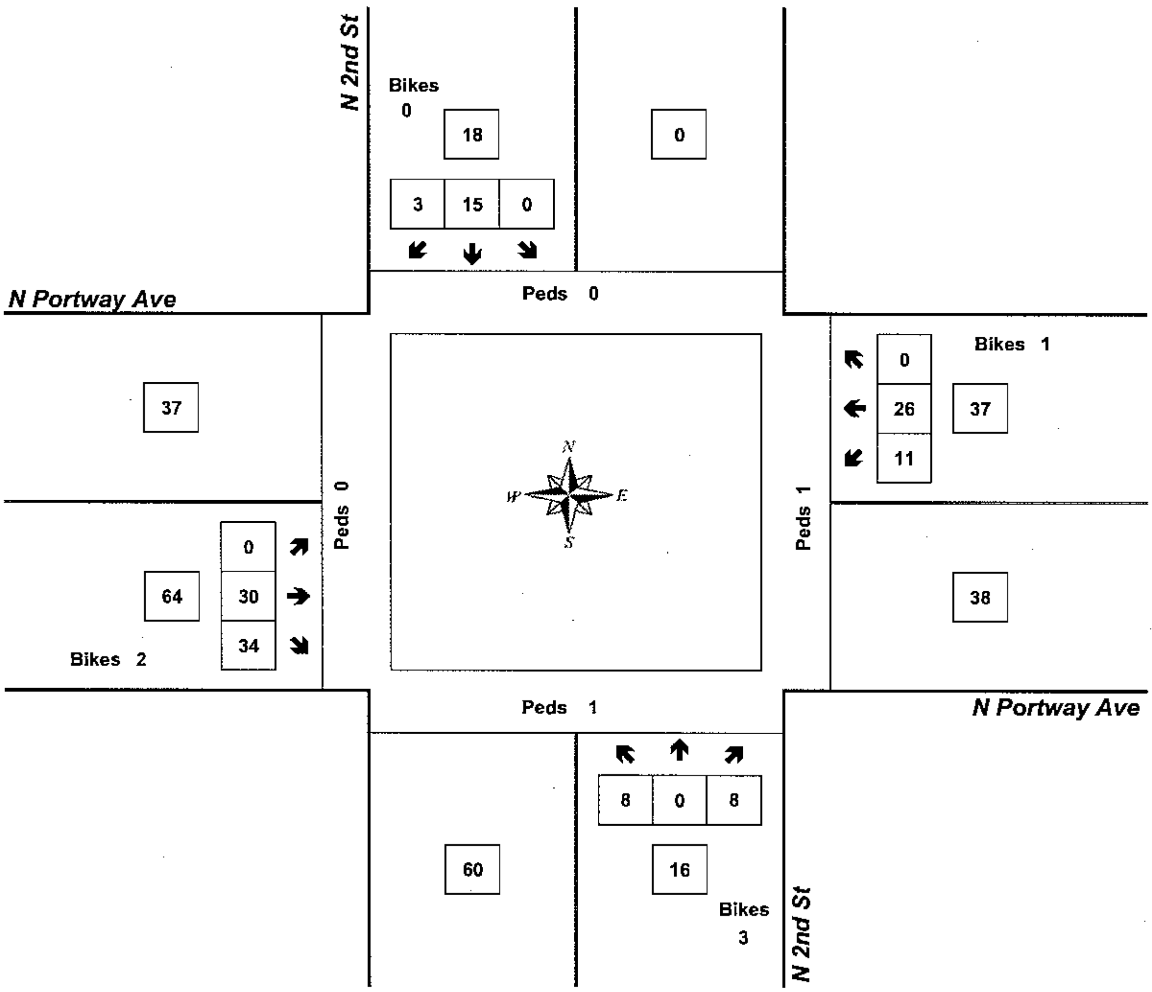
Interval Start Time	Northbound N 2nd St				Southbound N 2nd St				Eastbound N Portway Ave				Westbound N Portway Ave				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Peak Hour Summary

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

N 2nd St & N Portway Ave

4:05 PM to 5:05 PM
Sunday, August 19, 2007



Approach	PHF	HV%	Volume
EB	0.73	0.0%	64
WB	0.71	0.0%	37
NB	0.44	0.0%	16
SB	0.75	0.0%	18
Intersection	0.84	0.0%	135

Count Period: 3:30 PM to 5:30 PM

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Summary Report

Location RIVERSIDE DRIVE AT 2ND STREET-INTERSECTION
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
15:30 - 15:45	0	0	0	0	0	25	38	15	3	0	10	1	92
15:45 - 16:00	4	0	0	1	0	21	43	10	2	0	24	1	106
16:00 - 16:15	2	0	0	0	0	25	35	10	2	0	16	2	92
16:15 - 16:30	1	0	0	2	0	24	38	11	3	1	17	1	98
16:30 - 16:45	2	0	1	2	2	24	31	9	0	0	16	0	87
16:45 - 17:00	2	0	0	2	1	30	21	18	1	0	21	2	98
17:00 - 17:15	2	0	0	0	0	44	26	13	2	0	19	1	107
17:15 - 17:30	4	0	0	0	1	21	27	14	3	0	17	1	88
Movement Totals	17	0	1	7	4	214	259	100	16	1	140	9	768
Enter Totals	18			225			375			150			
Exit Totals	268			21			108			371			

Two-Hour Totals

Light Trucks	0	0	0	0	0	0	2	0	1	0	0	0	3
Medium Trucks	0	0	0	0	0	2	1	2	0	0	0	0	5
Heavy Trucks	0	0	0	0	0	0	1	0	0	0	1	0	2
% Trucks	0.0%	NA	0.0%	0.0%	0.0%	0.9%	1.5%	2.0%	6.3%	0.0%	0.7%	0.0%	1.3%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	1	0	0	4	0	0	0	0	1	6

	South	West	East	North	
Pedestrians	0	1	0	1	2

Peak Hour Information

Peak Hour 16:15 17:15

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	7	0	1	6	3	122	116	51	6	1	73	4	390
Peak Hour Factor	0.88	NA	0.25	0.75	0.38	0.69	0.76	0.71	0.50	0.25	0.87	0.50	0.91

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	8	78	173	131
Peak Hour Factor	0.67	0.85	0.83	0.74
Exit Totals	120	202	58	10
Peak Hour Factor	0.77	0.78	0.73	0.63

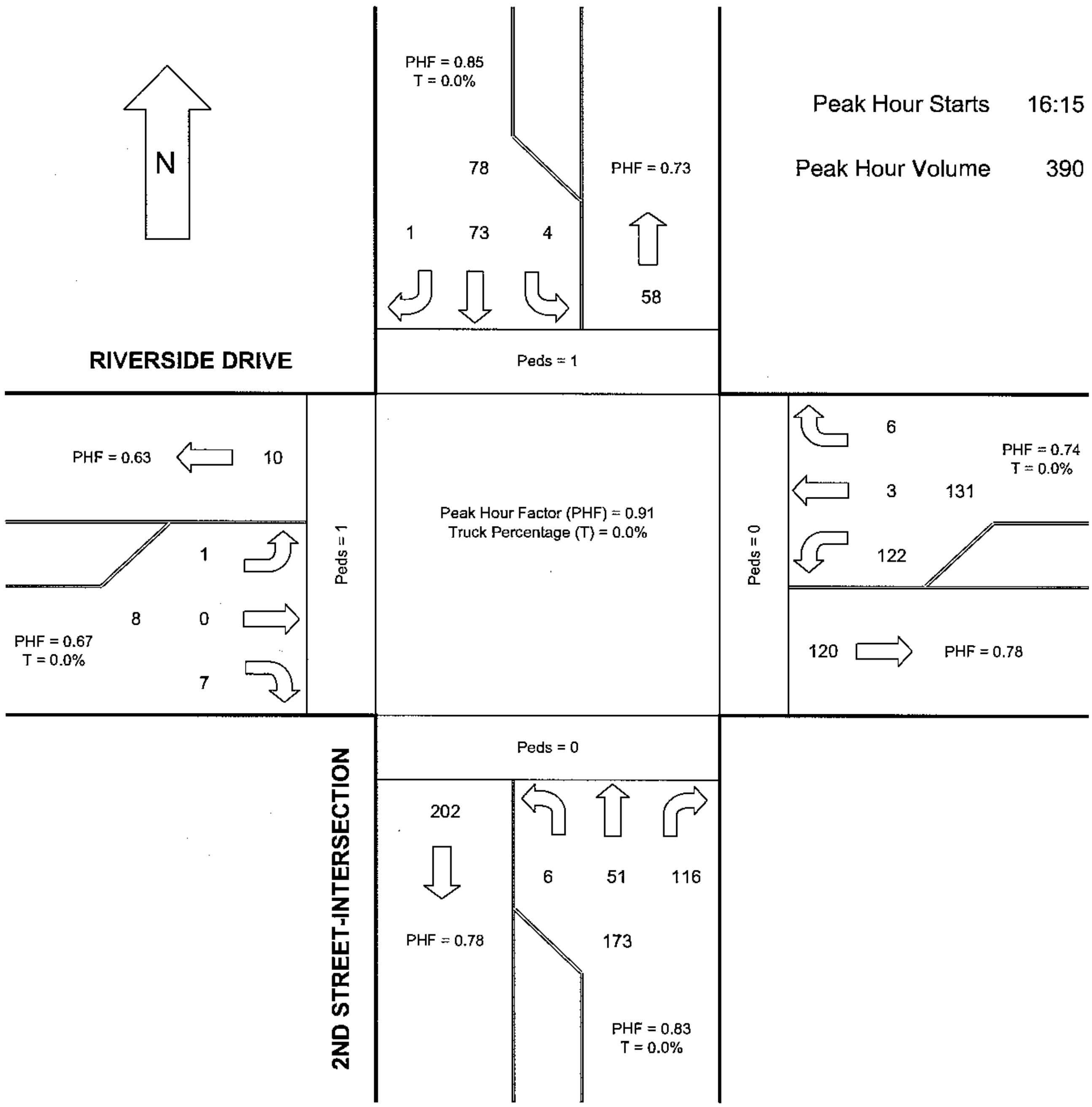
Light Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	0.0%	NA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	1	0	0	2	0	0	0	0	1	4

	South	West	East	North	
Pedestrians	0	1	0	1	2

Intersection Turning Movement

Peak Hour Diagram

Location RIVERSIDE DRIVE AT 2ND STREET-INTERSECTION
Date 8/20/2006
Day of Week Sunday
Time Begin 15:30
Reviewed By: BV



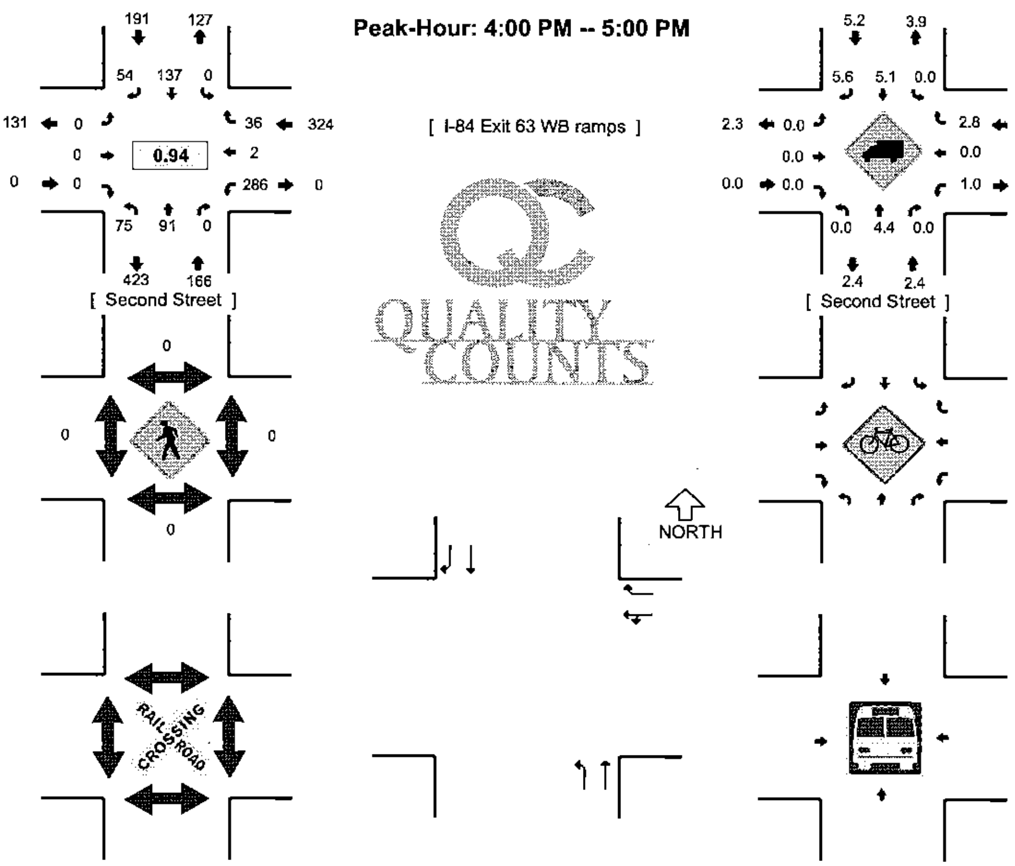
Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: Second Street--I-84 Exit 63 WB ramps
WEATHER:

QC JOB #: 10174505
DATE: 6/18/2006

Peak-Hour: 4:00 PM -- 5:00 PM



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Second Street (Northbound) Left	Thru	Right	U	Second Street (Southbound) Left	Thru	Right	U	I-84 Exit 63 WB r... (Eastbound) Left	Thru	Right	U	I-84 Exit 63 WB r... (Westbound) Left	Thru	Right	U	TOTAL	HOURLY TOTALS
3:30 PM	19	30	0		0	45	8		0	0	0		56	0	8		166	
3:45 PM	26	24	0		0	40	9		0	0	0		53	0	9		161	
4:00 PM	21	20	0		0	28	17		0	0	0		74	0	10		170	
4:15 PM	15	16	0		0	37	8		0	0	0		70	0	6		152	649
4:30 PM	20	34	0		0	31	16		0	0	0		65	1	10		177	660
4:45 PM	19	21	0		0	41	13		0	0	0		77	1	10		182	681
5:00 PM	19	21	0		0	31	14		0	0	0		60	0	11		156	667
5:15 PM	16	21	0		0	37	9		0	0	0		71	0	8		162	677

PEAK 15-MIN FLOW RATES	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	TOTAL
All Vehicles	76	84	0		0	164	52		0	0	0		308	4	40		728
Heavy Trucks	0	0	0		0	8	0		0	0	0		0	0	4		12
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 6/27/2006

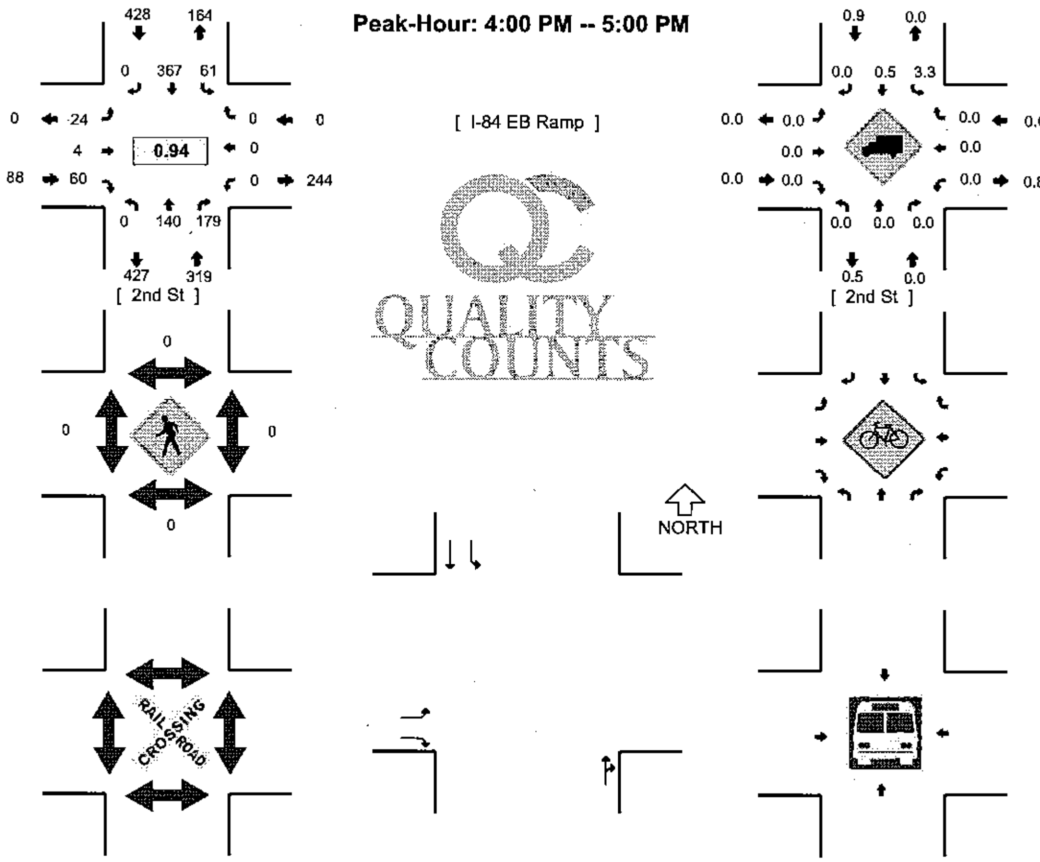
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

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

INTERSECTION: 2nd St--I-84 EB Ramp
WEATHER:

QC JOB #: 10174504
DATE: 6/18/2006

Peak-Hour: 4:00 PM -- 5:00 PM



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	2nd St (Northbound) Left	Thru	Right	U	2nd St (Southbound) Left	Thru	Right	U	I-84 EB Ramp (Eastbound) Left	Thru	Right	U	I-84 EB Ramp (Westbound) Left	Thru	Right	U	TOTAL	HOURLY TOTALS
3:30 PM	0	39	59		20	77	0		5	1	19		0	0	0		220	
3:45 PM	0	35	50		8	84	0		7	2	15		0	0	0		201	
4:00 PM	0	41	41		13	92	0		1	1	12		0	0	0		201	
4:15 PM	0	26	37		12	90	0		5	0	25		0	0	0		195	817
4:30 PM	0	46	54		14	83	0		8	2	11		0	0	0		218	815
4:45 PM	0	27	47		22	102	0		10	1	12		0	0	0		221	835
5:00 PM	0	36	29		10	82	0		6	3	13		0	0	0		179	813
5:15 PM	0	31	45		14	93	0		7	0	6		0	0	0		196	814

PEAK 15-MIN FLOW RATES	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	TOTAL
All Vehicles	0	108	188		88	408	0		40	4	48		0	0	0		884
Heavy Trucks	0	0	0		0	4	0		0	0	0		0	0	0		4
Pedestrians		0				0				0				0			0
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 6/27/2006

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of peak hour being reported: User Defined

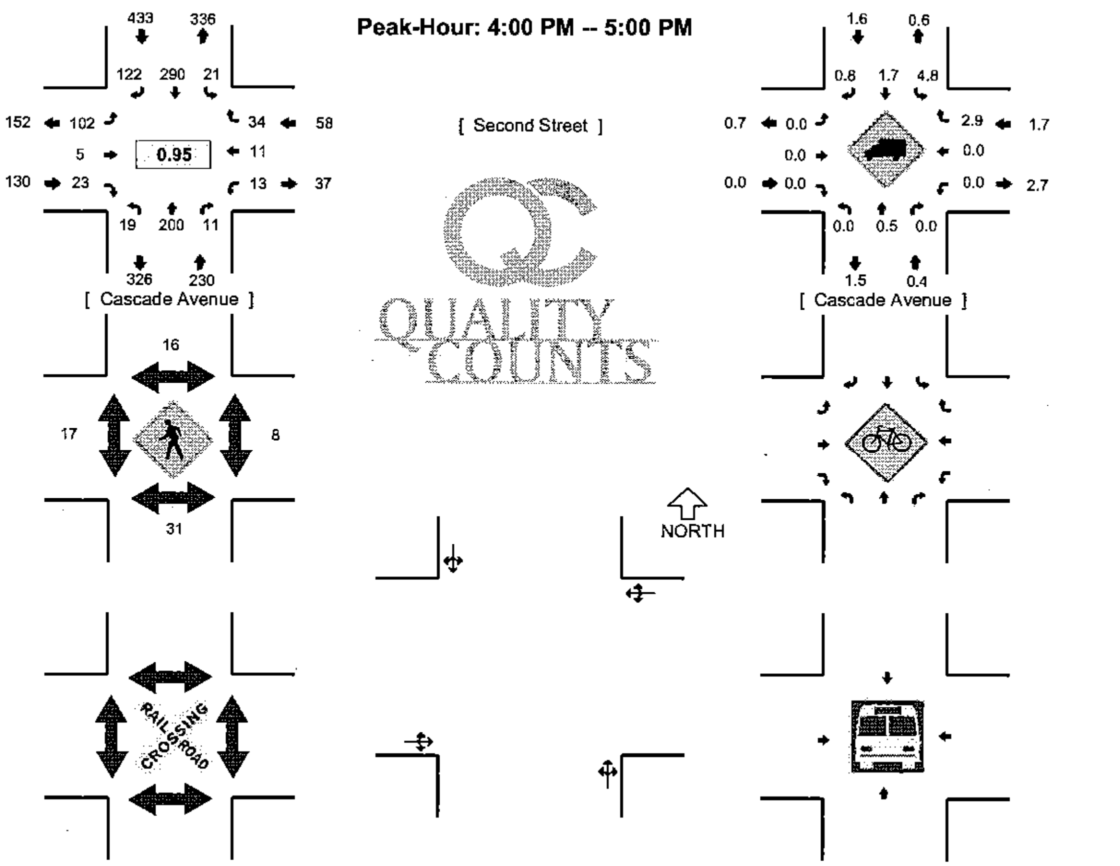
Method for determining peak hour: Total Entering Volume

INTERSECTION: Cascade Avenue--Second Street

WEATHER:

QC JOB #: 10174513

DATE: 6/18/2006



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Cascade Avenue (Northbound) Left	Thru	Right	U	Cascade Avenue (Southbound) Left	Thru	Right	U	Second Street (Eastbound) Left	Thru	Right	U	Second Street (Westbound) Left	Thru	Right	U	TOTAL	HOURLY TOTALS
3:30 PM	6	59	5		5	79	18		29	1	10		3	3	11		229	
3:45 PM	2	60	3		3	59	38		24	2	8		0	8	5		212	
4:00 PM	2	45	4		5	73	28		26	1	9		5	1	11		210	
4:15 PM	4	46	3		3	77	36		15	1	7		3	5	5		205	856
4:30 PM	7	60	4		6	70	24		29	2	4		4	1	13		224	851
4:45 PM	6	49	0		7	70	34		32	1	3		1	4	5		212	851
5:00 PM	4	46	3		4	68	27		17	1	6		5	1	5		187	828
5:15 PM	4	55	5		2	61	39		18	3	4		1	1	4		197	820

PEAK 15-MIN FLOW RATES	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	TOTAL
All Vehicles	28	240	16		24	280	96		116	8	16		16	4	52		896
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				0				8				4			12
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

Report generated on 6/27/2006

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

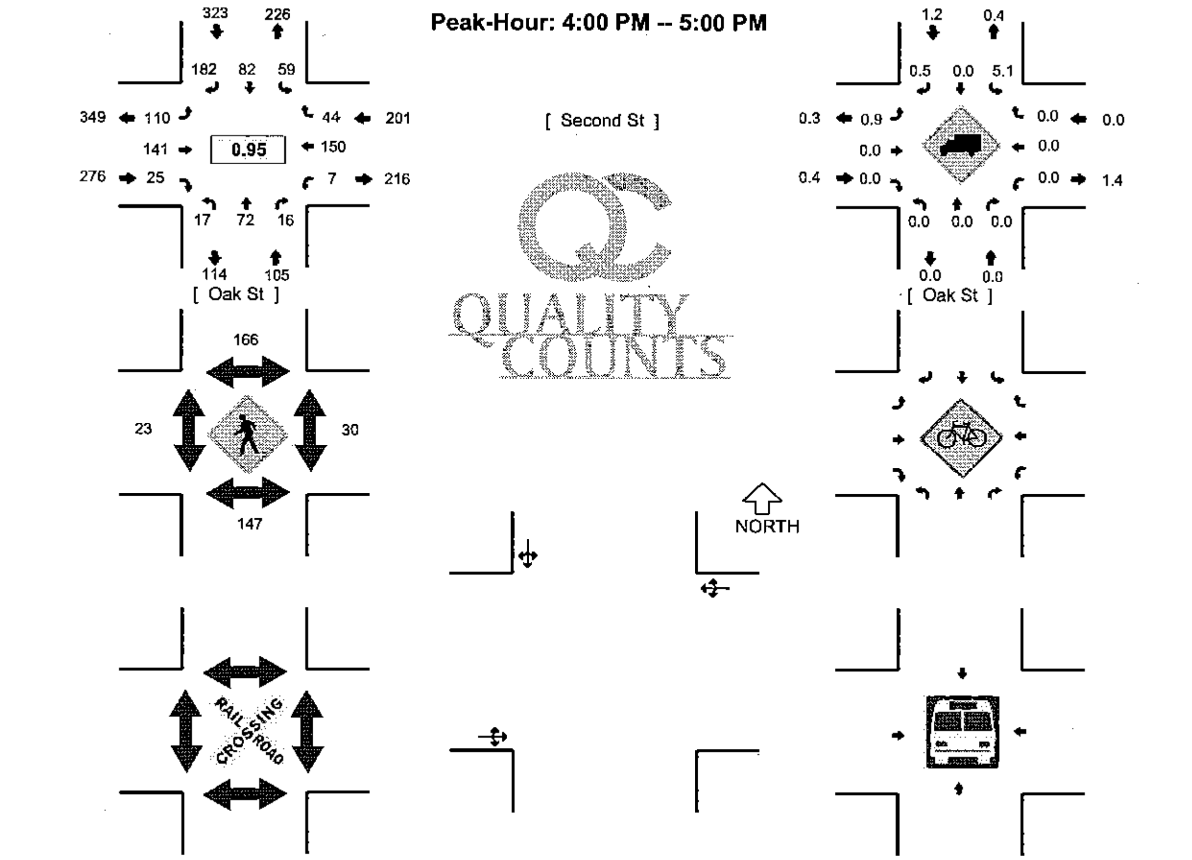
Type of peak hour being reported: User Defined

Method for determining peak hour: Total Entering Volume

INTERSECTION: Oak St--Second St
WEATHER:

QC JOB #: 10174509
DATE: 6/18/2006

Peak-Hour: 4:00 PM -- 5:00 PM



*SEE LEGEND SHEET

5-MIN COUNT PERIOD BEGINNING AT	Oak St (Northbound) Left	Thru	Right	U	Oak St (Southbound) Left	Thru	Right	U	Second St (Eastbound) Left	Thru	Right	U	Second St (Westbound) Left	Thru	Right	U	TOTAL	HOURLY TOTALS
3:30 PM	3	21	1		19	26	43		29	38	7		5	37	21		250	
3:45 PM	4	22	5		18	15	32		30	35	5		3	33	11		213	
4:00 PM	4	12	1		18	18	46		27	41	8		4	48	12		239	
4:15 PM	3	21	6		17	31	41		20	31	7		0	40	12		229	931
4:30 PM	6	21	7		11	18	45		36	43	6		3	26	11		233	914
4:45 PM	4	18	2		13	15	50		27	26	4		0	36	9		204	905
5:00 PM	2	13	2		15	24	38		25	40	1		1	28	13		202	868
5:15 PM	5	25	2		7	21	41		30	43	3		3	33	11		224	863

PEAK 15-MIN FLOW RATES	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	TOTAL
All Vehicles	16	48	4		72	72	184		108	164	32		16	192	48		956
Heavy Trucks	0	0	0		4	0	4		0	0	0		0	0	0		8
Pedestrians		96				76				16				8			196
Bicycles																	
Railroad																	
Stopped Buses																	

Counter Comments:

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 6:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
6:00 - 6:15	2	1	1	2	4	18	21	11	4	0	13	3	80
6:15 - 6:30	1	1	0	4	2	20	24	11	2	2	14	2	83
6:30 - 6:45	3	0	2	5	1	13	22	14	2	0	29	3	94
6:45 - 7:00	1	0	0	7	5	20	37	7	3	0	32	6	118
7:00 - 7:15	2	1	1	5	1	18	16	14	3	0	14	2	77
7:15 - 7:30	4	0	0	4	1	25	26	17	5	0	18	7	107
7:30 - 7:45	7	0	0	7	1	22	35	10	7	1	36	4	130
7:45 - 8:00	6	0	1	8	0	39	43	20	9	3	32	7	168
Movement Totals	26	3	5	42	15	175	224	104	35	6	188	34	857
Enter Totals	34			232			363			228			
Exit Totals	261			56			151			389			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	2	0	8	12	1	0	0	6	0	29
Medium Trucks	1	0	0	0	0	0	0	2	1	0	0	0	4
Heavy Trucks	0	0	0	0	0	2	2	1	0	0	3	0	8
% Trucks	3.8%	0.0%	0.0%	4.8%	0.0%	5.7%	6.3%	3.8%	2.9%	0.0%	4.8%	0.0%	4.8%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	1	0	0	0	0	0	0	0	1

	South	West	East	North	
Pedestrians	2	1	0	5	8

Peak Hour Information

Peak Hour 7:00 8:00

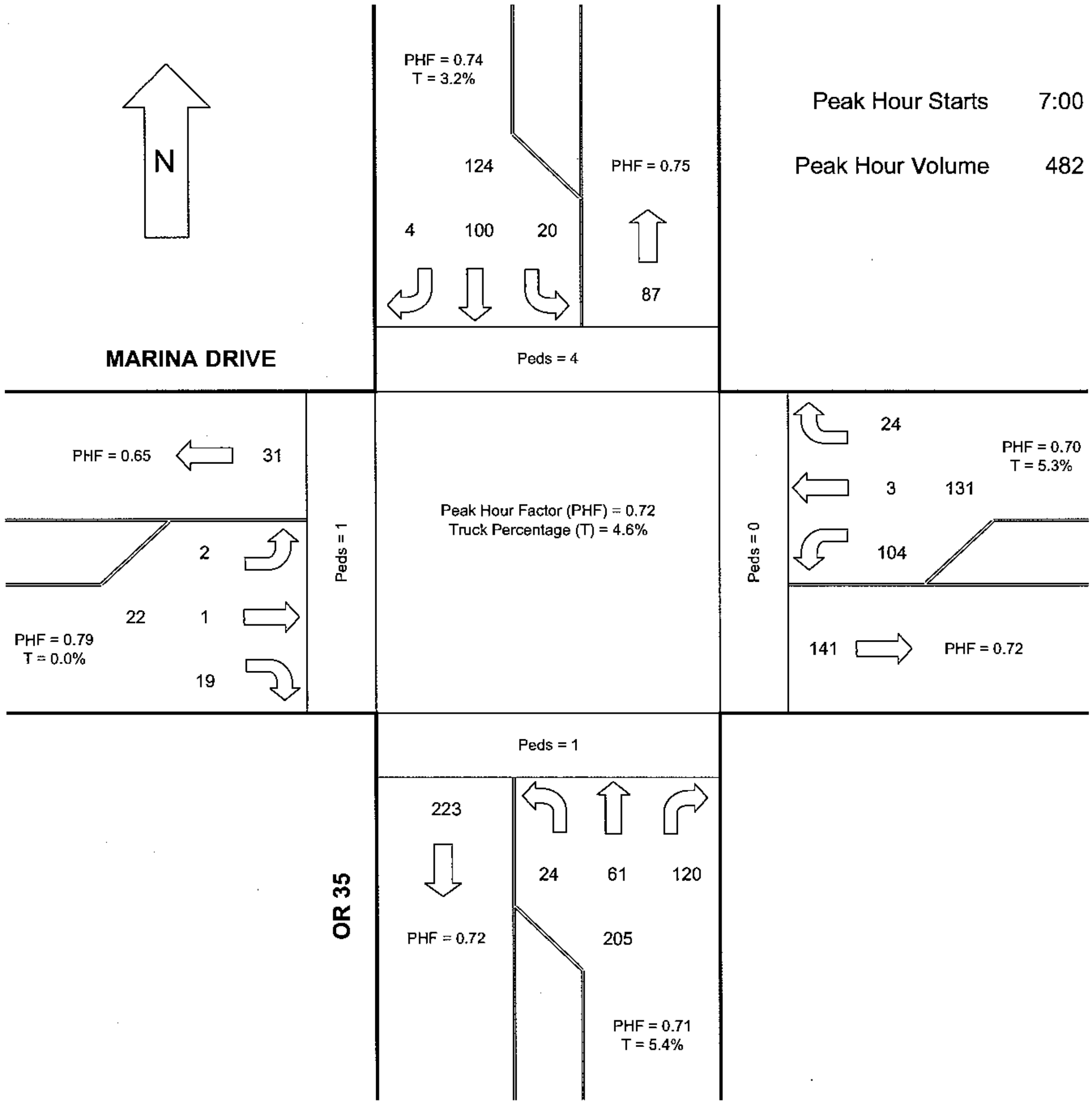
	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	19	1	2	24	3	104	120	61	24	4	100	20	482
Peak Hour Factor	0.68	0.25	0.50	0.75	0.75	0.67	0.70	0.76	0.67	0.33	0.69	0.71	0.72
Enter Totals	22			124			205			131			
Peak Hour Factor	0.79			0.74			0.71			0.70			
Exit Totals	141			223			87			31			
Peak Hour Factor	0.71			0.72			0.75			0.65			
Light Trucks	0	0	0	1	0	5	6	1	0	0	3	0	16
Medium Trucks	0	0	0	0	0	0	0	1	1	0	0	0	2
Heavy Trucks	0	0	0	0	0	1	1	1	0	0	1	0	4
% Trucks	0.0%	0.0%	0.0%	4.2%	0.0%	5.8%	5.8%	4.9%	4.2%	0.0%	4.0%	0.0%	4.6%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	1	1	0	4	6

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Peak Hour Diagram

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 6:00
Reviewed By: BV



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 8:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
8:00 - 8:15	2	0	1	7	2	35	42	19	4	1	39	5	157
8:15 - 8:30	2	1	0	13	2	44	58	28	9	4	37	5	203
8:30 - 8:45	11	1	1	7	2	48	44	37	7	2	46	12	218
8:45 - 9:00	8	4	0	5	4	42	38	45	8	2	59	10	225
9:00 - 9:15	7	0	1	7	5	40	48	57	9	1	40	5	220
9:15 - 9:30	7	1	1	7	3	52	45	47	10	4	66	7	250
9:30 - 9:45	9	3	2	14	4	43	37	57	16	6	73	11	275
9:45 - 10:00	13	4	2	14	4	49	64	55	10	2	57	3	277
Movement Totals	59	14	8	74	26	353	376	345	73	22	417	58	1825
Enter Totals	81			453			794			497			
Exit Totals	448			121			427			829			

Two-Hour Totals

	EB Right	EB Thru	EB Left	WB Right	WB Thru	WB Left	NB Right	NB Thru	NB Left	SB Right	SB Thru	SB Left	Totals
Light Trucks	0	0	0	0	0	5	4	4	0	0	4	0	17
Medium Trucks	1	0	0	1	0	0	1	2	0	0	3	0	8
Heavy Trucks	0	0	0	0	0	0	0	6	1	0	4	0	11
% Trucks	1.7%	0.0%	0.0%	1.4%	0.0%	1.4%	1.3%	3.5%	1.4%	0.0%	2.6%	0.0%	2.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	2	0	0	0	0	0	0	0	0	0	0	0	2

	South	West	East	North	
Pedestrians	10	0	1	7	18

Peak Hour Information

Peak Hour 9:00 10:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	36	8	6	42	16	184	194	216	45	13	236	26	1022
Peak Hour Factor	0.69	0.50	0.75	0.75	0.80	0.88	0.76	0.95	0.70	0.54	0.81	0.59	0.92

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	50	275	455	242
Peak Hour Factor	0.66	0.76	0.88	0.90
Exit Totals	228	456	264	74
Peak Hour Factor	0.80	0.91	0.90	0.71

	EB Right	EB Thru	EB Left	WB Right	WB Thru	WB Left	NB Right	NB Thru	NB Left	SB Right	SB Thru	SB Left	Totals
Light Trucks	0	0	0	0	0	1	1	3	0	0	3	0	8
Medium Trucks	0	0	0	1	0	0	0	0	0	0	3	0	4
Heavy Trucks	0	0	0	0	0	0	0	4	1	0	1	0	6
% Trucks	0.0%	0.0%	0.0%	2.4%	0.0%	0.5%	0.5%	3.2%	2.2%	0.0%	3.0%	0.0%	1.8%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	2	0	0	0	0	0	0	0	0	0	0	0	2

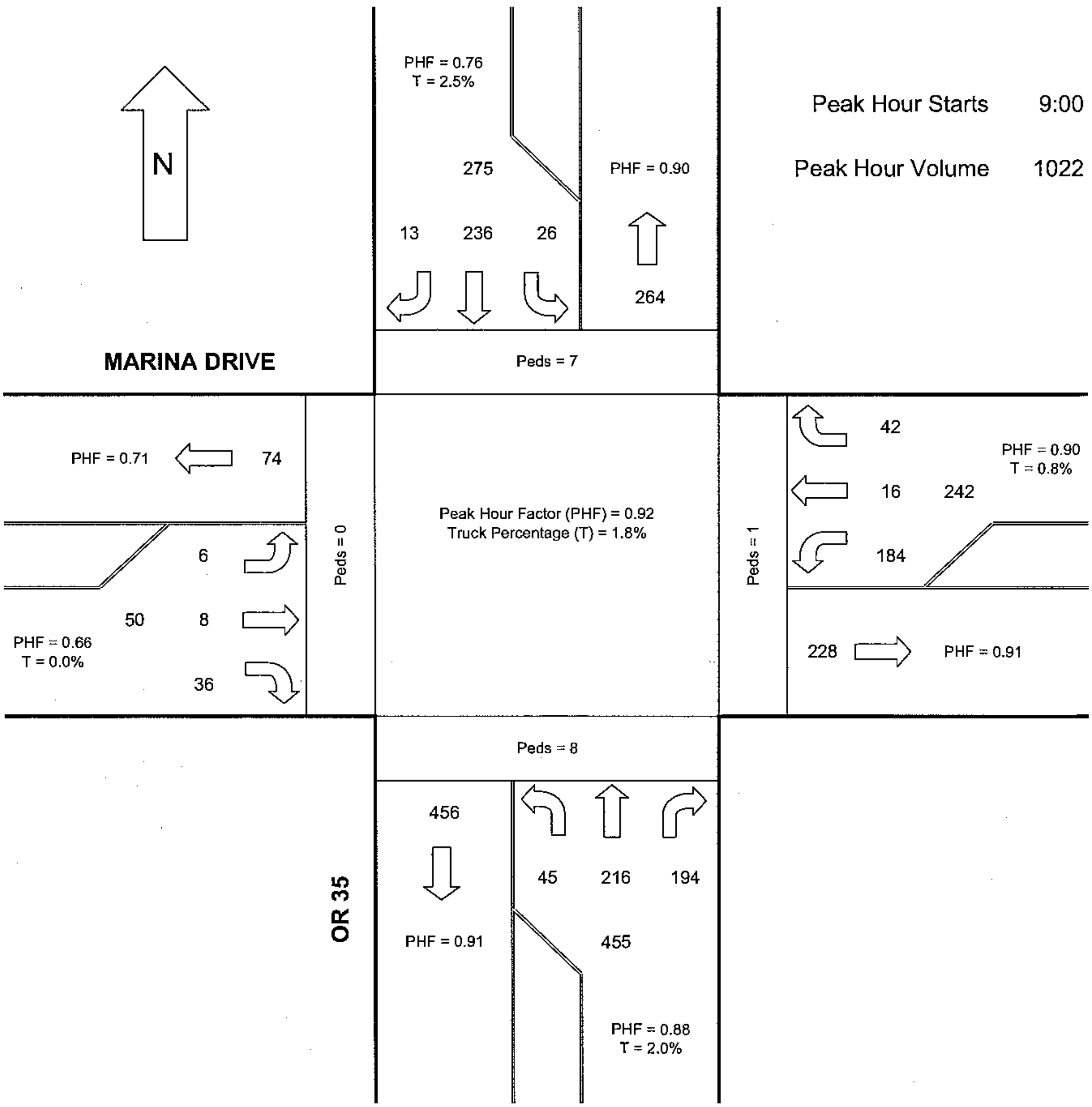
	South	West	East	North	
Pedestrians	8	0	1	7	16

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 8:00
Reviewed By: BV



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 10:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
10:00 - 10:15	9	3	1	10	3	46	45	68	14	0	71	12	282
10:15 - 10:30	7	3	1	9	3	42	43	63	17	0	63	8	259
10:30 - 10:45	11	2	1	13	5	65	61	70	7	1	69	9	314
10:45 - 11:00	16	5	2	9	7	39	53	56	12	5	67	3	274
11:00 - 11:15	10	6	2	17	3	44	50	61	17	3	73	7	293
11:15 - 11:30	13	3	1	7	4	52	45	65	14	1	69	14	288
11:30 - 11:45	11	4	3	15	5	56	63	73	24	2	62	10	328
11:45 - 12:00	12	4	0	10	3	56	58	89	24	3	55	8	322
Movement Totals	89	30	11	90	33	400	418	545	129	15	529	71	2360
Enter Totals	130			523			1092			615			
Exit Totals	519			177			646			1018			

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	1	0	0	0	8	6	15	2	0	10	1	43
Medium Trucks	1	0	0	0	0	1	2	3	1	0	3	0	11
Heavy Trucks	1	0	0	0	0	0	0	4	0	0	6	0	11
% Trucks	2.2%	3.3%	0.0%	0.0%	0.0%	2.3%	1.9%	4.0%	2.3%	0.0%	3.6%	1.4%	2.8%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	2	0	0	3	0	0	0	0	0	0	0	5

	South	West	East	North	
Pedestrians	2	0	0	1	3

Peak Hour Information

Peak Hour 11:00 12:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Movement Total	46	17	6	49	15	208	216	288	79	9	259	39	1231
Peak Hour Factor	0.88	0.71	0.50	0.72	0.75	0.93	0.86	0.81	0.82	0.75	0.89	0.70	0.94

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	69	307	583	272
Peak Hour Factor	0.96	0.91	0.85	0.89
Exit Totals	272	513	343	103
Peak Hour Factor	0.88	0.96	0.87	0.83

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	1	0	0	0	5	4	5	2	0	5	1	23
Medium Trucks	1	0	0	0	0	0	1	2	1	0	1	0	6
Heavy Trucks	0	0	0	0	0	0	0	1	0	0	3	0	4
% Trucks	2.2%	5.9%	0.0%	0.0%	0.0%	2.4%	2.3%	2.8%	3.8%	0.0%	3.5%	2.6%	2.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	1	0	0	0	0	0	0	0	1

	South	West	East	North	
Pedestrians	2	0	0	0	2

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

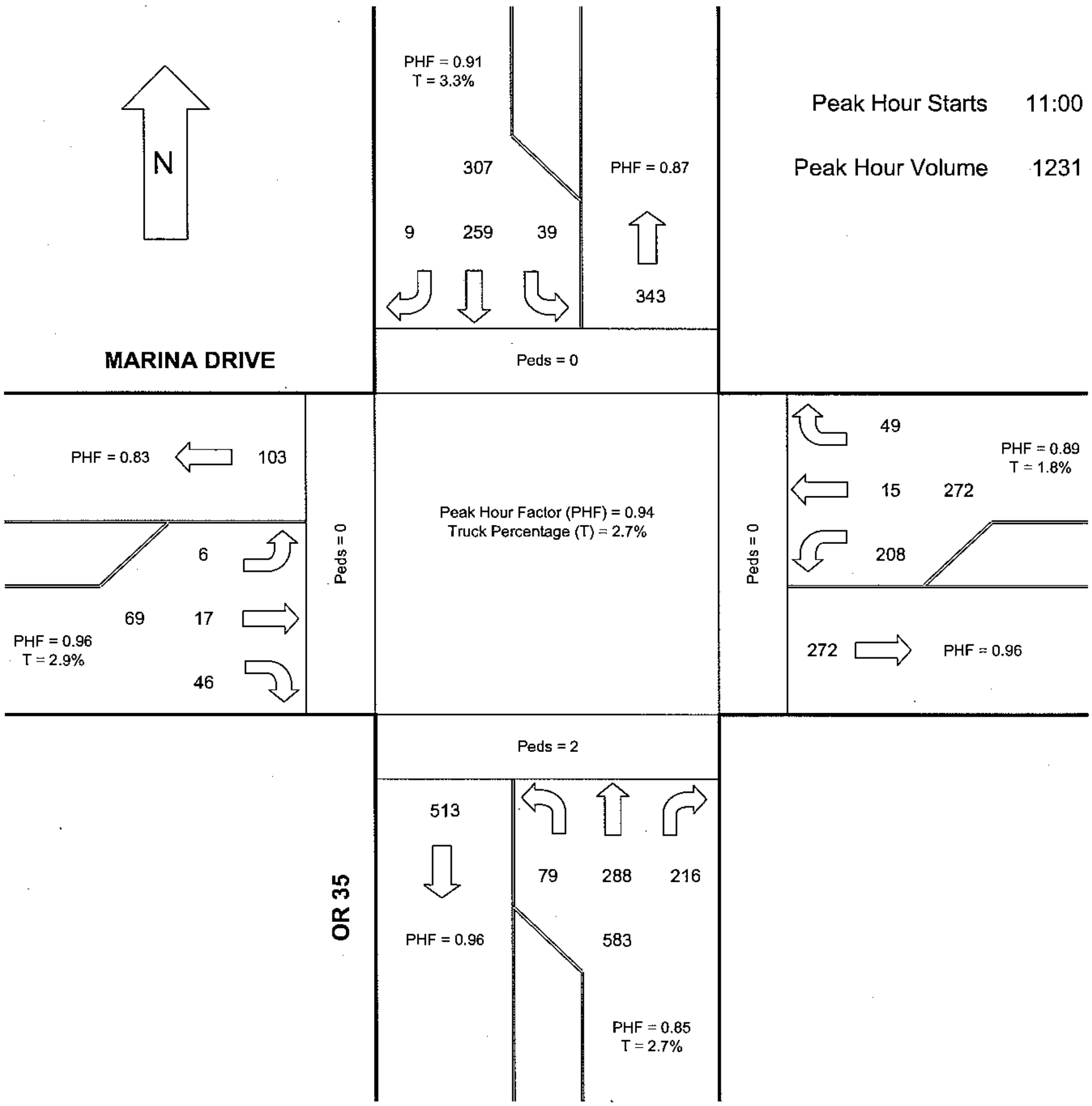
Intersection Turning Movement

Peak Hour Diagram

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 10:00
Reviewed By: BV

Peak Hour Starts 11:00

Peak Hour Volume 1231



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 12:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
12:00 - 12:15	10	3	0	8	5	60	57	81	18	9	67	3	321
12:15 - 12:30	16	1	2	10	4	45	54	89	25	2	69	6	323
12:30 - 12:45	23	2	2	10	12	57	59	95	32	6	57	9	364
12:45 - 13:00	19	10	4	9	5	56	77	84	20	1	63	4	352
13:00 - 13:15	33	6	1	14	4	52	60	89	25	4	58	6	352
13:15 - 13:30	27	6	1	11	8	43	58	96	24	5	60	4	343
13:30 - 13:45	25	3	10	15	4	52	71	79	33	6	53	9	360
13:45 - 14:00	30	8	0	18	5	58	56	87	29	3	54	2	350
Movement Totals	183	39	20	95	47	423	492	700	206	36	481	43	2765
Enter Totals	242			565			1398			560			
Exit Totals	574			289			815			1087			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	2	0	0	2	3	5	8	8	5	2	12	0	47
Medium Trucks	1	0	0	0	0	1	0	0	1	0	1	0	4
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	1	0	1
% Trucks	1.6%	0.0%	0.0%	2.1%	6.4%	1.4%	1.6%	1.1%	2.9%	5.6%	2.9%	0.0%	1.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	2	0	0	2	0	0	0	0	0	0	0	4

	South	West	East	North	
Pedestrians	2	0	0	8	10

Peak Hour Information

Peak Hour 12:30 13:30

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	102	24	8	44	29	208	254	364	101	16	238	23	1411
Peak Hour Factor	0.77	0.60	0.50	0.79	0.60	0.91	0.82	0.95	0.79	0.67	0.94	0.64	0.97

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	134	277	719	281
Peak Hour Factor	0.84	0.96	0.97	0.89
Exit Totals	301	548	416	146
Peak Hour Factor	0.83	0.96	0.96	0.73

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	1	0	0	1	3	3	3	3	3	1	5	0	23
Medium Trucks	1	0	0	0	0	0	0	0	1	0	0	0	2
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	1	0	1
% Trucks	2.0%	0.0%	0.0%	2.3%	10.3%	1.4%	1.2%	0.8%	4.0%	6.3%	2.5%	0.0%	1.8%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	1	0	0	1	0	0	0	0	0	0	0	2

	South	West	East	North	
Pedestrians	0	0	0	4	4

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 576-0628

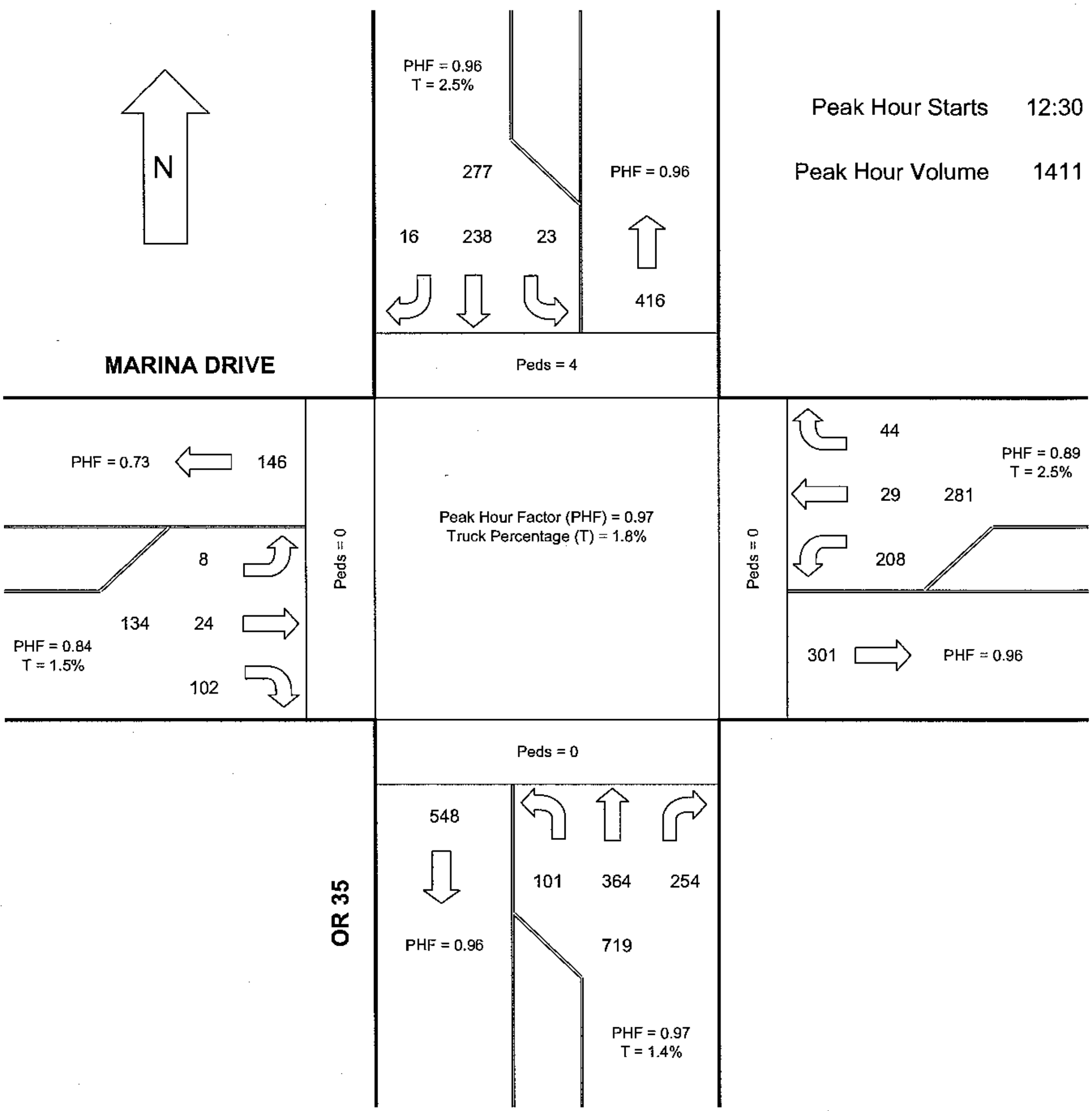
Intersection Turning Movement

Peak Hour Diagram

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 12:00
Reviewed By: BV

Peak Hour Starts 12:30

Peak Hour Volume 1411



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 14:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
14:00 - 14:15	19	12	2	15	5	55	62	100	25	6	51	10	362
14:15 - 14:30	19	9	1	17	4	63	70	82	30	8	38	5	346
14:30 - 14:45	22	4	5	5	6	57	38	72	38	4	36	6	293
14:45 - 15:00	31	10	2	8	7	38	63	71	34	2	49	5	320
15:00 - 15:15	17	2	3	10	4	64	49	88	21	2	63	8	331
15:15 - 15:30	22	7	2	10	4	64	68	95	34	10	49	6	371
15:30 - 15:45	32	2	3	20	2	71	54	94	29	3	42	8	360
15:45 - 16:00	29	3	2	7	6	66	56	85	27	3	43	8	335
Movement Totals	191	49	20	92	38	478	460	687	238	38	371	56	2718
Enter Totals	260			608			1385			465			
Exit Totals	565			314			799			1040			

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	2	1	0	3	1	7	7	9	2	1	5	2	40
Medium Trucks	1	0	0	0	0	0	0	0	1	0	1	0	3
Heavy Trucks	0	0	0	0	0	0	1	0	0	0	1	0	2
% Trucks	1.6%	2.0%	0.0%	3.3%	2.6%	1.5%	1.7%	1.3%	1.3%	2.6%	1.9%	3.6%	1.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	4	0	0	16	20

Peak Hour Information

Peak Hour 15:00 16:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Movement Total	100	14	10	47	16	265	227	362	111	18	197	30	1397
Peak Hour Factor	0.78	0.50	0.83	0.59	0.67	0.93	0.83	0.95	0.82	0.45	0.78	0.94	0.94

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	124	245	700	328
Peak Hour Factor	0.84	0.84	0.89	0.88
Exit Totals	271	562	419	145
Peak Hour Factor	0.84	0.97	0.90	0.76

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	1	1	0	3	1	5	7	6	1	1	5	2	33
Medium Trucks	1	0	0	0	0	0	0	0	1	0	0	0	2
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	1	0	1
% Trucks	2.0%	7.1%	0.0%	6.4%	6.3%	1.9%	3.1%	1.7%	1.8%	5.6%	3.0%	6.7%	2.6%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats

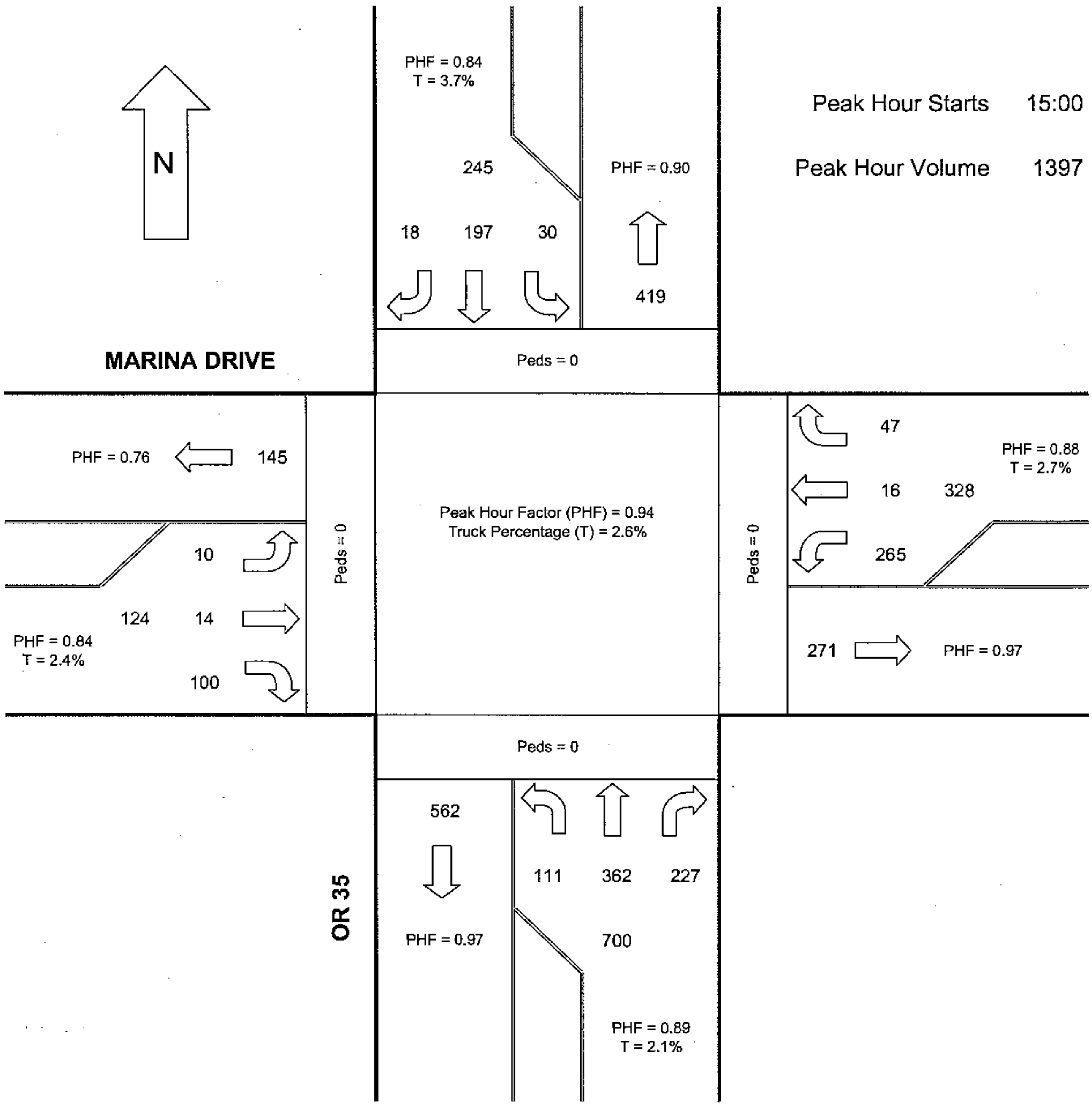
Intersection Turning Movement

Peak Hour Diagram

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 14:00
Reviewed By: BV

Peak Hour Starts 15:00

Peak Hour Volume 1397



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 16:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
16:00 - 16:15	42	3	3	5	4	64	49	80	32	4	55	7	348
16:15 - 16:30	36	9	6	12	5	54	41	71	21	4	41	6	306
16:30 - 16:45	18	10	2	10	8	57	50	81	36	8	56	8	344
16:45 - 17:00	25	7	5	12	4	52	37	104	27	1	43	10	327
17:00 - 17:15	36	7	3	8	6	47	44	84	28	3	46	7	319
17:15 - 17:30	46	3	2	9	10	40	30	91	19	2	50	8	310
17:30 - 17:45	40	3	3	14	5	46	47	81	24	7	51	8	329
17:45 - 18:00	37	2	4	13	3	44	37	82	28	1	55	2	308
Movement Totals	280	44	28	83	45	404	335	674	215	30	397	56	2591
Enter Totals	352			532			1224			483			
Exit Totals	435			290			785			1081			

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	1	0	0	0	0	6	1	9	2	0	7	0	26
Medium Trucks	1	0	0	0	0	2	0	1	1	0	1	0	6
Heavy Trucks	0	0	0	0	0	0	1	0	0	0	1	0	2
% Trucks	0.7%	0.0%	0.0%	0.0%	0.0%	2.0%	0.6%	1.5%	1.4%	0.0%	2.3%	0.0%	1.3%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	2	0	0	2	1	1	0	0	0	0	0	6

	South	West	East	North	
Pedestrians	0	0	0	6	6

Peak Hour Information

Peak Hour 16:00 17:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	121	29	16	39	21	227	177	336	116	17	195	31	1325
Peak Hour Factor	0.72	0.73	0.67	0.81	0.66	0.89	0.89	0.81	0.81	0.53	0.87	0.78	0.95

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	166	243	629	287
Peak Hour Factor	0.81	0.84	0.94	0.96
Exit Totals	237	543	391	154
Peak Hour Factor	0.87	0.84	0.81	0.74

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	1	0	0	0	0	5	1	5	1	0	6	0	19
Medium Trucks	0	0	0	0	0	2	0	1	0	0	1	0	4
Heavy Trucks	0	0	0	0	0	0	1	0	0	0	1	0	2
% Trucks	0.8%	0.0%	0.0%	0.0%	0.0%	3.1%	1.1%	1.8%	0.9%	0.0%	4.1%	0.0%	1.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	1	0	0	1	0	0	0	0	0	0	0	2

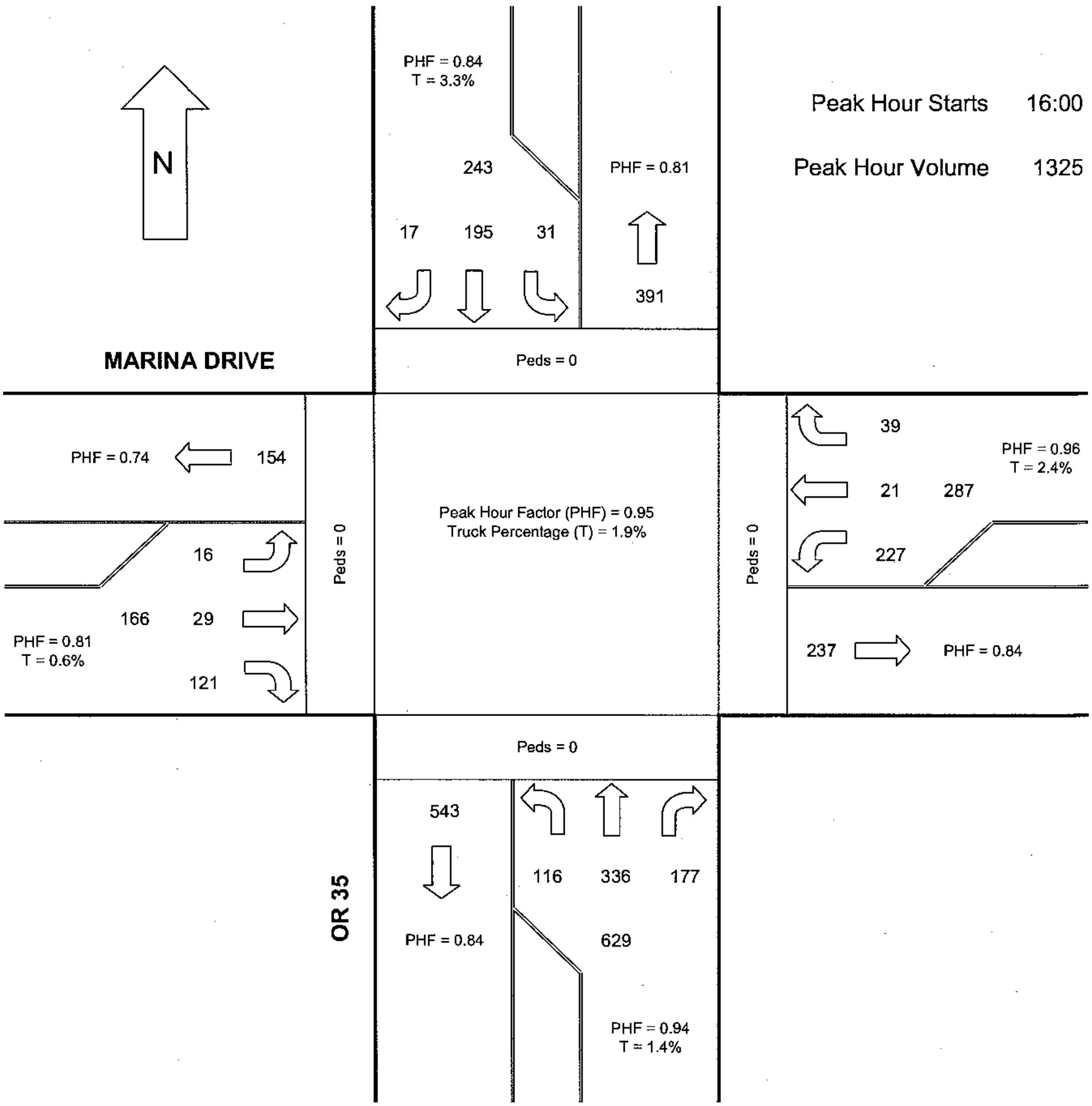
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 16:00
Reviewed By: BV



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 18:00
Reviewed By: BV

Time Period	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
18:00 - 18:15	33	4	1	6	3	31	34	69	14	2	60	7	264
18:15 - 18:30	26	1	4	4	3	31	37	58	14	4	69	9	260
18:30 - 18:45	24	3	0	8	2	31	41	54	10	3	53	4	233
18:45 - 19:00	33	3	4	11	2	24	37	48	18	6	62	3	251
19:00 - 19:15	24	2	4	2	1	47	29	82	18	3	60	13	285
19:15 - 19:30	18	1	0	9	4	24	29	54	10	2	76	6	233
19:30 - 19:45	25	2	2	5	2	27	29	53	11	6	44	8	214
19:45 - 20:00	19	4	1	3	1	29	24	57	8	1	57	2	206
Movement Totals	202	20	16	48	18	244	260	475	103	27	481	52	1946
Enter Totals	238			310			838			560			
Exit Totals	332			148			539			927			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	6	0	0	0	0	1	1	8	2	0	2	1	21
Medium Trucks	0	0	0	0	0	0	0	2	0	0	0	0	2
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	3.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%	2.1%	1.9%	0.0%	0.4%	1.9%	1.2%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	1	10	11

Peak Hour Information

Peak Hour 18:15 19:15

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Movement Total	107	9	12	25	8	133	144	242	60	16	244	29	1029
Peak Hour Factor	0.81	0.75	0.75	0.57	0.67	0.71	0.88	0.74	0.83	0.67	0.88	0.56	0.90

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	128	289	446	166
Peak Hour Factor	0.80	0.88	0.86	0.83
Exit Totals	182	484	279	84
Peak Hour Factor	0.95	0.92	0.79	0.81

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	3	0	0	0	0	1	1	3	0	0	0	0	8
Medium Trucks	0	0	0	0	0	0	0	1	0	0	0	0	1
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
% Trucks	2.8%	0.0%	0.0%	0.0%	0.0%	0.8%	0.7%	1.7%	0.0%	0.0%	0.0%	0.0%	0.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	2	2

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

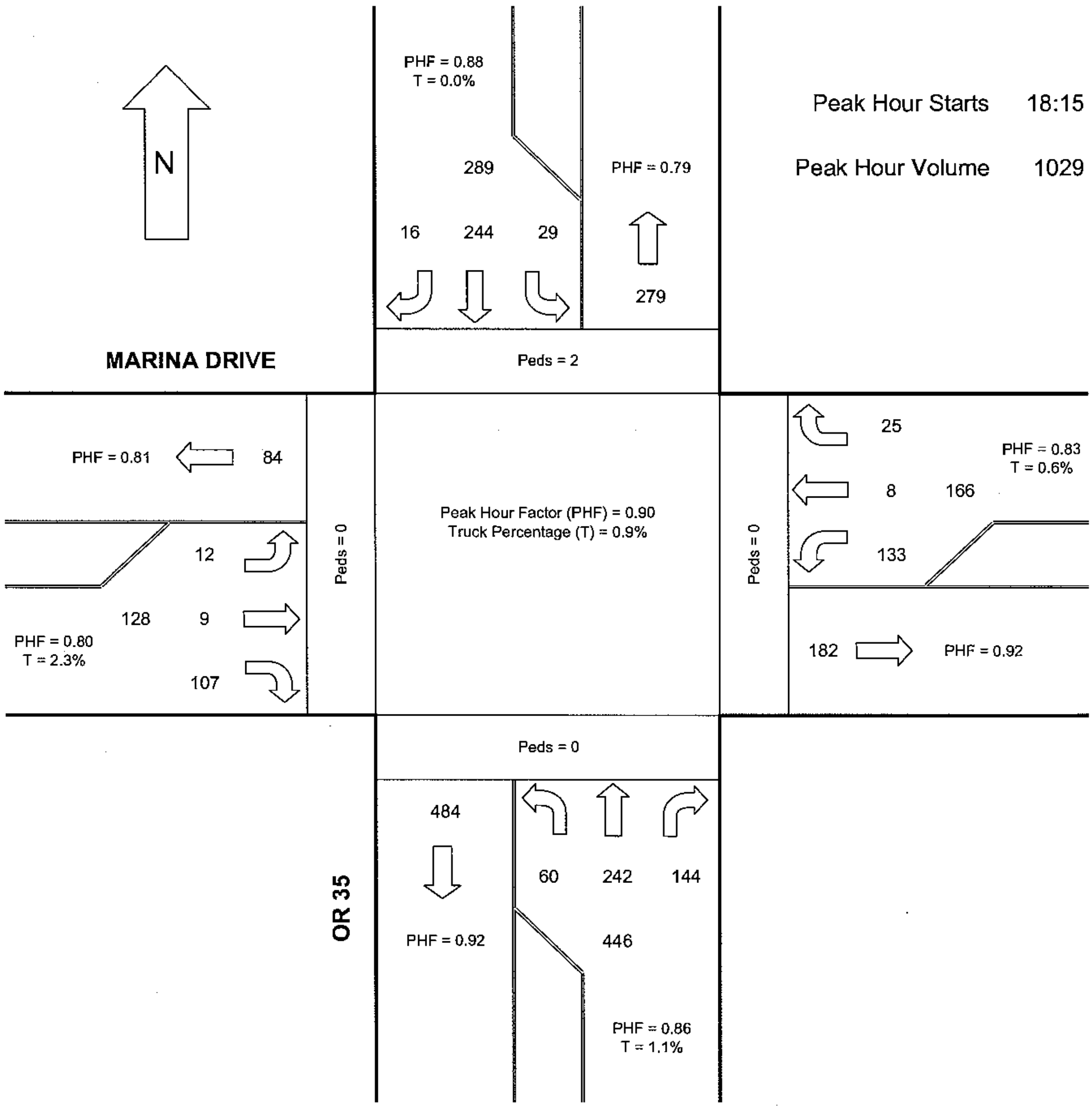
Intersection Turning Movement

Peak Hour Diagram

Location MARINA DRIVE AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 18:00
Reviewed By: BV

Peak Hour Starts 18:15

Peak Hour Volume 1029



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 6:00
Reviewed By: DH

Time Period	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
6:00 - 6:15	0	0	2	6	0	0	0	31	1	24	11	0	75
6:15 - 6:30	0	0	0	5	1	2	0	29	3	17	18	0	75
6:30 - 6:45	0	0	0	11	0	2	0	28	5	28	17	0	91
6:45 - 7:00	0	0	0	13	0	0	0	34	4	34	20	0	105
7:00 - 7:15	0	0	0	9	0	0	0	24	3	23	10	0	69
7:15 - 7:30	0	0	0	11	0	4	0	40	7	29	19	0	110
7:30 - 7:45	0	0	0	8	0	6	0	41	7	31	36	0	129
7:45 - 8:00	0	0	0	12	0	5	0	60	6	49	30	0	162
Movement Totals	0	0	2	75	1	19	0	287	36	235	161	0	816
Enter Totals	2			95			323			396			
Exit Totals	0			272			364			180			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	6	1	0	0	7	3	6	3	0	26
Medium Trucks	0	0	0	0	0	0	0	0	1	0	1	0	2
Heavy Trucks	0	0	0	0	0	3	0	6	0	4	1	0	14
% Trucks	NA	NA	0.0%	8.0%	100.0%	15.8%	NA	4.5%	11.1%	4.3%	3.1%	NA	5.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	1	0	0	1

Peak Hour Information

Peak Hour 7:00 8:00

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Movement Total	0	0	0	40	0	15	0	165	23	132	95	0	470
Peak Hour Factor	NA	NA	NA	0.83	NA	0.63	NA	0.69	0.82	0.67	0.66	NA	0.73

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	0	227	188	55
Peak Hour Factor	NA	0.72	0.71	0.81
Exit Totals	0	110	205	155
Peak Hour Factor	NA	0.65	0.71	0.70

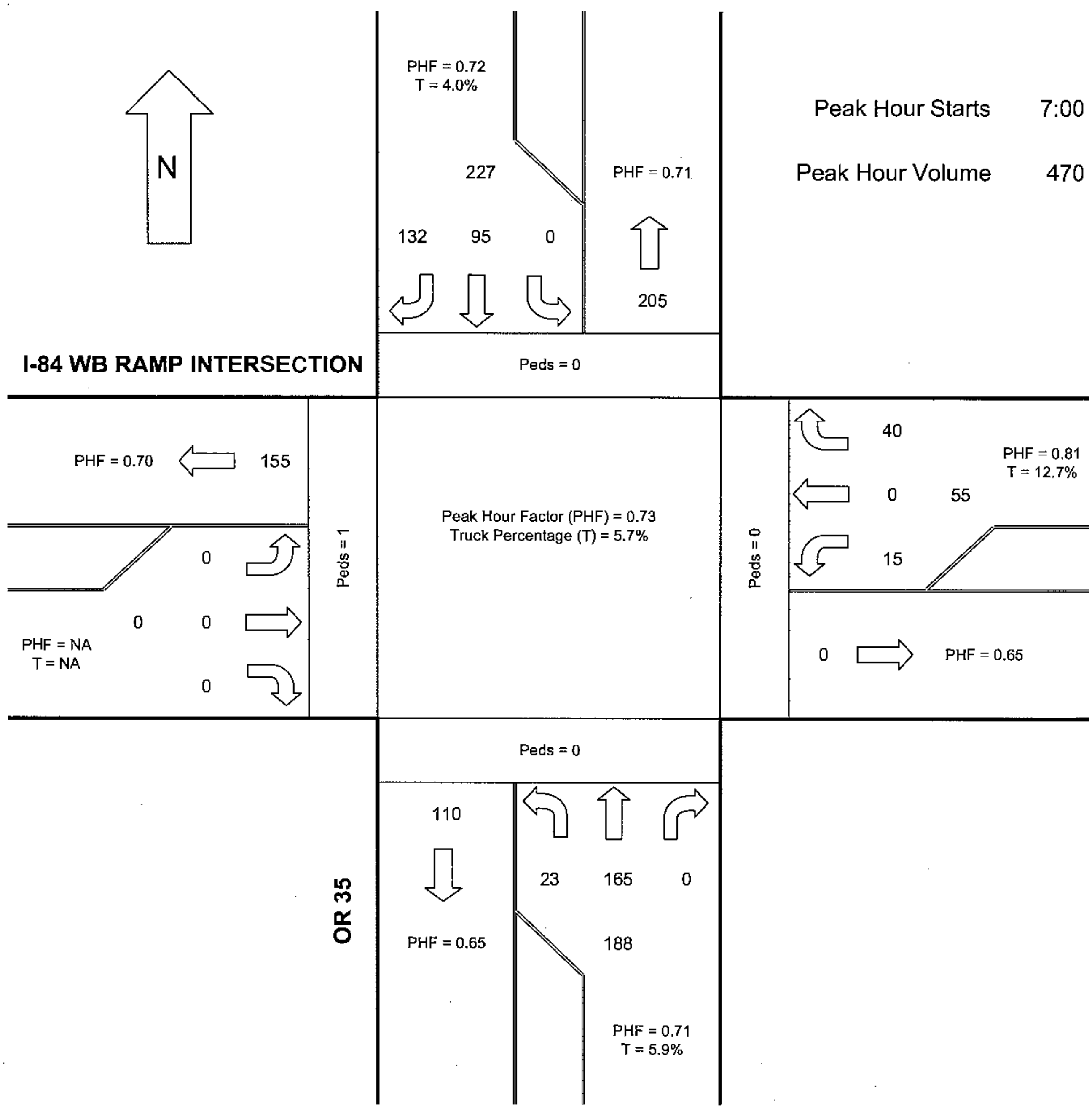
	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	4	0	0	0	4	3	2	3	0	16
Medium Trucks	0	0	0	0	0	0	0	0	1	0	1	0	2
Heavy Trucks	0	0	0	0	0	3	0	3	0	3	0	0	9
% Trucks	NA	NA	NA	10.0%	NA	20.0%	NA	4.2%	17.4%	3.8%	4.2%	NA	5.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	1	0	0	1

TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 926-0628

Intersection Turning Movement
Peak Hour Diagram

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 6:00
Reviewed By: DH



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Summary Report

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 8:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
8:00 - 8:15	0	0	0	16	1	8	0	48	9	51	28	0	161
8:15 - 8:30	0	0	0	18	2	4	0	79	11	51	37	0	202
8:30 - 8:45	0	0	0	9	0	5	0	79	12	55	46	0	206
8:45 - 9:00	0	0	0	17	0	10	0	81	15	80	52	0	255
9:00 - 9:15	0	0	0	25	1	12	0	93	16	62	35	0	244
9:15 - 9:30	0	0	0	15	0	11	0	89	8	78	46	0	247
9:30 - 9:45	0	0	0	18	0	7	0	93	5	78	73	0	274
9:45 - 10:00	0	0	0	22	2	6	0	111	24	76	62	0	303
Movement Totals	0	0	0	140	6	63	0	673	100	531	379	0	1892
Enter Totals	0			209			773			910			
Exit Totals	0			637			813			442			

Two-Hour Totals

Light Trucks	0	0	0	2	0	2	0	10	0	7	8	0	29
Medium Trucks	0	0	0	0	0	2	0	3	0	0	1	0	6
Heavy Trucks	0	0	0	2	1	3	0	5	3	4	1	0	19
% Trucks	NA	NA	NA	2.9%	16.7%	11.1%	NA	2.7%	3.0%	2.1%	2.6%	NA	2.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	3	0	3

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 9:00 10:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	0	0	80	3	36	0	386	53	294	216	0	1068
Peak Hour Factor	NA	NA	NA	0.80	0.38	0.75	NA	0.87	0.55	0.94	0.74	NA	0.88

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	0	510	439	119
Peak Hour Factor	NA	0.84	0.81	0.78
Exit Totals	0	252	466	350
Peak Hour Factor	NA	0.79	0.88	0.86

Light Trucks	0	0	0	1	0	2	0	4	0	2	5	0	14
Medium Trucks	0	0	0	0	0	0	0	0	0	0	1	0	1
Heavy Trucks	0	0	0	2	1	1	0	3	1	2	0	0	10
% Trucks	NA	NA	NA	3.8%	33.3%	8.3%	NA	1.8%	1.9%	1.4%	2.8%	NA	2.3%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	3	0	3

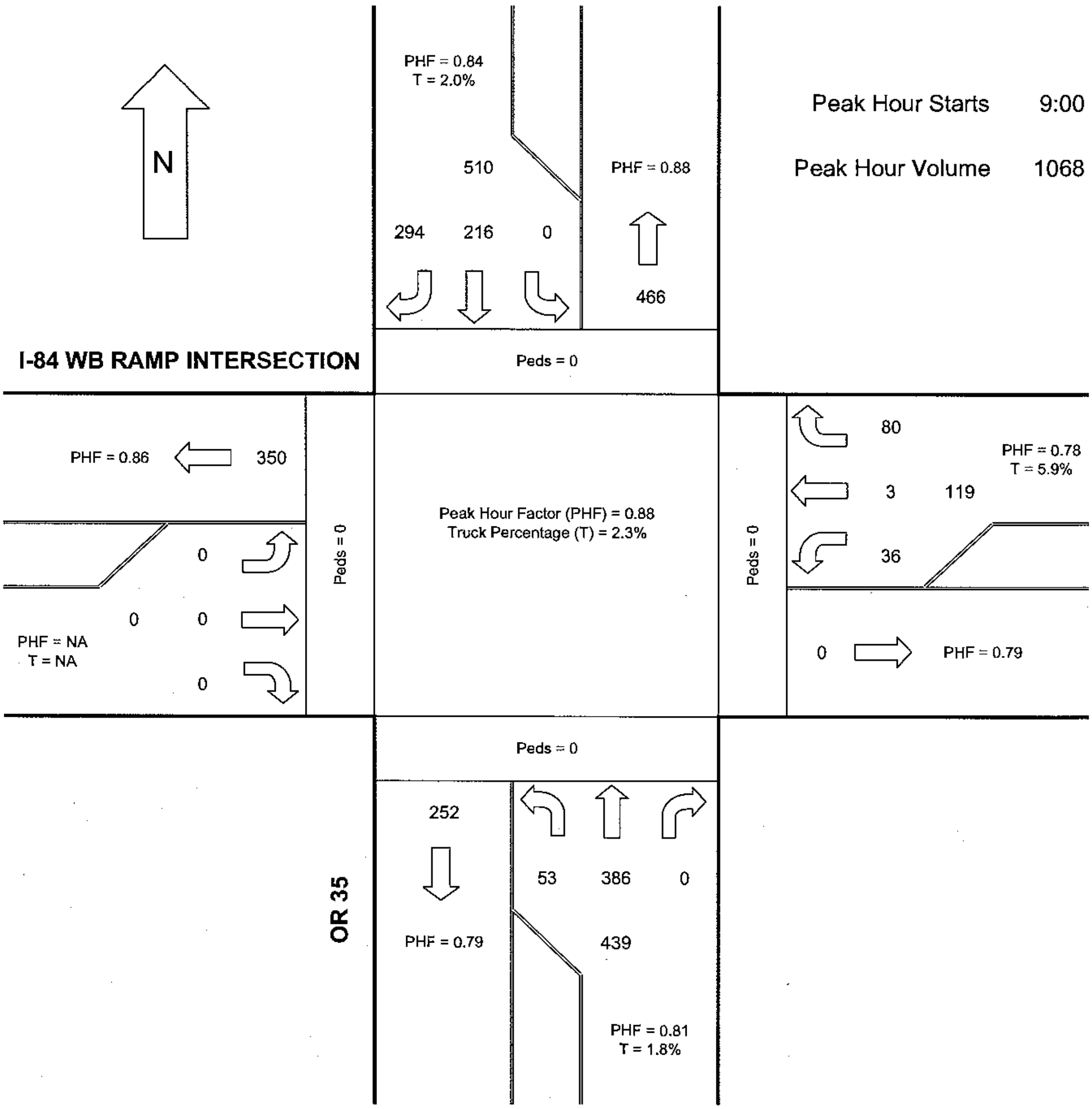
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 8:00
Reviewed By: DH



TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 10:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
10:00 - 10:15	0	0	0	17	0	13	0	108	12	88	59	0	297
10:15 - 10:30	0	0	0	17	1	17	0	98	13	81	55	0	282
10:30 - 10:45	0	0	0	20	1	11	0	127	11	94	67	0	331
10:45 - 11:00	0	0	0	13	0	14	0	110	17	81	48	0	283
11:00 - 11:15	0	0	0	15	1	11	0	98	11	67	50	0	253
11:15 - 11:30	0	0	0	25	1	13	0	98	16	87	59	0	299
11:30 - 11:45	0	0	0	21	0	11	0	134	16	80	62	0	324
11:45 - 12:00	0	0	0	29	0	25	0	126	12	75	72	0	339
Movement Totals	0	0	0	157	4	115	0	899	108	653	472	0	2408
Enter Totals	0			276			1007			1125			
Exit Totals	0			765			1056			587			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	4	0	1	0	18	4	11	10	0	48
Medium Trucks	0	0	0	0	0	2	0	2	0	1	1	0	6
Heavy Trucks	0	0	0	0	0	1	0	6	4	5	3	0	19
% Trucks	NA	NA	NA	2.5%	0.0%	3.5%	NA	2.9%	7.4%	2.6%	3.0%	NA	3.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 11:00 12:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	0	0	90	2	60	0	456	55	309	243	0	1215
Peak Hour Factor	NA	NA	NA	0.78	0.50	0.60	NA	0.85	0.86	0.89	0.84	NA	0.90

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	0	552	511	152
Peak Hour Factor	NA	0.94	0.85	0.70
Exit Totals	0	303	546	366
Peak Hour Factor	NA	0.78	0.88	0.88

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	2	0	0	0	7	2	4	8	0	23
Medium Trucks	0	0	0	0	0	1	0	2	0	0	0	0	3
Heavy Trucks	0	0	0	0	0	1	0	3	4	3	1	0	12
% Trucks	NA	NA	NA	2.2%	0.0%	3.3%	NA	2.6%	10.9%	2.3%	3.7%	NA	3.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

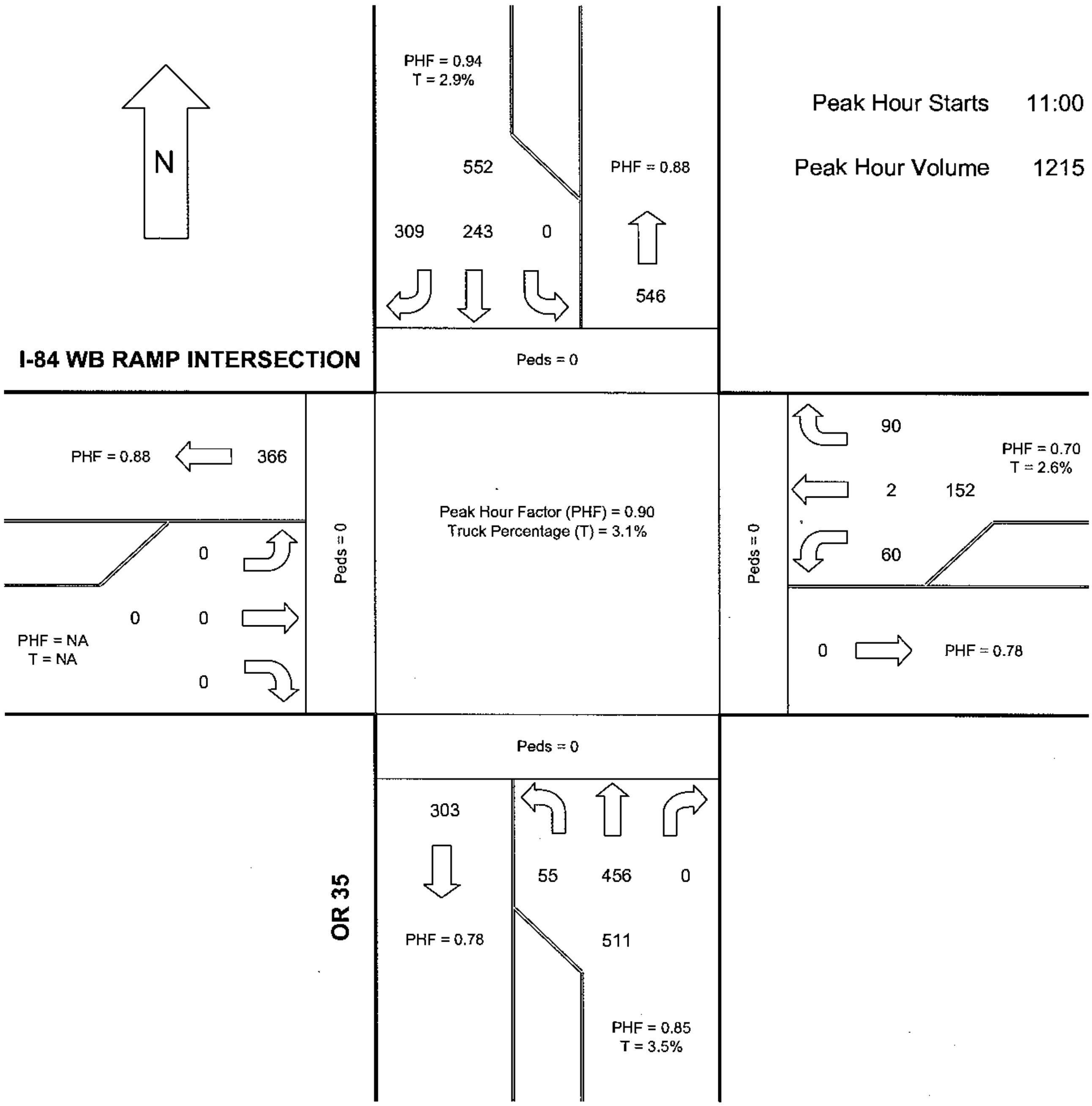
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 10:00
Reviewed By: DH



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 12:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
12:00 - 12:15	0	0	0	27	0	12	0	132	15	92	54	0	332
12:15 - 12:30	0	0	0	24	0	17	0	143	15	93	53	0	345
12:30 - 12:45	0	0	0	21	0	15	0	158	9	97	51	0	351
12:45 - 13:00	0	0	0	25	0	17	0	155	11	92	55	0	355
13:00 - 13:15	0	0	0	27	1	27	0	144	14	112	65	0	390
13:15 - 13:30	0	0	0	26	0	21	0	145	13	87	61	0	353
13:30 - 13:45	0	0	0	21	0	29	0	157	16	97	55	0	375
13:45 - 14:00	0	0	0	19	1	20	0	147	12	104	68	0	371
Movement Totals	0	0	0	190	2	158	0	1181	105	774	462	0	2872
Enter Totals	0			350			1286			1236			
Exit Totals	0			881			1371			620			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	7	0	6	0	21	3	11	5	0	53
Medium Trucks	0	0	0	0	0	0	0	1	2	1	2	0	6
Heavy Trucks	0	0	0	0	0	1	0	0	0	1	0	0	2
% Trucks	NA	NA	NA	3.7%	0.0%	4.4%	NA	1.9%	4.8%	1.7%	1.5%	NA	2.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	5	0	0	0	0	5

	South	West	East	North	
Pedestrians	0	0	1	0	1

Peak Hour Information

Peak Hour 13:00 14:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	0	0	93	2	97	0	593	55	400	249	0	1489
Peak Hour Factor	NA	NA	NA	0.86	0.50	0.84	NA	0.94	0.86	0.89	0.92	NA	0.95

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	0	649	648	192
Peak Hour Factor	NA	0.92	0.94	0.87
Exit Totals	0	346	686	457
Peak Hour Factor	NA	0.94	0.96	0.90

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	6	0	2	0	6	1	8	3	0	26
Medium Trucks	0	0	0	0	0	0	0	1	1	0	1	0	3
Heavy Trucks	0	0	0	0	0	1	0	0	0	1	0	0	2
% Trucks	NA	NA	NA	6.5%	0.0%	3.1%	NA	1.2%	3.6%	2.3%	1.6%	NA	2.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	3	0	0	0	0	3

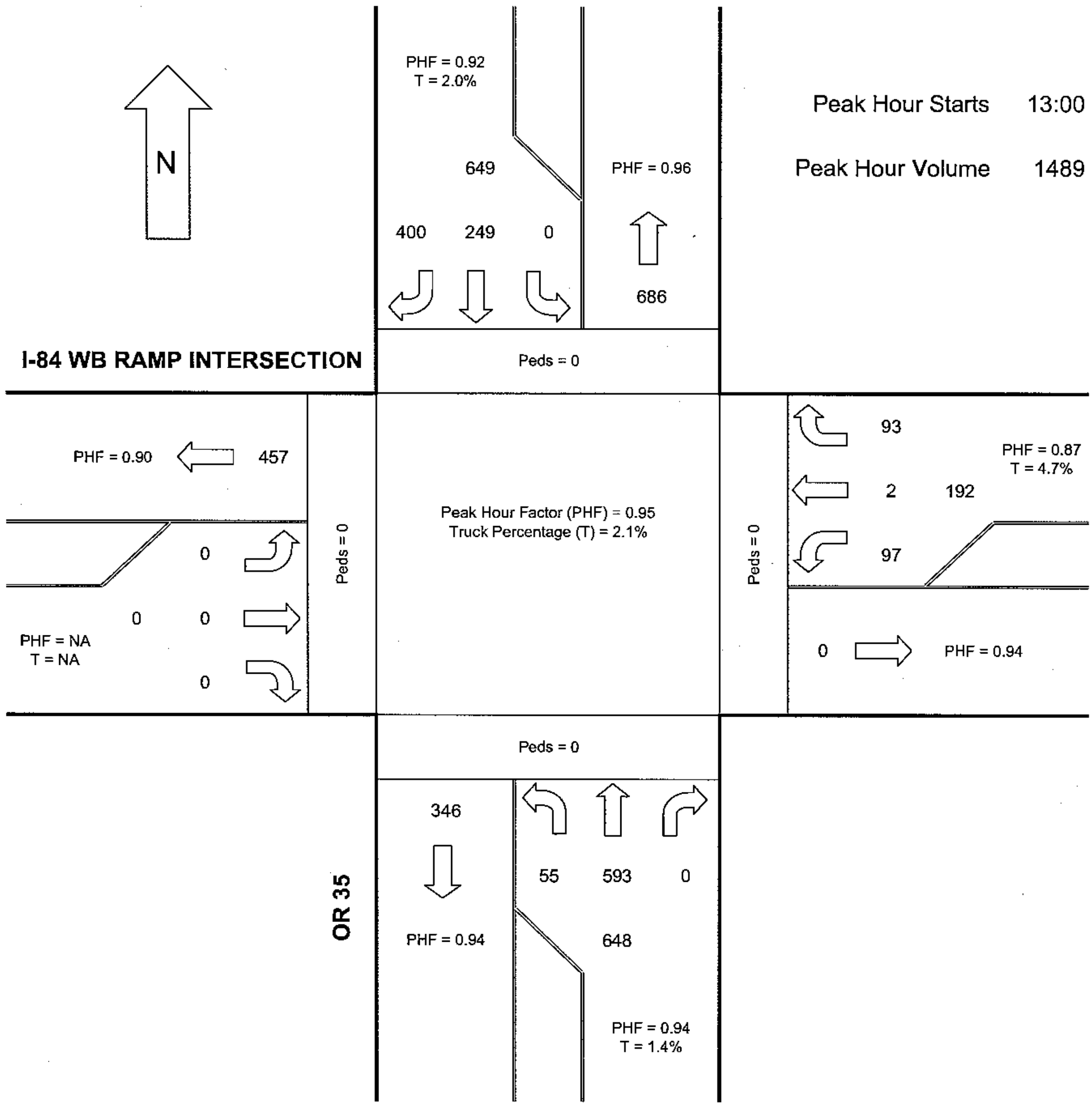
	South	West	East	North	
Pedestrians	0	0	0	0	0

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 12:00
Reviewed By: BV



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 14:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
14:00 - 14:15	0	0	0	24	0	15	0	157	14	100	48	0	358
14:15 - 14:30	0	0	0	31	1	12	0	150	8	94	62	0	358
14:30 - 14:45	0	0	0	24	0	14	0	128	21	84	48	0	319
14:45 - 15:00	0	0	0	24	1	12	0	137	15	102	57	0	348
15:00 - 15:15	0	0	0	29	0	20	0	129	22	99	66	0	365
15:15 - 15:30	0	0	0	32	0	14	0	143	17	101	62	0	369
15:30 - 15:45	0	0	0	21	0	17	0	138	16	118	73	0	383
15:45 - 16:00	0	0	0	19	2	27	0	143	14	103	64	0	372
Movement Totals	0	0	0	204	4	131	0	1125	127	801	480	0	2872
Enter Totals	0			339			1252			1281			
Exit Totals	0			932			1329			611			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	5	0	1	0	16	0	13	9	0	44
Medium Trucks	0	0	0	1	0	0	0	0	0	1	1	0	3
Heavy Trucks	0	0	0	0	0	2	0	1	5	1	0	0	9
% Trucks	NA	NA	NA	2.9%	0.0%	2.3%	NA	1.5%	3.9%	1.9%	2.1%	NA	1.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 15:00 16:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	0	0	101	2	78	0	553	69	421	265	0	1489
Peak Hour Factor	NA	NA	NA	0.79	0.25	0.72	NA	0.97	0.78	0.89	0.91	NA	0.97

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	0	686	622	181
Peak Hour Factor	NA	0.90	0.97	0.92
Exit Totals	0	343	654	492
Peak Hour Factor	NA	0.94	0.93	0.92

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	5	0	0	0	10	0	11	5	0	31
Medium Trucks	0	0	0	1	0	0	0	0	0	1	0	0	2
Heavy Trucks	0	0	0	0	0	1	0	0	1	1	0	0	3
% Trucks	NA	NA	NA	5.9%	0.0%	1.3%	NA	1.8%	1.4%	3.1%	1.9%	NA	2.4%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

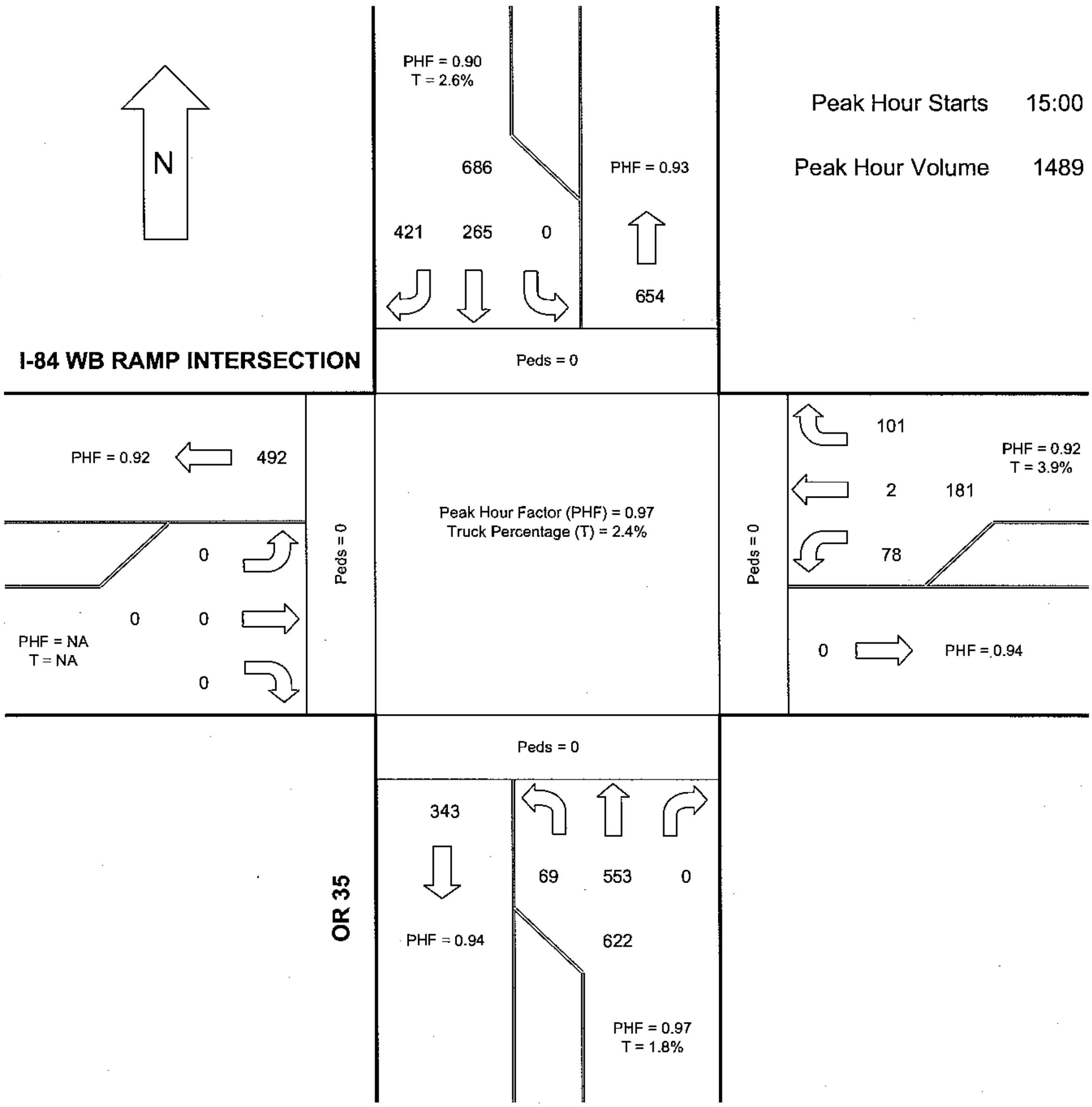
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 14:00
Reviewed By: BV



TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 16:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
16:00 - 16:15	0	0	0	23	0	15	0	136	15	107	73	0	369
16:15 - 16:30	0	0	0	14	2	14	0	126	14	111	46	0	327
16:30 - 16:45	0	0	0	20	1	20	0	137	19	105	59	0	361
16:45 - 17:00	0	0	0	11	0	21	0	142	21	93	52	0	340
17:00 - 17:15	0	0	0	18	3	15	0	131	15	104	55	0	341
17:15 - 17:30	0	0	0	20	0	9	0	111	19	100	56	0	315
17:30 - 17:45	0	0	0	19	1	18	0	127	21	104	53	0	343
17:45 - 18:00	0	0	0	19	1	12	0	132	17	96	63	0	340
Movement Totals	0	0	0	144	8	124	0	1042	141	820	457	0	2736
Enter Totals	0			276			1183			1277			
Exit Totals	0			969			1186			581			
Two-Hour Totals													
Light Trucks	0	0	0	3	0	2	0	9	1	13	2	0	30
Medium Trucks	0	0	0	2	0	0	0	0	1	2	0	0	5
Heavy Trucks	0	0	0	0	1	1	0	1	3	1	1	0	8
% Trucks	NA	NA	NA	3.5%	12.5%	2.4%	NA	1.0%	3.5%	2.0%	0.7%	NA	1.6%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	1	0	1

	South	West	East	North	
Pedestrians	0	0	3	0	3

Peak Hour Information

Peak Hour 16:00 17:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	0	0	68	3	70	0	541	69	416	230	0	1397
Peak Hour Factor	NA	NA	NA	0.74	0.38	0.83	NA	0.95	0.82	0.94	0.79	NA	0.95
Enter Totals	0			646			610			141			
Peak Hour Factor	NA			0.90			0.94			0.86			
Exit Totals	0			300			609			488			
Peak Hour Factor	NA			0.85			0.96			0.96			
Light Trucks	0	0	0	2	0	2	0	3	1	10	2	0	20
Medium Trucks	0	0	0	1	0	0	0	0	1	1	0	0	3
Heavy Trucks	0	0	0	0	0	1	0	1	2	0	1	0	5
% Trucks	NA	NA	NA	4.4%	0.0%	4.3%	NA	0.7%	5.8%	2.6%	1.3%	NA	2.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

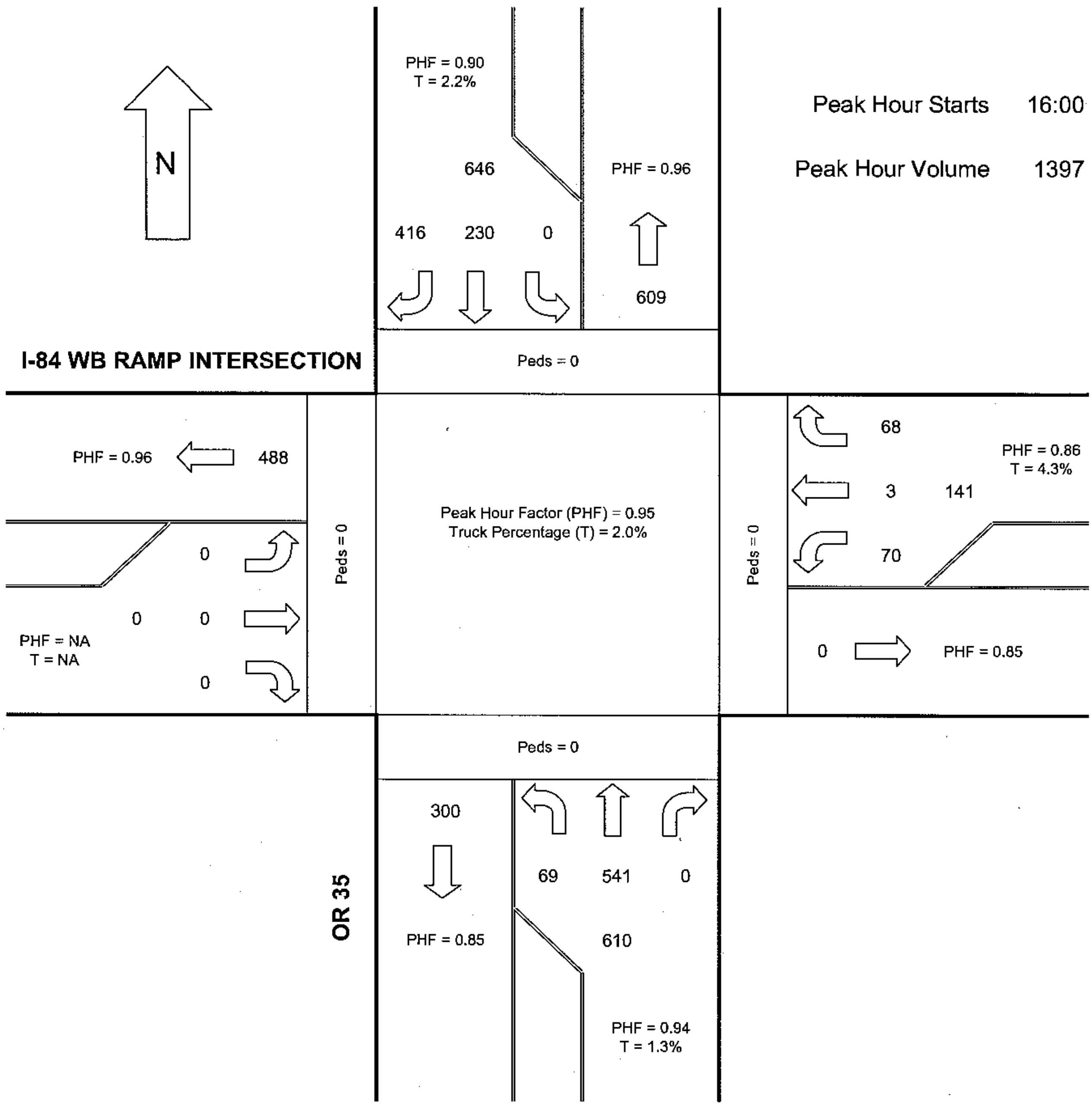
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 16:00
Reviewed By: DH



TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 18:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
18:00 - 18:15	0	0	0	20	2	8	0	80	13	83	51	0	257
18:15 - 18:30	0	0	0	17	0	8	0	94	13	98	43	0	273
18:30 - 18:45	0	0	0	15	0	10	0	91	9	73	43	0	241
18:45 - 19:00	0	0	0	10	1	12	0	86	8	93	41	0	251
19:00 - 19:15	0	0	0	19	0	4	0	110	13	108	38	0	292
19:15 - 19:30	0	0	0	11	1	4	0	84	14	93	41	0	248
19:30 - 19:45	0	0	0	9	0	8	0	84	3	73	35	0	212
19:45 - 20:00	0	0	0	14	0	15	0	73	11	74	38	0	225
Movement Totals	0	0	0	115	4	69	0	702	84	695	330	0	1999
Enter Totals	0			188			786			1025			
Exit Totals	0			783			817			399			

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	0	0	1	0	0	0	11	0	8	3	0	23
Medium Trucks	0	0	0	0	0	0	0	1	0	0	0	0	1
Heavy Trucks	0	0	0	0	0	0	0	1	1	0	0	0	2
% Trucks	NA	NA	NA	0.9%	0.0%	0.0%	NA	1.9%	1.2%	1.2%	0.9%	NA	1.3%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 18:15 19:15

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	0	0	61	1	34	0	381	43	372	165	0	1057
Peak Hour Factor	NA	NA	NA	0.80	0.25	0.71	NA	0.87	0.83	0.86	0.96	NA	0.90

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	0	537	424	96
Peak Hour Factor	NA	0.92	0.86	0.96

	Eastbound	Westbound	Northbound	Southbound
Exit Totals	0	199	442	416
Peak Hour Factor	NA	0.94	0.86	0.86

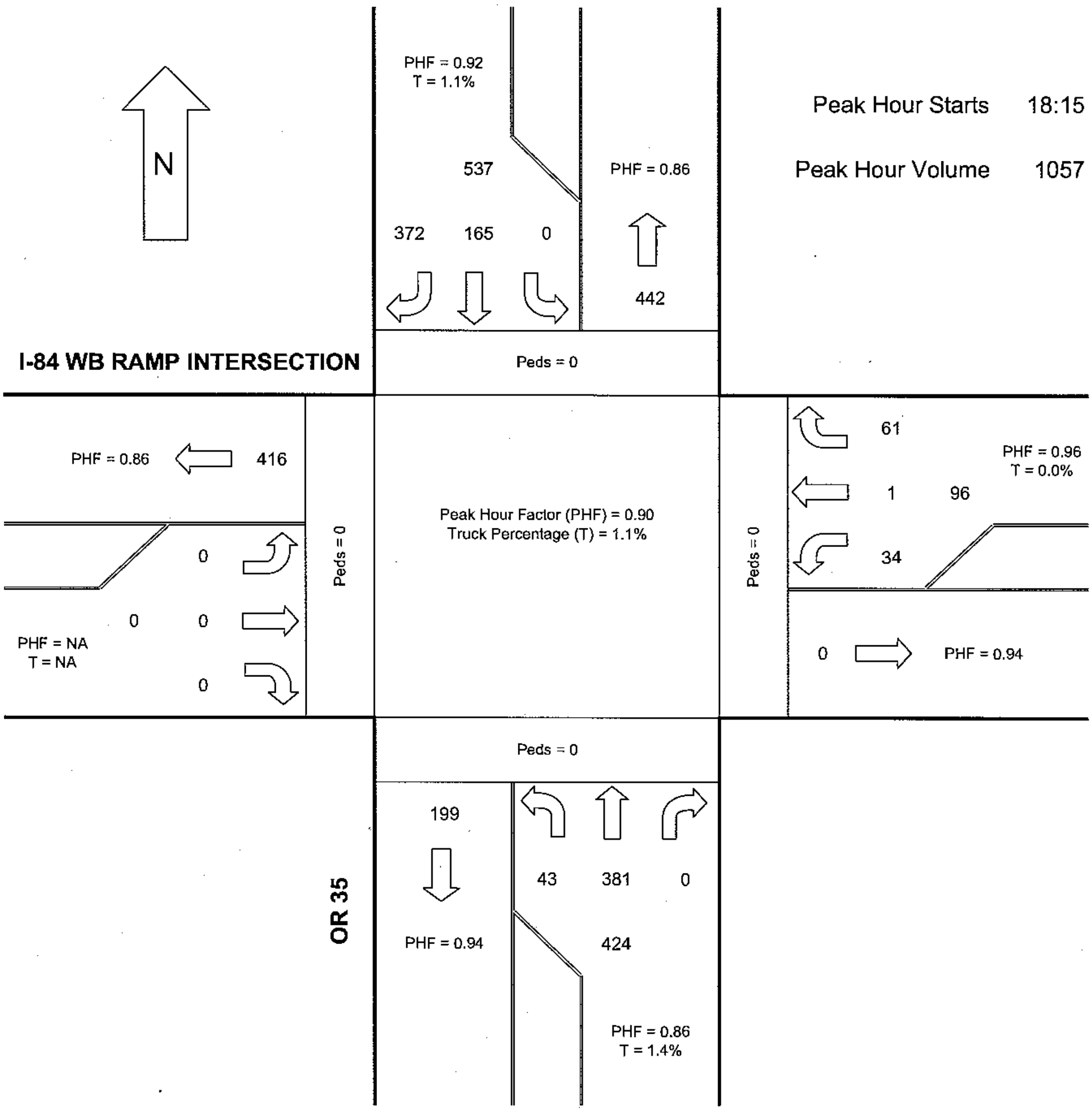
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	0	0	0	0	0	0	4	0	4	2	0	10
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	0	1	1	0	0	0	2
% Trucks	NA	NA	NA	0.0%	0.0%	0.0%	NA	1.3%	2.3%	1.1%	1.2%	NA	1.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699 Salem, OR 97309
Tel: (503) 646-2942 Fax: (503) 526-0628

Intersection Turning Movement
Peak Hour Diagram

Location I-84 WB RAMP INTERSECTION AT OR 35
Date 8/5/2006
Day of Week Saturday
Time Begin 18:00
Reviewed By: DH



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 6:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
6:00 - 6:15	5	0	20	0	0	0	0	12	0	0	11	0	48
6:15 - 6:30	3	0	18	0	0	0	0	13	0	0	19	0	53
6:30 - 6:45	3	0	12	0	0	0	0	21	0	0	18	0	54
6:45 - 7:00	1	0	16	0	0	0	0	23	0	0	20	0	60
7:00 - 7:15	7	0	13	0	0	0	0	15	0	0	12	0	47
7:15 - 7:30	4	0	24	0	0	0	0	19	0	0	23	0	70
7:30 - 7:45	4	0	22	0	0	0	0	30	0	0	34	0	90
7:45 - 8:00	6	0	38	0	0	0	0	32	0	0	42	0	118
Movement Totals	33	0	163	0	0	0	0	165	0	0	179	0	540
Enter Totals		196			0			165			179		
Exit Totals		0			0			328			212		

Two-Hour Totals

Light Trucks	2	0	4	0	0	0	0	4	0	0	4	0	14
Medium Trucks	2	0	1	0	0	0	0	2	0	0	1	0	6
Heavy Trucks	7	0	3	0	0	0	0	1	0	0	4	0	15
% Trucks	33.3%	NA	4.9%	NA	NA	NA	NA	4.2%	NA	NA	5.0%	NA	6.5%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 7:00 8:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	21	0	97	0	0	0	0	96	0	0	111	0	325
Peak Hour Factor	0.75	NA	0.64	NA	NA	NA	NA	0.75	NA	NA	0.66	NA	0.69

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	118	111	96	0
Peak Hour Factor	0.67	0.66	0.75	NA
Exit Totals	0	132	193	0
Peak Hour Factor	NA	0.69	0.69	NA

Light Trucks	2	0	3	0	0	0	0	2	0	0	4	0	11
Medium Trucks	2	0	1	0	0	0	0	1	0	0	1	0	5
Heavy Trucks	5	0	2	0	0	0	0	1	0	0	3	0	11
% Trucks	42.9%	NA	6.2%	NA	NA	NA	NA	4.2%	NA	NA	7.2%	NA	8.3%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

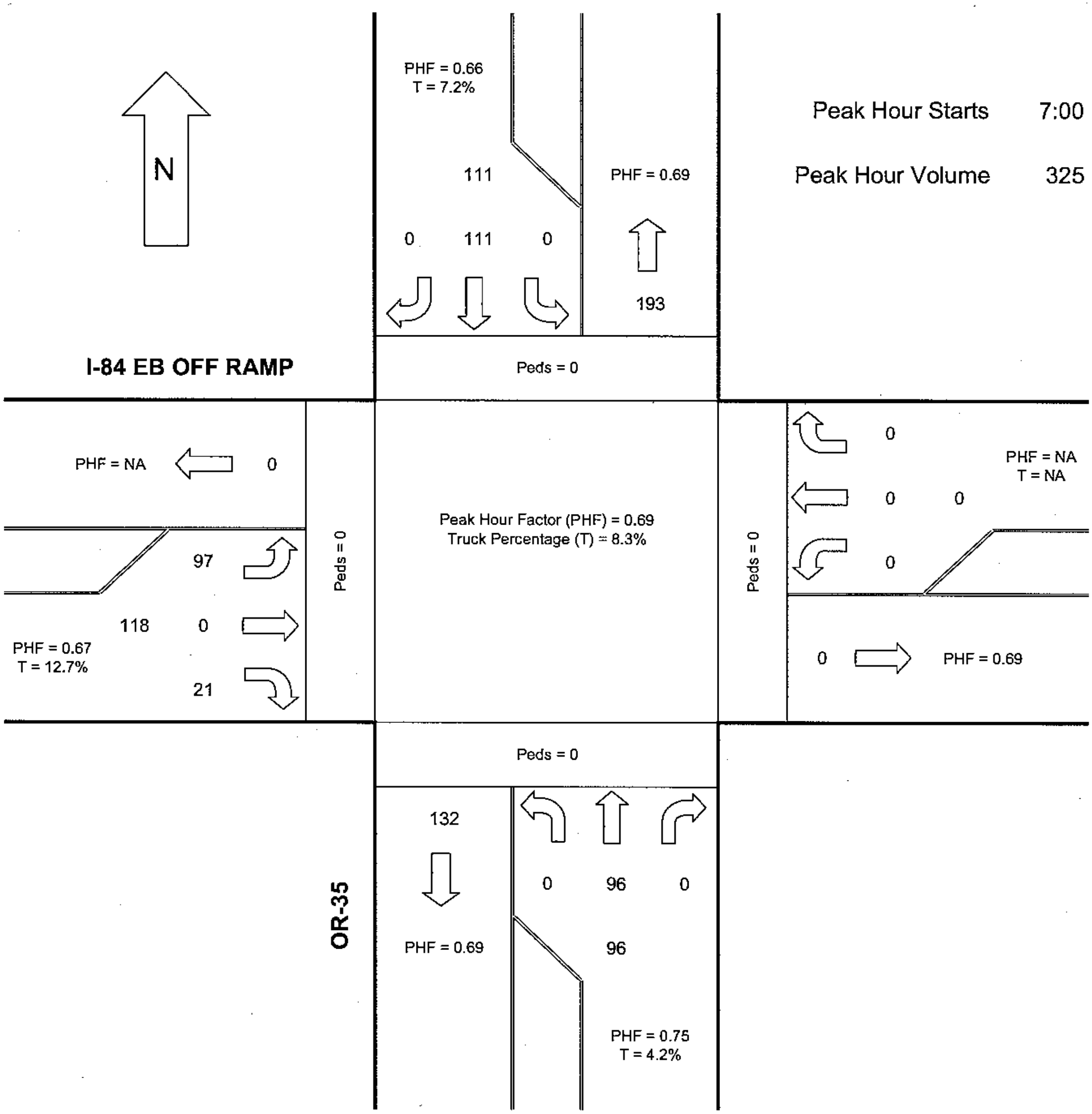
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 6:00
Reviewed By: DH



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 8:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
8:00 - 8:15	7	0	27	0	0	0	0	33	1	0	36	0	104
8:15 - 8:30	9	0	58	0	0	0	0	35	0	0	36	0	138
8:30 - 8:45	7	0	44	0	0	0	0	45	0	0	51	0	147
8:45 - 9:00	8	0	47	0	0	0	0	37	0	0	45	0	137
9:00 - 9:15	15	0	60	0	0	0	0	49	0	0	44	0	168
9:15 - 9:30	14	0	57	0	0	0	0	38	0	0	57	0	166
9:30 - 9:45	12	0	60	0	0	0	0	42	0	0	67	0	181
9:45 - 10:00	15	0	63	0	0	0	0	55	0	0	59	0	192
Movement Totals	87	0	416	0	0	0	0	334	1	0	395	0	1233
Enter Totals	503			0			335			395			
Exit Totals	0			1			750			482			

Two-Hour Totals

Light Trucks	0	0	5	0	0	0	0	3	0	0	5	0	13
Medium Trucks	2	0	0	0	0	0	0	3	0	0	5	0	10
Heavy Trucks	9	0	3	0	0	0	0	5	0	0	3	0	20
% Trucks	12.6%	NA	1.9%	NA	NA	NA	NA	3.3%	0.0%	NA	3.3%	NA	3.5%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	3	0	3

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 9:00 10:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	56	0	240	0	0	0	0	184	0	0	227	0	707
Peak Hour Factor	0.93	NA	0.95	NA	NA	NA	NA	0.84	NA	NA	0.85	NA	0.92

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	296	227	184	0
Peak Hour Factor	0.95	0.85	0.84	NA

	Eastbound	Westbound	Northbound	Southbound
Exit Totals	0	283	424	0
Peak Hour Factor	NA	0.90	0.90	NA

Light Trucks	0	0	3	0	0	0	0	0	0	0	3	0	6
Medium Trucks	1	0	0	0	0	0	0	0	0	0	3	0	4
Heavy Trucks	4	0	1	0	0	0	0	3	0	0	0	0	8
% Trucks	8.9%	NA	1.7%	NA	NA	NA	NA	1.6%	NA	NA	2.6%	NA	2.5%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	3	0	3

	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

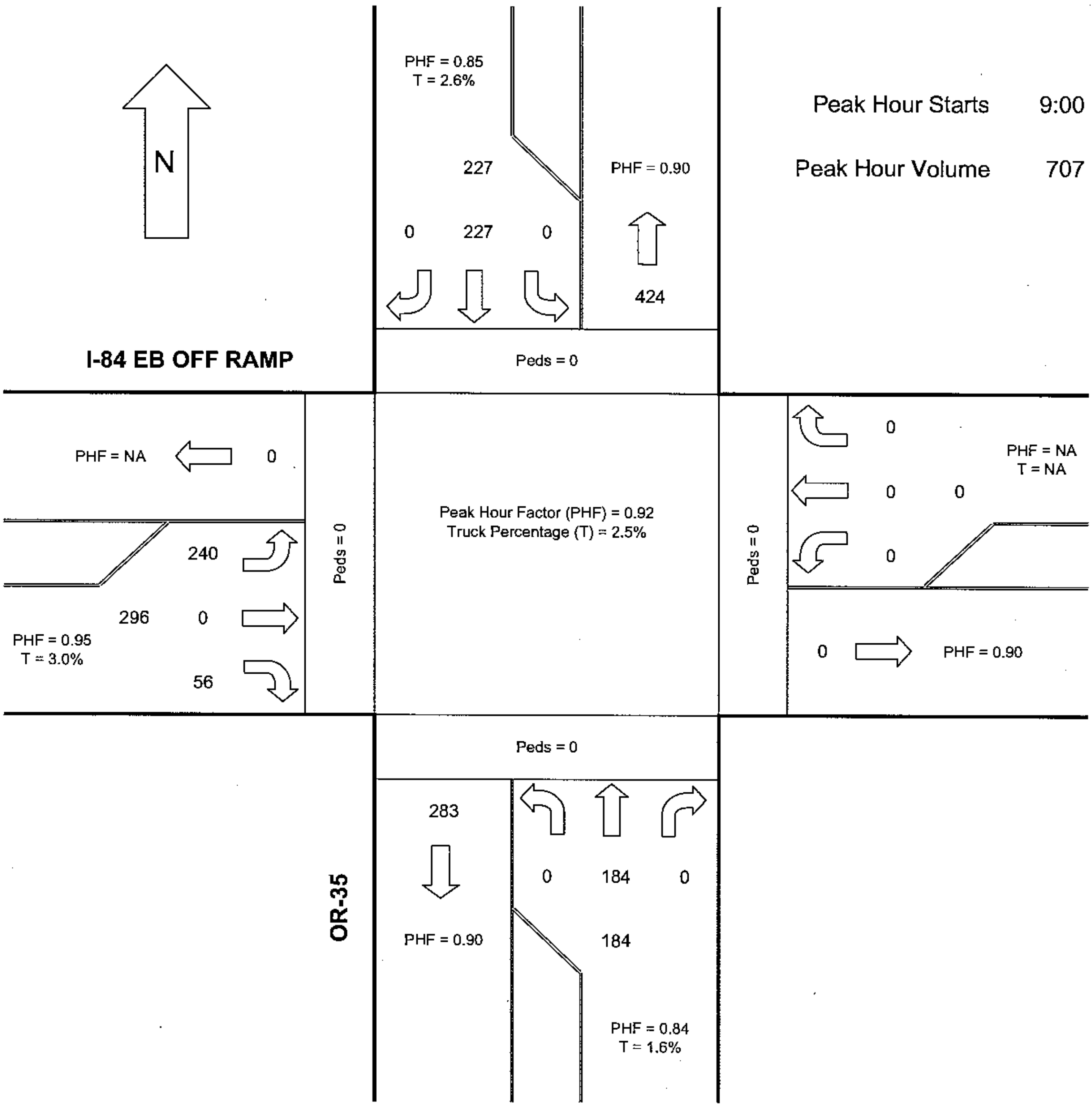
Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 8:00
Reviewed By: DH

Peak Hour Starts 9:00

Peak Hour Volume 707



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 10:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
10:00 - 10:15	17	0	65	0	0	0	0	60	0	0	68	0	210
10:15 - 10:30	15	0	67	0	0	0	0	46	0	3	57	0	188
10:30 - 10:45	22	0	62	0	0	0	0	70	0	2	76	0	232
10:45 - 11:00	31	0	60	0	0	0	0	57	0	0	60	0	208
11:00 - 11:15	34	0	81	0	0	0	0	39	0	0	64	0	218
11:15 - 11:30	36	0	61	0	0	0	0	63	0	0	84	0	244
11:30 - 11:45	28	0	81	0	0	0	0	57	0	0	60	0	226
11:45 - 12:00	19	0	85	0	0	0	0	69	0	0	79	0	252
Movement Totals	202	0	562	0	0	0	0	461	0	5	548	0	1778
Enter Totals		764			0			461			553		
Exit Totals		0			5			1023			750		

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	5	0	14	0	0	0	0	11	0	0	9	0	39
Medium Trucks	2	0	1	0	0	0	0	2	0	0	4	0	9
Heavy Trucks	10	0	4	0	0	0	0	6	0	0	4	0	24
% Trucks	8.4%	NA	3.4%	NA	NA	NA	NA	4.1%	NA	0.0%	3.1%	NA	4.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	4	0	4

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 11:00 12:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	117	0	308	0	0	0	0	228	0	0	287	0	940
Peak Hour Factor	0.81	NA	0.91	NA	NA	NA	NA	0.83	NA	NA	0.85	NA	0.93

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	425	287	228	0
Peak Hour Factor	0.92	0.85	0.83	NA
Exit Totals	0	404	536	0
Peak Hour Factor	NA	0.84	0.87	NA

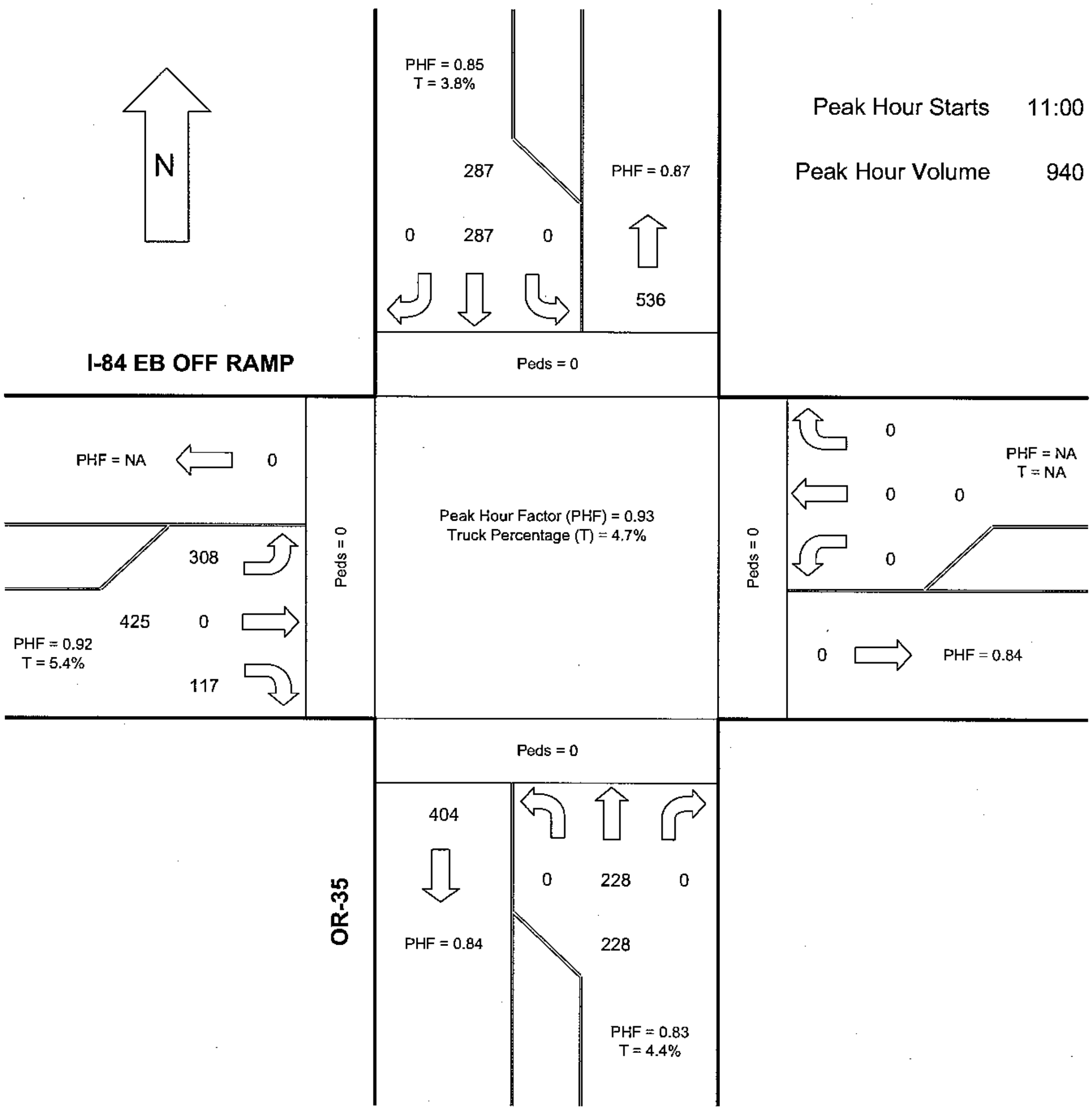
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	4	0	9	0	0	0	0	4	0	0	7	0	24
Medium Trucks	1	0	1	0	0	0	0	1	0	0	2	0	5
Heavy Trucks	6	0	2	0	0	0	0	5	0	0	2	0	15
% Trucks	9.4%	NA	3.9%	NA	NA	NA	NA	4.4%	NA	NA	3.8%	NA	4.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	4	0	4

	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699 Salem, OR 97309 Tel: (503) 646-2942 Fax: (503) 526-0628

Intersection Turning Movement
Peak Hour Diagram

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 10:00
Reviewed By: DH



TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Summary Report

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 12:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
12:00 - 12:15	23	0	74	0	0	0	0	32	41	0	71	0	241
12:15 - 12:30	24	0	95	0	0	0	0	0	72	0	80	0	271
12:30 - 12:45	19	0	80	0	0	0	0	70	0	0	60	0	229
12:45 - 13:00	28	0	96	0	0	0	0	83	0	0	73	0	280
13:00 - 13:15	25	0	89	0	0	0	0	75	0	0	103	0	292
13:15 - 13:30	30	0	84	0	0	0	0	79	0	0	89	0	282
13:30 - 13:45	31	0	90	0	0	0	0	71	0	0	76	0	268
13:45 - 14:00	33	0	85	0	0	0	0	67	0	2	90	0	277
Movement Totals	213	0	693	0	0	0	0	477	113	2	642	0	2140
Enter Totals	906			0			590			644			
Exit Totals	0			115			1170			855			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	4	0	20	0	0	0	0	4	2	0	12	0	42
Medium Trucks	0	0	1	0	0	0	0	3	0	0	2	0	6
Heavy Trucks	2	0	0	0	0	0	0	0	0	0	1	0	3
% Trucks	2.8%	NA	3.0%	NA	NA	NA	NA	1.5%	1.8%	0.0%	2.3%	NA	2.4%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	2	0	0	0	0	3	1	0	0	0	6

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 12:45 13:45

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	114	0	359	0	0	0	0	308	0	0	341	0	1122
Peak Hour Factor	0.92	NA	0.93	NA	NA	NA	NA	0.93	NA	NA	0.83	NA	0.96

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	473	341	308	0
Peak Hour Factor	0.95	0.83	0.93	NA
Exit Totals	0	455	667	0
Peak Hour Factor	NA	0.89	0.93	NA

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	2	0	7	0	0	0	0	1	0	0	6	0	16
Medium Trucks	0	0	1	0	0	0	0	3	0	0	1	0	5
Heavy Trucks	1	0	0	0	0	0	0	0	0	0	1	0	2
% Trucks	2.6%	NA	2.2%	NA	NA	NA	NA	1.3%	NA	NA	2.3%	NA	2.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	2	0	0	0	0	3	0	0	0	0	5

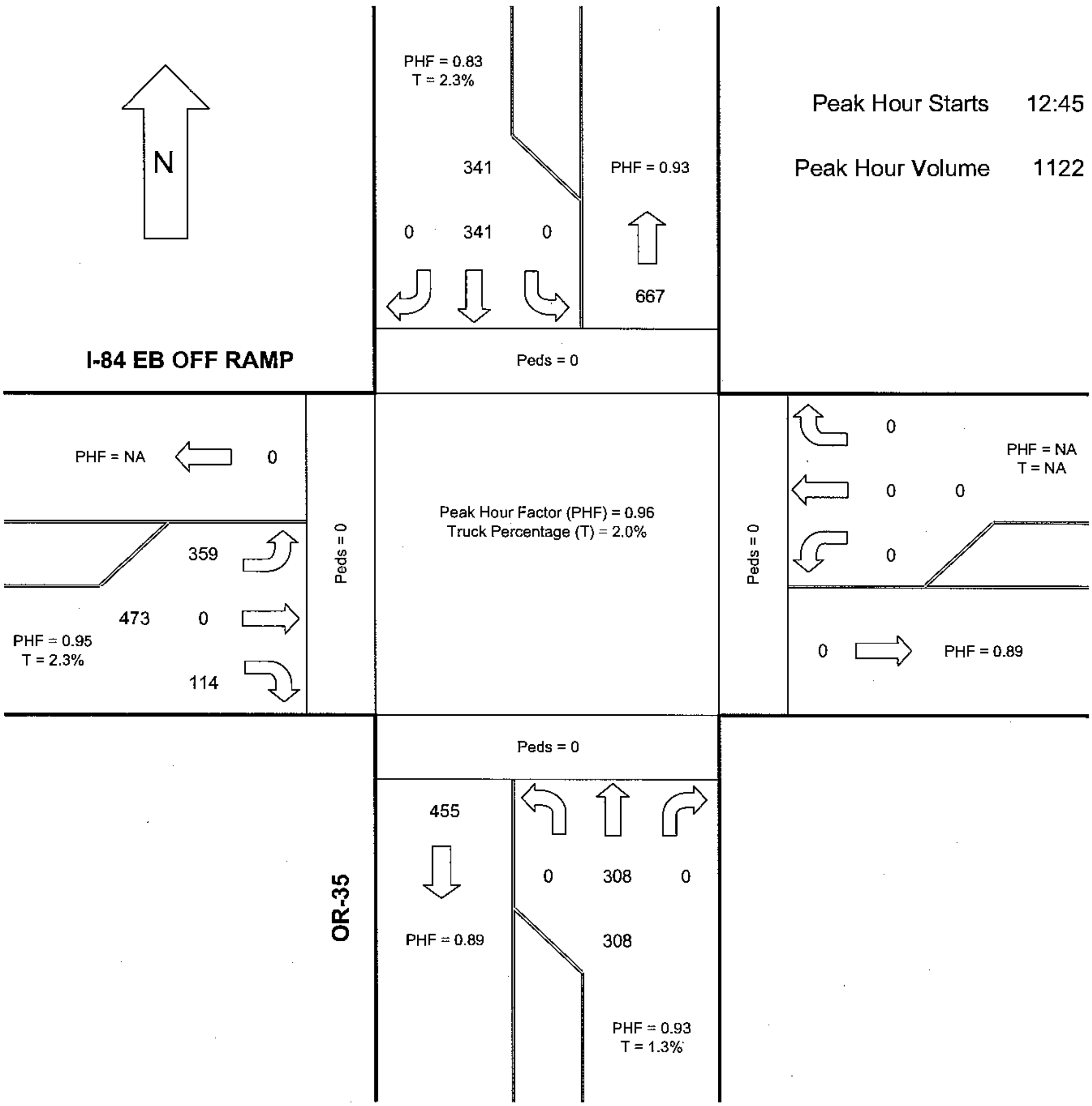
	South	West	East	North	
Pedestrians	0	0	0	0	0

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 12:00
Reviewed By: DH



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 14:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
14:00 - 14:15	28	0	105	0	0	0	0	70	0	0	63	0	266
14:15 - 14:30	28	0	92	0	0	0	0	76	0	0	71	0	267
14:30 - 14:45	35	0	89	0	0	0	0	76	0	0	68	0	268
14:45 - 15:00	33	0	87	0	0	0	0	62	0	0	65	0	247
15:00 - 15:15	26	0	91	0	0	0	0	86	0	0	86	0	289
15:15 - 15:30	27	0	83	0	0	0	0	88	0	0	81	0	279
15:30 - 15:45	27	0	91	0	0	0	0	94	0	0	94	0	306
15:45 - 16:00	32	0	84	0	0	0	0	86	0	0	94	0	296
Movement Totals	236	0	722	0	0	0	0	638	0	0	622	0	2218
Enter Totals	958			0			638			622			
Exit Totals	0			0			1360			858			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	2	0	13	0	0	0	0	5	0	0	7	0	27
Medium Trucks	2	0	0	0	0	0	0	0	0	0	1	0	3
Heavy Trucks	3	0	1	0	0	0	0	3	0	0	2	0	9
% Trucks	3.0%	NA	1.9%	NA	NA	NA	NA	1.3%	NA	NA	1.6%	NA	1.8%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	1	0	0	0	0	0	0	0	0	0	1

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 15:00 16:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Movement Total	112	0	349	0	0	0	0	354	0	0	355	0	1170
Peak Hour Factor	0.88	NA	0.96	NA	NA	NA	NA	0.94	NA	NA	0.94	NA	0.96

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	461	355	354	0
Peak Hour Factor	0.98	0.94	0.94	NA
Exit Totals	0	467	703	0
Peak Hour Factor	NA	0.93	0.95	NA

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	2	0	6	0	0	0	0	4	0	0	4	0	16
Medium Trucks	2	0	0	0	0	0	0	0	0	0	0	0	2
Heavy Trucks	0	0	0	0	0	0	0	1	0	0	1	0	2
% Trucks	3.6%	NA	1.7%	NA	NA	NA	NA	1.4%	NA	NA	1.4%	NA	1.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	1	0	0	0	0	0	0	0	0	0	1

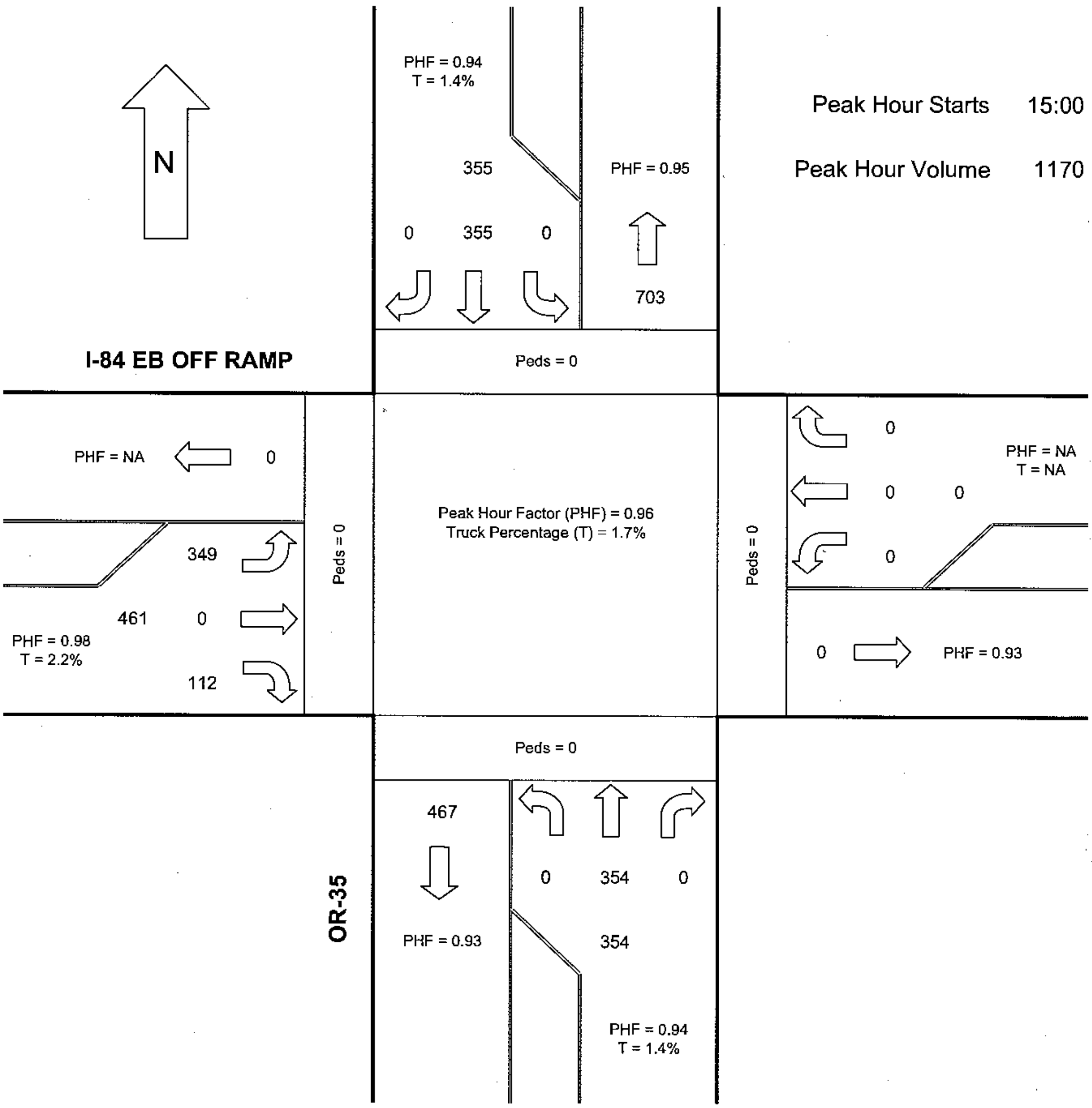
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 14:00
Reviewed By: BV



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 16:00
Reviewed By: VB

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
16:00 - 16:15	25	0	82	0	0	0	0	65	0	0	87	0	259
16:15 - 16:30	17	0	68	0	0	0	0	76	0	0	47	0	208
16:30 - 16:45	14	0	81	0	0	0	0	80	0	0	70	0	245
16:45 - 17:00	10	0	92	0	0	0	0	80	0	0	58	0	240
17:00 - 17:15	19	0	82	0	0	0	0	61	0	0	59	0	221
17:15 - 17:30	10	0	51	0	0	0	0	73	0	0	52	0	186
17:30 - 17:45	12	0	72	0	0	0	0	84	0	0	71	0	239
17:45 - 18:00	11	0	87	0	0	0	0	79	0	0	57	0	234
Movement Totals	118	0	615	0	0	0	0	598	0	0	501	0	1832
Enter Totals	733			0			598			501			
Exit Totals	0			0			1213			619			

Two-Hour Totals

Light Trucks	0	0	3	0	0	0	0	6	0	0	8	0	17
Medium Trucks	0	0	1	0	0	0	0	0	0	0	1	0	2
Heavy Trucks	0	0	1	0	0	0	0	3	0	0	1	0	5
% Trucks	0.0%	NA	0.8%	NA	NA	NA	NA	1.5%	NA	NA	2.0%	NA	1.3%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 16:00 17:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	66	0	323	0	0	0	0	301	0	0	262	0	952
Peak Hour Factor	0.66	NA	0.88	NA	NA	NA	NA	0.94	NA	NA	0.75	NA	0.92

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	389	262	301	0
Peak Hour Factor	0.91	0.75	0.94	NA

	Eastbound	Westbound	Northbound	Southbound
Exit Totals	0	328	624	0
Peak Hour Factor	NA	0.73	0.91	NA

Light Trucks	0	0	1	0	0	0	0	6	0	0	5	0	12
Medium Trucks	0	0	0	0	0	0	0	0	0	0	1	0	1
Heavy Trucks	0	0	1	0	0	0	0	2	0	0	1	0	4
% Trucks	0.0%	NA	0.6%	NA	NA	NA	NA	2.7%	NA	NA	2.7%	NA	1.8%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

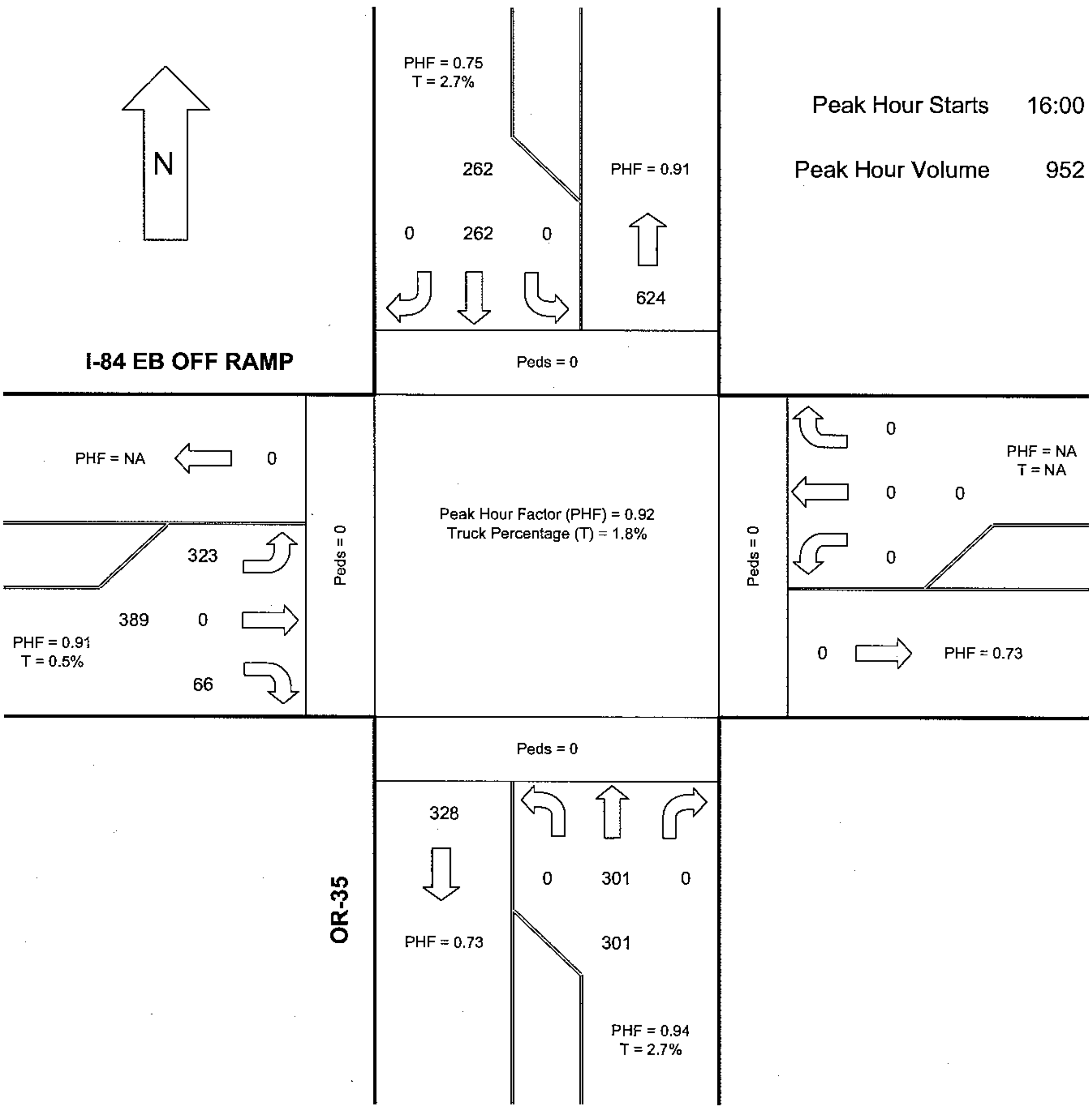
Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 16:00
Reviewed By: VB

Peak Hour Starts 16:00

Peak Hour Volume 952



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 18:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
18:00 - 18:15	15	0	68	0	0	0	0	52	0	0	57	0	192
18:15 - 18:30	14	0	57	0	0	0	0	55	0	0	47	0	173
18:30 - 18:45	10	0	55	0	0	0	0	47	0	0	50	0	162
18:45 - 19:00	10	0	53	0	0	0	0	44	0	0	55	0	162
19:00 - 19:15	11	0	67	0	0	0	0	63	0	0	41	0	182
19:15 - 19:30	11	0	60	0	0	0	0	37	0	1	39	0	148
19:30 - 19:45	11	0	52	0	0	0	0	37	0	0	44	0	144
19:45 - 20:00	11	0	53	0	0	0	0	33	0	0	49	0	146
Movement Totals	93	0	465	0	0	0	0	368	0	1	382	0	1309
Enter Totals	558			0			368			383			
Exit Totals	0			1			833			475			

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	1	0	11	0	0	0	0	3	0	0	3	0	18
Medium Trucks	0	0	1	0	0	0	0	1	0	0	0	0	2
Heavy Trucks	1	0	0	0	0	0	0	1	0	0	0	0	2
% Trucks	2.2%	NA	2.6%	NA	NA	NA	NA	1.4%	NA	0.0%	0.8%	NA	1.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 18:00 19:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Movement Total	49	0	233	0	0	0	0	198	0	0	209	0	689
Peak Hour Factor	0.82	NA	0.86	NA	NA	NA	NA	0.90	NA	NA	0.92	NA	0.90

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	282	209	198	0
Peak Hour Factor	0.85	0.92	0.90	NA
Exit Totals	0	258	431	0
Peak Hour Factor	NA	0.90	0.90	NA

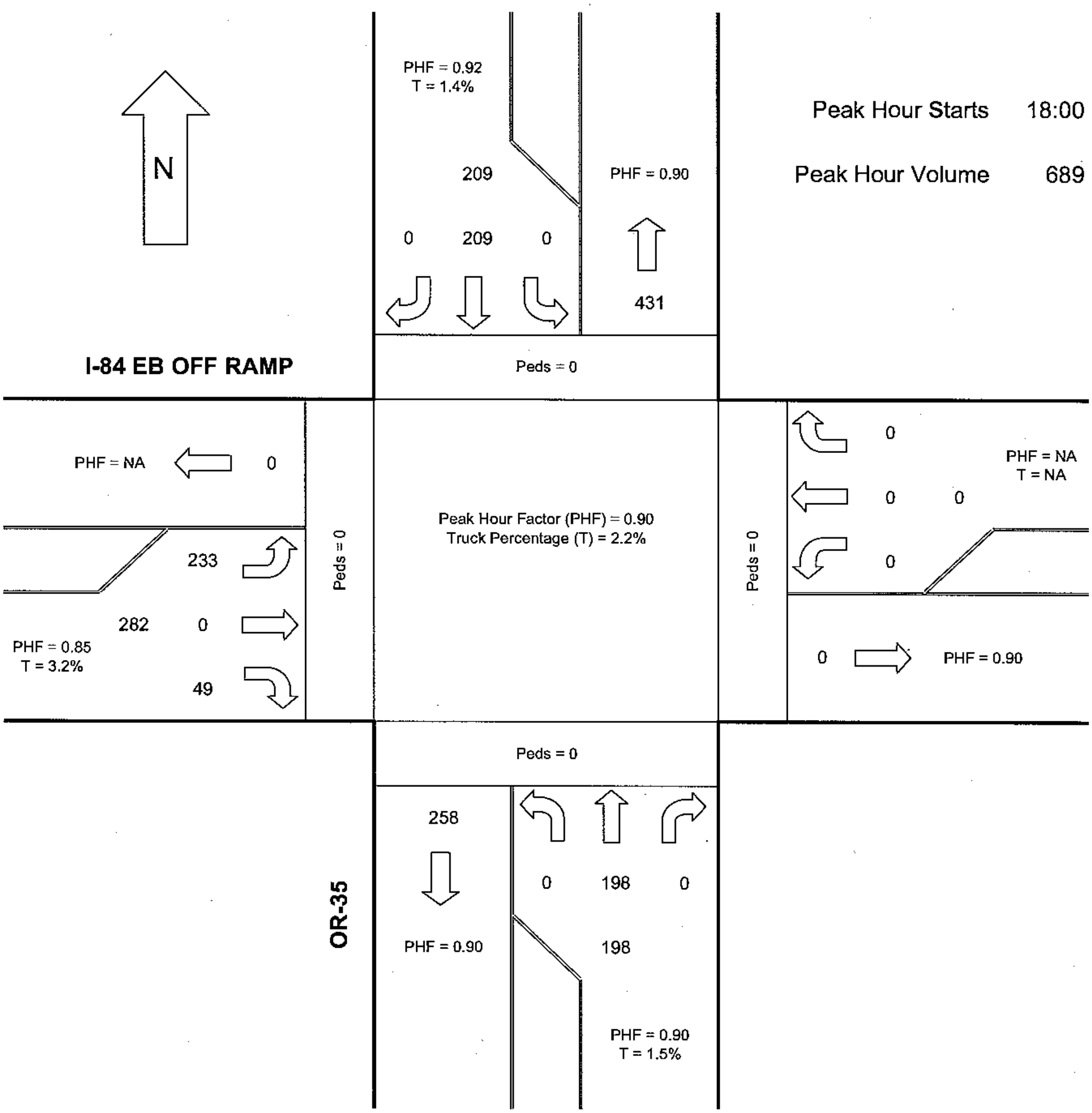
	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	8	0	0	0	0	1	0	0	3	0	12
Medium Trucks	0	0	1	0	0	0	0	1	0	0	0	0	2
Heavy Trucks	0	0	0	0	0	0	0	1	0	0	0	0	1
% Trucks	0.0%	NA	3.9%	NA	NA	NA	NA	1.5%	NA	NA	1.4%	NA	2.2%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Peak Hour Diagram

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 18:00
Reviewed By: BV



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 6:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
6:00 - 6:15	0	6	11	0	0	0	0	0	0	8	0	8	33
6:15 - 6:30	0	15	13	0	0	0	0	0	0	11	0	10	49
6:30 - 6:45	0	2	21	0	0	0	0	0	0	18	0	4	45
6:45 - 7:00	0	9	24	0	0	0	0	0	0	7	0	12	52
7:00 - 7:15	0	4	14	0	0	0	0	0	0	15	0	2	35
7:15 - 7:30	0	6	19	0	0	0	0	0	0	19	0	11	55
7:30 - 7:45	0	19	27	0	0	0	0	0	0	34	0	5	85
7:45 - 8:00	0	7	34	0	0	0	0	0	0	36	0	11	88
Movement Totals	0	68	163	0	0	0	0	0	0	148	0	63	442
Enter Totals		231			0			0			211		
Exit Totals		131			148			163			0		

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	2	6	0	0	0	0	0	0	8	0	0	16
Medium Trucks	0	0	2	0	0	0	0	0	0	1	0	0	3
Heavy Trucks	0	0	1	0	0	0	0	0	0	12	0	1	14
% Trucks	NA	2.9%	5.5%	NA	NA	NA	NA	NA	NA	14.2%	NA	1.6%	7.5%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 7:00 8:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	36	94	0	0	0	0	0	0	104	0	29	263
Peak Hour Factor	NA	0.47	0.69	NA	NA	NA	NA	NA	NA	0.72	NA	0.66	0.75

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	130	133	0	0
Peak Hour Factor	0.71	0.71	NA	NA
Exit Totals	65	0	94	104
Peak Hour Factor	0.68	NA	0.69	0.72

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	1	4	0	0	0	0	0	0	6	0	0	11
Medium Trucks	0	0	1	0	0	0	0	0	0	1	0	0	2
Heavy Trucks	0	0	1	0	0	0	0	0	0	10	0	0	11
% Trucks	NA	2.8%	6.4%	NA	NA	NA	NA	NA	NA	16.3%	NA	0.0%	9.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

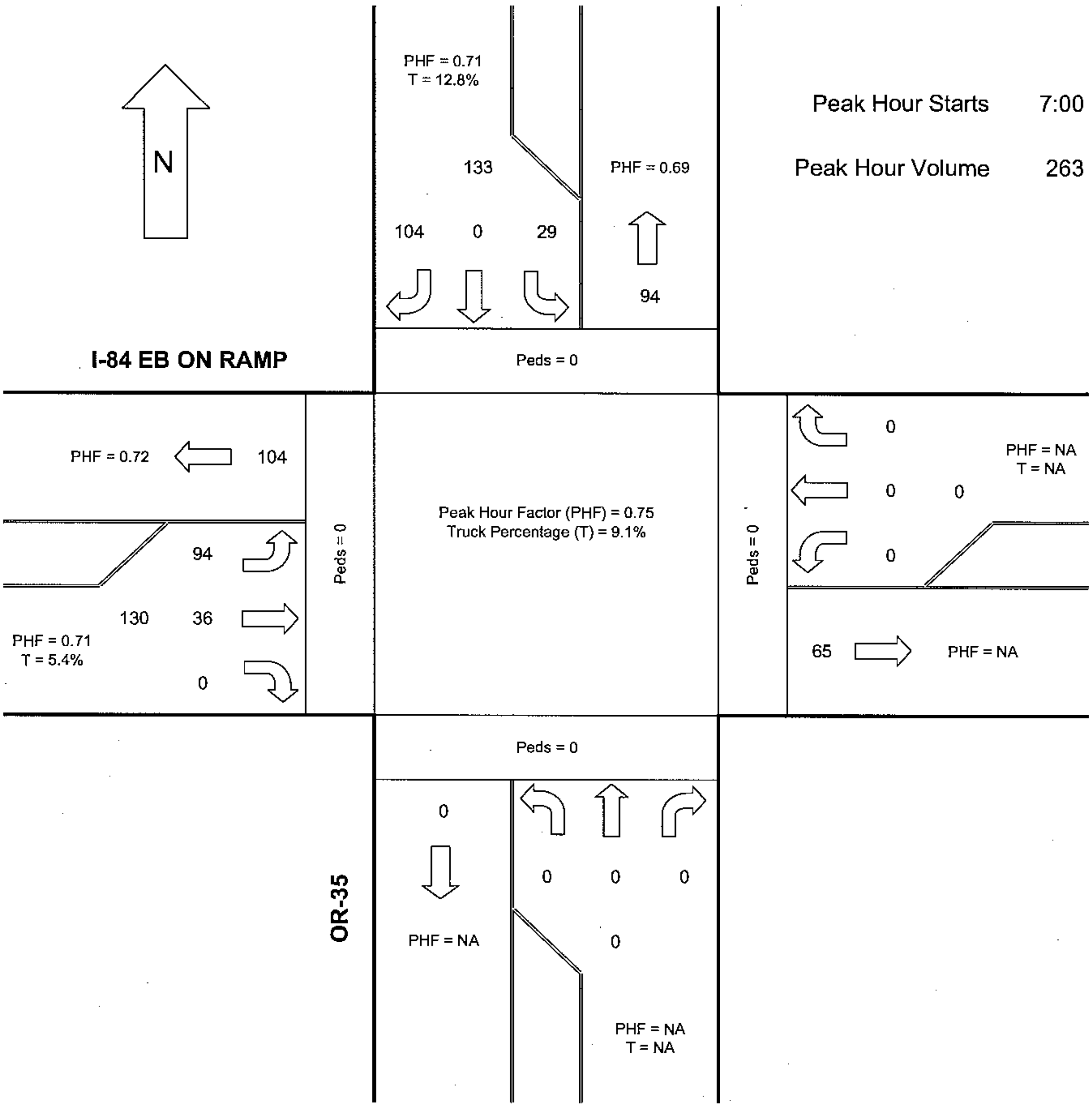
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 6:00
Reviewed By: DH



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 8:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
8:00 - 8:15	0	8	34	0	0	0	0	0	0	29	0	12	83
8:15 - 8:30	0	5	35	0	0	0	0	0	0	34	0	15	89
8:30 - 8:45	0	12	42	0	0	0	0	0	0	37	0	21	112
8:45 - 9:00	0	18	41	0	0	0	0	0	0	46	0	17	122
9:00 - 9:15	0	15	46	0	0	0	0	0	0	47	0	10	118
9:15 - 9:30	0	17	42	0	0	0	0	0	0	53	0	19	131
9:30 - 9:45	0	14	41	0	0	0	0	0	0	63	0	20	138
9:45 - 10:00	0	11	62	0	0	0	0	0	0	57	0	18	148
Movement Totals	0	100	343	0	0	0	0	0	0	366	0	132	941
Enter Totals	443			0			0			498			
Exit Totals	232			366			343			0			

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	3	4	0	0	0	0	0	0	1	0	5	13
Medium Trucks	0	0	3	0	0	0	0	0	0	7	0	0	10
Heavy Trucks	0	3	5	0	0	0	0	0	0	13	0	0	21
% Trucks	NA	6.0%	3.5%	NA	NA	NA	NA	NA	NA	5.7%	NA	3.8%	4.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	3	0	0	3

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 9:00 10:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Movement Total	0	57	191	0	0	0	0	0	0	220	0	67	535
Peak Hour Factor	NA	0.84	0.77	NA	NA	NA	NA	NA	NA	0.87	NA	0.84	0.90

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	248	287	0	0
Peak Hour Factor	0.85	0.86	NA	NA
Exit Totals	124	0	191	220
Peak Hour Factor	0.86	NA	0.77	0.87

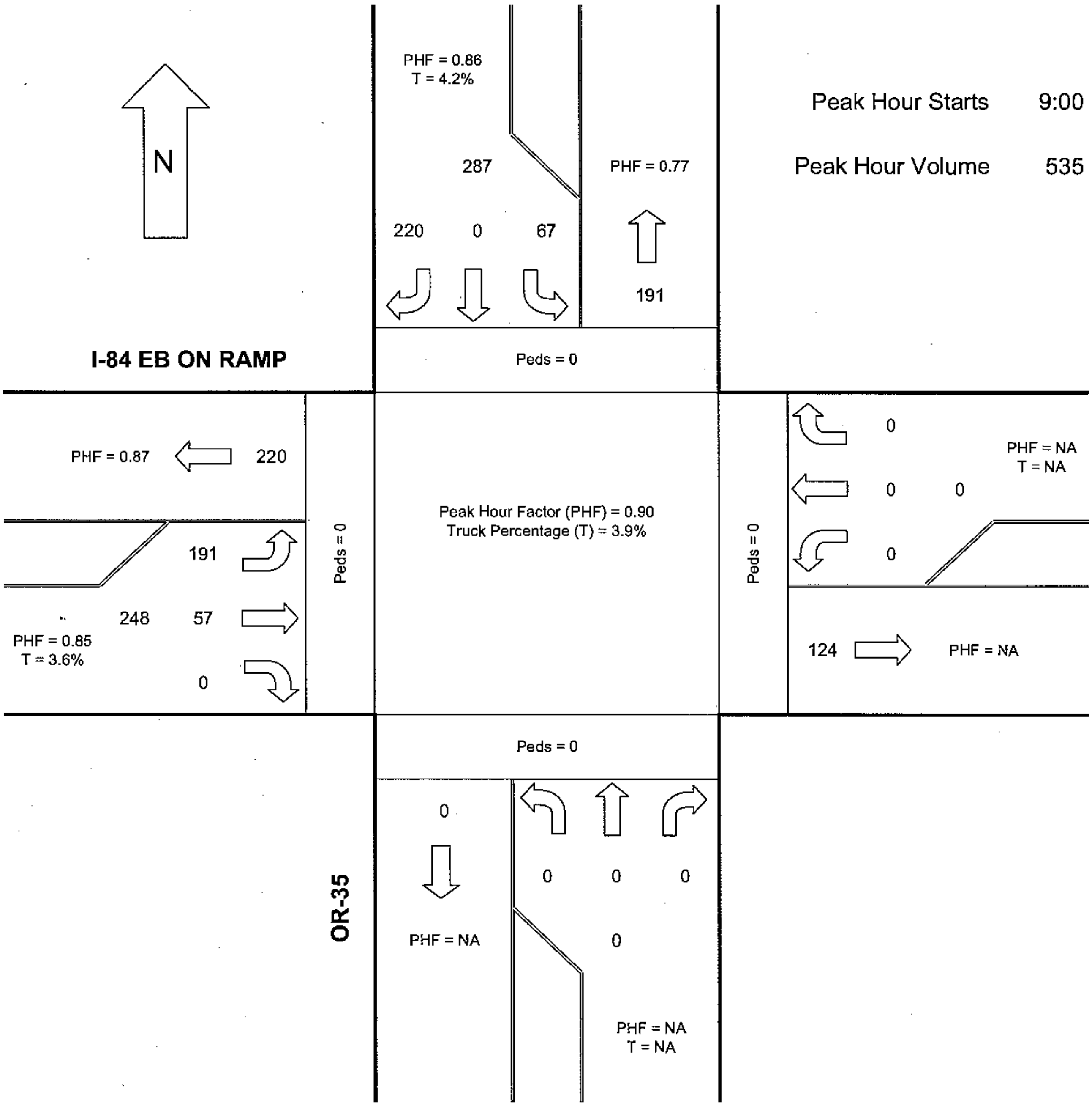
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	3	1	0	0	0	0	0	0	1	0	3	8
Medium Trucks	0	0	0	0	0	0	0	0	0	4	0	0	4
Heavy Trucks	0	2	3	0	0	0	0	0	0	4	0	0	9
% Trucks	NA	8.8%	2.1%	NA	NA	NA	NA	NA	NA	4.1%	NA	4.5%	3.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	3	0	0	3

	South	West	East	North	
Pedestrians	0	0	0	0	0

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Peak Hour Diagram

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 8:00
Reviewed By: DH



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Summary Report

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 10:00
Reviewed By: DH

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
10:00 - 10:15	0	17	62	0	0	0	0	0	0	53	0	21	153
10:15 - 10:30	0	19	56	0	0	0	0	0	0	67	0	13	155
10:30 - 10:45	0	15	70	0	0	0	0	0	0	77	0	16	178
10:45 - 11:00	0	21	63	0	0	0	0	0	0	71	0	13	168
11:00 - 11:15	0	21	46	0	0	0	0	0	0	95	0	11	173
11:15 - 11:30	0	12	65	0	0	0	0	0	0	98	0	29	204
11:30 - 11:45	0	26	68	0	0	0	0	0	0	80	0	15	189
11:45 - 12:00	0	27	77	0	0	0	0	0	0	78	0	15	197
Movement Totals	0	158	507	0	0	0	0	0	0	619	0	133	1417
Enter Totals	665			0			0			752			
Exit Totals	291			619			507			0			

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	1	8	0	0	0	0	0	0	13	0	2	24
Medium Trucks	0	2	4	0	0	0	0	0	0	3	0	1	10
Heavy Trucks	0	3	5	0	0	0	0	0	0	13	0	3	24
% Trucks	NA	3.8%	3.4%	NA	NA	NA	NA	NA	NA	4.7%	NA	4.5%	4.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	1	0	3	4

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 11:00 12:00

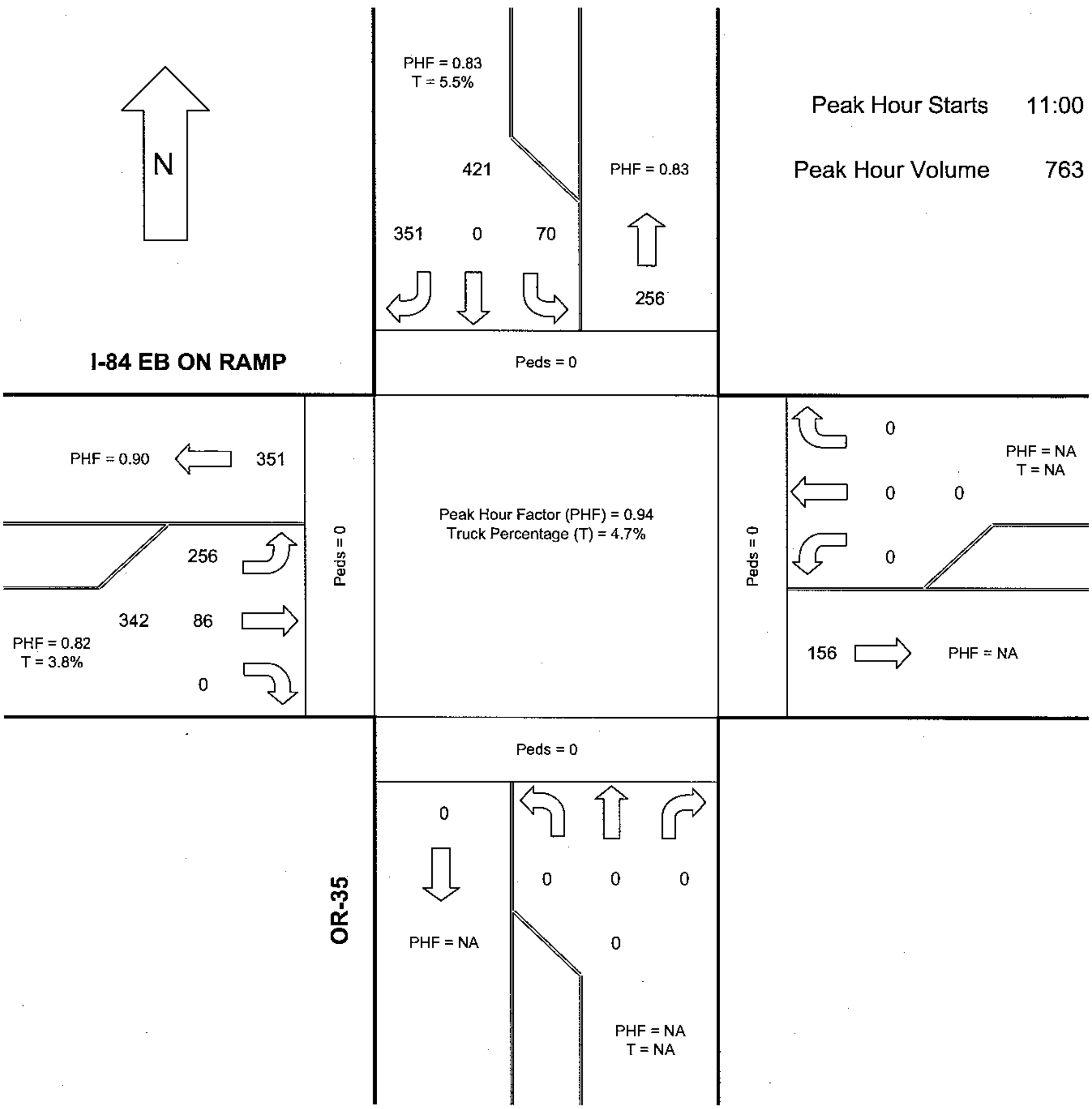
	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	86	256	0	0	0	0	0	0	351	0	70	763
Peak Hour Factor	NA	0.80	0.83	NA	NA	NA	NA	NA	NA	0.90	NA	0.60	0.94
Enter Totals	342			421			0			0			
Peak Hour Factor	0.82			0.83			NA			NA			
Exit Totals	156			0			256			351			
Peak Hour Factor	0.93			NA			0.83			0.90			
Light Trucks	0	1	3	0	0	0	0	0	0	9	0	2	15
Medium Trucks	0	1	2	0	0	0	0	0	0	2	0	1	6
Heavy Trucks	0	2	4	0	0	0	0	0	0	7	0	2	15
% Trucks	NA	4.7%	3.5%	NA	NA	NA	NA	NA	NA	5.1%	NA	7.1%	4.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	1	0	3	4

	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Peak Hour Diagram

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 10:00
Reviewed By: DH



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 12:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
12:00 - 12:15	0	28	70	0	0	0	0	0	0	71	0	22	191
12:15 - 12:30	0	15	70	0	0	0	0	0	0	84	0	17	186
12:30 - 12:45	0	22	74	0	0	0	0	0	0	77	0	14	187
12:45 - 13:00	0	31	80	0	0	0	0	0	0	79	0	21	211
13:00 - 13:15	0	4	8	0	0	0	0	0	0	17	0	3	32
13:15 - 13:30	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30 - 13:45	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45 - 14:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Movement Totals	0	100	302	0	0	0	0	0	0	328	0	77	807
Enter Totals	402			0			0			405			
Exit Totals	177			328			302			0			

Two-Hour Totals

Light Trucks	0	4	7	0	0	0	0	0	0	7	0	0	18
Medium Trucks	0	1	1	0	0	0	0	0	0	1	0	0	3
Heavy Trucks	0	2	0	0	0	0	0	0	0	2	0	0	4
% Trucks	NA	7.0%	2.6%	NA	NA	NA	NA	NA	NA	3.0%	NA	0.0%	3.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	1	0	0	0	0	0	0	0	0	0	1

	South	West	East	North	
Pedestrians	0	0	0	1	1

Peak Hour Information

Peak Hour 12:00 13:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	96	294	0	0	0	0	0	0	311	0	74	775
Peak Hour Factor	NA	0.77	0.92	NA	NA	NA	NA	NA	NA	0.93	NA	0.84	0.92

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	390	385	0	0
Peak Hour Factor	0.88	0.95	NA	NA
Exit Totals	170	0	294	311
Peak Hour Factor	0.82	NA	0.92	0.93

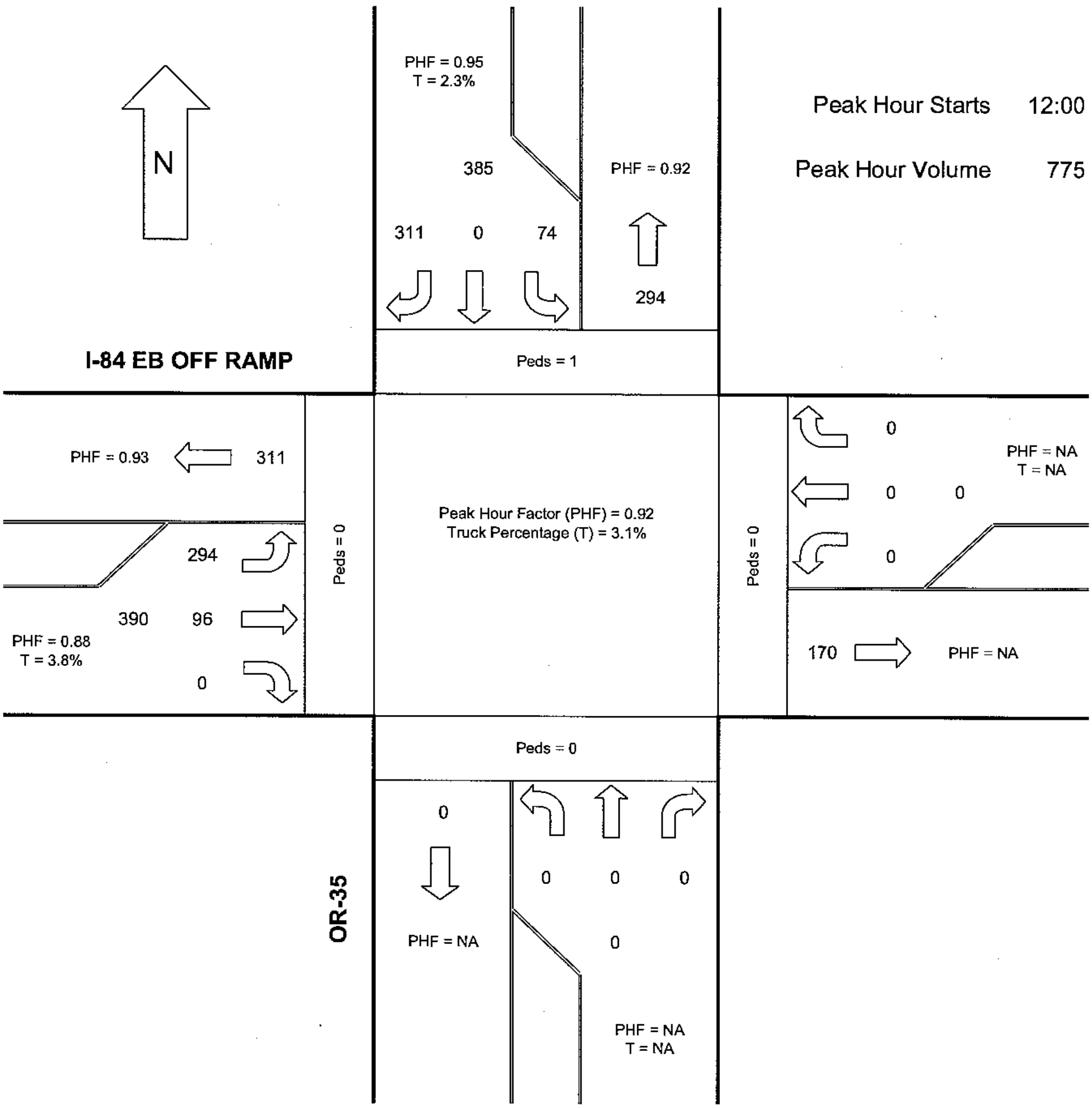
Light Trucks	0	4	7	0	0	0	0	0	0	6	0	0	17
Medium Trucks	0	1	1	0	0	0	0	0	0	1	0	0	3
Heavy Trucks	0	2	0	0	0	0	0	0	0	2	0	0	4
% Trucks	NA	7.3%	2.7%	NA	NA	NA	NA	NA	NA	2.9%	NA	0.0%	3.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	1	0	0	0	0	0	0	0	0	0	1

	South	West	East	North	
Pedestrians	0	0	0	1	1

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Peak Hour Diagram

Location I-84 EB OFF RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 12:00
Reviewed By: BV



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 14:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
14:00 - 14:15	0	18	71	0	0	0	0	0	0	81	0	15	185
14:15 - 14:30	0	27	74	0	0	0	0	0	0	85	0	15	201
14:30 - 14:45	0	28	81	0	0	0	0	0	0	80	0	23	212
14:45 - 15:00	0	26	57	0	0	0	0	0	0	84	0	14	181
15:00 - 15:15	0	26	83	0	0	0	0	0	0	93	0	22	224
15:15 - 15:30	0	20	89	0	0	0	0	0	0	100	0	14	223
15:30 - 15:45	0	20	99	0	0	0	0	0	0	102	0	22	243
15:45 - 16:00	0	18	79	0	0	0	0	0	0	108	0	20	225
Movement Totals	0	183	633	0	0	0	0	0	0	733	0	145	1694
Enter Totals		816			0			0			878		
Exit Totals		328			733			633			0		

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	2	5	0	0	0	0	0	0	8	0	1	16
Medium Trucks	0	1	0	0	0	0	0	0	0	3	0	0	4
Heavy Trucks	0	2	3	0	0	0	0	0	0	5	0	0	10
% Trucks	NA	2.7%	1.3%	NA	NA	NA	NA	NA	NA	2.2%	NA	0.7%	1.8%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	1	0	0	0	0	0	0	0	0	0	1

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 15:00 16:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	84	350	0	0	0	0	0	0	403	0	78	915
Peak Hour Factor	NA	0.81	0.88	NA	NA	NA	NA	NA	NA	0.93	NA	0.89	0.94

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	434	481	0	0
Peak Hour Factor	0.91	0.94	NA	NA

	Eastbound	Westbound	Northbound	Southbound
Exit Totals	162	0	350	403
Peak Hour Factor	0.84	NA	0.88	0.93

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	0	4	0	0	0	0	0	0	6	0	1	11
Medium Trucks	0	0	0	0	0	0	0	0	0	2	0	0	2
Heavy Trucks	0	1	1	0	0	0	0	0	0	2	0	0	4
% Trucks	NA	1.2%	1.4%	NA	NA	NA	NA	NA	NA	2.5%	NA	1.3%	1.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	1	0	0	0	0	0	0	0	0	0	1

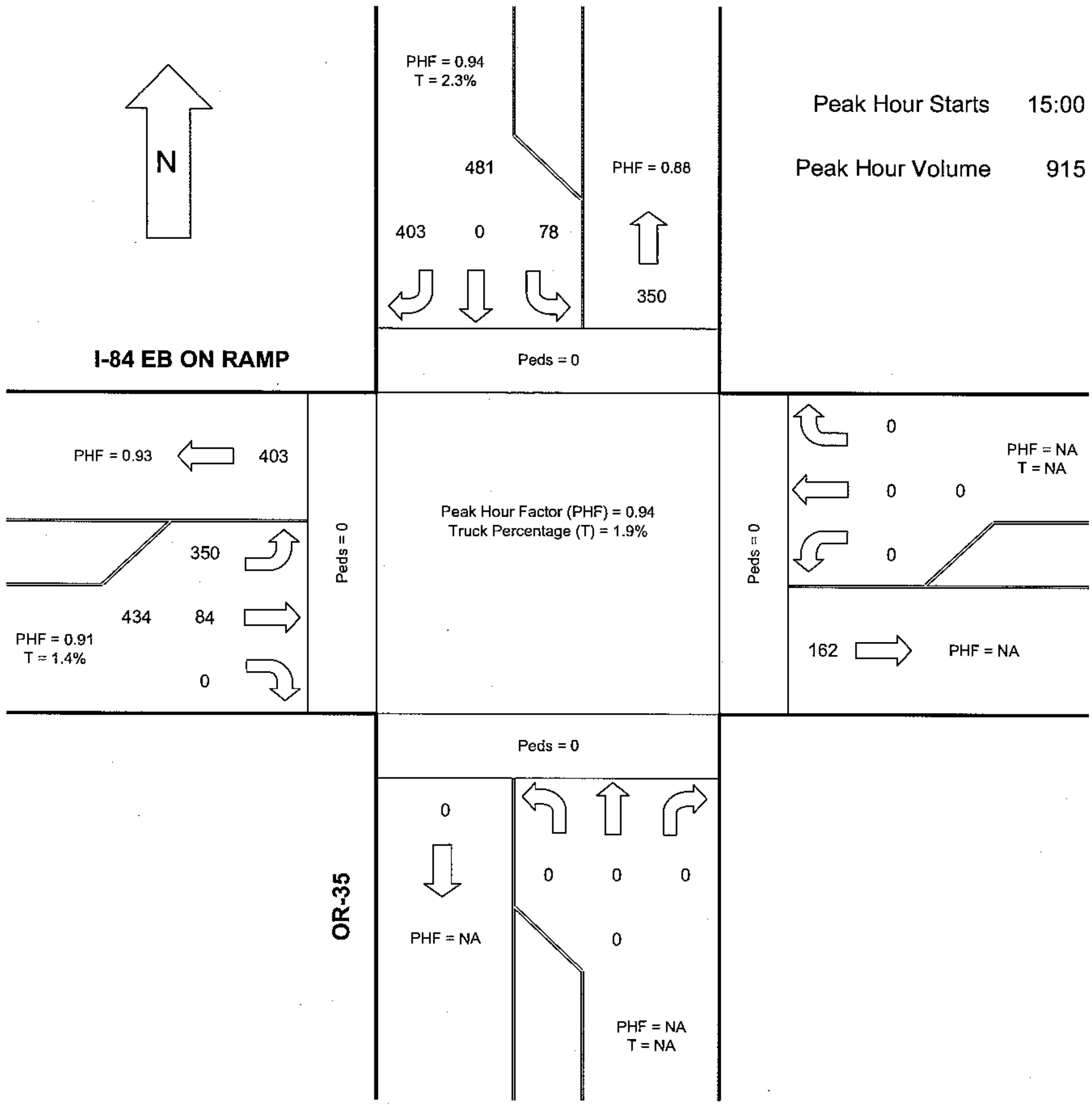
	South	West	East	North	
Pedestrians	0	0	0	0	0

TRAFSTATS

Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 14:00
Reviewed By: BV



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 16:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
16:00 - 16:15	0	22	71	0	0	0	0	0	0	96	0	28	217
16:15 - 16:30	0	17	74	0	0	0	0	0	0	63	0	12	166
16:30 - 16:45	0	29	76	0	0	0	0	0	0	83	0	13	201
16:45 - 17:00	0	19	78	0	0	0	0	0	0	81	0	15	193
17:00 - 17:15	0	24	64	0	0	0	0	0	0	83	0	11	182
17:15 - 17:30	0	22	83	0	0	0	0	0	0	59	0	17	181
17:30 - 17:45	0	13	75	0	0	0	0	0	0	69	0	25	182
17:45 - 18:00	0	15	75	0	0	0	0	0	0	72	0	14	176
Movement Totals	0	161	596	0	0	0	0	0	0	606	0	135	1498
Enter Totals		757			0			0			741		
Exit Totals		296			606			596			0		

Two-Hour Totals

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	3	1	0	0	0	0	0	0	3	0	1	8
Medium Trucks	0	0	2	0	0	0	0	0	0	0	0	0	2
Heavy Trucks	0	0	3	0	0	0	0	0	0	1	0	1	5
% Trucks	NA	1.9%	1.0%	NA	NA	NA	NA	NA	NA	0.7%	NA	1.5%	1.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	1	0	0	0	0	0	0	0	0	0	0	1

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 16:00 17:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	87	299	0	0	0	0	0	0	323	0	68	777
Peak Hour Factor	NA	0.75	0.96	NA	NA	NA	NA	NA	NA	0.84	NA	0.61	0.90

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	386	391	0	0
Peak Hour Factor	0.92	0.79	NA	NA
Exit Totals	155	0	299	323
Peak Hour Factor	0.78	NA	0.96	0.84

	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Light Trucks	0	3	1	0	0	0	0	0	0	1	0	1	6
Medium Trucks	0	0	2	0	0	0	0	0	0	0	0	0	2
Heavy Trucks	0	0	2	0	0	0	0	0	0	1	0	1	4
% Trucks	NA	3.4%	1.7%	NA	NA	NA	NA	NA	NA	0.6%	NA	2.9%	1.5%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

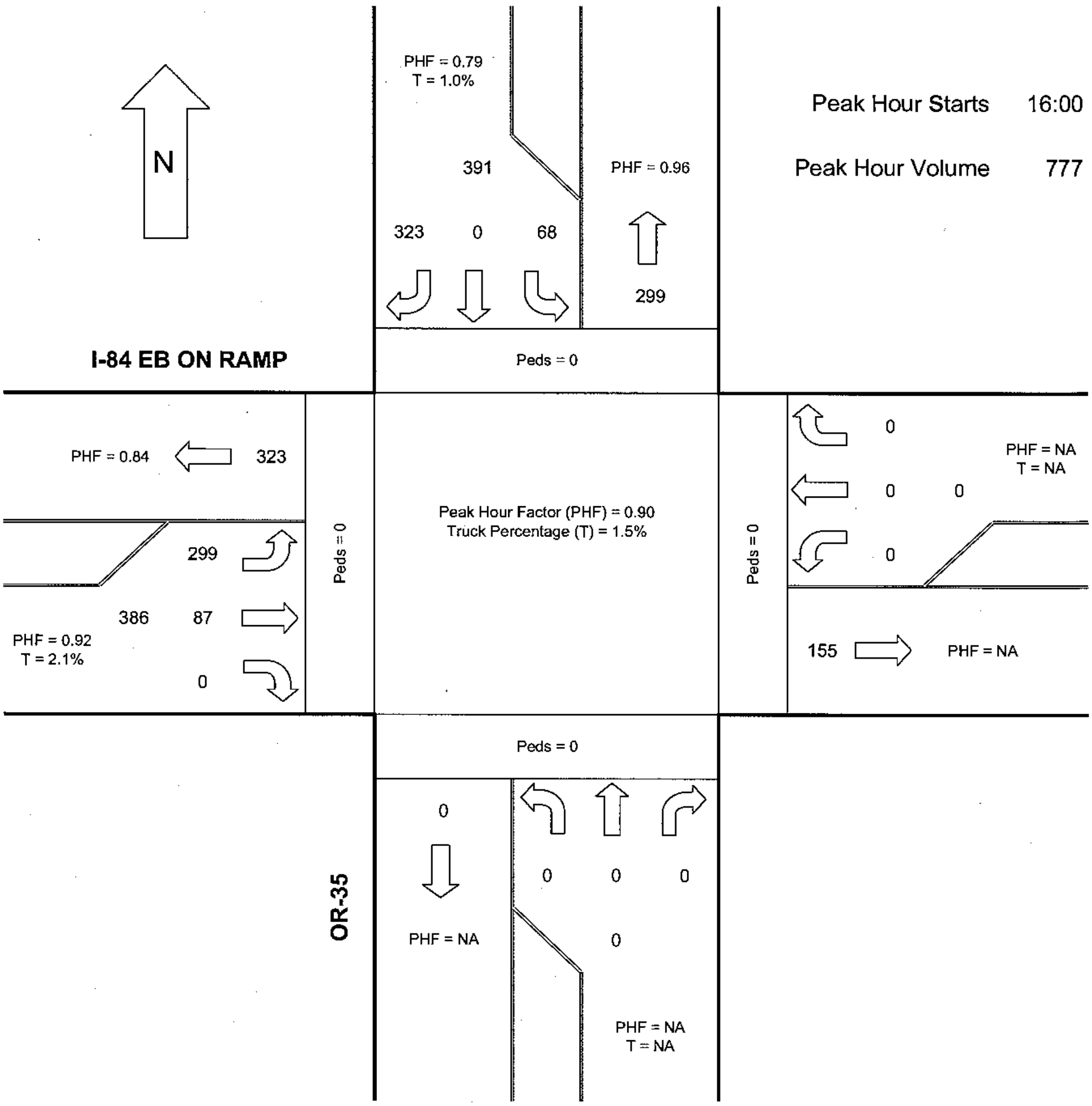
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 16:00
Reviewed By: BV



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 18:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
18:00 - 18:15	0	23	57	0	0	0	0	0	0	50	0	19	149
18:15 - 18:30	0	13	53	0	0	0	0	0	0	46	0	16	128
18:30 - 18:45	0	10	48	0	0	0	0	0	0	50	0	10	118
18:45 - 19:00	0	15	45	0	0	0	0	0	0	51	0	14	125
19:00 - 19:15	0	16	60	0	0	0	0	0	0	42	0	9	127
19:15 - 19:30	0	20	36	0	0	0	0	0	0	38	0	10	104
19:30 - 19:45	0	9	38	0	0	0	0	0	0	40	0	19	106
19:45 - 20:00	0	8	33	0	0	0	0	0	0	47	0	11	99
Movement Totals	0	114	370	0	0	0	0	0	0	364	0	108	956
Enter Totals		484			0			0			472		
Exit Totals		222			364			370			0		

Two-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	3	0	0	0	0	0	0	1	0	1	5
Medium Trucks	0	0	1	0	0	0	0	0	0	0	0	0	1
Heavy Trucks	0	0	1	0	0	0	0	0	0	1	0	0	2
% Trucks	NA	0.0%	1.4%	NA	NA	NA	NA	NA	NA	0.5%	NA	0.9%	0.8%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	West	East	North	
Pedestrians	0	0	0	0	0

Peak Hour Information

Peak Hour 18:00 19:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	0	61	203	0	0	0	0	0	0	197	0	59	520
Peak Hour Factor	NA	0.66	0.89	NA	NA	NA	NA	NA	NA	0.97	NA	0.78	0.87

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	264	256	0	0
Peak Hour Factor	0.83	0.93	NA	NA
Exit Totals	120	0	203	197
Peak Hour Factor	0.71	NA	0.89	0.97

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	3	0	0	0	0	0	0	1	0	1	5
Medium Trucks	0	0	1	0	0	0	0	0	0	0	0	0	1
Heavy Trucks	0	0	1	0	0	0	0	0	0	0	0	0	1
% Trucks	NA	0.0%	2.5%	NA	NA	NA	NA	NA	NA	0.5%	NA	1.7%	1.3%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

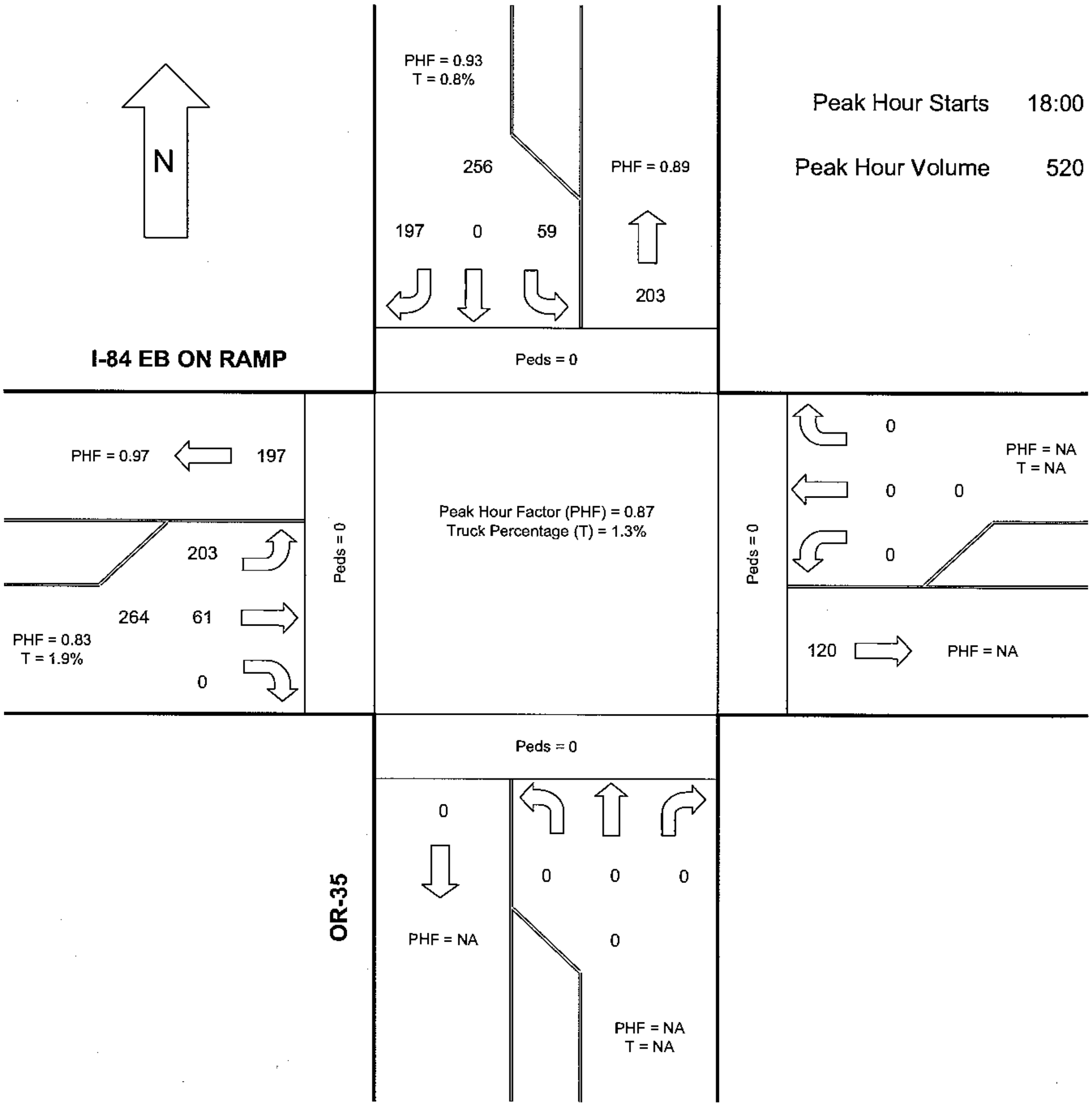
	South	West	East	North	
Pedestrians	0	0	0	0	0

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location I-84 EB ON RAMP AT OR-35
Date 8/5/2006
Day of Week Saturday
Time Begin 18:00
Reviewed By: BV



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 12:00
Reviewed By: BV

Time Period	Eastbound			Westbound			Northbound			Southbound			Totals
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
12:00 - 12:15	33	7	54	5	1	3	2	39	34	45	66	8	297
12:15 - 12:30	36	5	43	1	6	1	3	38	35	34	54	6	262
12:30 - 12:45	35	12	65	7	5	1	2	45	33	36	53	2	296
12:45 - 13:00	32	1	40	5	8	1	0	57	31	31	44	3	253
13:00 - 13:15	49	1	59	5	6	3	3	37	35	38	44	4	284
13:15 - 13:30	37	7	49	4	6	3	1	38	35	32	69	7	288
13:30 - 13:45	44	7	53	3	12	3	2	47	31	32	54	4	292
13:45 - 14:00	55	6	49	2	11	3	3	41	46	31	46	5	298
14:00 - 14:15	29	4	65	12	6	4	6	53	37	31	51	3	301
14:15 - 14:30	40	7	56	5	5	0	0	60	35	32	67	3	310
14:30 - 14:45	50	6	56	5	6	0	4	51	31	36	59	3	307
14:45 - 15:00	31	10	63	7	10	0	2	60	41	36	61	7	328
Movement Totals	471	73	652	61	82	22	28	566	424	414	668	55	3516
Enter Totals	1196			165			1018			1137			
Exit Totals	552			524			1240			1200			

Three-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	6	0	1	0	0	10	3	1	13	1	35
Medium Trucks	0	0	0	0	0	0	1	3	0	0	3	0	7
Heavy Trucks	0	0	1	0	0	0	0	14	0	0	14	0	29
% Trucks	0.0%	0.0%	1.1%	0.0%	1.2%	0.0%	3.6%	4.8%	0.7%	0.2%	4.5%	1.8%	2.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	1	0	0	0	1

	South	North	East	West	
Pedestrians	14	35	3	0	52

Peak Hour Information

Peak Hour 14:00 15:00

	Eastbound			Westbound			Northbound			Southbound			Totals
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
Movement Total	150	27	240	29	27	4	12	224	144	135	238	16	1246
Peak Hour Factor	0.75	0.68	0.92	0.60	0.68	0.25	0.50	0.93	0.88	0.94	0.89	0.57	0.95

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	417	60	380	389
Peak Hour Factor	0.93	0.68	0.92	0.94
Exit Totals	55	306	493	392
Peak Hour Factor	0.72	0.88	0.95	0.90

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	0	0	0	0	0	0	0	1	2	0	2	0	5
Medium Trucks	0	0	0	0	0	0	1	1	0	0	0	0	2
Heavy Trucks	0	0	1	0	0	0	0	5	0	0	5	0	11
% Trucks	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	8.3%	3.1%	1.4%	0.0%	2.9%	0.0%	1.4%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

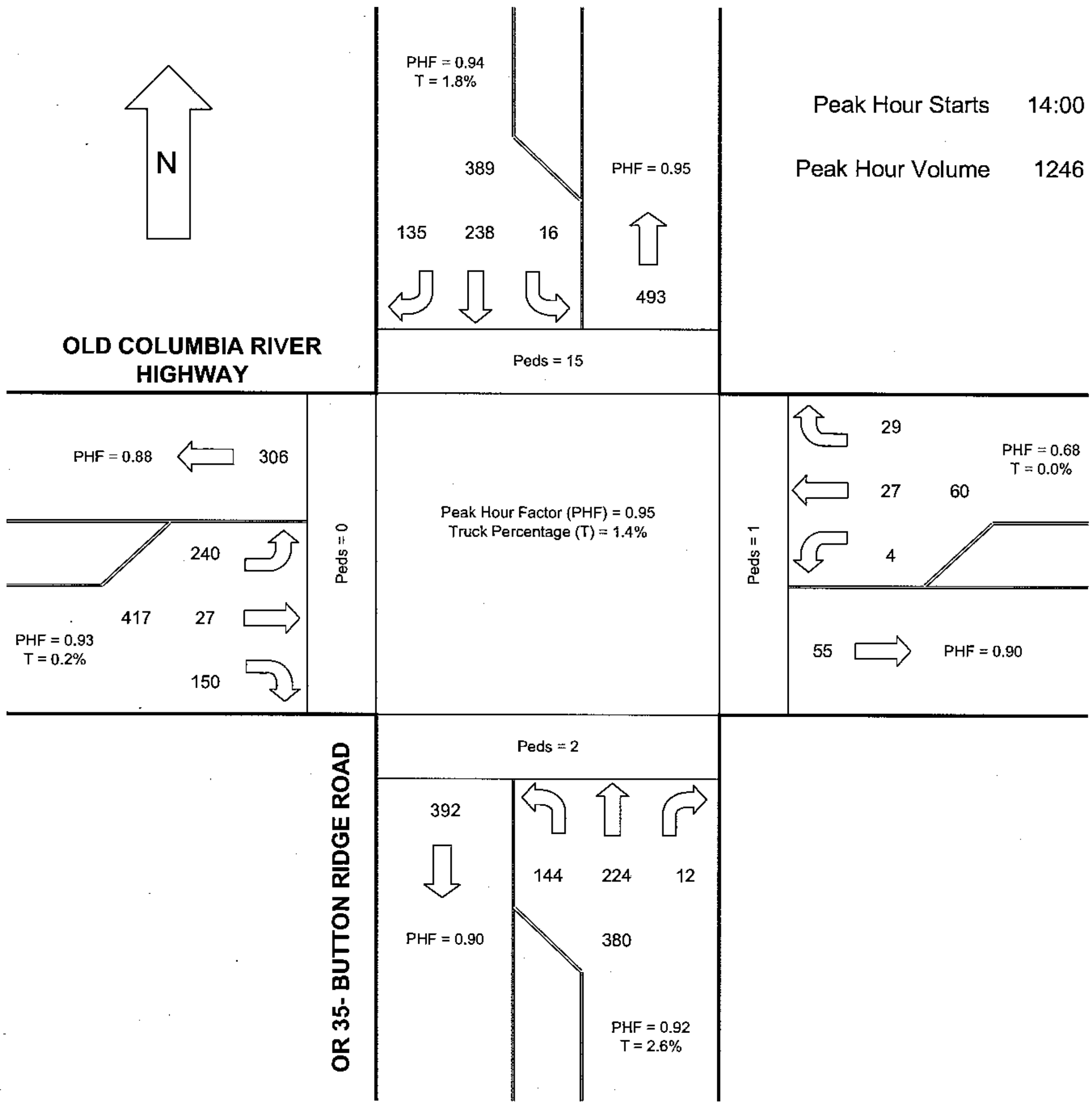
	South	North	East	West	
Pedestrians	2	15	1	0	18

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 12:00
Reviewed By: BV



TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 9:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
9:00 - 9:15	19	3	28	5	6	0	2	28	28	28	15	4	166
9:15 - 9:30	15	3	25	3	10	1	2	20	23	31	36	3	172
9:30 - 9:45	22	6	40	5	3	1	0	29	26	29	33	10	204
9:45 - 10:00	23	2	37	2	3	2	3	29	32	30	34	5	202
10:00 - 10:15	24	9	39	4	2	0	1	19	29	18	27	3	175
10:15 - 10:30	22	8	36	4	10	3	3	49	30	25	49	4	243
10:30 - 10:45	22	2	39	4	6	3	0	27	38	39	49	2	231
10:45 - 11:00	33	3	39	1	10	1	2	33	36	26	57	3	244
11:00 - 11:15	29	7	40	3	1	0	3	47	28	33	39	2	232
11:15 - 11:30	31	7	50	3	7	1	1	47	32	19	57	3	258
11:30 - 11:45	36	7	47	6	9	0	1	88	40	35	46	5	320
11:45 - 12:00	33	5	50	5	5	2	1	66	52	34	51	5	309
Movement Totals	309	62	470	45	72	14	19	482	394	347	493	49	2756
Enter Totals	841			131			895			889			
Exit Totals	505			438			966			847			

Three-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	2	2	7	2	1	0	0	12	4	6	8	0	44
Medium Trucks	0	0	0	0	0	0	3	0	0	0	1	0	4
Heavy Trucks	0	0	0	0	0	0	0	13	1	0	17	0	31
% Trucks	0.6%	3.2%	1.5%	4.4%	1.4%	0.0%	15.8%	5.2%	1.3%	1.7%	5.3%	0.0%	2.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	6	0	0	3	9

	South	North	East	West	
Pedestrians	71	56	1	0	128

Peak Hour Information

Peak Hour 11:00 12:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Totals
Movement Total	129	26	187	17	22	3	6	248	152	121	193	15	1119
Peak Hour Factor	0.90	0.93	0.94	0.71	0.61	0.38	0.50	0.70	0.73	0.86	0.85	0.75	0.87
Enter Totals	342			42			406			329			
Peak Hour Factor	0.95			0.70			0.79			0.91			
Exit Totals	47			295			452			325			
Peak Hour Factor	0.90			0.81			0.80			0.91			
Light Trucks	1	2	1	1	1	0	0	6	0	1	3	0	16
Medium Trucks	0	0	0	0	0	0	1	0	0	0	0	0	1
Heavy Trucks	0	0	0	0	0	0	0	5	0	0	3	0	8
% Trucks	0.8%	7.7%	0.5%	5.9%	4.5%	0.0%	16.7%	4.4%	0.0%	0.8%	3.1%	0.0%	2.2%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

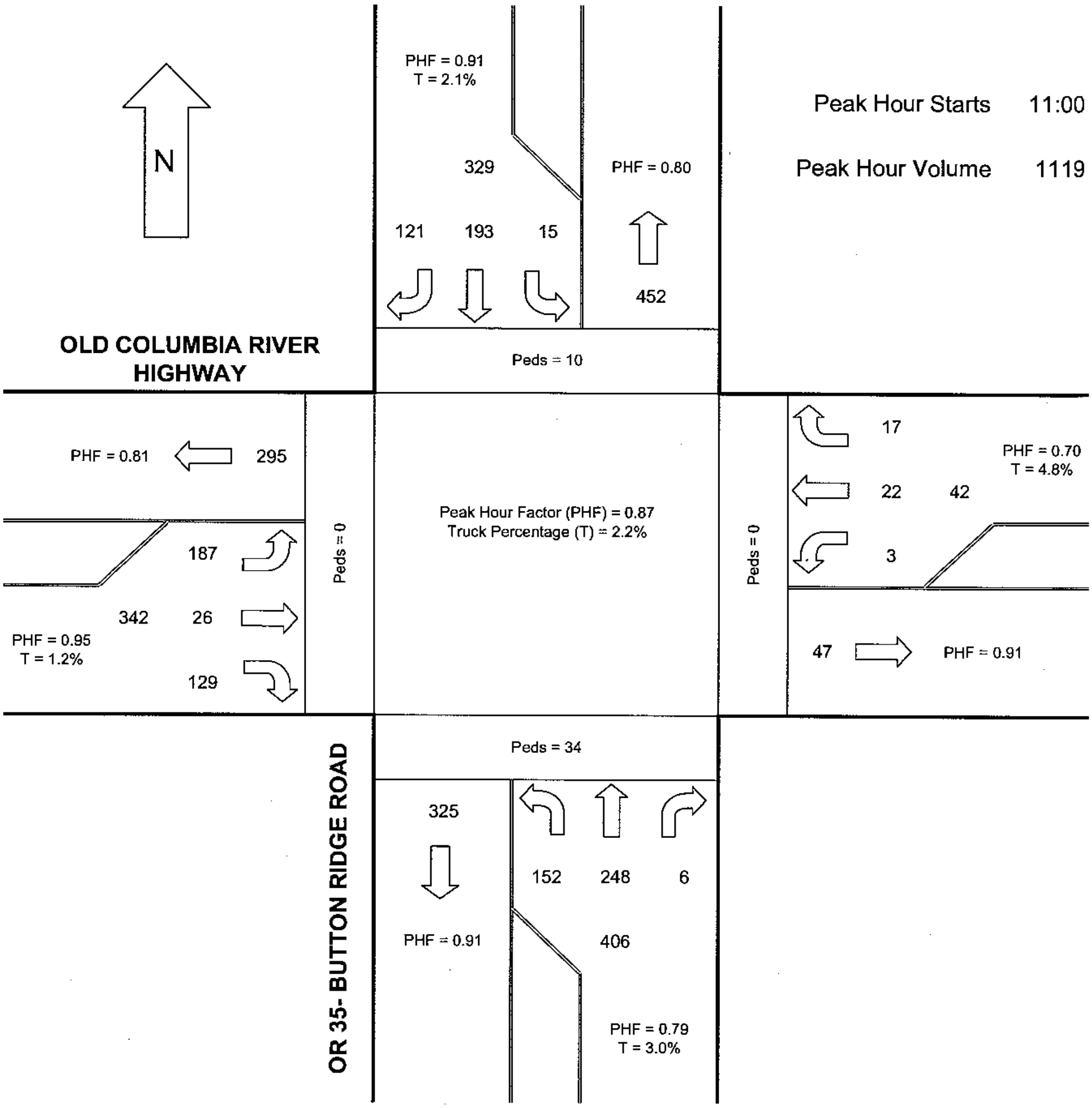
	South	North	East	West	
Pedestrians	34	10	0	0	44

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 9:00
Reviewed By: BV



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 18:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
18:00 - 18:15	27	6	32	6	8	0	2	36	36	22	24	2	201
18:15 - 18:30	36	5	27	3	4	2	7	29	41	23	32	3	212
18:30 - 18:45	36	6	26	2	6	2	1	40	38	22	28	5	212
18:45 - 19:00	24	4	29	2	13	0	2	26	32	21	24	10	187
19:00 - 19:15	30	4	34	5	1	1	0	32	18	19	32	3	179
19:15 - 19:30	18	3	29	5	4	2	2	16	13	28	17	4	141
19:30 - 19:45	20	4	25	7	2	3	1	21	32	23	17	1	156
19:45 - 20:00	26	2	30	4	2	1	0	13	23	24	17	5	147
Movement Totals	217	34	232	34	40	11	15	213	233	182	191	33	1435
Enter Totals	483			85			461			406			
Exit Totals	82			455			479			419			

Two-Hour Totals

	EB Right	EB Thru	EB Left	WB Right	WB Thru	WB Left	NB Right	NB Thru	NB Left	SB Right	SB Thru	SB Left	Totals
Light Trucks	1	0	1	0	0	0	0	1	0	0	3	0	6
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	0	2	0	0	4	0	6
% Trucks	0.5%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	0.0%	3.7%	0.0%	0.8%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	2	0	0	0	0	0	0	0	0	2

	South	West	East	North	
Pedestrians	8	0	0	8	16

Peak Hour Information

Peak Hour 18:00 19:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	123	21	114	13	31	4	12	131	147	88	108	20	812
Peak Hour Factor	0.85	0.88	0.89	0.54	0.60	0.50	0.43	0.82	0.90	0.96	0.84	0.50	0.96

	Eastbound	Westbound	Northbound	Southbound
Enter Totals	258	48	290	216
Peak Hour Factor	0.95	0.80	0.92	0.93
Exit Totals	53	266	258	235
Peak Hour Factor	0.83	0.98	0.87	0.84

	EB Right	EB Thru	EB Left	WB Right	WB Thru	WB Left	NB Right	NB Thru	NB Left	SB Right	SB Thru	SB Left	Totals
Light Trucks	1	0	1	0	0	0	0	0	0	0	1	0	3
Medium Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Trucks	0	0	0	0	0	0	0	2	0	0	3	0	5
% Trucks	0.8%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	0.0%	3.7%	0.0%	1.0%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

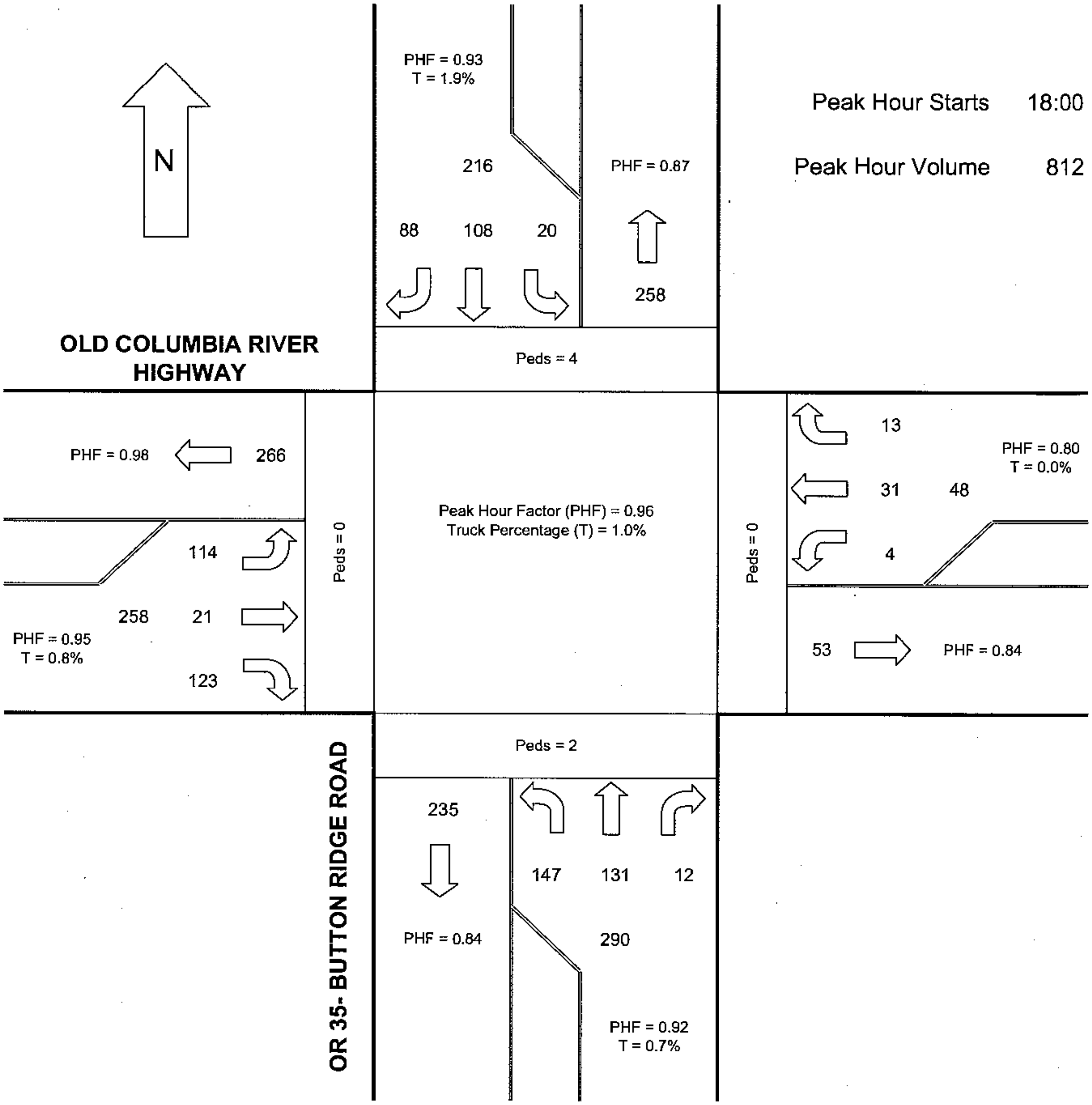
	South	West	East	North	
Pedestrians	2	0	0	4	6

TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Peak Hour Diagram

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 18:00
Reviewed By: BV



TRAF STATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Summary Report

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 6:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
6:00 - 6:15	2	2	6	0	3	1	0	20	6	3	11	0	54
6:15 - 6:30	8	0	10	0	1	1	1	12	5	2	18	0	58
6:30 - 6:45	5	1	7	1	1	0	0	14	7	3	12	2	53
6:45 - 7:00	6	1	12	0	1	1	0	15	9	3	15	0	63
7:00 - 7:15	5	2	12	1	2	0	1	12	12	5	11	0	63
7:15 - 7:30	9	4	14	0	2	0	0	18	15	7	13	2	84
7:30 - 7:45	9	3	9	5	5	0	0	18	21	6	17	3	96
7:45 - 8:00	8	1	18	0	2	0	0	22	26	8	13	1	99
8:00 - 8:15	15	3	14	2	1	0	0	19	9	17	20	3	103
8:15 - 8:30	11	2	19	3	2	0	1	28	12	13	27	5	123
8:30 - 8:45	17	1	23	0	1	0	0	23	20	20	24	1	130
8:45 - 9:00	17	5	22	0	3	0	0	24	18	18	26	0	133
Movement Totals	112	25	166	12	24	3	3	225	160	105	207	17	1059
Enter Totals	303			39			388			329			
Exit Totals	202			132			394			331			

Three-Hour Totals

	Eastbound Right	Eastbound Thru	Eastbound Left	Westbound Right	Westbound Thru	Westbound Left	Northbound Right	Northbound Thru	Northbound Left	Southbound Right	Southbound Thru	Southbound Left	Totals
Light Trucks	1	0	3	0	0	0	0	3	0	2	5	0	14
Medium Trucks	0	0	0	0	0	3	0	1	0	0	1	0	5
Heavy Trucks	0	0	1	0	0	0	0	10	0	0	11	0	22
% Trucks	0.9%	0.0%	2.4%	0.0%	0.0%	100.0%	0.0%	6.2%	0.0%	1.9%	8.2%	0.0%	3.9%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	North	East	West	
Pedestrians	21	13	2	2	38

Peak Hour Information

Peak Hour 8:00 9:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	60	11	78	5	7	0	1	94	59	68	97	9	489
Peak Hour Factor	0.88	0.55	0.85	0.42	0.58	NA	0.25	0.84	0.74	0.85	0.90	0.45	0.92
Enter Totals	149			12			154			174			
Peak Hour Factor	0.85			0.60			0.90			0.97			
Exit Totals	21			134			177			157			
Peak Hour Factor	0.66			0.82			0.89			0.91			
Light Trucks	0	0	2	0	0	0	0	0	0	1	3	0	6
Medium Trucks	0	0	0	0	0	0	0	1	0	0	0	0	1
Heavy Trucks	0	0	0	0	0	0	0	4	0	0	7	0	11
% Trucks	0.0%	0.0%	2.6%	0.0%	0.0%	NA	0.0%	5.3%	0.0%	1.5%	10.3%	0.0%	3.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

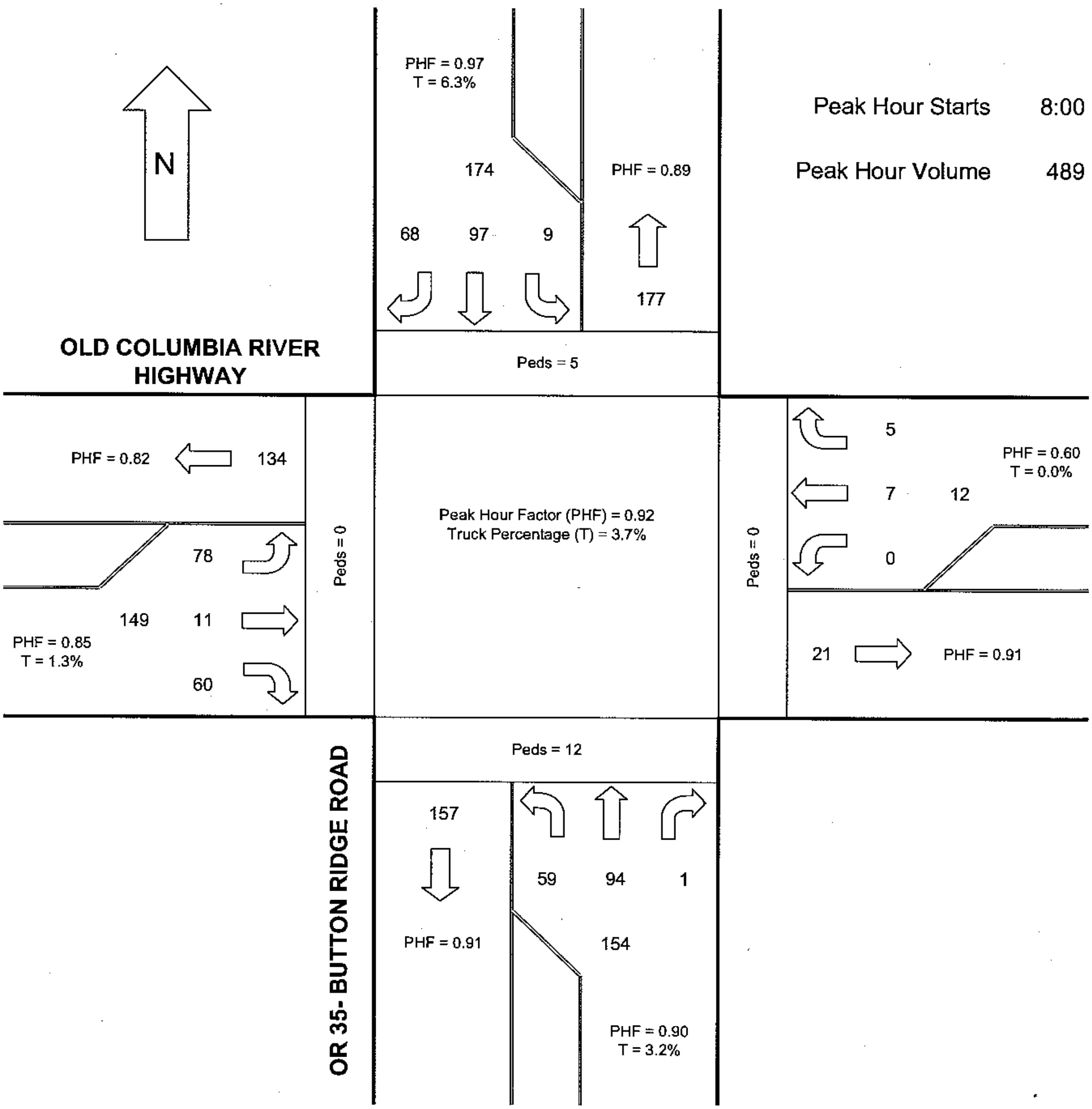
	South	North	East	West	
Pedestrians	12	5	0	0	17

TRAFSTATS
PO Box 13699
Salem, OR 97309

Intersection Turning Movement

Peak Hour Diagram

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 6:00
Reviewed By: BV



TrafStats
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement

Summary Report

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 15:00
Reviewed By: BV

	Eastbound			Westbound			Northbound			Southbound			
Time Period	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
15:00 - 15:15	48	4	39	4	6	2	3	46	29	33	47	3	264
15:15 - 15:30	34	2	64	4	7	3	3	48	39	31	61	1	297
15:30 - 15:45	38	6	56	3	5	0	1	67	41	26	63	2	308
15:45 - 16:00	38	6	45	3	4	1	1	56	53	39	45	1	292
16:00 - 16:15	31	4	53	2	4	1	0	40	25	44	49	6	259
16:15 - 16:30	31	3	51	8	2	0	0	53	41	21	33	3	246
16:30 - 16:45	31	3	49	4	2	2	1	46	39	37	57	4	275
16:45 - 17:00	38	9	46	4	1	2	2	46	30	35	30	2	245
17:00 - 17:15	34	3	57	7	4	1	3	37	27	32	41	0	246
17:15 - 17:30	35	6	44	2	5	1	6	49	35	34	23	3	243
17:30 - 17:45	33	5	48	3	6	2	3	37	27	45	32	3	244
17:45 - 18:00	33	16	38	2	5	0	6	42	31	27	28	5	233
Movement Totals	424	67	590	46	51	15	29	567	417	404	509	33	3152
Enter Totals	1081			112			1013			946			
Exit Totals	517			484			1172			979			

Three-Hour Totals

Light Trucks	2	0	6	0	0	0	0	6	7	8	12	0	41
Medium Trucks	0	0	0	0	0	0	0	1	0	0	2	0	3
Heavy Trucks	0	0	0	0	0	0	0	7	0	0	2	0	9
% Trucks	0.5%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	2.5%	1.7%	2.0%	3.1%	0.0%	1.7%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	3	0	2	0	0	0	5

	South	North	East	West	
Pedestrians	7	15	3	0	25

Peak Hour Information

Peak Hour 15:00 16:00

	Eastbound			Westbound			Northbound			Southbound			
	Right	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Right**	**Thru**	**Left**	**Totals**
Movement Total	158	18	204	14	22	6	8	217	162	129	216	7	1161
Peak Hour Factor	0.82	0.75	0.80	0.88	0.79	0.50	0.67	0.81	0.76	0.83	0.86	0.58	0.94

Enter Totals	380	42	387	352
Peak Hour Factor	0.95	0.75	0.88	0.95

Exit Totals	33	313	435	380
Peak Hour Factor	0.83	0.82	0.86	0.94

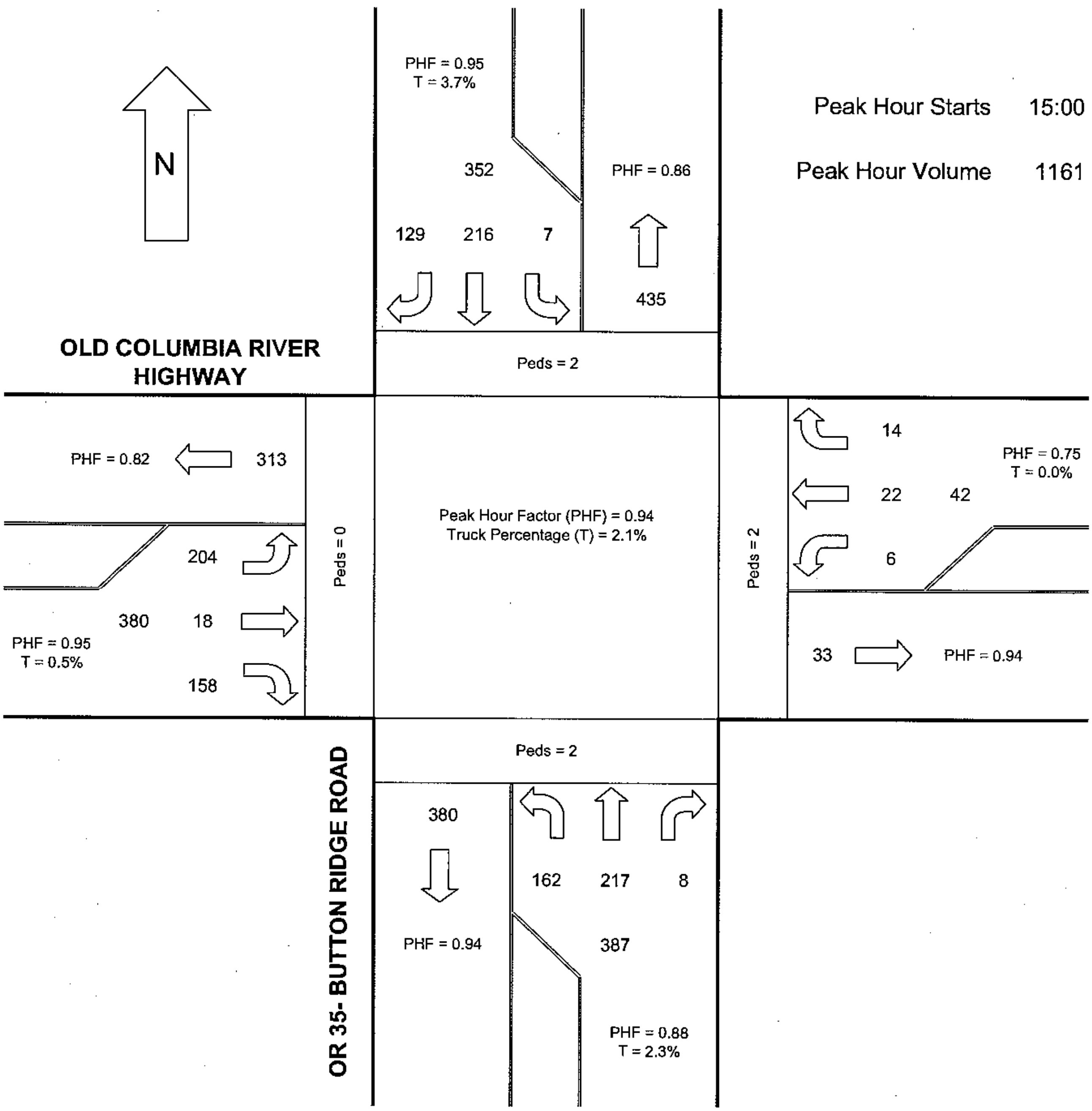
Light Trucks	0	0	2	0	0	0	0	3	2	3	6	0	16
Medium Trucks	0	0	0	0	0	0	0	1	0	0	2	0	3
Heavy Trucks	0	0	0	0	0	0	0	3	0	0	2	0	5
% Trucks	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	3.2%	1.2%	2.3%	4.6%	0.0%	2.1%
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0

	South	North	East	West	
Pedestrians	2	2	2	0	6

TRAFSTATS
PO Box 13699
Salem, OR 97309
Tel: (503) 646-2942
Fax: (503) 526-0628

Intersection Turning Movement
Peak Hour Diagram

Location OLD COLUMBIA RIVER HIGHWAY AT OR 35- BUTTON RIDGE ROAD
Date 7/14/2007
Day of Week Saturday
Time Begin 15:00
Reviewed By: BV



2007 Existing Conditions
Study Intersections Operational Analysis

Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	1	1	85	65	50
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	6	1	1	109	83	64
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	195	83	83			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	195	83	83			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	793	976	1514			

Direction, Lane #	WB 1	SE 1	NW 1	NW 2
Volume Total	8	110	83	64
Volume Left	6	1	0	0
Volume Right	1	0	0	64
cSH	819	1514	1700	1700
Volume to Capacity	0.01	0.00	0.05	0.04
Queue Length 95th (ft)	1	0	0	0
Control Delay (s)	9.4	0.1	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.4	0.1	0.0	
Approach LOS	A			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	15.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	220	0	20	0	60	30	245	95	0
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)	0	0	0	244	0	22	0	67	33	272	106	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	756	733	83	733	750	106	106			100		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	756	733	83	733	750	106	106			100		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	15	100	98	100			82		
cM capacity (veh/h)	273	284	976	289	278	949	1486			1493		

Direction, Lane #	WB 1	SE 1	NW 1
Volume Total	267	100	378
Volume Left	244	0	272
Volume Right	22	33	0
cSH	307	1700	1493
Volume to Capacity	0.87	0.06	0.18
Queue Length 95th (ft)	195	0	17
Control Delay (s)	61.2	0.0	6.2
Lane LOS	F		A
Approach Delay (s)	61.2	0.0	6.2
Approach LOS	F		

Intersection Summary			
Average Delay	25.0		
Intersection Capacity Utilization	47.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	5	255	0	0	0	25	255	0	0	315	175
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)	27	5	277	0	0	0	27	277	0	0	342	190
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	674	674	277	954	674	342	342			277		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	674	674	277	954	674	342	342			277		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	99	64	100	100	100	98			100		
cM capacity (veh/h)	362	368	762	147	368	700	1217			1286		

Direction, Lane #	EB 1	SE 1	NW 1	NW 2
Volume Total	310	304	342	190
Volume Left	27	27	0	0
Volume Right	277	0	0	190
cSH	683	1217	1700	1700
Volume to Capacity	0.45	0.02	0.20	0.11
Queue Length 95th (ft)	59	2	0	0
Control Delay (s)	14.6	0.9	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	14.6	0.9	0.0	
Approach LOS	B			

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	405	105	60	375	115	75
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	413	107	61	383	117	77
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			520		972	467
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			520		972	467
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		55	87
cM capacity (veh/h)			1046		264	596

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	520	444	194
Volume Left	0	61	117
Volume Right	107	0	77
cSH	1700	1046	338
Volume to Capacity	0.31	0.06	0.57
Queue Length 95th (ft)	0	5	85
Control Delay (s)	0.0	1.8	29.0
Lane LOS		A	D
Approach Delay (s)	0.0	1.8	29.0
Approach LOS			D

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	340	70	15	410	50	30	10	10	35	20	45
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	27	366	75	16	441	54	32	11	11	38	22	48
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									4			2
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	495			441			965	984	403	930	995	468
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	495			441			965	984	403	930	995	468
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			83	95	98	83	91	92
cM capacity (veh/h)	1069			1119			194	239	647	228	235	595

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	27	441	16	495	54	108
Volume Left	27	0	16	0	32	38
Volume Right	0	75	0	54	11	48
cSH	1069	1700	1119	1700	257	419
Volume to Capacity	0.03	0.26	0.01	0.29	0.21	0.26
Queue Length 95th (ft)	2	0	1	0	19	25
Control Delay (s)	8.5	0.0	8.3	0.0	23.8	19.5
Lane LOS	A		A		C	C
Approach Delay (s)	0.5		0.3		23.8	19.5
Approach LOS					C	C

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	30	55	20	25	0	30	0	35	0	25	5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	34	62	23	28	0	34	0	40	0	28	6
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	28			97			159	139	65	179	170	28
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	28			97			159	139	65	179	170	28
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			96	100	96	100	96	99
cM capacity (veh/h)	1585			1497			769	740	999	743	712	1047

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	97	51	74	34
Volume Left	0	23	34	0
Volume Right	62	0	40	6
cSH	1700	1497	878	752
Volume to Capacity	0.06	0.02	0.08	0.05
Queue Length 95th (ft)	0	1	7	4
Control Delay (s)	0.0	3.4	9.5	10.0
Lane LOS		A	A	B
Approach Delay (s)	0.0	3.4	9.5	10.0
Approach LOS			A	B

Intersection Summary				
Average Delay	4.7			
Intersection Capacity Utilization	26.6%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	0	10	150	5	5	5	55	120	5	90	5
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)	5	0	11	165	5	5	5	60	132	5	99	5

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	11	176	5	192	5	104
Volume Left (vph)	5	0	165	5	0	5	0
Volume Right (vph)	0	11	5	0	132	0	5
Hadj (s)	0.23	-0.57	0.20	0.53	-0.45	0.53	0.00
Departure Headway (s)	5.1	3.2	4.8	5.6	4.6	5.7	5.1
Degree Utilization, x	0.01	0.01	0.24	0.01	0.25	0.01	0.15
Capacity (veh/h)	645	1121	706	615	745	602	667
Control Delay (s)	8.1	6.2	9.3	7.5	8.0	7.5	7.9
Approach Delay (s)	6.9		9.3	7.9		7.8	
Approach LOS	A		A	A		A	

Intersection Summary			
Delay	8.4		
HCM Level of Service	A		
Intersection Capacity Utilization	33.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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	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)					1682	1500	1660	1748			1748	1443
Flt Permitted					0.95	1.00	0.56	1.00			1.00	1.00
Satd. Flow (perm)					1682	1500	977	1748			1748	1443
Volume (vph)	0	0	0	370	5	55	95	125	0	0	180	70
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	394	5	59	101	133	0	0	191	74
RTOR Reduction (vph)	0	0	0	0	0	41	0	0	0	0	0	40
Lane Group Flow (vph)	0	0	0	0	399	18	101	133	0	0	191	34
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	3%	3%	3%	2%	3%	6%
Turn Type				Split		Perm	pm+pt					Perm
Protected Phases				4	4		1	6			2	
Permitted Phases						4	6					2
Actuated Green, G (s)					22.4	22.4	46.3	46.3			35.9	35.9
Effective Green, g (s)					22.9	22.9	46.3	46.3			35.9	35.9
Actuated g/C Ratio					0.30	0.30	0.60	0.60			0.47	0.47
Clearance Time (s)					4.5	4.5	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)					499	445	643	1048			813	671
v/s Ratio Prot					c0.24		c0.01	0.08			c0.11	
v/s Ratio Perm						0.01	0.08					0.02
v/c Ratio					0.80	0.04	0.16	0.13			0.23	0.05
Uniform Delay, d1					25.0	19.3	6.8	6.7			12.4	11.3
Progression Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2					8.7	0.0	0.1	0.2			0.7	0.1
Delay (s)					33.8	19.4	6.9	6.9			13.1	11.5
Level of Service					C	B	A	A			B	B
Approach Delay (s)		0.0			31.9			6.9			12.6	
Approach LOS		A			C			A			B	

Intersection Summary

HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	77.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.92		1.00	1.00	
Flt Protected		0.96	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1675	1485					1616		1660	1748	
Flt Permitted		0.96	1.00					1.00		0.41	1.00	
Satd. Flow (perm)		1675	1485					1616		713	1748	
Volume (vph)	30	5	85	0	0	0	0	190	240	80	470	0
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	32	5	90	0	0	0	0	202	255	85	500	0
RTOR Reduction (vph)	0	0	80	0	0	0	0	39	0	0	0	0
Lane Group Flow (vph)	0	37	10	0	0	0	0	418	0	85	500	0
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Turn Type	Split		Perm							pm+pt		
Protected Phases	8	8						6		5	2	
Permitted Phases			8							2		
Actuated Green, G (s)		7.2	7.2					42.6		52.0	52.0	
Effective Green, g (s)		7.7	7.7					42.6		52.0	52.0	
Actuated g/C Ratio		0.11	0.11					0.63		0.77	0.77	
Clearance Time (s)		4.5	4.5					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		191	169					1017		623	1343	
v/s Ratio Prot		c0.02						c0.26		0.01	c0.29	
v/s Ratio Perm			0.01							0.09		
v/c Ratio		0.19	0.06					0.41		0.14	0.37	
Uniform Delay, d1		27.2	26.8					6.3		2.5	2.5	
Progression Factor		1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2		0.5	0.2					1.2		0.1	0.8	
Delay (s)		27.7	26.9					7.5		2.6	3.3	
Level of Service		C	C					A		A	A	
Approach Delay (s)		27.1			0.0			7.5			3.2	
Approach LOS		C			A			A			A	

Intersection Summary

HCM Average Control Delay	7.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	67.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	130	5	30	15	15	45	25	255	15	30	370	155
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)	137	5	32	16	16	47	26	268	16	32	389	163
Pedestrians		48			39			48			33	
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		4			3			4			3	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											365	
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	999	958	567	984	1032	348	601			323		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	999	955	533	983	1034	348	569			323		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	10	97	93	90	92	93	97			97		
cM capacity (veh/h)	151	210	467	163	189	654	893			1196		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	174	79	311	584
Volume Left	137	16	26	32
Volume Right	32	47	16	163
cSH	174	312	893	1196
Volume to Capacity	1.00	0.25	0.03	0.03
Queue Length 95th (ft)	201	25	2	2
Control Delay (s)	121.0	20.4	1.1	0.7
Lane LOS	F	C	A	A
Approach Delay (s)	121.0	20.4	1.1	0.7
Approach LOS	F	C		

Intersection Summary			
Average Delay	20.4		
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	140	180	35	10	190	55	20	95	20	75	105	235
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)	147	189	37	11	200	58	21	100	21	79	111	247

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total (vph)	374	268	142	189	247
Volume Left (vph)	147	11	21	79	0
Volume Right (vph)	37	58	21	0	247
Hadj (s)	0.05	-0.09	-0.03	0.24	-0.67
Departure Headway (s)	6.2	6.3	7.0	7.1	6.2
Degree Utilization, x	0.65	0.47	0.28	0.37	0.42
Capacity (veh/h)	542	517	444	476	547
Control Delay (s)	19.9	14.9	12.6	13.1	12.4
Approach Delay (s)	19.9	14.9	12.6	12.7	
Approach LOS	C	B	B	B	

Intersection Summary			
Delay	15.4		
HCM Level of Service	C		
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

Exh 64

Hood River IAMP

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Base Volume Alternative)

Intersection #1 Marina Way and Button Bridge Road Intersection

Cycle (sec):	100	Critical Vol./Cap.(X):	0.920
Loss Time (sec):	0 (Y+R=4.0 sec)	Average Delay (sec/veh):	33.2
Optimal Cycle:	0	Level Of Service:	D

Street Name:	Button Bridge Rd						marina Way					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1 0 1 0 1			1 0 0 1 0			0 0 1! 0 0			1 0 0 1 0		
Volume Module:												
Base Vol:	120	390	240	30	355	20	10	15	105	270	15	50
Growth Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Initial Bse:	120	390	240	30	355	20	10	15	105	270	15	50
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
PHF Volume:	128	415	255	32	378	21	11	16	112	287	16	53
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	128	415	255	32	378	21	11	16	112	287	16	53
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FinalVolume:	128	415	255	32	378	21	11	16	112	287	16	53
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	1.00	1.00	1.00	1.00	0.95	0.05	0.08	0.11	0.81	1.00	0.23	0.77
Final Sat.:	417	451	490	416	429	24	31	46	324	404	104	348
Capacity Analysis Module:												
Vol/Sat:	0.31	0.92	0.52	0.08	0.88	0.88	0.35	0.35	0.35	0.71	0.15	0.15
Crit Moves:		****			****				****	****		
Delay/Veh:	14.7	52.2	17.4	11.8	44.3	44.3	15.5	15.5	15.5	28.9	11.7	11.7
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	14.7	52.2	17.4	11.8	44.3	44.3	15.5	15.5	15.5	28.9	11.7	11.7
LOS by Move:	B	F	C	B	E	E	C	C	C	D	B	B
ApproachDel:		35.0			41.9			15.5			25.6	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		35.0			41.9			15.5			25.6	
LOS by Appr:		E			E			C			D	
AllWayAvgQ:	0.4	5.2	1.0	0.1	4.2	4.2	0.5	0.5	0.5	2.0	0.2	0.2

Note: Queue reported is the number of cars per lane.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	80	5	105	80	645	0	0	300	430
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	0	0	0	82	5	108	82	665	0	0	309	443
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						5						
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1418	1361	531	1361	1139	665	309			665		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1418	1361	531	1361	1139	665	309			665		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.2		
p0 queue free %	100	100	100	31	97	76	93			100		
cM capacity (veh/h)	82	140	552	120	190	453	1257			934		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	196	747	753
Volume Left	82	82	0
Volume Right	108	0	443
cSH	277	1257	1700
Volume to Capacity	0.71	0.07	0.44
Queue Length 95th (ft)	122	5	0
Control Delay (s)	46.5	1.7	0.0
Lane LOS	E	A	
Approach Delay (s)	46.5	1.7	0.0
Approach LOS	E		

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	99.9%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	360	115	0	365	380	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	375	120	0	380	396	0

Direction, Lane #	EB 1	EB 2	NB 1	SB 1
Volume Total (vph)	375	120	380	396
Volume Left (vph)	375	0	0	0
Volume Right (vph)	0	120	0	0
Hadj (s)	0.53	-0.63	0.02	0.02
Departure Headway (s)	7.3	6.1	6.3	6.3
Degree Utilization, x	0.76	0.20	0.66	0.69
Capacity (veh/h)	471	564	549	547
Control Delay (s)	29.1	9.5	20.8	21.9
Approach Delay (s)	24.4		20.8	21.9
Approach LOS	C		C	C

Intersection Summary			
Delay	22.5		
HCM Level of Service	C		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	365	85	0	0	80	415
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	388	90	0	0	85	441
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0				867	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				867	0
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	76				66	59
cM capacity (veh/h)	1630				247	1085

Direction, Lane #	EB 1	SB 1	SB 2
Volume Total	479	85	441
Volume Left	388	85	0
Volume Right	0	0	441
cSH	1630	247	1085
Volume to Capacity	0.24	0.34	0.41
Queue Length 95th (ft)	23	37	50
Control Delay (s)	6.8	27.0	10.6
Lane LOS	A	D	B
Approach Delay (s)	6.8	13.2	
Approach LOS		B	

Intersection Summary			
Average Delay	10.2		
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	205	20	160	5	20	15	160	220	10	10	215	130
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)	218	21	170	5	21	16	170	234	11	11	229	138

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	239	170	27	16	404	11	239	138
Volume Left (vph)	218	0	5	0	170	0	11	0
Volume Right (vph)	0	170	0	16	0	11	0	138
Hadj (s)	0.20	-0.60	0.04	-0.60	0.12	-0.60	0.10	-0.67
Departure Headway (s)	6.1	3.2	6.6	3.2	5.5	3.2	6.0	5.2
Degree Utilization, x	0.41	0.15	0.05	0.01	0.62	0.01	0.40	0.20
Capacity (veh/h)	543	1121	449	1121	625	1121	574	653
Control Delay (s)	13.3	6.8	9.9	6.2	17.1	6.2	11.8	8.3
Approach Delay (s)	10.6		8.5		16.9		10.5	
Approach LOS	B		A		C		B	

Intersection Summary			
Delay	12.6		
HCM Level of Service	B		
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

2007 Existing Conditions
I-84 Freeway Analysis

HCS2000: Basic Freeway Segments Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Operational Analysis

Analyst: DKS Associates
Agency or Company: DKS Associates
Date Performed: 9/27/2007
Analysis Time Period: PM Peak 4:00-5:00
Freeway/Direction: I-84 WB
From/To: West of Exit 62
Jurisdiction: ODOT
Analysis Year: 2007
Description: Hood River IAMP

Flow Inputs and Adjustments

Volume, V	1535	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	426	v
Trucks and buses	15	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, vp	0.90	
Flow rate, vp	1019	pc/h

Speed Inputs and Adjustments

Lane width	12.0	m
Right-shoulder lateral clearance	6.0	m
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Ideal	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	1019	pc/h/ln
Free-flow speed, FFS	65.5	mi/h
Average passenger-car speed, S	65.5	mi/h
Number of lanes, N	2	
Density, D	15.6	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Ramps and Ramp Junctions Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Diverge Analysis

Analyst:	DKS Associates
Agency/Co.:	DSK Associates
Date performed:	9/27/2007
Analysis time period:	PM Peak 4:00-5:00
Freeway/dir or travel:	I-84 Exit 62 WB off-ramp
Junction:	I-84/2nd Street
Jurisdiction:	ODOT
Analysis Year:	2007
Description:	Hood River IAMP

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1500	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	240	vph
Length of first accel/decel lane	260	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	275	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1750	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1500		240		275		vph
Peak-hour factor, PHF	0.90		0.90		0.90		
Peak 15-min volume, v15	417		67		76		v
Trucks and buses	15		2		2		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.930		0.990		0.990		
Driver population factor, fP	0.90		0.90		0.90		
Flow rate, vp	1991		299		343		pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1991 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1991	4700	No
v_{12}	1991	4400	No
$v_{FO} = v_F - v_R$	1692	4700	No
v_R	299	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D$ = 19.0 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.455

Space mean speed in ramp influence area, S_R = 55 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 54.5 mph

HCS2000: Ramps and Ramp Junctions Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Diverge Analysis

Analyst:	DKS Associates
Agency/Co.:	DSK Associates
Date performed:	9/27/2007
Analysis time period:	PM Peak 4:00-5:00
Freeway/dir or travel:	I-84 Exit 62 EB off-ramp
Junction:	I-84/2nd Street
Jurisdiction:	ODOT
Analysis Year:	2007
Description:	Hood River IAMP

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	880	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	285	vph
Length of first accel/decel lane	210	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	205	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	2100	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	880		285		205	vph
Peak-hour factor, PHF	0.90		0.97		0.97	
Peak 15-min volume, v15	244		73		53	v
Trucks and buses	15		3		3	%
Recreational vehicles	0		0		0	%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5		1.5		1.5	
Recreational vehicle PCE, ER	1.2		1.2		1.2	
Heavy vehicle adjustment, fHV	0.930		0.985		0.985	
Driver population factor, fP	0.90		0.90		0.90	
Flow rate, vp	1168		331		238	pcph

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1168 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1168	4700	No
v_{12}	1168	4400	No
$v_{FO} = v_F - v_R$	837	4700	No
v_R	331	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 12.4 pc/mi/l

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.458	
Space mean speed in ramp influence area,	S_R = 54	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.5	mph

HCS2000: Ramps and Ramp Junctions Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Merge Analysis

Analyst:	DKS Associates
Agency/Co.:	DSK Associates
Date performed:	9/27/2007
Analysis time period:	PM Peak 4:00-5:00
Freeway/dir or travel:	I-84 Exit 62 EB On-Ramp
Junction:	I-84/2nd Street
Jurisdiction:	ODOT
Analysis Year:	2007
Description:	Hood River IAMP

Freeway Data

Type of analysis	54.7	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	595	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	205	vph
Length of first accel/decel lane	600	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	285	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	2100	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	595	205	285	vph
Peak-hour factor, PHF	0.90	0.97	0.97	
Peak 15-min volume, v15	165	53	73	v
Trucks and buses	15	3	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.930	0.985	0.985	
Driver population factor, fP	0.90	0.90	0.90	
Flow rate, vp	790	238	331	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 790 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1028	4700	No
v_{R12}	1028	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 9.6 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.290	
Space mean speed in ramp influence area,	S_R = 58.3	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 58.3	mph

HCS2000: Ramps and Ramp Junctions Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Merge Analysis

Analyst:	DKS Associates
Agency/Co.:	DSK Associates
Date performed:	9/27/2007
Analysis time period:	PM Peak 4:00-5:00
Freeway/dir or travel:	I-84 Exit 62 WB On-Ramp
Junction:	I-84/2nd Street
Jurisdiction:	ODOT
Analysis Year:	2007
Description:	Hood River IAMP

Freeway Data

Type of analysis	54.4	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1260	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	275	vph
Length of first accel/decel lane	530	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	240	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1750	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1260		275		240	vph
Peak-hour factor, PHF	0.90		0.90		0.90	
Peak 15-min volume, v15	350		76		67	v
Trucks and buses	15		2		3	%
Recreational vehicles	0		0		0	%
Terrain type:	Level		Level		Level	
Grade		%		%		%
Length		mi		mi		mi
Trucks and buses PCE, ET	1.5		1.5		1.5	
Recreational vehicle PCE, ER	1.2		1.2		1.2	
Heavy vehicle adjustment, fHV	0.930		0.990		0.985	
Driver population factor, fP	0.90		0.90		0.90	
Flow rate, vp	1672		343		301	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1672 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2015	4700	No
v_{R12}	2015	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\, v_R + 0.0078\, v_{12} - 0.00627\, L_A$ = 17.7 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.313	
Space mean speed in ramp influence area,	S_R = 57.8	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 57.8	mph

HCS2000: Basic Freeway Segments Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Operational Analysis

Analyst: DKS Associates
Agency or Company: DKS Associates
Date Performed: 9/10/2007
Analysis Time Period: PM Peak 4:00-5:00
Freeway/Direction: I-84 WB
From/To: West of Exit 63
Jurisdiction: ODOT
Analysis Year: 2007
Description: Hood River IAMP

Flow Inputs and Adjustments

Volume, V	1500	veh/h
Peak-hour factor, PHF	0.90	
Peak 15-min volume, v15	417	v
Trucks and buses	15	%
Recreational vehicles	0	%
Terrain type:	Level	
Grade	0.00	%
Segment length	0.00	mi
Trucks and buses PCE, ET	1.5	
Recreational vehicle PCE, ER	1.2	
Heavy vehicle adjustment, fHV	0.930	
Driver population factor, vp	0.90	
Flow rate, vp	995	pc/h

Speed Inputs and Adjustments

Lane width	12.0	m
Right-shoulder lateral clearance	6.0	m
Interchange density	0.50	interchange/mi
Number of lanes, N	2	
Free-flow speed:	Ideal	
FFS or BFFS	70.0	mi/h
Lane width adjustment, fLW	0.0	mi/h
Lateral clearance adjustment, fLC	0.0	mi/h
Interchange density adjustment, fID	0.0	mi/h
Number of lanes adjustment, fN	4.5	mi/h
Free-flow speed, FFS	65.5	mi/h
	Urban Freeway	

LOS and Performance Measures

Flow rate, vp	995	pc/h/ln
Free-flow speed, FFS	65.5	mi/h
Average passenger-car speed, S	65.5	mi/h
Number of lanes, N	2	
Density, D	15.2	pc/mi/ln
Level of service, LOS	B	

Overall results are not computed when free-flow speed is less than 55 mph.

HCS2000: Freeway Weaving Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Operational Analysis

Analyst:	DKS Associate
Agency/Co.:	DKS
Date Performed:	9/10/2007
Analysis Time Period:	PM Peak 4:00-5:00
Freeway/dir or Travel:	I-84 WB
Weaving Location:	Exit 63-64
Jurisdiction:	ODOT
Analysis Year:	2007
Description:	Hood River IAMP

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1210	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.28	
Weaving ratio, R	0.43	

Conversion to pc/h Under Base Conditions

	Non-Weaving V A-C	Non-Weaving V B-D	Weaving V A-D	Weaving V B-C	
Volume, V	1021	206	224	309	veh/h
Peak-hour factor, PHF	0.90	0.97	0.94	0.97	
Peak 15-min volume, v15	284	53	60	80	v
Trucks and buses	15	2	1	3	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.930	0.990	0.995	0.985	
Driver population adjustment, fP	0.90	0.90	0.90	0.90	
Flow rate, v	1355	238	266	359	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
Weaving intensity factor, Wi	0.54	0.25
Weaving and non-weaving speeds, Si	50.79	59.11
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		1.02
Maximum number of lanes, Nw (max) (Exhibit 24-7)		1.40
Type of operation is		Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	56.50	mph
Weaving segment density, D	13.09	pc/mi/ln
Level of service, LOS	B	
Capacity for base condition, cb	5564	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded See Not Maximum	Note
Weaving flow rate, Vw	625	2800	a
Average flow rate (pcphpl)	739	2350	b
Volume ratio, VR	0.28	0.45	c
Weaving ratio, R	0.43	N/A	d
Weaving length (ft)	1210	2500	e

Notes:
a. Capacity constrained by maximum allowable weaving flow rate.
b. Capacity constrained by basic freeway capacity.
c. Segments do not operate well at VR's exceeding max. Poor operations and some local queuing are expected in such cases.
d. Breakdown may occur in some cases for Type C segments.
e. When length exceeds these limits, merge and diverge are treated as isolated junctions and analyzed accordingly (HCM Chapter 25, HCS Ramps.)

HCS2000: Freeway Weaving Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Operational Analysis

Analyst:	DKS Associate
Agency/Co.:	DKS
Date Performed:	9/10/2007
Analysis Time Period:	PM Peak 4:00-5:00
Freeway/dir or Travel:	I-84 EB
Weaving Location:	Exit 63-64
Jurisdiction:	ODOT
Analysis Year:	2007
Description:	Hood River IAMP

Inputs

Freeway free-flow speed, SFF	65	mph
Weaving number of lanes, N	3	
Weaving segment length, L	1140	ft
Terrain type	Level	
Grade		%
Length		mi
Weaving type	A	Multilane or C-D
Volume ratio, VR	0.52	
Weaving ratio, R	0.36	

Conversion to pc/h Under Base Conditions

	Non-Weaving V A-C	Non-Weaving V B-D	Weaving V A-D	Weaving V B-C	
Volume, V	335	130	345	195	veh/h
Peak-hour factor, PHF	0.90	0.94	0.94	0.94	
Peak 15-min volume, v15	93	35	92	52	v
Trucks and buses	15	1	4	1	%
Recreational vehicles	0	0	0	0	%
Trucks and buses PCE, ET	1.5	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.930	0.995	0.980	0.995	
Driver population adjustment, fP	0.90	0.90	0.90	0.90	
Flow rate, v	444	154	415	231	pc/h

Weaving and Non-Weaving Speeds

	Weaving	Non-Weaving
Weaving intensity factor, Wi	0.47	0.24
Weaving and non-weaving speeds, Si	52.49	59.34
Number of lanes required for unconstrained operation, Nw (Exhibit 24-7)		1.40

Maximum number of lanes, Nw (max) (Exhibit 24-7)	1.40
Type of operation is	Unconstrained

Weaving Segment Speed, Density, Level of Service and Capacity

Weaving segment speed, S	55.57	mph
Weaving segment density, D	7.46	pc/mi/ln
Level of service, LOS	A	
Capacity for base condition, cb	4618	pc/h

Limitations on Weaving Segments

	Analyzed	If Max Exceeded See Not Maximum	Note
Weaving flow rate, Vw	646	2800	a
Average flow rate (pcphpl)	414	2350	b
Volume ratio, VR	0.52	0.45	c
Weaving ratio, R	0.36	N/A	d
Weaving length (ft)	1140	2500	e

Notes:

a. Capacity constrained by maximum allowable weaving flow rate.
b. Capacity constrained by basic freeway capacity.
c. Segments do not operate well at VR's exceeding max. Poor operations and some local queuing are expected in such cases.
d. Breakdown may occur in some cases for Type C segments.
e. When length exceeds these limits, merge and diverge are treated as isolated junctions and analyzed accordingly (HCM Chapter 25, HCS Ramps.)

HCS2000: Ramps and Ramp Junctions Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Diverge Analysis

Analyst:	DKS Associates
Agency/Co.:	DSK Associates
Date performed:	9/27/2007
Analysis time period:	PM Peak 4:00-5:00
Freeway/dir or travel:	I-84 Exit 64 WB off-ramp
Junction:	I-84/Button Bridge Rd
Jurisdiction:	ODOT
Analysis Year:	2007
Description:	Hood River IAMP

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1435	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	190	vph
Length of first accel/decel lane	140	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	515	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1630	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp		
Volume, V (vph)	1435		190		515		vph
Peak-hour factor, PHF	0.90		0.97		0.97		
Peak 15-min volume, v15	399		49		133		v
Trucks and buses	15		4		5		%
Recreational vehicles	0		0		0		%
Terrain type:	Level		Level		Level		
Grade	0.00	%	0.00	%	0.00	%	
Length	0.00	mi	0.00	mi	0.00	mi	
Trucks and buses PCE, ET	1.5		1.5		1.5		
Recreational vehicle PCE, ER	1.2		1.2		1.2		
Heavy vehicle adjustment, fHV	0.930		0.980		0.976		
Driver population factor, fP	0.90		0.90		0.90		
Flow rate, vp	1904		222		605		pcph

Estimation of V12 Diverge Areas

$L_{EQ} =$ 0.00 (Equation 25-8 or 25-9)

$P_{FD} =$ 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD} =$ 1904 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1904	4700	No
v_{12}	1904	4400	No
$v_{FO} = v_F - v_R$	1682	4700	No
v_R	222	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\, v_{12} - 0.009\, L_D =$ 19.4 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, $D_S = 0.448$

Space mean speed in ramp influence area, $S_R = 55$ mph

Space mean speed in outer lanes, $S_0 =$ N/A mph

Space mean speed for all vehicles, $S = 54.7$ mph

HCS2000: Ramps and Ramp Junctions Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Diverge Analysis

Analyst:	DKS Associates
Agency/Co.:	DSK Associates
Date performed:	9/10/2007
Analysis time period:	PM Peak 4:00-5:00
Freeway/dir or travel:	I-84 Exit 63 EB off-ramp
Junction:	I-84/2nd Street
Jurisdiction:	ODOT
Analysis Year:	2007
Description:	Hood River IAMP

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	800	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	35.0	mph
Volume on ramp	120	vph
Length of first accel/decel lane	175	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent ramp	325	vph
Position of adjacent ramp	Downstream	
Type of adjacent ramp	On	
Distance to adjacent ramp	1815	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	800		120		325	vph
Peak-hour factor, PHF	0.90		0.94		0.94	
Peak 15-min volume, v15	222		32		86	v
Trucks and buses	15		1		2	%
Recreational vehicles	0		0		0	%
Terrain type:	Level		Level		Level	
Grade	0.00	%	0.00	%	0.00	%
Length	0.00	mi	0.00	mi	0.00	mi
Trucks and buses PCE, ET	1.5		1.5		1.5	
Recreational vehicle PCE, ER	1.2		1.2		1.2	
Heavy vehicle adjustment, fHV	0.930		0.995		0.990	
Driver population factor, fP	1.00		1.00		1.00	
Flow rate, vp	956		128		349	pcpl

Estimation of V12 Diverge Areas

L_{EQ} = 0.00 (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 956 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	956	4700	No
v_{12}	956	4400	No
$v_{FO} = v_F - v_R$	828	4700	No
v_R	128	2000	No

Level of Service Determination (if not F)

Density, $D_R = 4.252 + 0.0086\ v_{12} - 0.009\ L_D$ = 10.9 pc/mi/l

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.440	
Space mean speed in ramp influence area,	S_R = 55	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 54.9	mph

HCS2000: Ramps and Ramp Junctions Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Merge Analysis

Analyst: DKS Associates
Agency/Co.: DSK Associates
Date performed: 9/10/2007
Analysis time period: PM Peak 4:00-5:00
Freeway/dir or travel: I-84 Exit 63 WB on-ramp
Junction: I-84/2nd Street
Jurisdiction: ODOT
Analysis Year: 2007
Description: Hood River IAMP

Freeway Data

Type of analysis	54.7	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	1330	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	170	vph
Length of first accel/decel lane	550	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	Yes	
Volume on adjacent Ramp	430	vph
Position of adjacent Ramp	Upstream	
Type of adjacent Ramp	Off	
Distance to adjacent Ramp	1810	ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1330	170	430	vph
Peak-hour factor, PHF	0.90	0.94	0.94	
Peak 15-min volume, v15	369	45	114	v
Trucks and buses	15	2	3	%
Recreational vehicles	0	0	0	%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5	1.5	
Recreational vehicle PCE, ER	1.2	1.2	1.2	
Heavy vehicle adjustment, fHV	0.930	0.990	0.985	
Driver population factor, fP	0.90	0.90	0.90	
Flow rate, vp	1765	203	516	pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1765 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1968	4700	No
v_{R12}	1968	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 17.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, M_S = 0.310

Space mean speed in ramp influence area, S_R = 57.9 mph

Space mean speed in outer lanes, S_0 = N/A mph

Space mean speed for all vehicles, S = 57.9 mph

HCS2000: Ramps and Ramp Junctions Release 4.1

DKS
DKS
DKS

Phone: 5032433500 Fax:
E-mail:

Merge Analysis

Analyst:	DKS Associates
Agency/Co.:	DSK Associates
Date performed:	9/10/2007
Analysis time period:	PM Peak 4:00-5:00
Freeway/dir or travel:	I-84 Exit 64 EB on-ramp
Junction:	I-84/Button Bridge Rd
Jurisdiction:	ODOT
Analysis Year:	2007
Description:	Hood River IAMP

Freeway Data

Type of analysis	54.8	
Number of lanes in freeway	2	
Free-flow speed on freeway	65.0	mph
Volume on freeway	530	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	35.0	mph
Volume on ramp	165	vph
Length of first accel/decel lane	650	ft
Length of second accel/decel lane		ft

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		ft

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	530	165		vph
Peak-hour factor, PHF	0.90	0.96		
Peak 15-min volume, v15	147	43		v
Trucks and buses	15	1		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level	Level	
Grade	%	%	%	
Length	mi	mi	mi	
Trucks and buses PCE, ET	1.5	1.5		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.930	0.995		
Driver population factor, fP	0.90	0.90		
Flow rate, vp	703	192		pcph

Estimation of V12 Merge Areas

L_{EQ} = 0.00 (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 703 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	895	4700	No
v_{R12}	895	4600	No

Level of Service Determination (if not F)

Density, $D_R = 5.475 + 0.00734\ v_R + 0.0078\ v_{12} - 0.00627\ L_A$ = 8.3 pc/mi/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	M_S = 0.285	
Space mean speed in ramp influence area,	S_R = 58.4	mph
Space mean speed in outer lanes,	S_0 = N/A	mph
Space mean speed for all vehicles,	S = 58.4	mph

APPENDIX H

Technical Memorandum #4: Future Needs Analysis

DKS Associates
TRANSPORTATION SOLUTIONS

Technical Memorandum

DATE: February 25, 2009

TO: Hood River IAMPs Project Team

FROM: John Bosket, PE
France Campbell, EIT

SUBJECT: **Hood River Interchange Area Management Plans (IAMPs) Future Needs Analysis** P05001-011

The focus of this Technical Memorandum is on the identification of future (year 2031) transportation deficiencies within the interchange study areas to guide the development of improvement alternatives in the next phase of this study. This assessment includes a two-step process, beginning with the modeling of future conditions and concluding with an analysis of those conditions and comparison against applicable policies and standards to determine where improvements will be needed. For the purposes of the future needs analysis, the transportation system is assumed to be in a "No Build" condition, meaning that only improvements that are currently planned for and reasonably likely to be funded are assumed to be in place.

Future Traffic Forecast (2031)

The development of future year traffic volumes is a critical task in transportation system planning projects, as those volumes are typically used to identify and quantify system needs and are a foundational element in the design of improvements. The methodology used to forecast future traffic volumes for the Interchange Area Management Plans is similar to that used for the City's Transportation System Plan and combines the use of traffic volume growth rates on major roadways feeding into the study area with estimates of local trips related to city-wide growth in housing and employment opportunities.

Traffic Forecasting Process

The cumulative analysis forecasting process used involves the development of two models reflecting the time periods of interest: one representing and existing summer weekday p.m. peak hour and one representing an existing summer Sunday p.m. peak hour. These existing year models are used for calibration so assumptions regarding area land uses and trip patterns can be checked against actual traffic counts. Once calibrated, the existing year models act as foundations upon which growth assumptions are applied to reach desired future year (2031) conditions.

Existing Year (2006) Model Development

The selection of a year to represent "existing" conditions was based on the availability of data describing that year. Much of the data obtained for recent studies was collected in the years 2005, 2006, and 2007. After evaluation of this data, the year 2006 was selected for use.

Each model was created using four major components describing the area within the urban growth boundary (UGB):[1]

- Traffic volumes on major roadways feeding the study area
- Population
- Number of dwelling units
- Number of employees

Traffic volumes on area roadways were obtained from a variety of sources, including: recent studies, the Port of Hood River (toll booth), ODOT's Traffic Volume Tables, the Hood River County Transportation System Plan, an Automatic Traffic Recorder (ATR) station on I-84, and other historic count databases.

A ***population*** for the year 2006 of 6,580 was obtained from the Oregon Economic & Community Development Department.[2] In comparison, the City's website currently states that there is a population of approximately 6,500 full-time residents.

The number of ***dwelling units*** in 2006 was estimated through a rooftop count using aerial photos. The resulting estimate was 2,927 within the city limits and 3,583 within the UGB. In comparison, the Hood River Public Facilities Plan (2000) estimated there would be 2,923 dwelling units within the UGB by 2006 and the 2000 Census reported a total of 2,657 in the year 2000.

By dividing the population and dwelling unit estimates, a persons per dwelling unit ratio of 2.25 is provided. In comparison, the following persons per dwelling unit ratio estimates for the City of Hood River (shown in Table 1) have been used for various planning studies over the past 25 years. The average value of 2.32 is within 5% of the estimate proposed for use in this effort.

Table 1: Past References for Persons/Dwelling Units Estimates in Hood River

Source	Persons/Dwelling Unit Ratio
City of Hood River Goal 10 Study, 1983	2.04
US Census Bureau, 2000	2.20
Hood River Public Facilities Plan, 2001	2.64
Housing Market Analysis, Oregon Downtown Development Association, 2005	2.38
AVERAGE	**2.32**

[1] For this study, the area within the UGB is assumed to include the area within the City Limits as well.
[2] Data from Center for Population Research and Census, Portland State University.

> The number of ***employees*** within the City of Hood River during the year of 2006 was obtained from the Oregon Employment Department. The data provided contained monthly estimates of employee totals for various industry types. In aggregate, the reported totals were 5,384 employees within the city limits and 5,527 employees within the UGB.

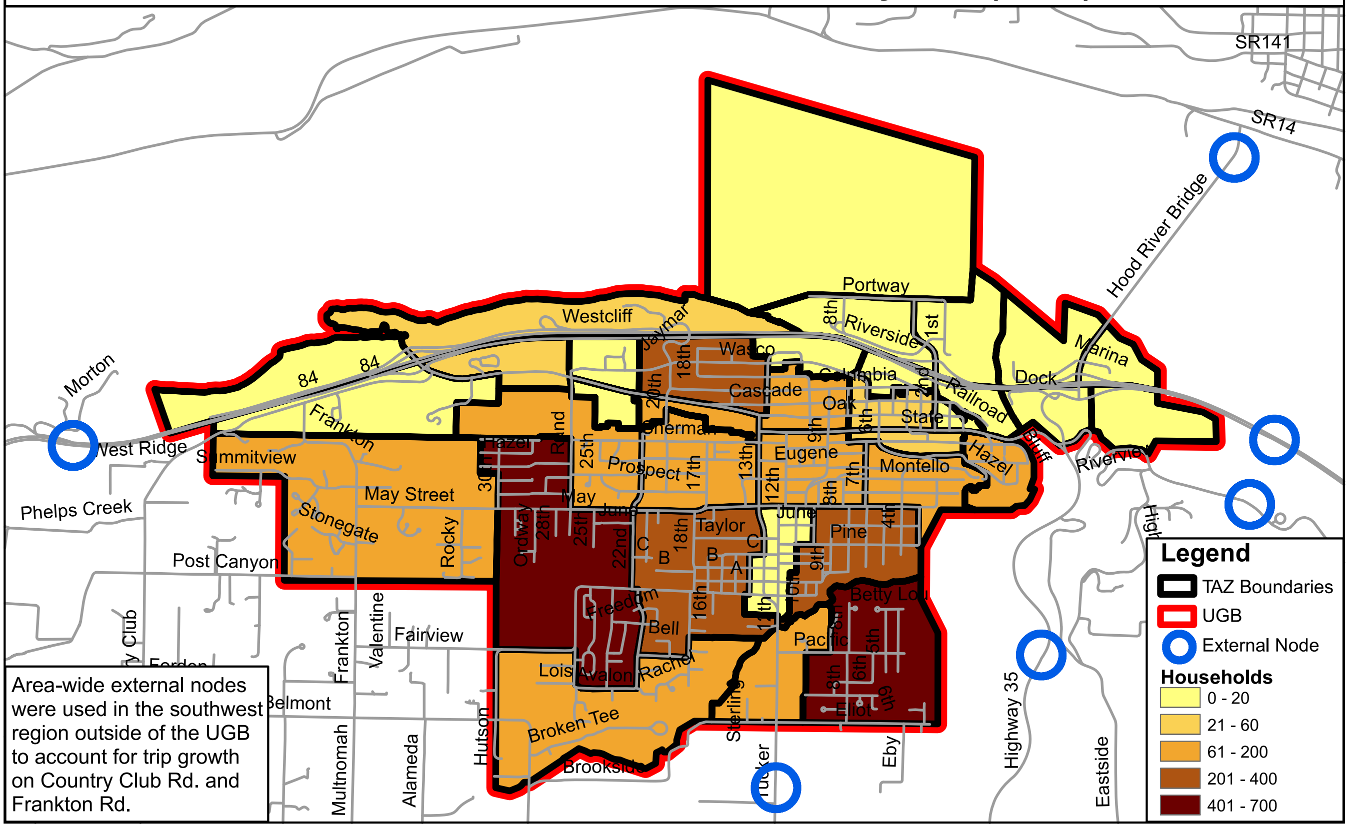
The individual dwelling units and employees estimated for the year 2006 were distributed on lands within the Hood River UGB by creating Transportation Analysis Zones (TAZs) that divided the area based on zoning designations, major transportation facilities, topography, and other barriers/constraints. The dwelling units were allocated according to the results of the aerial photo survey. The employment was allocated by cross-referencing information from the aerial photo with the underlying property zoning and inventories of business types from windshield surveys. This was further supplemented by phone conversations with several employers, including: Embarq, Hood River Sand & Gravel, Columbia River Gorge Hotel, Parkhurst Assisted Living, Best Western Hood River Inn, Dakine, Hood River Distillers, Covenant Christian Church, Maritime Services Corp., Smokehouse, Frankton School, Westside Elementary School, Hood River Middle School, and Providence Memorial Hospital.

Figure 1 shows the TAZ system formed for the area within the City of Hood River UGB and illustrates where the dwelling units and employment for the year 2006 were allocated. Note that the figure also shows, “external nodes”, which act as gateways into and out of the study area along major transportation routes. Growth through these gateways is based on projected growth rates for each facility (as described below).

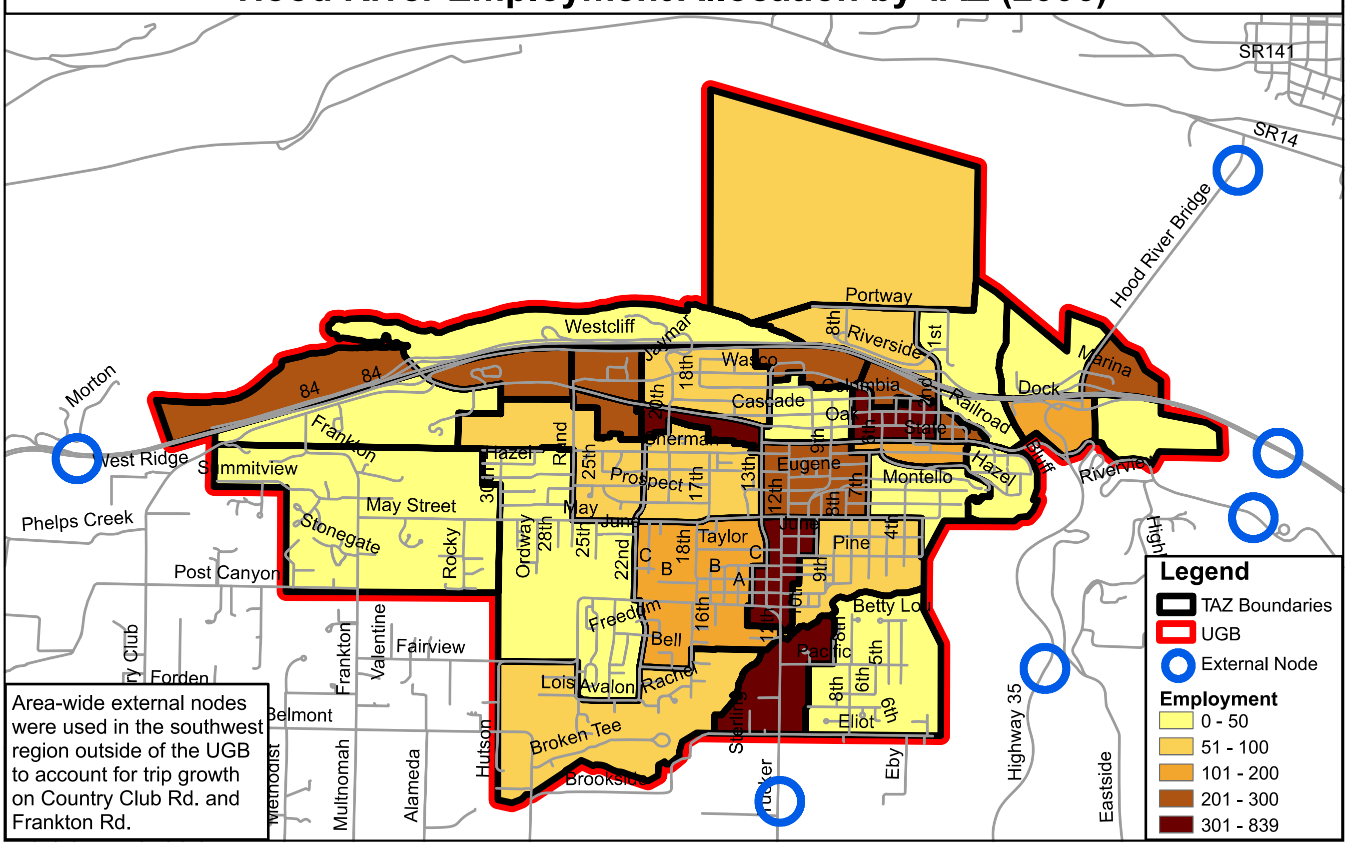
With the local land uses allocated among the TAZs, trip tables for the weekday p.m. peak hour and Sunday p.m. peak hour (i.e., matrices) were made to match potential origins with destinations within (TAZs) and outside of (external nodes) the City. Trips were assigned to area streets by the model, which looked for the most direct and fastest route between points. Streets in the model were coded with speeds, capacities, and traffic controls (e.g., stop signs, signals, etc…) to help determine the attractiveness of each route.

The resulting volumes on network streets were compared to the actual volumes from traffic counts to determine if the model was sufficiently calibrated and reasonably reflective of actual traffic patterns in the study area. Calibration was performed on the model using base year weekday and Sunday p.m. peak hour counts at the study intersections and average link speed data in an iterative process until model volumes produced were within 10 % of actual volumes obtained from the field.

Hood River Household Allocation by TAZ (2006)



Hood River Employment Allocation by TAZ (2006)



Hood River Interchange Area Management Plans

Figure 1 Hood River Household and Employment Allocations by TAZ (2006)

DKS Associates
TRANSPORTATION SOLUTIONS

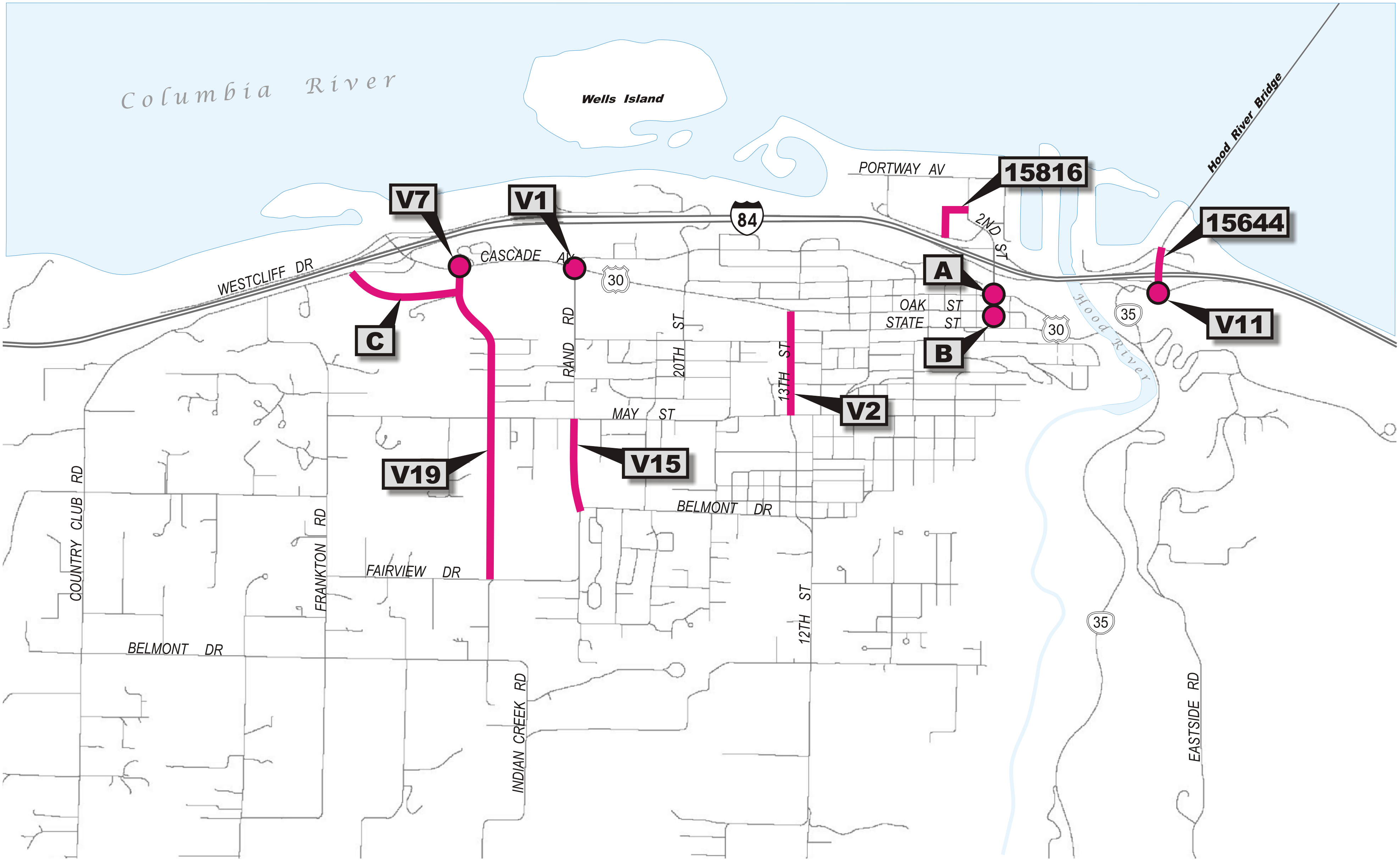
Future Year (2031) Model Development

The future year models intended to represent the year 2031 during the weekday p.m. peak hour and Sunday p.m. peak hour were created using the calibrated existing year models as a base and incorporating planned and reasonably likely to be funded transportation improvements, as well as new local trips generated by anticipated growth in housing and employment and growth in through trips on regional routes.

Future transportation improvements were identified through review of the City Transportation System Plan, County Transportation System Plan, ODOT's Statewide Improvement Program, and projects conditioned on new development as mitigation. These projects are described in Table 2 and illustrated in Figure 2.

Table 2: Assumed Future Transportation Improvements for Traffic Forecast Modeling Purposes (2031)

Project Code	Project Name	Project Description
		City of Hood River TSP
V1	Cascade Avenue and Rand Road	New Signal at Cascade and Rand.
V2	13th Street	Additional Southbound Lane on 13th Street. This project will increase the capacity of 13th Street in the Southbound between State and May direction by converting existing curbside parking into a general purpose travel lane.
V7	Mt. Adams and West Cascade	New signal at intersection and intersection improvements; this may include providing turn lanes.
V11	I-84 and OR 35 (Exit 64)	New Traffic Signals at I-84 ramps and OR 35.
V15	Improve Rand Road	Widening of Rand Road to meet the collector standards and extend Rand to Belmont.
V19	Fairview Drive and US 30	New Road Connecting Fairview Drive and US 30. Construct new 5,400-foot roadway connecting these two streets.
		ODOT 2008-2011 STIP
15644	I-84: Exit 64 (Hood River) Bundle 224	Replace Bridge #07398 and Exit 64 Interchange Improvements
15816	Industrial Road (Hood River) IOF	Construct New Industrial Road.
		Mitigation Conditioned on Approved Development
A	2nd St./Cascade	Restrict turning movements to r-in/r-out only.
B	2nd St./ Oak	Install traffic signal.
C	Country Club Rd. Realignment to Mt. Adams	Realign Country Club Road to intersect with Mt. Adams Avenue. Intersection on Cascade Avenue will be removed. Intersection with Mt. Adams Avenue will be signalized.



Hood River Interchange Area Management Plans

Figure 2 Planned Transportation Improvement Projects Assumed in Traffic Forecasting

LEGEND

00 - Project Code (See Table 3)

DKS Associates
TRANSPORTATION SOLUTIONS

Of particular interest is the Exit 64 interchange reconstruction project, which is planned to be completed in 2011. Improvements included as part of this project are:

- Signalization of the intersections on Button Bridge Road with Marina Way, the I-84 westbound ramp terminal, and the I-84 eastbound ramp terminal;
- Realignment of the I-84 eastbound on-ramp to oppose the I-84 eastbound off-ramp;
- Shifting of the I-84 westbound ramps to increase the amount of distance to the Marina Way intersection;
- Widening the I-84 eastbound off-ramp to include three lanes;
- Provision of a five-lane cross-section along Button Bridge Road between Marina Way and the I-84 eastbound ramps; and
- Provision of bike lanes and sidewalk along Button Bridge Road between Marina Way and the I-84 eastbound ramps (sidewalk along east side only).

Sources and resulting assumptions for ***traffic volume growth on the major facilities*** feeding the area through the external nodes are shown in Table 3 below.

Table 3: Major Transportation Corridor Growth Rates

Facility	Source of Assumptions	Growth Rate Assumed (Annual Compound Rate)
I-84 (from West)	ODOT Future Volume Tables	1.89%
I-84 (from East)	ODOT Future Volume Tables	2.08%
OR 35	ODOT Future Volume Tables	1.95%
Historic Columbia River Hwy (east of OR 35)	ODOT Future Volume Tables	1.84%
Tucker Road	ODOT Future Volume Tables	1.29%
Columbia River Bridge	Port of Hood River Historic Count Data	1.80%
Country Club Road	Hood River County TSP	1.72%
Frankton Road	Hood River County TSP	1.72%

The future growth in housing and employment were based on the existing relationships between these inputs and the population of the City. The ***population growth*** was estimated using an assumed compound growth rate of 2.0% per year, which was based on historical growth in the City since the last census (2000) and I consistent with the recently completed Hood River County Coordinated Population Forecast.[3]

[3] Hood River County Population Forecast, 2008-2025, ECONorthwest, October 2008.

Using the relationships between existing housing (dwelling units) and employment within the UGB, the ratios of 2.25 people per dwelling unit and 1.46 people per job[4] were used to project future housing and employment for the year 2031. The resulting estimates for each are:

- 5,878 dwelling units (2,295 or 64% increase)
- 9,072 employees (3,545 or 64% increase)

The growth in housing and employment was allocated within the TAZs established by: 1) cross-referencing building permits issued and land use approvals since 2006 and 2) identifying areas within the UGB where vacant lands exist for residential and employment-based zones. Growth was spread proportionately across TAZs based on availability of land. However, during the allocation of growth, it was also assumed that the waterfront area (north of Exit 63) would be fully developed by 2031. The allocation of the growth in households and employment between the years 2006 and 2031 by TAZ is illustrated in Figure 3.

With new land use and highway traffic assumptions incorporated into the future year models, along with the future transportation improvements, the assignment process was repeated with new volumes for the future year time periods produced. However, rather than using the model-produced traffic volumes for analysis, the traffic volume growth found between the existing year and future year models was applied to the actual volume counts taken in the field to provide a more accurate assessment of future traffic. These volumes and the key findings related to future growth and traffic conditions within the interchange areas are discussed in the following sections.

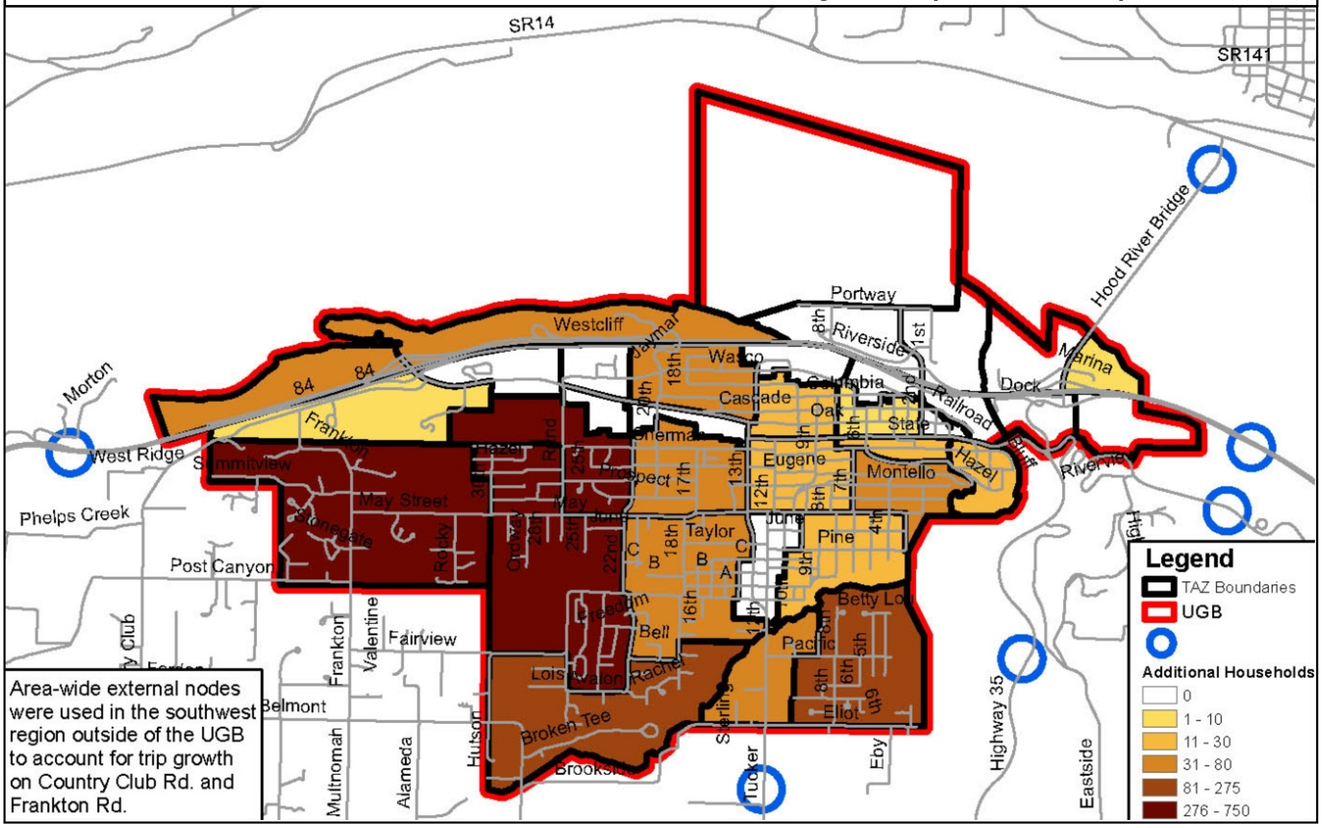
Key Assumptions

For quick reference, the key assumptions used in the development of the future year (2031) weekday and Sunday p.m. peak hour traffic volumes through the study areas are provided below.

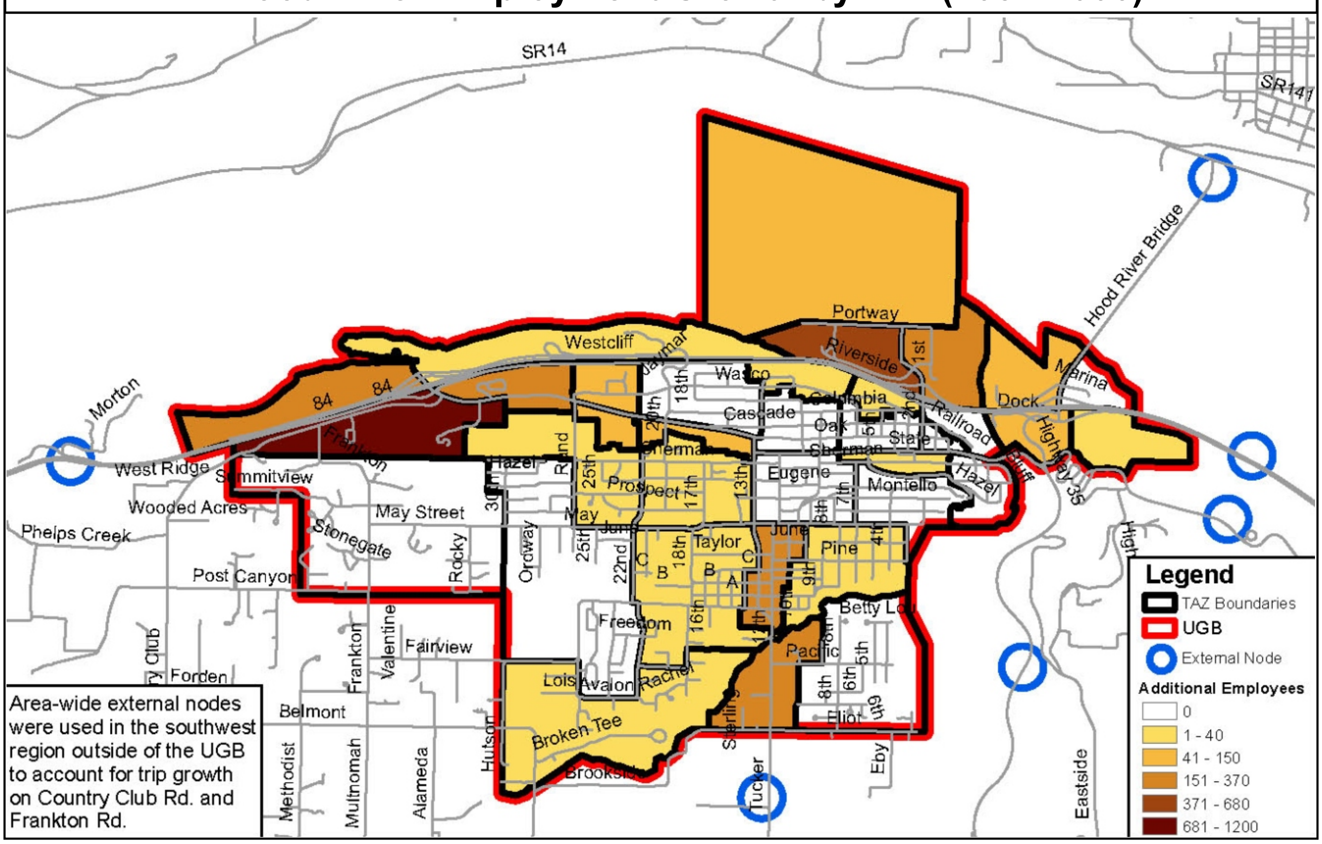
- 2006 population is 6,580 (source: Center for Population Research and Census, Portland State University).
- 2006 dwelling units were estimated at 2,927 within city limits and 3,583 within UGB (source: rooftop counts from aerial photos).
- 2006 employment was estimated at 5,384 employees within the city limits and 5,527 employees within the UGB (source: Oregon Employment Department).
- The population growth assumed a compound growth rate of 2.0% per year (source: historical growth in the City since the 2000 census).
- Future housing and employment were estimated using the forecasted population for 2031 and the existing relationships between housing, employment, and population (2.25 people per dwelling unit and 1.46 people per job).

[4] Ratio of assumed 2006 population within the UGB of 8,055 and employment within the UGB of 5,527. UGB population calculated using known ratio of population to households within the City Limits.

Hood River Household Growth by TAZ (2031-2006)



Hood River Employment Growth by TAZ (2031-2006)



Hood River Interchange Area Management Plans

Figure 3 Hood River Household and Employment Growth by TAZ (2006 to 2031)

DKS Associates
TRANSPORTATION SOLUTIONS

Future Traffic Volumes (2031)

Figures 4-1 through 4-4 display the forecasted turning movement volumes at study intersections for the year 2031 during the Sunday and weekday p.m. peak hour scenarios, while Figures 5-1 and 5-2 show the volumes along I-84. Significant changes between the 2008 and 2031 traffic volumes are discussed for study area intersections in the following sections.

Exit 62

Much of the growth in traffic between 2008 and 2031 in the Exit 62 study area is attributed to commercial growth surrounding the interchange and residential growth to the south. The commercial growth is primarily accessed by Westcliff Drive, County Club Road, and Cascade Avenue and the residential growth is primarily accessed by Mt. Adams Avenue and Rand Road. The growth in employment and households is shown in Figure 3. Exit 62 is a primary travel route for vehicles traveling to the south area of the city and to the Heights area along 13th Street.

Exits 63 & 64

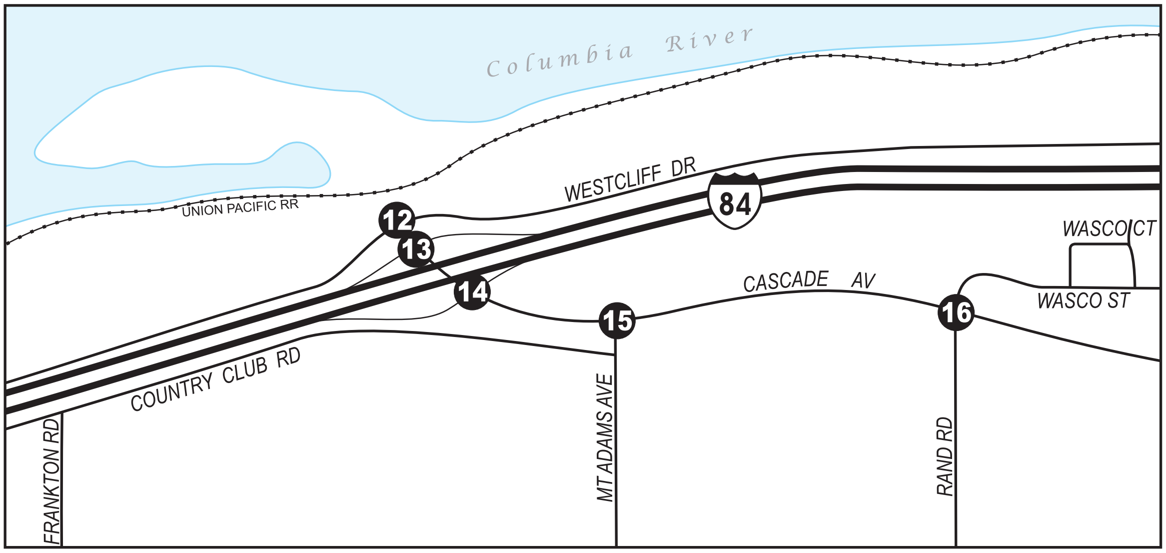
Much of the growth in traffic between 2008 and 2031 in the Exits 63 and 64 study area is attributed to growth at the waterfront north of the Exit 63 interchange and employment growth in downtown Hood River. Exit 63 is also a primary travel route for vehicles traveling to the south area of the city and the Heights area along 13th Street.

Future Transportation Conditions (2031)

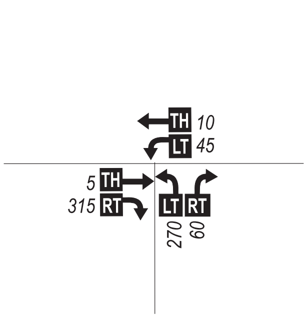
An operational analysis of the I-84 corridor and study area intersections for the Sunday and weekday p.m. peak hours in 2031 was conducted for the IAMP areas using the assumed lane configurations and traffic controls shown in Figures 6-1 and 6-2 and the forecasted traffic volumes documented in Figures 4 through 5. The analysis methodologies employed and corresponding results are discussed below.

Intersection Operations

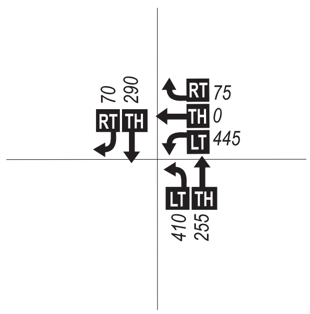
To evaluate the ability of study area intersections to adequately serve traffic demand in 2031, an analysis was performed to identify future operating conditions for comparison to adopted mobility standards. ODOT's adopted mobility standards, which are based on intersection volume to capacity (v/c) ratios, are documented in the *1999 Oregon Highway Plan* (and amendments) and vary with highway classification, environment, and posted speed. Mobility standards applicable to the IAMP study areas are referenced in Table 4.



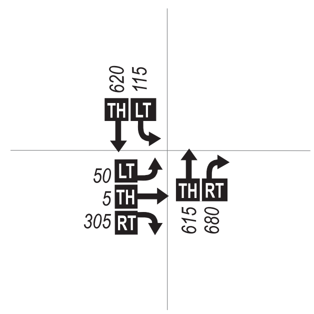
12 Westcliff Dr. @ Cascade Ave.



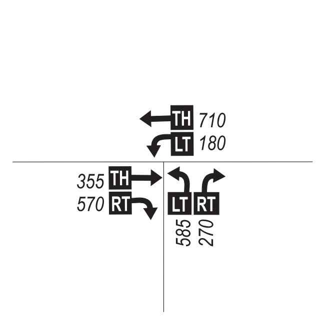
13 I-84 WB On/Off Ramps @ Cascade Ave.



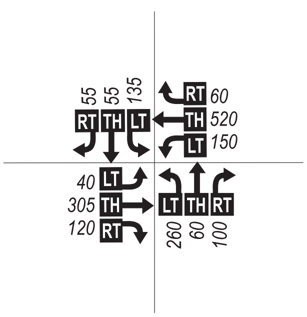
14 I-84 EB On/Off Ramps @ Cascade Ave.



15 Mt. Adams Ave. @ Cascade Ave.



16 Cascade Ave. @ Rand Rd.



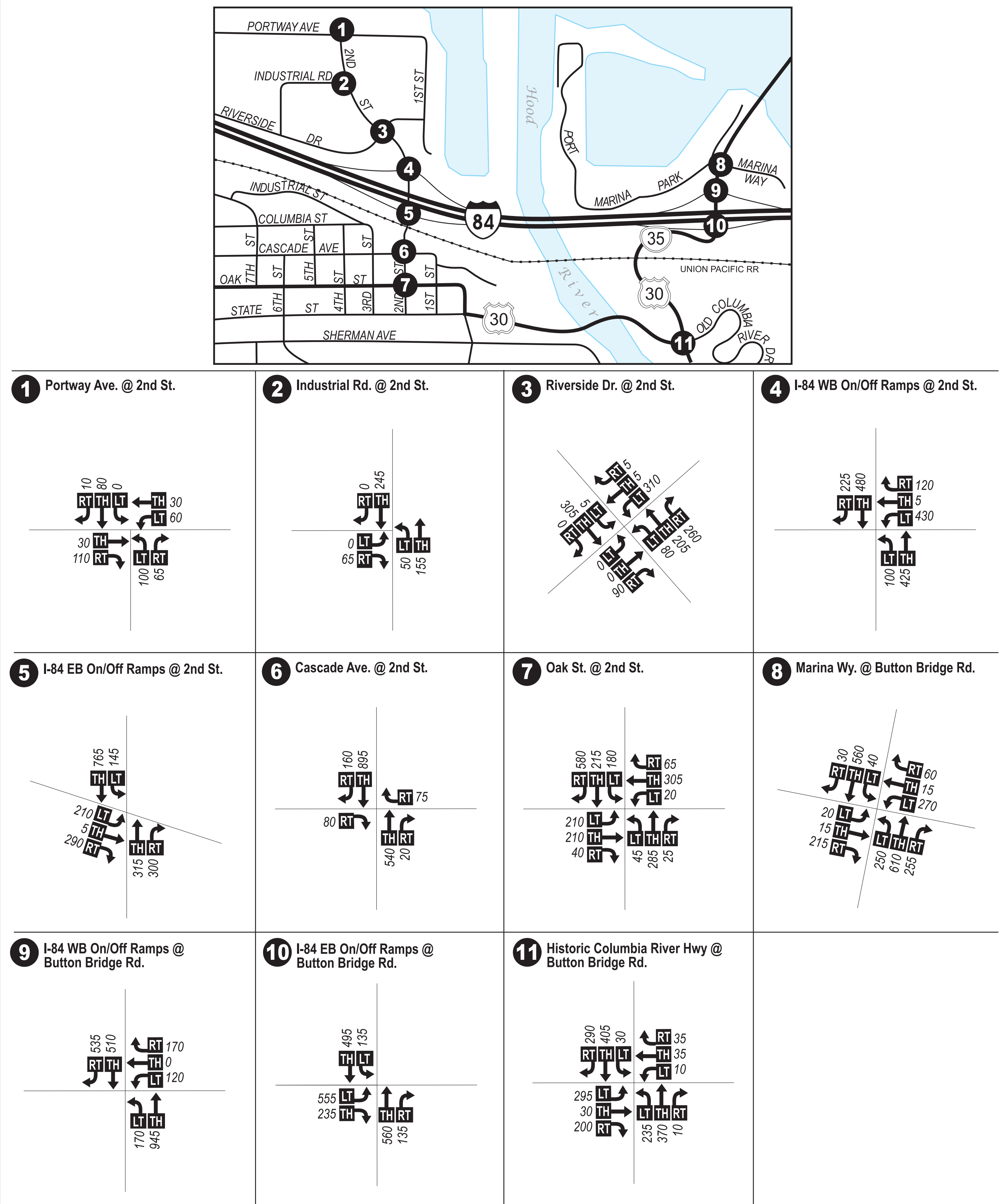
Hood River Interchange Area Management Plans

Figure 4-1 2031 Sunday PM Peak Hour Traffic Volumes (Exit 62 Study Area)

LEGEND

0 - Study Intersection & Number
RT 00 - Right Turn Movement Traffic Volume
TH 00 - Through Movement Traffic Volume
LT 00 - Left Turn Movement Traffic Volume

DKS Associates
TRANSPORTATION SOLUTIONS



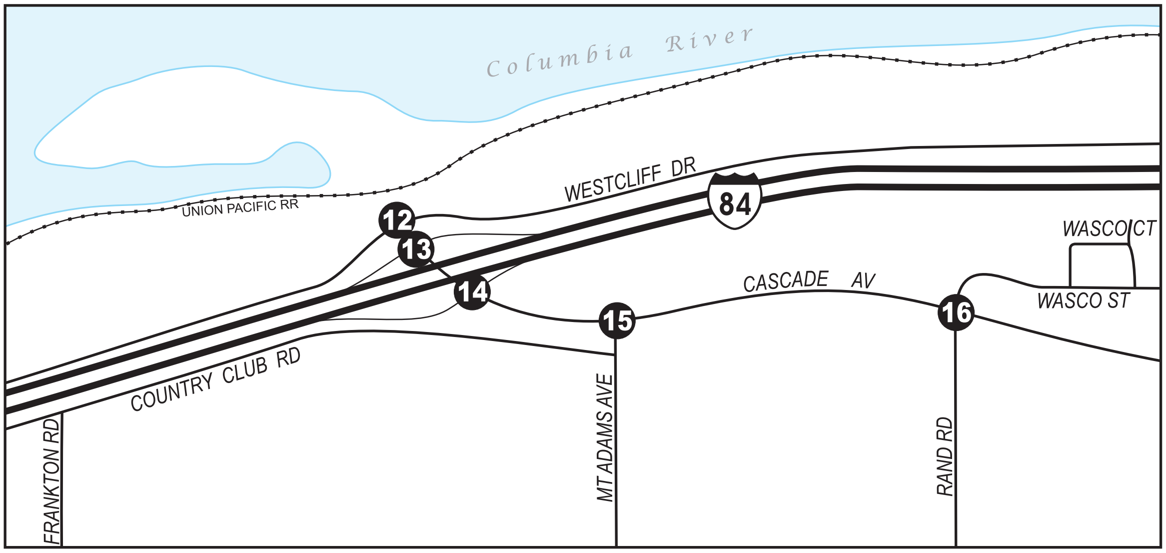
Hood River Interchange Area Management Plans

Figure 4-2 2031 Sunday PM Peak Hour Traffic Volumes (Exit 63-64 Study Area)

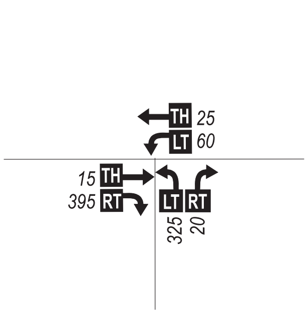
LEGEND

- 0 - Study Intersection & Number
- RT 00 - Right Turn Movement Traffic Volume
- TH 00 - Through Movement Traffic Volume
- LT 00 - Left Turn Movement Traffic Volume

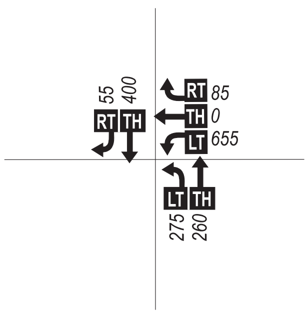
DKS Associates
TRANSPORTATION SOLUTIONS



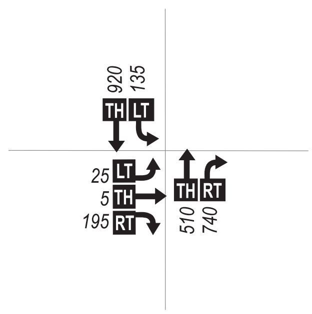
12 Westcliff Dr. @ Cascade Ave.



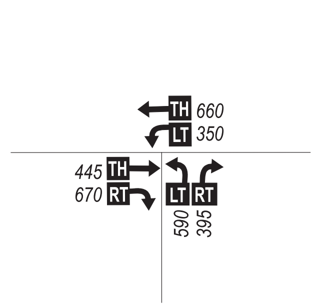
13 I-84 WB On/Off Ramps @ Cascade Ave.



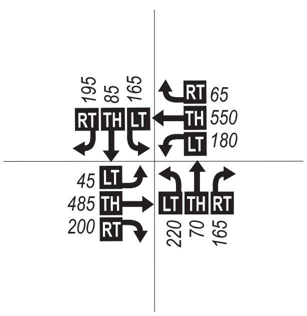
14 I-84 EB On/Off Ramps @ Cascade Ave.



15 Mt. Adams Ave. @ Cascade Ave.



16 Cascade Ave. @ Rand Rd.



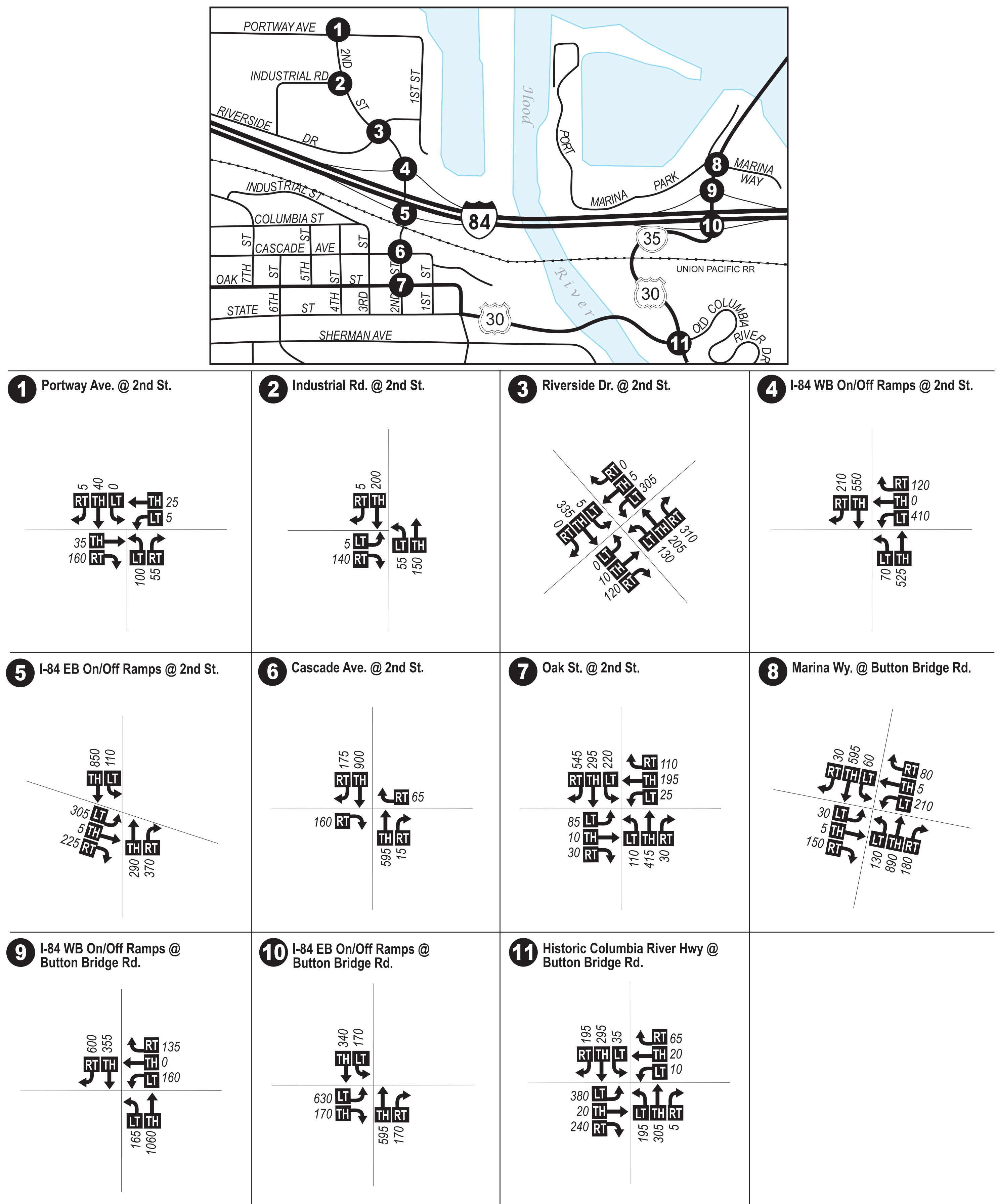
Hood River Interchange Area Management Plans

Figure 4-3 2031 Weekday PM Peak Hour Traffic Volumes (Exit 62 Study Area)

LEGEND

0 - Study Intersection & Number
RT 00 - Right Turn Movement Traffic Volume
TH 00 - Through Movement Traffic Volume
LT 00 - Left Turn Movement Traffic Volume

DKS Associates
TRANSPORTATION SOLUTIONS



**Hood River
Interchange Area
Management Plans**

Figure 4-4 2031 Weekday PM Peak Hour Traffic Volumes (Exit 63-64 Study Area)

LEGEND

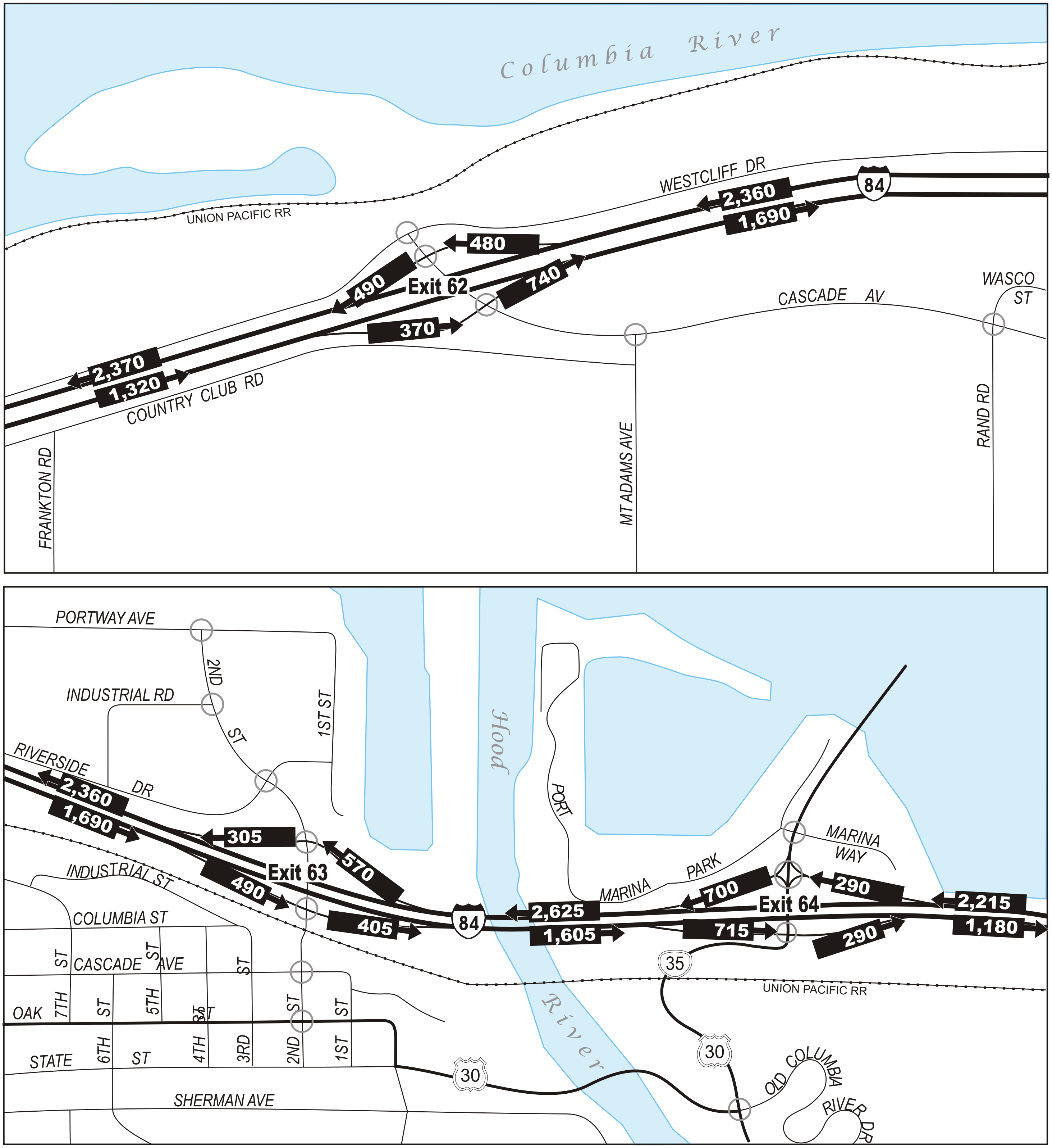
0 - Study Intersection & Number

RT 00 - Right Turn Movement Traffic Volume

TH 00 - Through Movement Traffic Volume

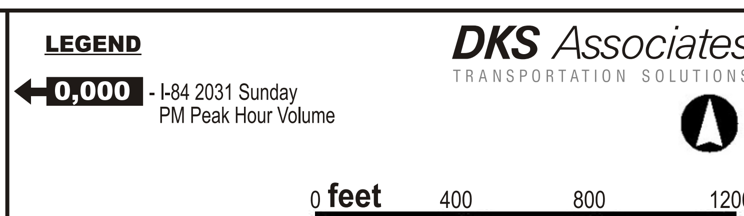
LT 00 - Left Turn Movement Traffic Volume

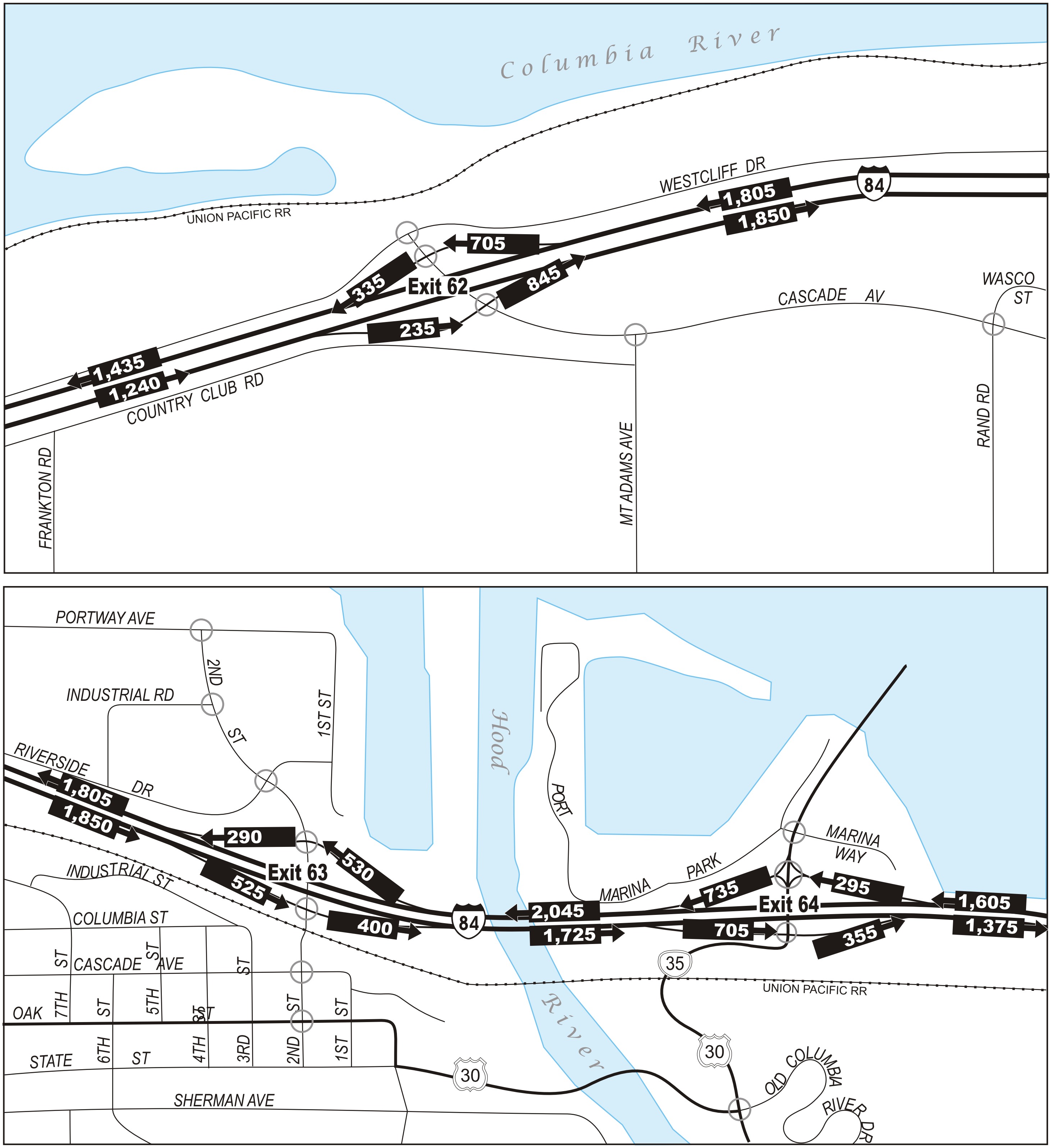
DKS Associates
TRANSPORTATION SOLUTIONS



Hood River
Interchange Area
Management Plans

Figure 5-1 I-84 2031 Sunday PM Peak Hour Traffic Volumes





Hood River Interchange Area Management Plans

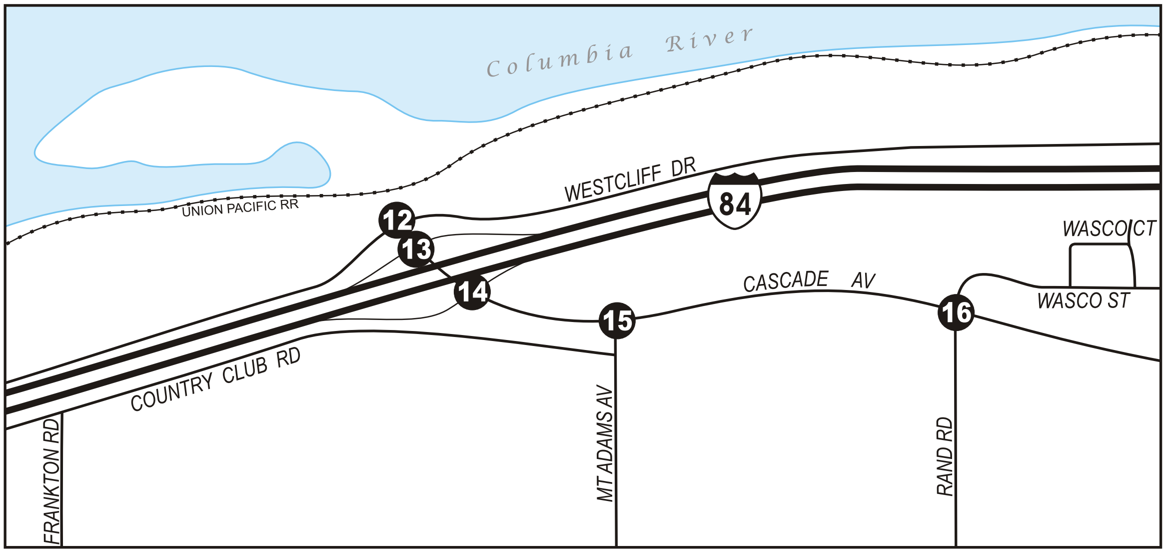
Figure 5-2 I-84 2031 Weekday PM Peak Hour Traffic Volumes

LEGEND

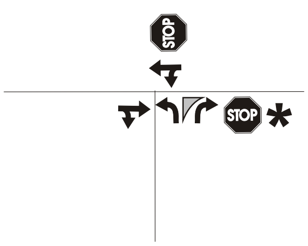
0,000 - I-84 2031 Weekday PM Peak Hour Volume

DKS Associates
TRANSPORTATION SOLUTIONS

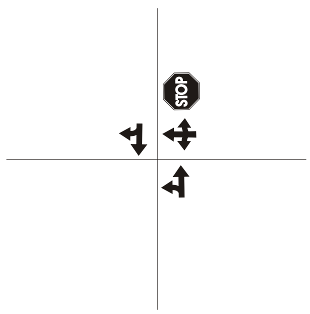
0 feet 400 800 1200



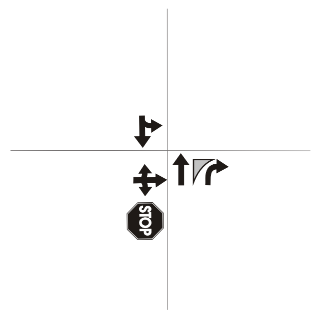
12 Westcliff Dr. @ Cascade Ave.



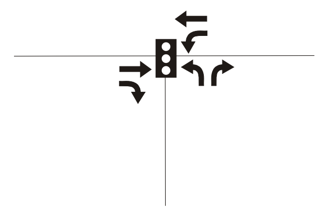
13 I-84 WB On/Off Ramps @ Cascade Ave.



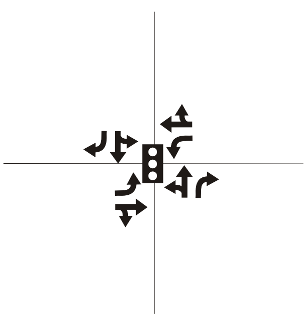
14 I-84 EB On/Off Ramps @ Cascade Ave.



15 Mt. Adams Ave. @ Cascade Ave.



16 Cascade Ave. @ Rand Rd.



* Stop control applied to right turn only.

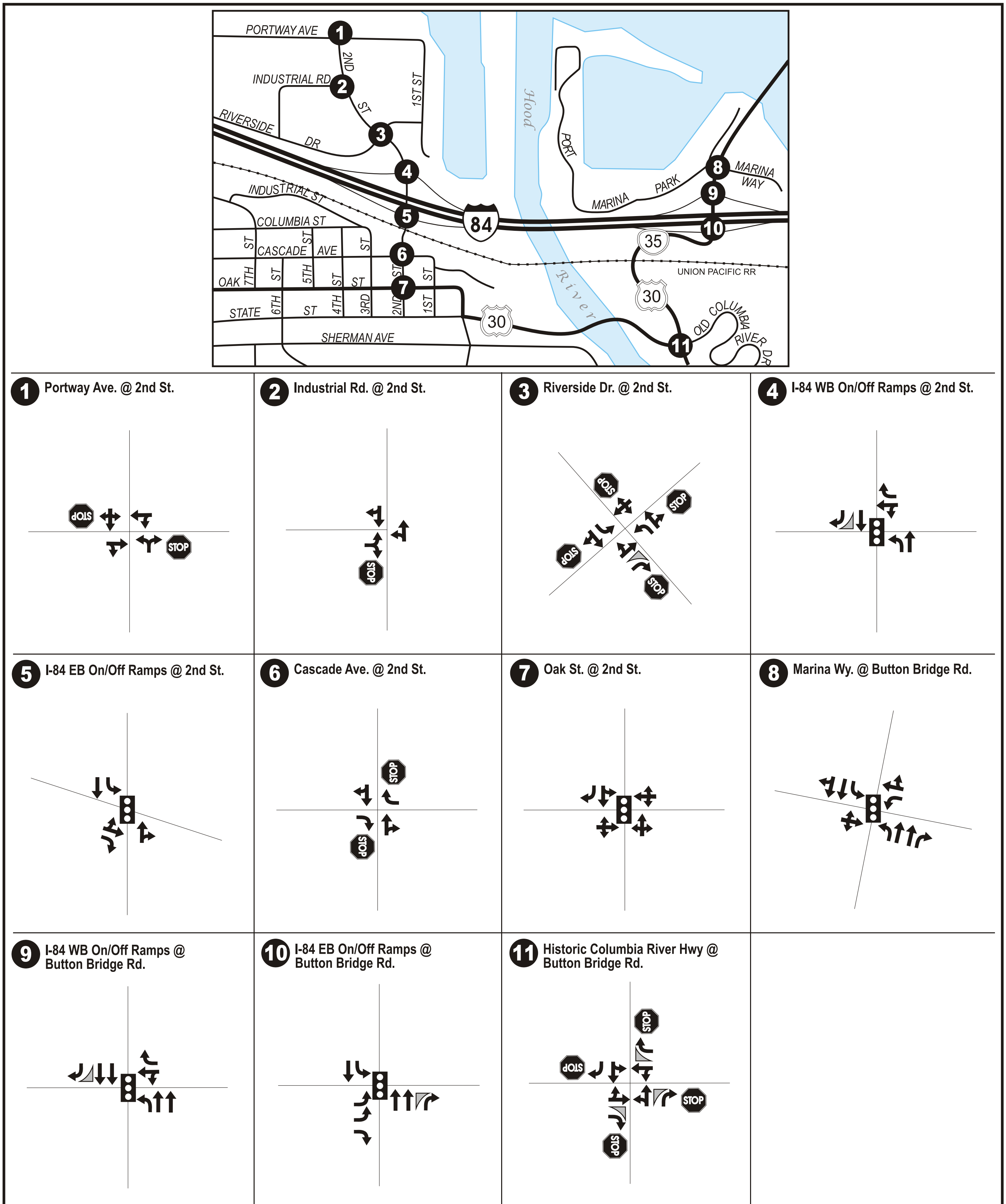
Hood River Interchange Area Management Plans

Figure 6-1 Future 2031 Geometry (Exit 62 Study Area)

LEGEND

- 0 - Study Intersection & Number
- ← - Lane Configuration
- Traffic Signal
- STOP - Stop Sign

DKS Associates
TRANSPORTATION SOLUTIONS



Hood River
Interchange Area
Management Plans

Figure 6-2 Future 2031 Geometry
(Exits 63-64 Study Area)

LEGEND

- 0 - Study Intersection & Number
- ← - Lane Configuration
- Traffic Signal
- STOP - Stop Sign

DKS Associates
TRANSPORTATION SOLUTIONS

Table 4: Applicable ODOT Mobility Standards (v/c ratios)

Highway Category	Inside Urban Growth Boundary		Outside Urban Growth Boundary
	Non-MPO outside of STA's where non-freeway speed ≤ 35 mph	Non-MPO where non-freeway speed limit ≥ 45mph	Rural Lands
Interstate Highways	-	0.70	-
Freight Route on a Statewide Highway	0.80	0.70	0.70
District/ Local Interest Roads	0.90	0.80	0.75

It should be noted that at unsignalized intersections, these standards are applicable only to movements that are not required to stop. For other movements at unsignalized intersections that are required to stop or otherwise yield the right of way, the standards for District/Local Interest Roads shall be applied for areas within urban growth boundaries. For interchange ramp terminals, the v/c ratio shall be the smaller of the values of the standard for the crossroad or 0.85.

The City of Hood River also maintains standards for mobility that require a minimum level of service C for intersection operations during the peak hour. This standard only applies to the Cascade Avenue/Westcliff Drive intersection. The 2nd Street/Portway Avenue and 2nd Street/Industrial Road intersections are on Port of Hood River property. The Port of Hood River does not maintain mobility standards for these intersections.

Study area intersections were analyzed for the Sunday and weekday p.m. peak hour through the use of a Synchro model that was created using the future lane configuration and traffic controls shown in Figures 6-1 and 6-2 and the future traffic volumes documented in Figures 4-1 through 4-4. From this analysis, intersection levels of service (LOS), delay, and v/c ratios were calculated using Highway Capacity Manual[5] methodologies for signalized and unsignalized intersections. Table 5 summarizes the results of the Sunday p.m. peak hour operational analysis for the study intersections under 2031 "No Build" conditions and compares them to the applicable mobility standards. Table 6 summarizes the results of the weekday p.m. peak hour operational analysis under 2031 "No Build" conditions. Note that the results shown for unsignalized intersections represent the critical movement (usually a stop-controlled movement, such as a side-street left turn or crossing movement). The operational analysis worksheets are included in the appendix.

Key Findings for the Exit 62 Study Area

- The unsignalized I-84 ramp terminals fail to meet mobility standards during the Sunday and weekday p.m. peak hours. The installation of traffic signals should be considered at these locations.
- The new intersection on Cascade Avenue at Mt. Adams Avenue that replaces the existing Country Club Road intersection fails to meet mobility standards during the weekday p.m. peak hour. This is partially related to the heavy northbound left turn movement onto

[5] *Highway Capacity Manual*, Transportation Research Board, Washington, D.C., 2000.

Cascade Avenue. Due to restrictions on widening the Historic Columbia River Highway (Cascade Avenue), adding dual northbound left turn lanes is not feasible.

- The intersection on Cascade Avenue at Rand Road fails to meet mobility standards during the weekday p.m. peak hour. Similar to the Mt. Adams Avenue intersection, this is due to the heavy northbound left turn movement onto Cascade Avenue. Due to restrictions on widening the Historic Columbia River Highway (Cascade Avenue), adding dual northbound left turn lanes is not feasible.

Key Findings for the Exit 63/64 Study Area

- The intersection on 2nd Street at Riverside Drive fails to meet mobility standards during the weekday p.m. peak hour as the all-way stop control can no longer adequately serve the northbound and southbound movements. Because this intersection is less than 400 feet from the I-84 westbound ramp terminal, signalization is not recommended. However, conversion to two-way stop control (on the west and east approaches), installation of a roundabout, or minor street turn restrictions should be considered.
- Even though the intersection on 2nd Street at Cascade Avenue will be limited to right-in/ right-out movements only, it will still fail to meet mobility standards during the weekday p.m. peak hour. The problem isn't associated with the Cascade Avenue intersection itself, but is related to queues spilling back from the 2nd Street/ Oak Street intersection (approximately 200 feet to the south) that block Cascade Avenue.
- The 2nd Street/ Oak Street intersection, which is planned to be signalized by 2031, will just meet mobility standards during the weekday p.m. peak hour, but will fail to meet them during the Sunday p.m. peak hour.
- The State Street/ Button Bridge Road intersection fails to meet mobility standards during both the Sunday and weekday p.m. peak hours. A potential improvement could be to signalize the intersection.

Table 5: Future (2031) Sunday PM Peak Hour No Build Hour Intersection Operational Analysis

Intersection	Traffic Control	Future Operations			Mobility Standard (v/c)
		LOS	Delay (sec)	v/c	
Exit 62					
Westcliff Dr/Cascade Ave	Unsignalized	A/B	14.5	0.15 (WB)	C*
I-84 Exit 62 WB ramp/Cascade Ave	Unsignalized	A/F	>60.0	**>1.00 (WB)**	0.85
I-84 Exit 62 EB ramp/Cascade Ave	Unsignalized	A/F	>60.0	**>1.00 (EB)**	0.85
Cascade Ave/ Mount Adams Ave	Signalized	C	25.6	0.90	0.90
Cascade Ave/Rand Rd	Signalized	B	20.9	0.78	0.90
Exit 63					
Portway Ave/2nd St	Unsignalized	A/B	12.7	0.28 (NB)	NA
Industrial Rd/2nd St	Unsignalized	A/B	10.4	0.10 (EB)	NA
Riverside Dr/2nd St	Unsignalized-AWSC	D	29.0	0.84	0.90
I-84 Exit 63 WB ramp/2nd St	Signalized	C	20.1	0.71	0.85
I-84 Exit 63 EB ramp/2nd St	Signalized	B	14.7	0.68	0.85
Cascade Ave/2nd St	Unsignalized-RIRO	B/E	47.8	0.65	0.90
Oak St/2nd St	Signalized	C	27.6	**0.96**	0.90
Exit 64					
Marina Way/Button Bridge Rd	Signalized	B	16.8	0.67	0.80
I-84 Exit 64 WB ramp/Button Bridge Rd	Signalized	A	6.6	0.43	0.80
I-84 Exit 64 EB ramp/Button Bridge Rd	Signalized	B	14.2	0.57	0.80
State St/Button Bridge Rd	Unsignalized-AWSC	F	>60.0	**>1.00 (NB)**	0.80

** City Mobility Standards use level of service, not v/c ratios.*
Highlighted values do not meet mobility standards.
LOS = Level of Service
(xx) = Critical Movement
Delay = Average vehicle delay (sec)
v/c = Volume to Capacity Ratio
A/A = Major Street turn LOS / Minor street turn LOS
NA = Not applicable
AWSC = All-Way Stop Control
RIRO = Right-in Right-out

Table 6: Future (2031) Weekday PM Peak Hour No Build Hour Intersection Operational Analysis

Intersection	Traffic Control	Operations			Mobility Standard (v/c)
		LOS	Delay (sec)	v/c	
Exit 62					
Westcliff Dr/Cascade Ave	Unsignalized	A/C	18.2	0.27 (WB)	C*
I-84 Exit 62 WB ramp/Cascade Ave	Unsignalized	A/F	>60.0	**>1.00 (WB)**	0.85
I-84 Exit 62 EB ramp/Cascade Ave	Unsignalized	A/F	>60.0	**>1.00 (EB)**	0.85
Cascade Ave/ Mount Adams Ave	Signalized	C	35.0	**0.96**	0.90
Cascade Ave/Rand Rd	Signalized	D	37.5	**1.05**	0.90
Exit 63					
Portway Ave/2nd St	Unsignalized	A/B	10.9	0.22 (NB)	NA
Industrial Rd/2nd St	Unsignalized	A/B	10.5	0.19 (EB)	NA
Riverside Dr/2nd St	Unsignalized-AWSC	E	40.6	**0.94**	0.90
I-84 Exit 63 WB ramp/2nd St	Signalized	C	20.2	0.74	0.85
I-84 Exit 63 EB ramp/2nd St	Signalized	B	18.9	0.81	0.85
Cascade Ave/2nd St	Unsignalized-RIRO	B/F	>60.0	**>1.00 (EB)**	0.90
Oak St/2nd St	Signalized	B	14.6	0.83	0.90
Exit 64					
Marina Way/Button Bridge Rd	Signalized	B	11.6	0.58	0.80
I-84 Exit 64 WB ramp/Button Bridge Rd	Signalized	A	8.4	0.49	0.80
I-84 Exit 64 EB ramp/Button Bridge Rd	Signalized	B	17.0	0.59	0.80
State St/Button Bridge Rd	Unsignalized-AWSC	F	>60.0	**>1.00 (NB)**	0.80

** City Mobility Standards use level of service, not v/c ratios.*
Highlighted values do not meet mobility standards.
LOS = Level of Service
(xx) = Critical Movement
Delay = Average vehicle delay (sec)
v/c = Volume to Capacity Ratio
A/A = Major Street turn LOS / Minor street turn LOS
NA = Not applicable
AWSC = All-Way Stop Control
RIRO = Right-in Right-out

Queuing Analysis

An additional analysis of anticipated vehicle queues at study intersections was performed to identify areas where queues might exceed available storage or spill back into adjacent intersections. This analysis considered the 95th percentile queues (commonly used for design purposes), which were calculated using SimTraffic.

At the Exit 62 study area, the queues on the I-84 westbound off ramp at Cascade Avenue spill onto I-84 in the Sunday and weekday p.m. peak hours, which leaves no room for vehicles to decelerate from freeway speeds before stopping (800-foot ramp). At the Cascade Avenue and Mt. Adams Avenue intersection, the northbound approach queue of Mt. Adams exceeds 1,000 feet during the Sunday and weekday p.m. peak hours, which is expected to spill back through the future intersection with Country Club Road.

Within the Exit 63/64 study area, the poor operational performance of the 2nd Street/Oak Street intersection causes southbound queues to spill back through adjacent intersections along 2nd Street to the new intersection with Industrial Road during the Sunday and weekday p.m. peak hours. With the planned improvements along Button Bridge Road between Marina Way and the I-84 eastbound ramps, queuing does not exceed available storage in the Exit 64 area. The queuing analysis worksheets are included in the appendix.

Freeway Operations

Additional analysis for the I-84 mainline was conducted around the Hood River interchanges to identify potential operational problems related to the entrance and exiting of traffic from the freeway and the close proximity of ramp connections. The movements analyzed included the impacts of merging, diverging, and weaving, as well as an assessment of the general capacity of the freeway to accommodate peak hour demand. All analysis was conducted in accordance with *Highway Capacity Manual* (HCM) methodologies using the peak hour volumes displayed in Figures 5-1 and 5-2. The results are shown in Tables 7 and 8, with analysis worksheets included in the appendix.

As shown in Table 7 and 8, all freeway movements will continue to operate within ODOT's mobility standards with the exception of the westbound diverge to the Exit 62 off-ramp during the Sunday p.m. peak hour. However, the degree of variance from the mobility standard is small.

Table 7: Future (2031) Sunday PM Peak Hour I-84 Operational Analysis

Location	Direction	2008 Operations		2031 Operations		Mobility Standard (v/c)
		LOS	v/c	LOS	v/c	
Basic Freeway Analysis						
West of Exit 62	WB	B	0.44	C	0.67	0.70
Weaving Analysis						
Exit 63-64	WB	B	0.41	C	0.62	0.70
	EB	A	0.29	B	0.48	0.70
Merging & Diverging Analysis						
Exit 62	EB Off-ramp Diverge	B	0.27	B	0.37	0.70
	EB On-ramp Merge	A	0.23	B	0.48	0.70
	WB Off-ramp Diverge	B	0.46	D	**0.72**	0.70
	WB On-ramp Merge	B	0.45	C	0.67	0.70
Exit 63	WB On-ramp Merge	B	0.44	C	0.68	0.70
	EB Off-ramp Diverge	B	0.22	C	0.48	0.70
Exit 64	WB Off-ramp Diverge	B	0.44	D	0.67	0.70
	EB On-ramp Merge	A	0.20	B	0.33	0.70

Table 8: Future (2031) Weekday PM Peak Hour I-84 Operational Analysis

Location	Direction	2008 Operations		2031 Operations		Mobility Standard (v/c)
		LOS	v/c	LOS	v/c	
Basic Freeway Analysis						
West of Exit 62	WB	A	0.24	B	0.40	0.70
Weaving Analysis						
Exit 63-64	WB	A	0.32	B	0.49	0.70
	EB	A	0.32	B	0.44	0.70
Merging & Diverging Analysis						
Exit 62	EB Off-ramp Diverge	B	0.26	B	0.37	0.70
	EB On-ramp Merge	B	0.26	B	0.51	0.70
	WB Off-ramp Diverge	B	0.29	C	0.55	0.70
	WB On-ramp Merge	B	0.24	B	0.40	0.70
Exit 63	WB On-ramp Merge	B	0.27	C	0.52	0.70
	EB Off-ramp Diverge	B	0.25	C	0.51	0.70
Exit 64	WB Off-ramp Diverge	B	0.30	C	0.48	0.70
	EB On-ramp Merge	B	0.26	B	0.38	0.70

Signal Spacing

Traffic signals spaced at least ½-mile (2,640 feet) apart generally do not impact each other and can operate without need for coordination. When closer than ½-mile, coordination of adjacent signals is typically recommended, but the ability of the signals to operate well together is usually very good if spacing of at least ¼-mile (1,320 feet) is maintained. When spacing is less that ¼-mile, coordination of adjacent signals is strongly recommended, with the ability of these signals to function without impacting each other degrading as spacing decreases. ODOT's signal spacing standard requires at least ½-mile between adjacent signals. However, signals spaced less than ½-mile apart can be allowed where an engineering investigation shows they can operate adequately.

Under existing conditions, the only signalized study intersections are at the Exit 63 I-84 ramp intersections. By 2031, there are several additional signals planned for construction, including:

- Cascade Avenue at Mt. Adams Avenue
- Cascade Avenue at Rand Road
- 2nd Street at Oak Street
- Button Bridge Road at Marina Way
- Button Bridge Road at I-84 westbound On/Off Ramps
- Button Bridge Road at I-84 eastbound On/Off Ramps

Table 9 shows the future signal spacing that will result from the construction of these planned signals. As shown, there will be very closely spaced signals at the intersections on 2nd Street at I-84 eastbound and at Oak Street, as well as on Button Bridge Road at I-84 westbound and Marina Way. Even with signal coordination in place, these intersections may experience queue spillback that could degrade operations.

Table 9: Signal Spacing for Study Area Intersections

Interchange	Intersection	Signal Spacing (ft)
Exit 62	Cascade Ave: Mt. Adams Ave to Rand Rd	1,900
Exit 63	2nd St: I-84 WB Ramps to I-84 EB Ramps	375*
	2nd St: I-84 EB Ramps to Oak St	600
Exit 64	Button Bridge Rd: Marina Way to I-84 WB Ramps	200
	Button Bridge Rd: I-84 WB Ramps to I-84 EB Ramps	350*

*Interchange ramp signals are typically designed and operated to function together, so close spacing can be accommodated.

In addition, while not currently planned for, the operations analysis of future conditions found that traffic signals may be needed at the following intersections:

- Cascade Avenue and I-84 westbound On/Off Ramps
- Cascade Avenue and I-84 eastbound On/Off Ramps (850 feet from Mt. Adams Ave. Signal)
- Button Bridge Road and Historic Columbia River Highway (1,800 feet from I-84 eastbound signal)

To appropriately plan for signalization needs within the IAMP study areas and avoid closely spaced signal that could degrade traffic operations, a traffic signal plan should be developed to identify all signalization needs along the interchange crossroads.

Roadway Connectivity

Improving street connectivity can be another way of mitigating poor operations at study intersections without constructing traffic signals or widening roads. When planning for future streets to enhance local connectivity in the IAMP area, consideration should be given to several constraints, including rail lines, the Columbia River, the Hood River, I-84, and the surrounding topography.

Projects for consideration that could enhance connectivity and reduce congestion through the I-84 interchanges could include:

- An overpass of I-84 west of Exit 62 from Frankton Road to Westcliff Drive. This connection could remove through traffic from Exit 62 and potentially divert the over-capacity northbound left turns from the Cascade Avenue and Mt. Adams Avenue intersection.

- A frontage road along the north side of I-84 from Exit 63 to Exit 64 that could remove some through traffic from the Exit 63 and Exit 64 interchanges.
- While well out of the study area, a new crossing over the Hood River between OR 35 and the east side of the City could reduce reliance on the I-84 interchanges for regional access.

Pedestrian Facilities

Existing pedestrian needs were previously identified in the Existing Conditions technical memorandum. The City of Hood River Transportation System Plan and ODOT Statewide Transportation Improvement Program were referenced to identify planned projects that would address these needs. Projects identified include:

- The Exit 64 reconstruction project will include roadway improvements along Button Bridge Road that will construct sidewalks along the east side of Button Bridge Road from Marina Way to south of the I-84 eastbound ramps intersection.
- A multi-use path along Westcliff Drive from Ruthton Park to Jaymar Road.

With these projects in place, remaining needs would include:

- In the Exit 62 study area, sidewalk infill is needed on most streets, with existing sidewalk only available on the north side of Cascade Avenue east of the interchange.
- There are no separate pedestrian facilities on Cascade Avenue through the Exit 62 interchange itself.
- Sidewalk infill will be needed along Button Bridge Road between the I-84 eastbound ramps and the Historic Columbia River Highway to provide a continuous walking route.

The alternatives analysis for the IAMP study areas should consider projects to address pedestrian needs to ensure adequate facilities are available to support multimodal travel.

Bicycle Facilities

Existing bicycle needs were previously identified in the Existing Conditions technical memorandum. The City of Hood River Transportation System Plan and ODOT Statewide Transportation Improvement Program were referenced to identify planned projects that would address these needs. Projects identified include:

- Bicycle lanes are planned along both directions of Country Club Road from Post Canyon Road to Cascade Avenue.
- The Exit 64 reconstruction project will include roadway improvements along Button Bridge Road that will construct dedicated bike lanes along both directions of Button Bridge Road from Marina Way to south of the I-84 eastbound ramps intersection.
- A multi-use path along Westcliff Drive from Ruthton Park to Jaymar Road.

With these projects in place, remaining needs would include:

- The bike lanes on Cascade Avenue east of the Exit 62 interchange should be extended through the interchange to Westcliff Drive.
- Existing partial shoulder bikeways on streets within the Exit 62 study area should be widened and gaps should be filled to provide a continuous biking network.

The alternatives analysis for the IAMP study areas should consider projects to address bicycle needs to ensure adequate facilities are available to support multimodal travel.

Freight Movement

The primary routes that provide freight movement through and within the City are I-84, Button Bridge Road, Country Club Road and 2nd Street. Accommodations for freight movement will be considered during alternatives development for the IAMP areas. Specific needs in each area are discussed below.

Exit 62

Around the Exit 62 area, there is a significant amount of truck traffic on Country Club Road moving freight through and within the City. The planned project to realign Country Club Road to intersect with the new Mt. Adams Avenue extension must be designed to accommodate turning needs for large trucks.

Exits 63 & 64

The lands north of Exit 63 include a mix of commercial, industrial, and recreational zoning districts. The ability to accommodate large trucks on 2nd Street north of the I-84 interchange to serve the industrial and commercial development will be critical. Truck access to the south of I-84 along 2nd Street is also important for serving the downtown area and other destinations to the south.

Button Bridge Road has significant freight movement north across the Columbia River to Washington and south of the City along OR 35. The planned improvements along Button Bridge Road related with the Exit 64 interchange reconstruction project will benefit freight operations along this corridor by reducing travel delay and improving geometrics. However, the intersection on Button Bridge Road with the Historic Columbia River Highway will continue to be a bottleneck if not mitigated.

Summary of Deficiencies

This section provides a summary of the deficiencies identified for the 2031 No Build conditions.

Intersection Operations

The following intersections failed to meet mobility standards during the Sunday or Weekday p.m. peak hour operational analysis:

- Cascade Avenue at I-84 westbound ramps (Sunday and weekday p.m. peak hour)
- Cascade Avenue at I-84 eastbound ramps (Sunday and weekday p.m. peak hour)
- Cascade Avenue at Mt. Adams Avenue (weekday p.m. peak hour)
- Cascade Avenue at Rand Road (weekday p.m. peak hour)
- 2nd Street at Riverside Drive (weekday p.m. peak hour)
- 2nd Street at Cascade Avenue (weekday p.m. peak hour)
- 2nd Street at Oak Street (Sunday p.m. peak hour)
- State Street at Button Bridge Road (Sunday and weekday p.m. peak hour)

Queuing Analysis

A queuing analysis showed that queuing spilled beyond available storage at the following locations during the Sunday or Weekday p.m. peak hour:

- I-84 westbound off ramp at Cascade Avenue during the Sunday and weekday p.m. peak hours
- Cascade Avenue at Mt. Adams Avenue intersection, the northbound approach of Mt. Adams
- 2nd Street experienced southbound queuing from Oak Street extending north beyond the Industrial Road intersection

Roadway Connectivity

Some areas within the study areas and city have limited accessibility, which can create undue congestion on some roadways. Projects for consideration that could enhance connectivity and reduce congestion through the I-84 interchanges could include:

- An overpass of I-84 west of Exit 62 from Frankton Road to Westcliff Drive
- A frontage road along the north side of I-84 from Exit 63 to Exit 64
- A new crossing over the Hood River between OR 35 and the east side of the City

Pedestrian Facilities

With the construction of all planned pedestrian improvements, the following needs still remain:

- In the Exit 62 study area, sidewalk infill is needed on most streets, with existing sidewalk only available on the north side of Cascade Avenue east of the interchange.
- There are no separate pedestrian facilities on Cascade Avenue through the Exit 62 interchange itself.
- Sidewalk infill will be needed along Button Bridge Road between the I-84 eastbound ramps and the Historic Columbia River Highway to provide a continuous walking route.

Bicycle Facilities

With the construction of all planned bicycle improvements, the following needs still remain:

- The bike lanes on Cascade Avenue east of the Exit 62 interchange should be extended through the interchange to Westcliff Drive.
- Existing partial shoulder bikeways on streets within the Exit 62 study area should be widened and gaps should be filled to provide a continuous biking network.

2031 No Build Conditions
Study Intersections Operational Analysis

Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	40	10	5	315	270	60
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	47	12	6	371	318	71
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	700	318	318			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	700	318	318			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	98	100			
cM capacity (veh/h)	407	728	1254			

Direction, Lane #	WB 1	SE 1	NW 1	NW 2
Volume Total	59	376	318	71
Volume Left	47	6	0	0
Volume Right	12	0	0	71
cSH	446	1254	1700	1700
Volume to Capacity	0.13	0.00	0.19	0.04
Queue Length 95th (ft)	11	0	0	0
Control Delay (s)	14.3	0.2	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	14.3	0.2	0.0	
Approach LOS	B			

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	55	5	310	0	0	0	110	590	0	0	630	630
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)	58	5	326	0	0	0	116	621	0	0	663	663
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											889	
pX, platoon unblocked												
vC, conflicting volume	1516	1516	621	1845	1516	663	663			621		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1516	1516	621	1845	1516	663	663			621		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	30	95	32	100	100	100	86			100		
cM capacity (veh/h)	83	104	482	16	104	465	854			969		

Direction, Lane #	EB 1	SE 1	NW 1	NW 2
Volume Total	389	737	663	663
Volume Left	58	116	0	0
Volume Right	326	0	0	663
cSH	273	854	1700	1700
Volume to Capacity	1.43	0.14	0.39	0.39
Queue Length 95th (ft)	535	12	0	0
Control Delay (s)	247.5	3.3	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	247.5	3.3	0.0	
Approach LOS	F			

Intersection Summary			
Average Delay	40.3		
Intersection Capacity Utilization	114.1%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	415	0	65	0	285	70	420	265	0
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)	0	0	0	461	0	72	0	317	78	467	294	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											1275	
pX, platoon unblocked												
vC, conflicting volume	1656	1583	356	1583	1622	294	294			394		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1656	1583	356	1583	1622	294	294			394		
tC, single (s)	7.1	6.5	6.2	7.2	6.5	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.4	2.2			2.2		
p0 queue free %	100	100	100	0	100	90	100			60		
cM capacity (veh/h)	49	65	693	59	62	729	1279			1153		

Direction, Lane #	WB 1	SE 1	NW 1
Volume Total	533	394	761
Volume Left	461	0	467
Volume Right	72	78	0
cSH	67	1700	1153
Volume to Capacity	7.94	0.23	0.40
Queue Length 95th (ft)	Err	0	50
Control Delay (s)	Err	0.0	8.2
Lane LOS	F		A
Approach Delay (s)	Err	0.0	8.2
Approach LOS	F		

Intersection Summary			
Average Delay	3161.3		
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1800	1800	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	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1765	1500	1676	1765	1676	1500
Flt Permitted	1.00	1.00	0.34	1.00	0.95	1.00
Satd. Flow (perm)	1765	1500	598	1765	1676	1500
Volume (vph)	330	570	170	705	555	275
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	347	600	179	742	584	289
RTOR Reduction (vph)	0	396	0	0	0	172
Lane Group Flow (vph)	347	204	179	742	584	117
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	20.2	20.2	27.3	27.3	24.1	24.1
Effective Green, g (s)	20.2	20.2	27.3	27.3	24.1	24.1
Actuated g/C Ratio	0.34	0.34	0.46	0.46	0.41	0.41
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)	600	510	331	811	680	609
v/s Ratio Prot	0.20		0.03	c0.42	c0.35	
v/s Ratio Perm		0.14	0.22			0.08
v/c Ratio	0.58	0.40	0.54	0.91	0.86	0.19
Uniform Delay, d1	16.1	15.0	11.8	15.0	16.1	11.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.5	1.8	14.7	13.3	0.7
Delay (s)	17.5	15.5	13.6	29.7	29.4	12.1
Level of Service	B	B	B	C	C	B
Approach Delay (s)	16.2			26.6	23.7	
Approach LOS	B			C	C	

Intersection Summary

HCM Average Control Delay	22.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	59.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00			1.00	1.00		1.00	1.00
Frt	1.00	0.96		1.00	0.98			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.97	1.00
Satd. Flow (prot)	1379	1700		1676	1741			1730	1500		1691	1485
Flt Permitted	0.21	1.00		0.32	1.00			0.64	1.00		0.53	1.00
Satd. Flow (perm)	309	1700		559	1741			1151	1500		924	1485
Volume (vph)	35	300	115	175	515	60	255	60	100	130	55	60
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)	36	312	120	182	536	62	266	62	104	135	57	62
RTOR Reduction (vph)	0	23	0	0	7	0	0	0	68	0	0	41
Lane Group Flow (vph)	36	409	0	182	591	0	0	328	36	0	192	21
Heavy Vehicles (%)	24%	2%	0%	2%	2%	0%	0%	0%	2%	4%	0%	3%
Turn Type	pm+pt			pm+pt			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	20.8	19.5		24.0	21.1			18.1	18.1		18.1	18.1
Effective Green, g (s)	20.8	19.5		24.0	21.1			18.1	18.1		18.1	18.1
Actuated g/C Ratio	0.40	0.37		0.46	0.40			0.34	0.34		0.34	0.34
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)	149	631		317	700			397	517		319	512
v/s Ratio Prot	0.01	0.24		c0.03	c0.34							
v/s Ratio Perm	0.09			0.23				c0.29	0.02		0.21	0.01
v/c Ratio	0.24	0.65		0.57	0.84			0.83	0.07		0.60	0.04
Uniform Delay, d1	10.8	13.7		10.4	14.2			15.8	11.5		14.2	11.4
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.8	2.3		2.5	9.2			13.1	0.1		3.2	0.0
Delay (s)	11.7	16.0		12.9	23.4			28.9	11.6		17.4	11.5
Level of Service	B	B		B	C			C	B		B	B
Approach Delay (s)		15.6			21.0			24.7			16.0	
Approach LOS		B			C			C			B	

Intersection Summary

HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	52.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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	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)					1715	1530	1629	1698			1667	1224
Flt Permitted					0.95	1.00	0.33	1.00			1.00	1.00
Satd. Flow (perm)					1715	1530	572	1698			1667	1224
Volume (vph)	0	0	0	460	5	105	105	355	0	0	400	200
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	0	0	484	5	111	111	374	0	0	421	211
RTOR Reduction (vph)	0	0	0	0	0	62	0	0	0	0	0	63
Lane Group Flow (vph)	0	0	0	0	489	49	111	374	0	0	421	148
Heavy Vehicles (%)	4%	0%	7%	0%	0%	0%	5%	6%	0%	0%	8%	25%
Turn Type				Split		Perm	pm+pt					Perm
Protected Phases				4	4		1	6			2	
Permitted Phases						4	6					2
Actuated Green, G (s)					26.1	26.1	46.1	46.1			35.2	35.2
Effective Green, g (s)					26.6	26.6	46.1	46.1			35.2	35.2
Actuated g/C Ratio					0.33	0.33	0.57	0.57			0.44	0.44
Clearance Time (s)					4.5	4.5	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)					565	504	417	970			727	534
v/s Ratio Prot					c0.29		0.02	c0.22			c0.25	
v/s Ratio Perm						0.03	0.13					0.12
v/c Ratio					0.87	0.10	0.27	0.39			0.58	0.28
Uniform Delay, d1					25.4	18.7	9.3	9.5			17.2	14.6
Progression Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2					13.1	0.1	0.3	1.2			3.3	1.3
Delay (s)					38.5	18.8	9.7	10.7			20.5	15.9
Level of Service					D	B	A	B			C	B
Approach Delay (s)		0.0			34.8			10.4			19.0	
Approach LOS		A			C			B			B	

Intersection Summary

HCM Average Control Delay	22.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	80.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	65	50	125	200	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	68	53	132	211	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	450	213	216			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	450	213	216			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	92	96			
cM capacity (veh/h)	545	827	1354			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	74	184	216
Volume Left	5	53	0
Volume Right	68	0	5
cSH	797	1354	1700
Volume to Capacity	0.09	0.04	0.13
Queue Length 95th (ft)	8	3	0
Control Delay (s)	10.0	2.5	0.0
Lane LOS	A	A	
Approach Delay (s)	10.0	2.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	5	80	260	5	5	70	170	220	5	260	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	5	84	274	5	5	74	179	232	5	274	0

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	5	84	284	74	411	5	274
Volume Left (vph)	0	0	274	74	0	5	0
Volume Right (vph)	0	84	5	0	232	0	0
Hadj (s)	0.00	-0.60	0.21	0.99	-0.18	0.50	0.46
Departure Headway (s)	6.7	3.2	6.1	6.9	5.7	6.6	6.6
Degree Utilization, x	0.01	0.07	0.48	0.14	0.65	0.01	0.50
Capacity (veh/h)	434	1121	548	504	604	513	524
Control Delay (s)	9.8	6.5	14.7	9.8	17.6	8.5	14.9
Approach Delay (s)	6.7		14.7	16.4		14.8	
Approach LOS	A		B	C		B	

Intersection Summary			
Delay	14.8		
HCM Level of Service	B		
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	30	95	30	30	0	90	0	40	0	80	10
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)	0	33	106	33	33	0	100	0	44	0	89	11
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	33			139			242	186	86	231	239	33
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	33			139			242	186	86	231	239	33
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			84	100	95	100	86	99
cM capacity (veh/h)	1578			1445			620	692	973	679	647	1040

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	139	67	144	100
Volume Left	0	33	100	0
Volume Right	106	0	44	11
cSH	1700	1445	698	675
Volume to Capacity	0.08	0.02	0.21	0.15
Queue Length 95th (ft)	0	2	19	13
Control Delay (s)	0.0	3.9	11.5	11.3
Lane LOS		A	B	B
Approach Delay (s)	0.0	3.9	11.5	11.3
Approach LOS			B	B

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.93		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1716	1485					1613		1629	1731	
Flt Permitted		0.95	1.00					1.00		0.22	1.00	
Satd. Flow (perm)		1716	1485					1613		378	1731	
Volume (vph)	180	5	305	0	0	0	0	280	285	120	740	0
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	5	321	0	0	0	0	295	300	126	779	0
RTOR Reduction (vph)	0	0	126	0	0	0	0	46	0	0	0	0
Lane Group Flow (vph)	0	194	195	0	0	0	0	549	0	126	779	0
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	5%	3%	5%	4%	0%
Turn Type	Split		Perm							pm+pt		
Protected Phases	8	8						6		5	2	
Permitted Phases			8							2		
Actuated Green, G (s)		12.5	12.5					26.7		36.7	36.7	
Effective Green, g (s)		13.0	13.0					26.7		36.7	36.7	
Actuated g/C Ratio		0.23	0.23					0.46		0.64	0.64	
Clearance Time (s)		4.5	4.5					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		387	335					746		371	1101	
v/s Ratio Prot		0.11						0.34		0.04	c0.45	
v/s Ratio Perm			c0.13							0.18		
v/c Ratio		0.50	0.58					0.74		0.34	0.71	
Uniform Delay, d1		19.5	19.9					12.6		6.6	6.9	
Progression Factor		1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2		1.0	2.6					6.4		0.5	3.8	
Delay (s)		20.5	22.5					19.0		7.1	10.8	
Level of Service		C	C					B		A	B	
Approach Delay (s)		21.8			0.0			19.0			10.3	
Approach LOS		C			A			B			B	

Intersection Summary

HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	57.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0			4.0			4.0			4.0	4.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes		0.99			0.99			1.00			1.00	0.93
Flpb, ped/bikes		0.99			1.00			1.00			0.99	1.00
Frt		0.99			0.98			0.99			1.00	0.85
Flt Protected		0.98			1.00			0.99			0.98	1.00
Satd. Flow (prot)		1715			1730			1740			1642	1413
Flt Permitted		0.65			0.97			0.84			0.66	1.00
Satd. Flow (perm)		1145			1678			1470			1107	1413
Volume (vph)	200	200	40	20	270	60	70	255	25	180	210	575
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)	211	211	42	21	284	63	74	268	26	189	221	605
RTOR Reduction (vph)	0	6	0	0	13	0	0	5	0	0	0	255
Lane Group Flow (vph)	0	458	0	0	355	0	0	363	0	0	410	350
Confl. Peds. (#/hr)	19		28	28		19	19		19	28		28
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	6%	6%	1%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)		24.5			24.5			22.8			22.8	22.8
Effective Green, g (s)		24.5			24.5			22.8			22.8	22.8
Actuated g/C Ratio		0.44			0.44			0.41			0.41	0.41
Clearance Time (s)		4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		507			743			606			456	583
v/s Ratio Prot												
v/s Ratio Perm		c0.40			0.21			0.25			c0.37	0.25
v/c Ratio		0.90			0.48			0.60			0.90	0.60
Uniform Delay, d1		14.3			10.9			12.7			15.2	12.7
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		19.3			0.5			1.6			20.1	1.7
Delay (s)		33.6			11.4			14.3			35.3	14.4
Level of Service		C			B			B			D	B
Approach Delay (s)		33.6			11.4			14.3			22.9	
Approach LOS		C			B			B			C	

Intersection Summary

HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	55.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	101.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	85	0	0	70	0	495	20	0	880	165
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	89	0	0	74	0	521	21	0	926	174
Pedestrians		23			22			23			2	
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		2			2			2			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								254			365	
pX, platoon unblocked	0.72	0.72	0.67	0.72	0.72	0.90	0.67			0.90		
vC, conflicting volume	1643	1600	1059	1679	1677	556	1123			564		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1690	1630	1089	1740	1737	507	1184			516		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	100	100	47	100	100	85	100			100		
cM capacity (veh/h)	42	71	168	22	61	503	388			902		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	89	74	542	1100
Volume Left	0	0	0	0
Volume Right	89	74	21	174
cSH	168	503	1700	1700
Volume to Capacity	0.53	0.15	0.32	0.65
Queue Length 95th (ft)	67	13	0	0
Control Delay (s)	48.4	13.4	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	48.4	13.4	0.0	0.0
Approach LOS	E	B		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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		1.00	0.95	1.00	1.00	0.95	
Frt		0.89		1.00	0.88		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1509		1676	1583		1613	3353	1530	1710	3331	
Flt Permitted		0.98		0.65	1.00		0.31	1.00	1.00	0.41	1.00	
Satd. Flow (perm)		1483		1141	1583		522	3353	1530	744	3331	
Volume (vph)	15	15	145	275	15	60	155	610	255	40	560	30
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	15	15	149	284	15	62	160	629	263	41	577	31
RTOR Reduction (vph)	0	104	0	0	43	0	0	0	150	0	6	0
Lane Group Flow (vph)	0	75	0	284	34	0	160	629	113	41	602	0
Heavy Vehicles (%)	0%	25%	4%	2%	0%	0%	6%	2%	0%	0%	2%	0%
Turn Type	Perm			Perm			pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)		16.1		16.1	16.1		28.4	23.0	23.0	22.4	20.0	
Effective Green, g (s)		16.1		16.1	16.1		28.4	23.0	23.0	22.4	20.0	
Actuated g/C Ratio		0.30		0.30	0.30		0.53	0.43	0.43	0.42	0.37	
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)		446		343	476		387	1441	658	355	1245	
v/s Ratio Prot					0.02		c0.04	c0.19		0.01	0.18	
v/s Ratio Perm		0.05		c0.25			0.18		0.07	0.04		
v/c Ratio		0.17		0.83	0.07		0.41	0.44	0.17	0.12	0.48	
Uniform Delay, d1		13.8		17.4	13.4		7.0	10.7	9.4	9.3	12.8	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.2		15.1	0.1		0.7	0.2	0.1	0.1	0.3	
Delay (s)		13.9		32.5	13.4		7.7	10.9	9.5	9.4	13.1	
Level of Service		B		C	B		A	B	A	A	B	
Approach Delay (s)		13.9			28.4			10.1			12.9	
Approach LOS		B			C			B			B	

Intersection Summary

HCM Average Control Delay	14.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	53.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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
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)					1685	1485	1513	3386			3226	1515
Flt Permitted					0.95	1.00	0.40	1.00			1.00	1.00
Satd. Flow (perm)					1685	1485	634	3386			3226	1515
Volume (vph)	0	0	0	120	5	165	180	855	0	0	460	520
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	0	0	126	5	174	189	900	0	0	484	547
RTOR Reduction (vph)	0	0	0	0	0	105	0	0	0	0	0	295
Lane Group Flow (vph)	0	0	0	0	131	69	189	900	0	0	484	252
Heavy Vehicles (%)	0%	0%	0%	2%	0%	3%	13%	1%	0%	0%	6%	1%
Turn Type				Perm		Perm	pm+pt					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Actuated Green, G (s)					8.5	8.5	33.4	33.4			23.0	23.0
Effective Green, g (s)					8.5	8.5	33.4	33.4			23.0	23.0
Actuated g/C Ratio					0.17	0.17	0.67	0.67			0.46	0.46
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)					287	253	537	2266			1487	698
v/s Ratio Prot							0.05	c0.27			0.15	
v/s Ratio Perm					0.08	0.05	0.19					0.17
v/c Ratio					0.46	0.27	0.35	0.40			0.33	0.36
Uniform Delay, d1					18.6	18.0	3.4	3.7			8.5	8.7
Progression Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2					1.2	0.6	0.4	0.1			0.1	0.3
Delay (s)					19.8	18.6	3.8	3.8			8.7	9.0
Level of Service					B	B	A	A			A	A
Approach Delay (s)		0.0			19.1			3.8			8.9	
Approach LOS		A			B			A			A	

Intersection Summary

HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	49.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	310	30	190	10	35	35	230	380	15	25	415	245
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)	326	32	200	11	37	37	242	400	16	26	437	258

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	358	200	47	37	642	16	463	258
Volume Left (vph)	326	0	11	0	242	0	26	0
Volume Right (vph)	0	200	0	37	0	16	0	258
Hadj (s)	0.20	-0.60	0.04	-0.60	0.22	-0.60	0.08	-0.68
Departure Headway (s)	7.4	3.2	8.8	3.2	7.0	3.2	7.2	6.5
Degree Utilization, x	0.73	0.18	0.12	0.03	1.26	0.01	0.93	0.46
Capacity (veh/h)	475	1121	368	1121	518	1121	489	550
Control Delay (s)	28.1	6.9	12.9	6.3	153.5	6.2	50.5	13.7
Approach Delay (s)	20.5		10.0		149.9		37.3	
Approach LOS	C		B		F		E	

Intersection Summary			
Delay	68.2		
HCM Level of Service	F		
Intersection Capacity Utilization	95.5%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00					0.95		1.00	1.00	
Frt	1.00	1.00	0.85					0.97		1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1608	1608	1485					3239		1676	1748	
Flt Permitted	0.95	0.95	1.00					1.00		0.21	1.00	
Satd. Flow (perm)	1608	1608	1485					3239		365	1748	
Volume (vph)	490	0	225	0	0	0	0	545	160	130	450	0
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)	533	0	245	0	0	0	0	592	174	141	489	0
RTOR Reduction (vph)	0	0	176	0	0	0	0	44	0	0	0	0
Lane Group Flow (vph)	267	266	69	0	0	0	0	722	0	141	489	0
Heavy Vehicles (%)	1%	2%	3%	2%	2%	2%	0%	2%	2%	2%	3%	0%
Turn Type	Split		Perm							pm+pt		
Protected Phases	4	4						2		1	6	
Permitted Phases			4							6		
Actuated Green, G (s)	13.4	13.4	13.4					16.8		26.2	26.2	
Effective Green, g (s)	13.4	13.4	13.4					16.8		26.2	26.2	
Actuated g/C Ratio	0.28	0.28	0.28					0.35		0.55	0.55	
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)	453	453	418					1143		350	962	
v/s Ratio Prot	c0.17	0.17						c0.22		0.05	c0.28	
v/s Ratio Perm			0.05							0.18		
v/c Ratio	0.59	0.59	0.17					0.63		0.40	0.51	
Uniform Delay, d1	14.7	14.7	12.9					12.8		6.3	6.7	
Progression Factor	1.00	1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2	2.0	1.9	0.2					1.1		0.8	0.4	
Delay (s)	16.7	16.7	13.1					14.0		7.1	7.1	
Level of Service	B	B	B					B		A	A	
Approach Delay (s)		15.5			0.0			14.0			7.1	
Approach LOS		B			A			B			A	

Intersection Summary

HCM Average Control Delay	12.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	47.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	55	20	15	395	320	20
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	65	24	18	465	376	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	876	376	376			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	876	376	376			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	80	97	99			
cM capacity (veh/h)	317	675	1193			

Direction, Lane #	WB 1	SE 1	NW 1	NW 2
Volume Total	88	482	376	24
Volume Left	65	18	0	0
Volume Right	24	0	0	24
cSH	369	1193	1700	1700
Volume to Capacity	0.24	0.01	0.22	0.01
Queue Length 95th (ft)	23	1	0	0
Control Delay (s)	17.8	0.5	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	17.8	0.5	0.0	
Approach LOS	C			

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	30	5	200	0	0	0	130	890	0	0	510	715
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	32	5	211	0	0	0	137	937	0	0	537	753
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											889	
pX, platoon unblocked												
vC, conflicting volume	1747	1747	937	1961	1747	537	537			937		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1747	1747	937	1961	1747	537	537			937		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.3			4.1		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.4			2.2		
p0 queue free %	44	93	34	100	100	100	86			100		
cM capacity (veh/h)	56	75	317	14	75	548	955			739		

Direction, Lane #	EB 1	SE 1	NW 1	NW 2
Volume Total	247	1074	537	753
Volume Left	32	137	0	0
Volume Right	211	0	0	753
cSH	191	955	1700	1700
Volume to Capacity	1.30	0.14	0.32	0.44
Queue Length 95th (ft)	345	12	0	0
Control Delay (s)	214.8	3.8	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	214.8	3.8	0.0	
Approach LOS	F			

Intersection Summary			
Average Delay	21.9		
Intersection Capacity Utilization	128.8%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	0	625	0	80	0	395	55	280	260	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	0	0	735	0	94	0	465	65	329	306	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)											1275	
pX, platoon unblocked												
vC, conflicting volume	1556	1462	497	1462	1494	306	306			529		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1556	1462	497	1462	1494	306	306			529		
tC, single (s)	7.1	6.5	6.2	7.2	6.5	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.4	2.2			2.2		
p0 queue free %	100	100	100	0	100	87	100			68		
cM capacity (veh/h)	61	88	577	79	84	718	1266			1028		

Direction, Lane #	WB 1	SE 1	NW 1
Volume Total	829	529	635
Volume Left	735	0	329
Volume Right	94	65	0
cSH	87	1700	1028
Volume to Capacity	9.49	0.31	0.32
Queue Length 95th (ft)	Err	0	35
Control Delay (s)	Err	0.0	7.2
Lane LOS	F		A
Approach Delay (s)	Err	0.0	7.2
Approach LOS	F		

Intersection Summary			
Average Delay	4161.2		
Intersection Capacity Utilization	108.0%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1800	1800	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	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1765	1500	1676	1765	1676	1500
Flt Permitted	1.00	1.00	0.20	1.00	0.95	1.00
Satd. Flow (perm)	1765	1500	353	1765	1676	1500
Volume (vph)	430	660	345	665	560	405
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	453	695	363	700	589	426
RTOR Reduction (vph)	0	461	0	0	0	263
Lane Group Flow (vph)	453	234	363	700	589	163
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	16.0	16.0	29.0	29.0	23.0	23.0
Effective Green, g (s)	16.0	16.0	29.0	29.0	23.0	23.0
Actuated g/C Ratio	0.27	0.27	0.48	0.48	0.38	0.38
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)	471	400	369	853	642	575
v/s Ratio Prot	0.26		c0.15	0.40	c0.35	
v/s Ratio Perm		0.16	c0.33			0.11
v/c Ratio	0.96	0.59	0.98	0.82	0.92	0.28
Uniform Delay, d1	21.7	19.1	13.1	13.3	17.6	12.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	31.7	2.2	42.2	6.4	20.2	1.2
Delay (s)	53.4	21.3	55.3	19.6	37.8	14.0
Level of Service	D	C	E	B	D	B
Approach Delay (s)	34.0			31.8	27.8	
Approach LOS	C			C	C	

Intersection Summary

HCM Average Control Delay	31.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00			1.00	1.00		1.00	1.00
Frt	1.00	0.96		1.00	0.98			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.97	1.00
Satd. Flow (prot)	1379	1698		1676	1740			1737	1500		1698	1485
Flt Permitted	0.20	1.00		0.15	1.00			0.53	1.00		0.49	1.00
Satd. Flow (perm)	285	1698		260	1740			958	1500		851	1485
Volume (vph)	50	480	195	175	555	65	215	80	170	165	85	195
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)	52	500	203	182	578	68	224	83	177	172	89	203
RTOR Reduction (vph)	0	24	0	0	7	0	0	0	120	0	0	137
Lane Group Flow (vph)	52	679	0	182	639	0	0	307	57	0	261	66
Heavy Vehicles (%)	24%	2%	0%	2%	2%	0%	0%	0%	2%	4%	0%	3%
Turn Type	pm+pt			pm+pt			Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	28.0	25.6		31.2	27.2			19.9	19.9		19.9	19.9
Effective Green, g (s)	28.0	25.6		31.2	27.2			19.9	19.9		19.9	19.9
Actuated g/C Ratio	0.46	0.42		0.51	0.44			0.32	0.32		0.32	0.32
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)	172	707		224	770			310	485		275	481
v/s Ratio Prot	0.01	c0.40		c0.05	0.37							
v/s Ratio Perm	0.13			0.36				c0.32	0.04		0.31	0.04
v/c Ratio	0.30	0.96		0.81	0.83			0.99	0.12		0.95	0.14
Uniform Delay, d1	11.1	17.5		12.5	15.1			20.7	14.6		20.3	14.7
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	1.0	24.4		19.7	7.6			48.3	0.1		40.1	0.1
Delay (s)	12.1	41.9		32.2	22.7			69.0	14.7		60.4	14.9
Level of Service	B	D		C	C			E	B		E	B
Approach Delay (s)		39.8			24.8			49.2			40.5	
Approach LOS		D			C			D			D	

Intersection Summary

HCM Average Control Delay	36.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	61.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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	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)					1710	1530	1629	1698			1667	1224
Flt Permitted					0.95	1.00	0.20	1.00			1.00	1.00
Satd. Flow (perm)					1710	1530	341	1698			1667	1224
Volume (vph)	0	0	0	405	0	125	65	555	0	0	585	225
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	0	0	426	0	132	68	584	0	0	616	237
RTOR Reduction (vph)	0	0	0	0	0	87	0	0	0	0	0	46
Lane Group Flow (vph)	0	0	0	0	426	45	68	584	0	0	616	191
Heavy Vehicles (%)	4%	0%	7%	0%	0%	0%	5%	6%	0%	0%	8%	25%
Turn Type				Split		Perm	pm+pt					Perm
Protected Phases				4	4		1	6			2	
Permitted Phases						4	6					2
Actuated Green, G (s)					23.5	23.5	46.2	46.2			36.4	36.4
Effective Green, g (s)					24.0	24.0	46.2	46.2			36.4	36.4
Actuated g/C Ratio					0.31	0.31	0.59	0.59			0.47	0.47
Clearance Time (s)					4.5	4.5	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)					525	470	297	1003			776	570
v/s Ratio Prot					c0.25		0.02	c0.34			c0.37	
v/s Ratio Perm						0.03	0.12					0.16
v/c Ratio					0.81	0.10	0.23	0.58			0.79	0.34
Uniform Delay, d1					25.0	19.3	10.2	10.0			17.7	13.2
Progression Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2					9.3	0.1	0.4	2.5			8.2	1.6
Delay (s)					34.3	19.4	10.6	12.4			25.9	14.8
Level of Service					C	B	B	B			C	B
Approach Delay (s)		0.0			30.8			12.3			22.8	
Approach LOS		A			C			B			C	

Intersection Summary

HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	78.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	5	60	60	165	290	5
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	5	63	63	174	305	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	608	308	311			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	608	308	311			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	91	95			
cM capacity (veh/h)	436	732	1250			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	68	237	311
Volume Left	5	63	0
Volume Right	63	0	5
cSH	696	1250	1700
Volume to Capacity	0.10	0.05	0.18
Queue Length 95th (ft)	8	4	0
Control Delay (s)	10.7	2.5	0.0
Lane LOS	B	A	
Approach Delay (s)	10.7	2.5	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	10	125	340	5	0	125	225	330	5	345	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	11	132	358	5	0	132	237	347	5	363	0

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	11	132	363	132	584	5	363
Volume Left (vph)	0	0	358	132	0	5	0
Volume Right (vph)	0	132	0	0	347	0	0
Hadj (s)	0.00	-0.60	0.23	0.99	-0.21	0.50	0.46
Departure Headway (s)	8.1	3.2	6.9	7.7	6.5	7.5	7.5
Degree Utilization, x	0.02	0.12	0.70	0.28	1.05	0.01	0.75
Capacity (veh/h)	375	1121	508	458	558	469	472
Control Delay (s)	11.3	6.6	24.1	12.5	77.0	9.4	28.5
Approach Delay (s)	7.0		24.1	65.2		28.3	
Approach LOS	A		C	F		D	

Intersection Summary			
Delay	42.0		
HCM Level of Service	E		
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	30	150	80	25	0	105	0	65	0	65	10
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)	0	33	167	89	28	0	117	0	72	0	72	11
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	28			200			369	322	117	394	406	28
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	28			200			369	322	117	394	406	28
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			94			76	100	92	100	86	99
cM capacity (veh/h)	1586			1372			492	557	935	496	500	1047

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	200	117	189	83
Volume Left	0	89	117	0
Volume Right	167	0	72	11
cSH	1700	1372	600	537
Volume to Capacity	0.12	0.06	0.31	0.16
Queue Length 95th (ft)	0	5	34	14
Control Delay (s)	0.0	6.1	13.7	12.9
Lane LOS		A	B	B
Approach Delay (s)	0.0	6.1	13.7	12.9
Approach LOS			B	B

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	1.00	
Frt		1.00	0.85					0.94		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1716	1485					1619		1629	1731	
Flt Permitted		0.95	1.00					1.00		0.16	1.00	
Satd. Flow (perm)		1716	1485					1619		270	1731	
Volume (vph)	300	5	220	0	0	0	0	320	290	110	880	0
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)	316	5	232	0	0	0	0	337	305	116	926	0
RTOR Reduction (vph)	0	0	82	0	0	0	0	43	0	0	0	0
Lane Group Flow (vph)	0	321	150	0	0	0	0	599	0	116	926	0
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	5%	3%	5%	4%	0%
Turn Type	Split		Perm							pm+pt		
Protected Phases	8	8						6		5	2	
Permitted Phases			8							2		
Actuated Green, G (s)		15.6	15.6					26.3		36.4	36.4	
Effective Green, g (s)		16.1	16.1					26.3		36.4	36.4	
Actuated g/C Ratio		0.27	0.27					0.43		0.60	0.60	
Clearance Time (s)		4.5	4.5					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		457	395					704		299	1041	
v/s Ratio Prot		c0.19						0.37		0.04	c0.54	
v/s Ratio Perm			0.10							0.19		
v/c Ratio		0.70	0.38					0.85		0.39	0.89	
Uniform Delay, d1		20.0	18.1					15.3		8.7	10.3	
Progression Factor		1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2		4.8	0.6					12.3		0.8	11.3	
Delay (s)		24.9	18.7					27.7		9.5	21.7	
Level of Service		C	B					C		A	C	
Approach Delay (s)		22.3			0.0			27.7			20.3	
Approach LOS		C			A			C			C	

Intersection Summary

HCM Average Control Delay	22.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	60.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0			4.0			4.0			4.0	4.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes		0.98			0.98			1.00			1.00	0.93
Flpb, ped/bikes		0.99			1.00			1.00			0.99	1.00
Frt		0.97			0.95			0.99			1.00	0.85
Flt Protected		0.97			1.00			0.99			0.98	1.00
Satd. Flow (prot)		1643			1665			1743			1648	1413
Flt Permitted		0.53			0.97			0.78			0.64	1.00
Satd. Flow (perm)		897			1624			1378			1072	1413
Volume (vph)	75	15	30	25	190	110	120	375	30	230	295	565
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)	79	16	32	26	200	116	126	395	32	242	311	595
RTOR Reduction (vph)	0	21	0	0	32	0	0	4	0	0	0	136
Lane Group Flow (vph)	0	106	0	0	310	0	0	549	0	0	553	459
Confl. Peds. (#/hr)	19		28	28		19	19		19	28		28
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	6%	6%	1%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)		13.6			13.6			33.2			33.2	33.2
Effective Green, g (s)		13.6			13.6			33.2			33.2	33.2
Actuated g/C Ratio		0.25			0.25			0.61			0.61	0.61
Clearance Time (s)		4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		223			403			835			649	856
v/s Ratio Prot												
v/s Ratio Perm		0.12			c0.19			0.40			c0.52	0.33
v/c Ratio		0.48			0.77			0.66			0.85	0.54
Uniform Delay, d1		17.6			19.1			7.1			8.8	6.3
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		1.6			8.8			1.9			10.5	0.7
Delay (s)		19.2			28.0			9.0			19.3	7.0
Level of Service		B			C			A			B	A
Approach Delay (s)		19.2			28.0			9.0			12.9	
Approach LOS		B			C			A			B	

Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	54.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	103.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	0	170	0	0	65	0	545	15	0	920	180
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	179	0	0	68	0	574	16	0	968	189
Pedestrians		23			22			23			2	
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		2			2			2			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)								254			365	
pX, platoon unblocked	0.52	0.52	0.46	0.52	0.52	0.88	0.46			0.88		
vC, conflicting volume	1738	1698	1109	1869	1784	606	1181			611		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2071	1993	1239	2323	2160	550	1396			557		
tC, single (s)	7.2	6.5	6.2	7.1	6.5	6.2	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	100	100	0	0	100	85	100			100		
cM capacity (veh/h)	16	31	94	0	24	463	220			848		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	179	68	589	1158
Volume Left	0	0	0	0
Volume Right	179	68	16	189
cSH	94	463	1700	1700
Volume to Capacity	1.91	0.15	0.35	0.68
Queue Length 95th (ft)	377	13	0	0
Control Delay (s)	520.0	14.1	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	520.0	14.1	0.0	0.0
Approach LOS	F	B		

Intersection Summary			
Average Delay	47.1		
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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		1.00	0.95	1.00	1.00	0.95	
Frt		0.90		1.00	0.86		1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.99		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1542		1676	1546		1613	3353	1530	1710	3332	
Flt Permitted		0.93		0.72	1.00		0.36	1.00	1.00	0.21	1.00	
Satd. Flow (perm)		1449		1264	1546		605	3353	1530	383	3332	
Volume (vph)	30	5	100	215	5	80	75	890	180	60	595	30
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	31	5	103	222	5	82	77	918	186	62	613	31
RTOR Reduction (vph)	0	75	0	0	60	0	0	0	107	0	5	0
Lane Group Flow (vph)	0	64	0	222	27	0	77	918	79	62	639	0
Heavy Vehicles (%)	0%	25%	4%	2%	0%	0%	6%	2%	0%	0%	2%	0%
Turn Type	Perm			Perm			pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)		13.8		13.8	13.8		25.7	22.0	22.0	25.9	22.1	
Effective Green, g (s)		13.8		13.8	13.8		25.7	22.0	22.0	25.9	22.1	
Actuated g/C Ratio		0.27		0.27	0.27		0.50	0.43	0.43	0.50	0.43	
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)		388		338	413		374	1430	652	290	1427	
v/s Ratio Prot					0.02		0.01	c0.27		c0.02	0.19	
v/s Ratio Perm		0.04		c0.18			0.09		0.05	0.09		
v/c Ratio		0.16		0.66	0.07		0.21	0.64	0.12	0.21	0.45	
Uniform Delay, d1		14.5		16.8	14.1		6.9	11.7	9.0	7.2	10.4	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.2		4.6	0.1		0.3	1.0	0.1	0.4	0.2	
Delay (s)		14.7		21.3	14.2		7.2	12.7	9.0	7.5	10.7	
Level of Service		B		C	B		A	B	A	A	B	
Approach Delay (s)		14.7			19.3			11.8			10.4	
Approach LOS		B			B			B			B	

Intersection Summary

HCM Average Control Delay	12.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	51.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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
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)					1676	1485	1513	3386			3226	1515
Flt Permitted					0.95	1.00	0.45	1.00			1.00	1.00
Satd. Flow (perm)					1676	1485	717	3386			3226	1515
Volume (vph)	0	0	0	160	0	135	165	1010	0	0	340	570
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	0	0	168	0	142	174	1063	0	0	358	600
RTOR Reduction (vph)	0	0	0	0	0	67	0	0	0	0	0	343
Lane Group Flow (vph)	0	0	0	0	168	75	174	1063	0	0	358	257
Heavy Vehicles (%)	0%	0%	0%	2%	0%	3%	13%	1%	0%	0%	6%	1%
Turn Type				Perm		Perm	pm+pt					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Actuated Green, G (s)					9.1	9.1	30.7	30.7			20.5	20.5
Effective Green, g (s)					9.1	9.1	30.7	30.7			20.5	20.5
Actuated g/C Ratio					0.19	0.19	0.64	0.64			0.43	0.43
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)					319	283	564	2175			1384	650
v/s Ratio Prot							0.04	c0.31			0.11	
v/s Ratio Perm					0.10	0.05	0.16					0.17
v/c Ratio					0.53	0.26	0.31	0.49			0.26	0.40
Uniform Delay, d1					17.4	16.5	3.7	4.5			8.8	9.4
Progression Factor					1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2					1.6	0.5	0.3	0.2			0.1	0.4
Delay (s)					19.0	17.0	4.0	4.6			8.9	9.8
Level of Service					B	B	A	A			A	A
Approach Delay (s)		0.0			18.1			4.5			9.4	
Approach LOS		A			B			A			A	

Intersection Summary

HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	445	35	240	10	20	60	195	305	5	35	300	195
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)	468	37	253	11	21	63	205	321	5	37	316	205

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	505	253	32	63	526	5	353	205
Volume Left (vph)	468	0	11	0	205	0	37	0
Volume Right (vph)	0	253	0	63	0	5	0	205
Hadj (s)	0.20	-0.60	0.07	-0.60	0.22	-0.60	0.10	-0.68
Departure Headway (s)	7.2	3.2	9.2	3.2	7.3	3.2	7.8	7.1
Degree Utilization, x	1.01	0.22	0.08	0.06	1.07	0.00	0.77	0.40
Capacity (veh/h)	493	1122	375	1121	502	1121	452	504
Control Delay (s)	68.8	7.1	13.0	6.4	86.2	6.2	31.3	13.6
Approach Delay (s)	48.3		8.6		85.4		24.7	
Approach LOS	E		A		F		C	

Intersection Summary			
Delay	49.7		
HCM Level of Service	E		
Intersection Capacity Utilization	91.7%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00					0.95		1.00	1.00	
Frt	1.00	1.00	0.85					0.97		1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1608	1608	1485					3238		1676	1748	
Flt Permitted	0.95	0.95	1.00					1.00		0.18	1.00	
Satd. Flow (perm)	1608	1608	1485					3238		318	1748	
Volume (vph)	535	0	170	0	0	0	0	640	190	165	335	0
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)	582	0	185	0	0	0	0	696	207	179	364	0
RTOR Reduction (vph)	0	0	132	0	0	0	0	45	0	0	0	0
Lane Group Flow (vph)	291	291	53	0	0	0	0	858	0	179	364	0
Heavy Vehicles (%)	1%	2%	3%	2%	2%	2%	0%	2%	2%	2%	3%	0%
Turn Type	Split		Perm							pm+pt		
Protected Phases	4	4						2		1	6	
Permitted Phases			4							6		
Actuated Green, G (s)	14.3	14.3	14.3					18.2		27.8	27.8	
Effective Green, g (s)	14.3	14.3	14.3					18.2		27.8	27.8	
Actuated g/C Ratio	0.29	0.29	0.29					0.36		0.55	0.55	
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)	459	459	424					1176		328	970	
v/s Ratio Prot	c0.18	0.18						c0.27		c0.06	0.21	
v/s Ratio Perm			0.04							0.24		
v/c Ratio	0.63	0.63	0.12					0.73		0.55	0.38	
Uniform Delay, d1	15.6	15.6	13.3					13.8		7.4	6.3	
Progression Factor	1.00	1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2	2.9	2.9	0.1					2.3		1.9	0.2	
Delay (s)	18.5	18.5	13.4					16.1		9.2	6.5	
Level of Service	B	B	B					B		A	A	
Approach Delay (s)		17.2			0.0			16.1			7.4	
Approach LOS		B			A			B			A	

Intersection Summary

HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	50.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queuing Analysis Worksheets

Intersection: 1: Westcliff Drive & Cascade Ave, Interval #1

Movement	WB	SE	NW	NW
Directions Served	LR	LT	T	R
Maximum Queue (ft)	65	10	17	47
Average Queue (ft)	36	1	2	37
95th Queue (ft)	57	10	26	60
Link Distance (ft)	673	508	84	
Upstream Blk Time (%)			0	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)				20
Storage Blk Time (%)				1
Queuing Penalty (veh)				3

Intersection: 1: Westcliff Drive & Cascade Ave, Interval #2

Movement	WB	SE	NW	NW
Directions Served	LR	LT	T	R
Maximum Queue (ft)	49	26	56	52
Average Queue (ft)	26	2	4	33
95th Queue (ft)	53	15	31	63
Link Distance (ft)	673	508	84	
Upstream Blk Time (%)			0	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)				20
Storage Blk Time (%)			0	1
Queuing Penalty (veh)			0	2

Intersection: 1: Westcliff Drive & Cascade Ave, All Intervals

Movement	WB	SE	NW	NW
Directions Served	LR	LT	T	R
Maximum Queue (ft)	65	30	57	52
Average Queue (ft)	29	2	4	34
95th Queue (ft)	55	14	30	62
Link Distance (ft)	673	508	84	
Upstream Blk Time (%)			0	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)				20
Storage Blk Time (%)			0	1
Queuing Penalty (veh)			0	2

Intersection: 4: I-84 EB Ramp & Cascade Ave, Interval #1

Movement	EB	SE	NW	NW	B18
Directions Served	LTR	LT	T	R	T
Maximum Queue (ft)	280	56	143	60	227
Average Queue (ft)	152	16	111	54	49
95th Queue (ft)	282	56	164	60	218
Link Distance (ft)	552	317	70		682
Upstream Blk Time (%)			9	1	
Queuing Penalty (veh)			114	0	
Storage Bay Dist (ft)				25	
Storage Blk Time (%)			1	9	
Queuing Penalty (veh)			7	57	

Intersection: 4: I-84 EB Ramp & Cascade Ave, Interval #2

Movement	EB	SE	NW	NW	B18
Directions Served	LTR	LT	T	R	T
Maximum Queue (ft)	478	90	146	62	174
Average Queue (ft)	189	25	113	55	33
95th Queue (ft)	407	70	156	60	137
Link Distance (ft)	552	317	70		682
Upstream Blk Time (%)	1		9	1	
Queuing Penalty (veh)	0		111	0	
Storage Bay Dist (ft)				25	
Storage Blk Time (%)			1	8	
Queuing Penalty (veh)			9	50	

Intersection: 4: I-84 EB Ramp & Cascade Ave, All Intervals

Movement	EB	SE	NW	NW	B18
Directions Served	LTR	LT	T	R	T
Maximum Queue (ft)	478	99	146	62	301
Average Queue (ft)	180	23	112	54	37
95th Queue (ft)	382	67	158	60	160
Link Distance (ft)	552	317	70		682
Upstream Blk Time (%)	1		9	1	
Queuing Penalty (veh)	0		112	0	
Storage Bay Dist (ft)				25	
Storage Blk Time (%)			1	8	
Queuing Penalty (veh)			8	52	

Intersection: 5: I-84 WB Ramp & Cascade Ave, Interval #1

Movement	WB	SE	NW
Directions Served	LR	TR	LT
Maximum Queue (ft)	760	23	259
Average Queue (ft)	754	6	136
95th Queue (ft)	768	22	261
Link Distance (ft)	737	84	317
Upstream Blk Time (%)	98		0
Queuing Penalty (veh)	0		2
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: I-84 WB Ramp & Cascade Ave, Interval #2

Movement	WB	SE	NW
Directions Served	LR	TR	LT
Maximum Queue (ft)	766	36	294
Average Queue (ft)	757	6	120
95th Queue (ft)	767	25	238
Link Distance (ft)	737	84	317
Upstream Blk Time (%)	96		0
Queuing Penalty (veh)	0		3
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: I-84 WB Ramp & Cascade Ave, All Intervals

Movement	WB	SE	NW
Directions Served	LR	TR	LT
Maximum Queue (ft)	766	36	300
Average Queue (ft)	756	6	124
95th Queue (ft)	768	24	244
Link Distance (ft)	737	84	317
Upstream Blk Time (%)	96		0
Queuing Penalty (veh)	0		3
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 10: Cascade Ave & Mt Adams Ave, Interval #1

Movement	EB	EB	WB	WB	NB	NB
Directions Served	T	R	L	T	L	R
Maximum Queue (ft)	270	130	131	1324	132	1035
Average Queue (ft)	145	101	113	1128	129	860
95th Queue (ft)	276	155	156	1521	132	1317
Link Distance (ft)	682			1874		1060
Upstream Blk Time (%)						16
Queuing Penalty (veh)						0
Storage Bay Dist (ft)		100	100		100	
Storage Blk Time (%)	8	1	13	44	49	3
Queuing Penalty (veh)	50	3	97	78	142	15

Intersection: 10: Cascade Ave & Mt Adams Ave, Interval #2

Movement	EB	EB	WB	WB	NB	NB
Directions Served	T	R	L	T	L	R
Maximum Queue (ft)	286	131	133	1517	135	1077
Average Queue (ft)	111	88	100	1174	129	999
95th Queue (ft)	209	139	156	1731	133	1294
Link Distance (ft)	682			1874		1060
Upstream Blk Time (%)				1		24
Queuing Penalty (veh)				4		0
Storage Bay Dist (ft)		100	100		100	
Storage Blk Time (%)	6	1	10	45	51	2
Queuing Penalty (veh)	35	2	72	74	137	12

Intersection: 10: Cascade Ave & Mt Adams Ave, All Intervals

Movement	EB	EB	WB	WB	NB	NB
Directions Served	T	R	L	T	L	R
Maximum Queue (ft)	327	131	133	1616	136	1077
Average Queue (ft)	119	91	103	1163	129	965
95th Queue (ft)	229	144	157	1686	133	1321
Link Distance (ft)	682			1874		1060
Upstream Blk Time (%)				0		22
Queuing Penalty (veh)				3		0
Storage Bay Dist (ft)		100	100		100	
Storage Blk Time (%)	7	1	11	44	50	2
Queuing Penalty (veh)	39	3	78	75	138	12

Intersection: 15: Cascade Ave & Rand Road, Interval #1

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	R	LT	R
Maximum Queue (ft)	87	275	154	407	232	104	145	74
Average Queue (ft)	36	148	93	220	137	50	89	38
95th Queue (ft)	104	273	165	404	239	106	146	80
Link Distance (ft)		1874		828	1174		457	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150		125			100		50
Storage Blk Time (%)		6	3	16	18	0	20	2
Queuing Penalty (veh)		2	20	29	19	0	13	5

Intersection: 15: Cascade Ave & Rand Road, Interval #2

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	R	LT	R
Maximum Queue (ft)	134	288	154	496	384	132	195	80
Average Queue (ft)	34	136	87	235	169	62	88	37
95th Queue (ft)	96	238	154	464	317	132	165	80
Link Distance (ft)		1874		828	1174		457	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150		125			100		50
Storage Blk Time (%)		5	3	16	24	0	21	3
Queuing Penalty (veh)		2	17	28	24	1	12	5

Intersection: 15: Cascade Ave & Rand Road, All Intervals

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	R	LT	R
Maximum Queue (ft)	136	306	154	523	392	132	200	80
Average Queue (ft)	34	139	88	231	161	59	88	37
95th Queue (ft)	98	247	157	450	301	127	161	80
Link Distance (ft)		1874		828	1174		457	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150		125			100		50
Storage Blk Time (%)		5	3	16	22	0	21	3
Queuing Penalty (veh)		2	18	28	22	1	12	5

Nework Summary

Network wide Queuing Penalty, Interval #1: 656
Network wide Queuing Penalty, Interval #2: 601
Network wide Queuing Penalty, All Intervals: 615

Intersection: 1: I-84 WB Ramp & 2nd Street, Interval #1

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	L	T	T	R
Maximum Queue (ft)	1489	155	107	269	343	95
Average Queue (ft)	1330	90	60	167	318	44
95th Queue (ft)	1779	206	125	292	352	120
Link Distance (ft)	1470			357	274	
Upstream Blk Time (%)	53			0	66	
Queuing Penalty (veh)	0			0	419	
Storage Bay Dist (ft)		125	90			65
Storage Blk Time (%)	84	0	1	14	72	0
Queuing Penalty (veh)	93	0	5	15	153	0

Intersection: 1: I-84 WB Ramp & 2nd Street, Interval #2

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	L	T	T	R
Maximum Queue (ft)	1489	155	123	373	352	103
Average Queue (ft)	1487	64	56	142	325	51
95th Queue (ft)	1495	174	113	286	358	129
Link Distance (ft)	1470			357	274	
Upstream Blk Time (%)	81			1	71	
Queuing Penalty (veh)	0			6	415	
Storage Bay Dist (ft)		125	90			65
Storage Blk Time (%)	82	0	1	15	74	0
Queuing Penalty (veh)	84	0	5	15	145	0

Intersection: 1: I-84 WB Ramp & 2nd Street, All Intervals

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	L	T	T	R
Maximum Queue (ft)	1489	155	124	373	352	103
Average Queue (ft)	1449	70	57	148	324	50
95th Queue (ft)	1696	183	116	289	357	127
Link Distance (ft)	1470			357	274	
Upstream Blk Time (%)	74			1	69	
Queuing Penalty (veh)	0			4	416	
Storage Bay Dist (ft)		125	90			65
Storage Blk Time (%)	82	0	1	15	74	0
Queuing Penalty (veh)	87	0	5	15	147	0

Intersection: 2: Industrial St & 2nd Street, Interval #1

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	171	44	162
Average Queue (ft)	93	10	86
95th Queue (ft)	238	42	266
Link Distance (ft)	967	366	350
Upstream Blk Time (%)			4
Queuing Penalty (veh)			9
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Industrial St & 2nd Street, Interval #2

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	788	153	363
Average Queue (ft)	424	21	233
95th Queue (ft)	839	97	413
Link Distance (ft)	967	366	350
Upstream Blk Time (%)	3		13
Queuing Penalty (veh)	0		25
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Industrial St & 2nd Street, All Intervals

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	788	153	365
Average Queue (ft)	344	18	197
95th Queue (ft)	781	86	405
Link Distance (ft)	967	366	350
Upstream Blk Time (%)	2		11
Queuing Penalty (veh)	0		21
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Riverside Drive & 2nd Street, Interval #1

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	68	80	430	98	221	40	405
Average Queue (ft)	27	21	329	51	123	6	349
95th Queue (ft)	124	78	529	112	225	44	471
Link Distance (ft)	1475		426		274		366
Upstream Blk Time (%)			36		0		43
Queuing Penalty (veh)			0		2		120
Storage Bay Dist (ft)		65		125		75	
Storage Blk Time (%)	0	2			8		94
Queuing Penalty (veh)	0	0			6		5

Intersection: 3: Riverside Drive & 2nd Street, Interval #2

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	152	94	453	162	292	83	434
Average Queue (ft)	18	28	444	53	131	8	396
95th Queue (ft)	99	89	457	124	253	52	435
Link Distance (ft)	1475		426		274		366
Upstream Blk Time (%)			93		3		78
Queuing Penalty (veh)			0		12		203
Storage Bay Dist (ft)		65		125		75	
Storage Blk Time (%)		2		0	11		100
Queuing Penalty (veh)		0		0	8		5

Intersection: 3: Riverside Drive & 2nd Street, All Intervals

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	174	95	453	164	294	83	434
Average Queue (ft)	20	26	416	53	129	7	385
95th Queue (ft)	105	86	544	121	247	50	461
Link Distance (ft)	1475		426		274		366
Upstream Blk Time (%)			79		2		69
Queuing Penalty (veh)			0		9		182
Storage Bay Dist (ft)		65		125		75	
Storage Blk Time (%)	0	2		0	10		98
Queuing Penalty (veh)	0	0		0	7		5

Intersection: 4: Portway Ave & 2nd Street, Interval #1

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	12	9	62	64
Average Queue (ft)	4	4	41	39
95th Queue (ft)	26	17	61	59
Link Distance (ft)	976	444	350	318
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Portway Ave & 2nd Street, Interval #2

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	94	59	93	105
Average Queue (ft)	14	9	43	48
95th Queue (ft)	69	38	77	102
Link Distance (ft)	976	444	350	318
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Portway Ave & 2nd Street, All Intervals

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	94	59	98	106
Average Queue (ft)	12	8	42	46
95th Queue (ft)	61	34	74	94
Link Distance (ft)	976	444	350	318
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 9: I-84 EB Ramp & 2nd Street, Interval #1

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	997	152	286	119	379
Average Queue (ft)	617	148	174	64	369
95th Queue (ft)	1623	154	296	135	381
Link Distance (ft)	1973		295		357
Upstream Blk Time (%)	5		2		50
Queuing Penalty (veh)	0		10		451
Storage Bay Dist (ft)		120		90	
Storage Blk Time (%)	5	57		1	69
Queuing Penalty (veh)	15	110		5	86

Intersection: 9: I-84 EB Ramp & 2nd Street, Interval #2

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	1890	156	314	122	397
Average Queue (ft)	1339	147	177	63	373
95th Queue (ft)	2481	166	311	137	389
Link Distance (ft)	1973		295		357
Upstream Blk Time (%)	24		2		48
Queuing Penalty (veh)	0		14		402
Storage Bay Dist (ft)		120		90	
Storage Blk Time (%)	7	64		1	65
Queuing Penalty (veh)	22	116		5	77

Intersection: 9: I-84 EB Ramp & 2nd Street, All Intervals

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	1890	157	318	122	397
Average Queue (ft)	1164	147	176	63	372
95th Queue (ft)	2387	164	308	136	387
Link Distance (ft)	1973		295		357
Upstream Blk Time (%)	19		2		48
Queuing Penalty (veh)	0		13		414
Storage Bay Dist (ft)		120		90	
Storage Blk Time (%)	7	62		1	66
Queuing Penalty (veh)	21	115		5	79

Intersection: 16: Oak Street & 2nd Street, Interval #1

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	1424	180	230	263	80
Average Queue (ft)	954	120	181	228	79
95th Queue (ft)	1754	197	287	261	84
Link Distance (ft)	2366	459	228	197	
Upstream Blk Time (%)			17	44	
Queuing Penalty (veh)			0	447	
Storage Bay Dist (ft)					50
Storage Blk Time (%)				54	30
Queuing Penalty (veh)				327	124

Intersection: 16: Oak Street & 2nd Street, Interval #2

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	1995	251	247	268	84
Average Queue (ft)	1684	129	190	227	79
95th Queue (ft)	2460	219	295	259	92
Link Distance (ft)	2366	459	228	197	
Upstream Blk Time (%)	15		21	38	
Queuing Penalty (veh)	0		0	365	
Storage Bay Dist (ft)					50
Storage Blk Time (%)				50	33
Queuing Penalty (veh)				281	126

Intersection: 16: Oak Street & 2nd Street, All Intervals

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	2035	251	247	269	84
Average Queue (ft)	1507	127	188	227	79
95th Queue (ft)	2444	214	293	260	90
Link Distance (ft)	2366	459	228	197	
Upstream Blk Time (%)	11		20	40	
Queuing Penalty (veh)	0		0	385	
Storage Bay Dist (ft)					50
Storage Blk Time (%)				51	32
Queuing Penalty (veh)				292	126

Intersection: 19: Cascade Ave & 2nd Street, Interval #1

Movement	EB	WB	NB	SB
Directions Served	R	R	TR	TR
Maximum Queue (ft)	692	66	63	336
Average Queue (ft)	473	42	13	316
95th Queue (ft)	800	74	58	335
Link Distance (ft)	2405	272	197	295
Upstream Blk Time (%)				40
Queuing Penalty (veh)				441
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 19: Cascade Ave & 2nd Street, Interval #2

Movement	EB	WB	NB	SB
Directions Served	R	R	TR	TR
Maximum Queue (ft)	1624	93	153	343
Average Queue (ft)	1181	43	18	316
95th Queue (ft)	1823	75	85	332
Link Distance (ft)	2405	272	197	295
Upstream Blk Time (%)			1	36
Queuing Penalty (veh)			3	367
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 19: Cascade Ave & 2nd Street, All Intervals

Movement	EB	WB	NB	SB
Directions Served	R	R	TR	TR
Maximum Queue (ft)	1624	98	153	343
Average Queue (ft)	1010	43	17	316
95th Queue (ft)	1777	74	79	333
Link Distance (ft)	2405	272	197	295
Upstream Blk Time (%)			0	37
Queuing Penalty (veh)			2	385
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 24: Marina Way & Button Bridge Road, Interval #1

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	105	286	103	134	162	186	139	38	153	232
Average Queue (ft)	71	186	59	70	106	114	65	22	86	164
95th Queue (ft)	110	298	125	126	170	183	135	49	153	267
Link Distance (ft)	409	346			180	180			1443	1443
Upstream Blk Time (%)		0			0	1				
Queuing Penalty (veh)		0			2	6				
Storage Bay Dist (ft)			75	125			125	125		
Storage Blk Time (%)		41	2	1	3	4	0		2	
Queuing Penalty (veh)		31	5	3	4	9	0		1	

Intersection: 24: Marina Way & Button Bridge Road, Interval #2

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	112	302	105	145	168	172	148	66	186	256
Average Queue (ft)	56	143	46	65	82	90	51	25	79	135
95th Queue (ft)	94	255	109	114	141	146	101	60	147	227
Link Distance (ft)	409	346			180	180			1443	1443
Upstream Blk Time (%)		0			0	0				
Queuing Penalty (veh)		0			1	0				
Storage Bay Dist (ft)			75	125			125	125		
Storage Blk Time (%)		27	1	1	1	1	0		1	
Queuing Penalty (veh)		20	2	3	1	3	0		0	

Intersection: 24: Marina Way & Button Bridge Road, All Intervals

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	118	318	105	153	185	189	153	66	187	257
Average Queue (ft)	60	154	49	67	88	96	54	24	81	142
95th Queue (ft)	99	269	113	117	150	157	111	58	149	239
Link Distance (ft)	409	346			180	180			1443	1443
Upstream Blk Time (%)		0			0	0				
Queuing Penalty (veh)		0			1	2				
Storage Bay Dist (ft)			75	125			125	125		
Storage Blk Time (%)		30	1	1	1	2	0		1	
Queuing Penalty (veh)		23	3	3	2	4	0		0	

Intersection: 26: I-84 WB Ramp & Button Bridge Road, Interval #1

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	111	122	124	128	141	128	162	130
Average Queue (ft)	66	73	72	74	88	81	93	70
95th Queue (ft)	117	129	123	141	158	140	178	152
Link Distance (ft)	1919			277	277	180	180	
Upstream Blk Time (%)						0	1	
Queuing Penalty (veh)						0	4	
Storage Bay Dist (ft)		125	100					100
Storage Blk Time (%)	0	0	2	2			3	1
Queuing Penalty (veh)	0	0	9	4			17	3

Intersection: 26: I-84 WB Ramp & Button Bridge Road, Interval #2

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	130	129	122	157	154	138	135	122
Average Queue (ft)	64	59	62	67	72	59	51	43
95th Queue (ft)	115	105	115	133	136	114	105	110
Link Distance (ft)	1919			277	277	180	180	
Upstream Blk Time (%)							0	
Queuing Penalty (veh)							0	
Storage Bay Dist (ft)		125	100					100
Storage Blk Time (%)	0	0	1	2			1	1
Queuing Penalty (veh)	1	0	4	3			4	2

Intersection: 26: I-84 WB Ramp & Button Bridge Road, All Intervals

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	131	132	132	158	165	142	182	132
Average Queue (ft)	65	62	64	69	76	65	61	49
95th Queue (ft)	115	112	118	135	142	122	131	123
Link Distance (ft)	1919			277	277	180	180	
Upstream Blk Time (%)						0	0	
Queuing Penalty (veh)						0	1	
Storage Bay Dist (ft)		125	100					100
Storage Blk Time (%)	0	0	1	2			1	1
Queuing Penalty (veh)	1	0	5	3			7	2

Intersection: 32: Historic Columbia River Hwy & Button Bridge Road, Interval #1

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	314	128	58	50	1301	201	1440	84
Average Queue (ft)	190	90	28	30	1174	58	976	80
95th Queue (ft)	385	180	59	66	1505	208	1672	84
Link Distance (ft)	1316		509		1272		1680	
Upstream Blk Time (%)					40		0	
Queuing Penalty (veh)					0		3	
Storage Bay Dist (ft)		100		40		175		50
Storage Blk Time (%)	36	0	3	0	92	0	79	21
Queuing Penalty (veh)	72	1	1	0	15	0	204	99

Intersection: 32: Historic Columbia River Hwy & Button Bridge Road, Interval #2

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	400	130	57	50	1301	205	1495	86
Average Queue (ft)	160	65	27	29	1296	66	657	80
95th Queue (ft)	354	164	54	66	1305	224	1361	87
Link Distance (ft)	1316		509		1272		1680	
Upstream Blk Time (%)					80			
Queuing Penalty (veh)					0			
Storage Bay Dist (ft)		100		40		175		50
Storage Blk Time (%)	23	0	2	0	92	0	73	22
Queuing Penalty (veh)	43	1	1	0	14	0	176	97

Intersection: 32: Historic Columbia River Hwy & Button Bridge Road, All Intervals

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	426	130	64	52	1301	205	1530	86
Average Queue (ft)	167	71	28	29	1267	64	734	80
95th Queue (ft)	363	169	55	66	1451	220	1471	87
Link Distance (ft)	1316		509		1272		1680	
Upstream Blk Time (%)					70		0	
Queuing Penalty (veh)					0		1	
Storage Bay Dist (ft)		100		40		175		50
Storage Blk Time (%)	26	0	3	0	92	0	75	22
Queuing Penalty (veh)	51	1	1	0	14	0	183	97

Intersection: 36: I-84 EB Ramp & Button Bridge Road, Interval #1

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	L	LT	R	T	TR	L	T
Maximum Queue (ft)	162	167	124	144	165	146	263
Average Queue (ft)	93	113	69	103	112	80	158
95th Queue (ft)	154	172	123	156	181	154	261
Link Distance (ft)		1849		1680	1680	277	277
Upstream Blk Time (%)						0	0
Queuing Penalty (veh)						1	1
Storage Bay Dist (ft)	300		300				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 36: I-84 EB Ramp & Button Bridge Road, Interval #2

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	L	LT	R	T	TR	L	T
Maximum Queue (ft)	137	163	119	147	166	128	247
Average Queue (ft)	76	92	65	84	84	57	123
95th Queue (ft)	125	142	109	137	142	100	211
Link Distance (ft)		1849		1680	1680	277	277
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)	300		300				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 36: I-84 EB Ramp & Button Bridge Road, All Intervals

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	L	LT	R	T	TR	L	T
Maximum Queue (ft)	162	182	147	153	181	171	275
Average Queue (ft)	80	97	66	89	90	62	131
95th Queue (ft)	133	151	113	143	155	118	227
Link Distance (ft)		1849		1680	1680	277	277
Upstream Blk Time (%)						0	0
Queuing Penalty (veh)						0	0
Storage Bay Dist (ft)	300		300				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Nework Summary

Network wide Queuing Penalty, Interval #1: 3343
Network wide Queuing Penalty, Interval #2: 3077
Network wide Queuing Penalty, All Intervals: 3143

Intersection: 1: Westcliff Drive & Cascade Ave, Interval #1

Movement	WB	NW	NW
Directions Served	LR	T	R
Maximum Queue (ft)	96	17	47
Average Queue (ft)	50	2	20
95th Queue (ft)	87	19	55
Link Distance (ft)	673	84	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			20
Storage Blk Time (%)		0	0
Queuing Penalty (veh)		0	1

Intersection: 1: Westcliff Drive & Cascade Ave, Interval #2

Movement	WB	SE	NW	NW
Directions Served	LR	LT	T	R
Maximum Queue (ft)	63	24	16	49
Average Queue (ft)	36	2	1	17
95th Queue (ft)	56	16	12	51
Link Distance (ft)	673	508	84	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				20
Storage Blk Time (%)			0	0
Queuing Penalty (veh)			0	1

Intersection: 1: Westcliff Drive & Cascade Ave, All Intervals

Movement	WB	SE	NW	NW
Directions Served	LR	LT	T	R
Maximum Queue (ft)	96	24	24	49
Average Queue (ft)	39	2	1	18
95th Queue (ft)	66	14	14	52
Link Distance (ft)	673	508	84	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				20
Storage Blk Time (%)			0	0
Queuing Penalty (veh)			0	1

Intersection: 4: I-84 EB Ramp & Cascade Ave, Interval #1

Movement	EB	SE	NW	NW	B18
Directions Served	LTR	LT	T	R	T
Maximum Queue (ft)	148	80	144	62	78
Average Queue (ft)	86	27	100	56	15
95th Queue (ft)	147	76	159	63	74
Link Distance (ft)	552	317	70		682
Upstream Blk Time (%)			6	1	
Queuing Penalty (veh)			81	0	
Storage Bay Dist (ft)				25	
Storage Blk Time (%)			1	8	
Queuing Penalty (veh)			10	44	

Intersection: 4: I-84 EB Ramp & Cascade Ave, Interval #2

Movement	EB	SE	NW	NW	B18
Directions Served	LTR	LT	T	R	T
Maximum Queue (ft)	294	116	146	62	118
Average Queue (ft)	124	27	96	55	14
95th Queue (ft)	313	80	148	63	69
Link Distance (ft)	552	317	70		682
Upstream Blk Time (%)	1		7	1	
Queuing Penalty (veh)	0		84	0	
Storage Bay Dist (ft)				25	
Storage Blk Time (%)			1	8	
Queuing Penalty (veh)			4	40	

Intersection: 4: I-84 EB Ramp & Cascade Ave, All Intervals

Movement	EB	SE	NW	NW	B18
Directions Served	LTR	LT	T	R	T
Maximum Queue (ft)	294	120	147	62	130
Average Queue (ft)	115	27	97	56	14
95th Queue (ft)	285	79	151	63	70
Link Distance (ft)	552	317	70		682
Upstream Blk Time (%)	1		7	1	
Queuing Penalty (veh)	0		83	0	
Storage Bay Dist (ft)				25	
Storage Blk Time (%)			1	8	
Queuing Penalty (veh)			6	41	

Intersection: 5: I-84 WB Ramp & Cascade Ave, Interval #1

Movement	WB	SE	NW
Directions Served	LR	TR	LT
Maximum Queue (ft)	762	30	287
Average Queue (ft)	752	5	175
95th Queue (ft)	767	26	311
Link Distance (ft)	737	84	317
Upstream Blk Time (%)	98		1
Queuing Penalty (veh)	0		8
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: I-84 WB Ramp & Cascade Ave, Interval #2

Movement	WB	SE	NW
Directions Served	LR	TR	LT
Maximum Queue (ft)	766	38	213
Average Queue (ft)	759	4	84
95th Queue (ft)	767	22	162
Link Distance (ft)	737	84	317
Upstream Blk Time (%)	93		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: I-84 WB Ramp & Cascade Ave, All Intervals

Movement	WB	SE	NW
Directions Served	LR	TR	LT
Maximum Queue (ft)	766	42	287
Average Queue (ft)	757	4	106
95th Queue (ft)	768	23	221
Link Distance (ft)	737	84	317
Upstream Blk Time (%)	94		0
Queuing Penalty (veh)	0		2
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 10: Cascade Ave & Mt Adams Ave, Interval #1

Movement	EB	EB	WB	WB	NB	NB
Directions Served	T	R	L	T	L	R
Maximum Queue (ft)	300	130	131	1653	132	1078
Average Queue (ft)	185	117	124	1317	129	1041
95th Queue (ft)	332	153	148	2036	133	1262
Link Distance (ft)	682			1874		1060
Upstream Blk Time (%)				3		31
Queuing Penalty (veh)				27		0
Storage Bay Dist (ft)		100	100		100	
Storage Blk Time (%)	19	6	38	30	51	6
Queuing Penalty (veh)	129	29	269	110	219	34

Intersection: 10: Cascade Ave & Mt Adams Ave, Interval #2

Movement	EB	EB	B18	WB	WB	NB	NB
Directions Served	T	R	T	L	T	L	R
Maximum Queue (ft)	653	134	18	132	1895	139	1086
Average Queue (ft)	295	118	1	125	1657	129	1078
95th Queue (ft)	624	155	12	143	2154	135	1081
Link Distance (ft)	682		70		1874		1060
Upstream Blk Time (%)	1		0		7		33
Queuing Penalty (veh)	9		0		65		0
Storage Bay Dist (ft)		100		100		100	
Storage Blk Time (%)	24	9		39	28	51	6
Queuing Penalty (veh)	155	37		257	95	201	36

Intersection: 10: Cascade Ave & Mt Adams Ave, All Intervals

Movement	EB	EB	B18	WB	WB	NB	NB
Directions Served	T	R	T	L	T	L	R
Maximum Queue (ft)	653	134	18	134	1895	139	1086
Average Queue (ft)	268	118	1	124	1575	129	1069
95th Queue (ft)	574	155	10	144	2183	134	1181
Link Distance (ft)	682		70		1874		1060
Upstream Blk Time (%)	1		0		6		32
Queuing Penalty (veh)	7		0		56		0
Storage Bay Dist (ft)		100		100		100	
Storage Blk Time (%)	23	8		39	29	51	6
Queuing Penalty (veh)	148	35		260	99	206	35

Intersection: 15: Cascade Ave & Rand Road, Interval #1

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	R	LT	R
Maximum Queue (ft)	76	360	155	767	888	129	369	84
Average Queue (ft)	24	228	137	629	672	112	243	76
95th Queue (ft)	80	377	186	941	1416	163	455	91
Link Distance (ft)		1874		828	1174		423	
Upstream Blk Time (%)				16	10		6	
Queuing Penalty (veh)				0	0		0	
Storage Bay Dist (ft)	150		125			100		50
Storage Blk Time (%)		21	36	33	60	3	48	26
Queuing Penalty (veh)		11	230	61	107	10	98	69

Intersection: 15: Cascade Ave & Rand Road, Interval #2

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	R	LT	R
Maximum Queue (ft)	139	509	157	852	1194	134	448	90
Average Queue (ft)	35	253	136	838	946	120	313	77
95th Queue (ft)	110	431	197	936	1524	164	527	95
Link Distance (ft)		1874		828	1174		423	
Upstream Blk Time (%)				50	43		19	
Queuing Penalty (veh)				0	0		0	
Storage Bay Dist (ft)	150		125			100		50
Storage Blk Time (%)		22	39	39	76	5	58	28
Queuing Penalty (veh)		11	236	67	128	16	111	68

Intersection: 15: Cascade Ave & Rand Road, All Intervals

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	LT	R	LT	R
Maximum Queue (ft)	164	509	157	852	1194	134	448	90
Average Queue (ft)	33	247	137	787	880	118	296	76
95th Queue (ft)	104	419	195	1016	1531	164	515	94
Link Distance (ft)		1874		828	1174		423	
Upstream Blk Time (%)				41	35		16	
Queuing Penalty (veh)				0	0		0	
Storage Bay Dist (ft)	150		125			100		50
Storage Blk Time (%)		22	38	38	72	5	55	27
Queuing Penalty (veh)		11	234	66	122	14	107	68

Nework Summary

Network wide Queuing Penalty, Interval #1: 1544
Network wide Queuing Penalty, Interval #2: 1621
Network wide Queuing Penalty, All Intervals: 1602

Intersection: 1: I-84 WB Ramp & 2nd Street, Interval #1

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	L	T	T	R
Maximum Queue (ft)	1068	150	102	362	340	98
Average Queue (ft)	722	88	50	224	320	41
95th Queue (ft)	1172	184	120	385	356	116
Link Distance (ft)	1470			357	274	
Upstream Blk Time (%)	1			1	60	
Queuing Penalty (veh)	0			9	511	
Storage Bay Dist (ft)		125	90			65
Storage Blk Time (%)	71	1	1	24	66	0
Queuing Penalty (veh)	94	3	8	16	156	0

Intersection: 1: I-84 WB Ramp & 2nd Street, Interval #2

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	L	T	T	R
Maximum Queue (ft)	1485	151	122	368	353	110
Average Queue (ft)	1219	100	46	222	316	46
95th Queue (ft)	1784	197	107	363	352	121
Link Distance (ft)	1470			357	274	
Upstream Blk Time (%)	30			1	56	
Queuing Penalty (veh)	0			7	448	
Storage Bay Dist (ft)		125	90			65
Storage Blk Time (%)	72	1	0	25	65	0
Queuing Penalty (veh)	89	3	2	16	144	0

Intersection: 1: I-84 WB Ramp & 2nd Street, All Intervals

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	L	T	T	R
Maximum Queue (ft)	1485	151	122	379	354	110
Average Queue (ft)	1099	97	47	223	317	45
95th Queue (ft)	1743	194	110	369	353	120
Link Distance (ft)	1470			357	274	
Upstream Blk Time (%)	23			1	57	
Queuing Penalty (veh)	0			7	464	
Storage Bay Dist (ft)		125	90			65
Storage Blk Time (%)	72	1	1	24	65	0
Queuing Penalty (veh)	90	3	3	16	147	0

Intersection: 2: Industrial St & 2nd Street, Interval #1

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	190	52	310
Average Queue (ft)	102	14	181
95th Queue (ft)	208	47	392
Link Distance (ft)	967	366	350
Upstream Blk Time (%)			16
Queuing Penalty (veh)			54
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Industrial St & 2nd Street, Interval #2

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	663	98	368
Average Queue (ft)	435	18	250
95th Queue (ft)	945	64	452
Link Distance (ft)	967	366	350
Upstream Blk Time (%)	10		30
Queuing Penalty (veh)	0		84
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Industrial St & 2nd Street, All Intervals

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	663	102	372
Average Queue (ft)	355	17	233
95th Queue (ft)	860	61	443
Link Distance (ft)	967	366	350
Upstream Blk Time (%)	7		26
Queuing Penalty (veh)	0		77
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Riverside Drive & 2nd Street, Interval #1

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	114	76	448	163	244	39	418
Average Queue (ft)	18	24	408	95	179	6	383
95th Queue (ft)	81	84	551	183	282	43	438
Link Distance (ft)	1475		426		274		366
Upstream Blk Time (%)			76		1		62
Queuing Penalty (veh)			0		7		229
Storage Bay Dist (ft)		65		125		75	
Storage Blk Time (%)		3		0	21		99
Queuing Penalty (veh)		0		0	28		5

Intersection: 3: Riverside Drive & 2nd Street, Interval #2

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	161	88	456	169	308	100	432
Average Queue (ft)	25	18	442	99	188	10	401
95th Queue (ft)	105	72	451	185	307	60	426
Link Distance (ft)	1475		426		274		366
Upstream Blk Time (%)			97		3		72
Queuing Penalty (veh)			0		20		246
Storage Bay Dist (ft)		65		125		75	
Storage Blk Time (%)	0	6		0	24		100
Queuing Penalty (veh)	0	1		2	30		5

Intersection: 3: Riverside Drive & 2nd Street, All Intervals

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	180	90	460	169	309	100	432
Average Queue (ft)	24	19	434	98	186	9	396
95th Queue (ft)	100	75	509	185	302	56	434
Link Distance (ft)	1475		426		274		366
Upstream Blk Time (%)			92		3		69
Queuing Penalty (veh)			0		17		242
Storage Bay Dist (ft)		65		125		75	
Storage Blk Time (%)	0	5		0	23		100
Queuing Penalty (veh)	0	1		1	29		5

Intersection: 4: Portway Ave & 2nd Street, Interval #1

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	84	95	58	92
Average Queue (ft)	26	25	41	49
95th Queue (ft)	123	107	62	100
Link Distance (ft)	976	444	350	318
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Portway Ave & 2nd Street, Interval #2

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	149	203	80	187
Average Queue (ft)	45	83	42	104
95th Queue (ft)	152	292	67	295
Link Distance (ft)	976	444	350	318
Upstream Blk Time (%)		1		18
Queuing Penalty (veh)		0		0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Portway Ave & 2nd Street, All Intervals

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	150	203	83	187
Average Queue (ft)	40	69	42	91
95th Queue (ft)	146	259	66	263
Link Distance (ft)	976	444	350	318
Upstream Blk Time (%)		1		13
Queuing Penalty (veh)		0		0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 9: I-84 EB Ramp & 2nd Street, Interval #1

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	379	150	290	103	396
Average Queue (ft)	212	115	192	61	376
95th Queue (ft)	440	174	325	127	399
Link Distance (ft)	1973		295		357
Upstream Blk Time (%)			3		36
Queuing Penalty (veh)			20		380
Storage Bay Dist (ft)		120		90	
Storage Blk Time (%)	18	16		1	55
Queuing Penalty (veh)	41	51		12	64

Intersection: 9: I-84 EB Ramp & 2nd Street, Interval #2

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	552	158	314	115	386
Average Queue (ft)	204	117	182	59	373
95th Queue (ft)	429	175	325	122	404
Link Distance (ft)	1973		295		357
Upstream Blk Time (%)			2		35
Queuing Penalty (veh)			14		336
Storage Bay Dist (ft)		120		90	
Storage Blk Time (%)	15	12		1	52
Queuing Penalty (veh)	31	37		5	56

Intersection: 9: I-84 EB Ramp & 2nd Street, All Intervals

Movement	EB	EB	NB	SB	SB
Directions Served	LT	R	TR	L	T
Maximum Queue (ft)	573	159	316	115	398
Average Queue (ft)	206	116	184	60	374
95th Queue (ft)	432	175	325	123	403
Link Distance (ft)	1973		295		357
Upstream Blk Time (%)			2		35
Queuing Penalty (veh)			15		347
Storage Bay Dist (ft)		120		90	
Storage Blk Time (%)	15	13		1	53
Queuing Penalty (veh)	34	41		7	58

Intersection: 16: Oak Street & 2nd Street, Interval #1

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	205	293	250	253	84
Average Queue (ft)	132	172	231	215	77
95th Queue (ft)	288	324	294	243	84
Link Distance (ft)	2366	459	228	197	
Upstream Blk Time (%)		0	56	32	
Queuing Penalty (veh)		0	0	363	
Storage Bay Dist (ft)					50
Storage Blk Time (%)				47	18
Queuing Penalty (veh)				277	101

Intersection: 16: Oak Street & 2nd Street, Interval #2

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	185	317	250	254	83
Average Queue (ft)	79	158	212	214	76
95th Queue (ft)	153	284	303	243	81
Link Distance (ft)	2366	459	228	197	
Upstream Blk Time (%)			36	30	
Queuing Penalty (veh)			0	322	
Storage Bay Dist (ft)					50
Storage Blk Time (%)				43	18
Queuing Penalty (veh)				241	91

Intersection: 16: Oak Street & 2nd Street, All Intervals

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	248	368	254	259	87
Average Queue (ft)	92	162	217	214	76
95th Queue (ft)	199	294	303	243	82
Link Distance (ft)	2366	459	228	197	
Upstream Blk Time (%)		0	41	30	
Queuing Penalty (veh)		0	0	332	
Storage Bay Dist (ft)					50
Storage Blk Time (%)				44	18
Queuing Penalty (veh)				250	93

Intersection: 19: Cascade Ave & 2nd Street, Interval #1

Movement	EB	WB	NB	SB
Directions Served	R	R	TR	TR
Maximum Queue (ft)	969	61	78	334
Average Queue (ft)	697	38	26	304
95th Queue (ft)	1039	71	106	365
Link Distance (ft)	2405	272	197	295
Upstream Blk Time (%)			0	23
Queuing Penalty (veh)			2	262
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 19: Cascade Ave & 2nd Street, Interval #2

Movement	EB	WB	NB	SB
Directions Served	R	R	TR	TR
Maximum Queue (ft)	2424	63	125	334
Average Queue (ft)	1879	34	28	293
95th Queue (ft)	2676	60	99	390
Link Distance (ft)	2405	272	197	295
Upstream Blk Time (%)	28		0	22
Queuing Penalty (veh)	0		0	234
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 19: Cascade Ave & 2nd Street, All Intervals

Movement	EB	WB	NB	SB
Directions Served	R	R	TR	TR
Maximum Queue (ft)	2424	72	152	339
Average Queue (ft)	1594	35	28	296
95th Queue (ft)	2692	63	101	386
Link Distance (ft)	2405	272	197	295
Upstream Blk Time (%)	21		0	22
Queuing Penalty (veh)	0		1	241
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 24: Marina Way & Button Bridge Road, Interval #1

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	81	122	91	80	173	167	95	58	79	167
Average Queue (ft)	50	77	35	42	98	104	48	30	46	108
95th Queue (ft)	86	138	78	81	168	170	116	62	83	182
Link Distance (ft)	409	346			180	180			1443	1443
Upstream Blk Time (%)					1	1				
Queuing Penalty (veh)					4	3				
Storage Bay Dist (ft)			75	125			125	125		
Storage Blk Time (%)		11	0		2	3	0		0	
Queuing Penalty (veh)		9	0		2	5	0		0	

Intersection: 24: Marina Way & Button Bridge Road, Interval #2

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	97	206	100	109	200	197	151	59	103	200
Average Queue (ft)	50	88	40	35	106	112	46	27	48	102
95th Queue (ft)	85	166	89	78	179	188	109	56	86	179
Link Distance (ft)	409	346			180	180			1443	1443
Upstream Blk Time (%)					1	1				
Queuing Penalty (veh)					4	4				
Storage Bay Dist (ft)			75	125			125	125		
Storage Blk Time (%)		12	0		3	4	0		0	
Queuing Penalty (veh)		10	0		2	6	0		0	

Intersection: 24: Marina Way & Button Bridge Road, All Intervals

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	100	206	101	124	201	197	151	70	103	200
Average Queue (ft)	50	85	39	36	104	110	46	28	47	104
95th Queue (ft)	85	160	87	79	177	184	111	57	85	180
Link Distance (ft)	409	346			180	180			1443	1443
Upstream Blk Time (%)					1	1				
Queuing Penalty (veh)					4	4				
Storage Bay Dist (ft)			75	125			125	125		
Storage Blk Time (%)		11	0		3	3	0		0	
Queuing Penalty (veh)		10	0		2	6	0		0	

Intersection: 26: I-84 WB Ramp & Button Bridge Road, Interval #1

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	120	92	108	136	140	85	73	102
Average Queue (ft)	80	50	57	88	91	42	26	38
95th Queue (ft)	122	91	102	148	152	78	64	84
Link Distance (ft)	1919			277	277	180	180	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		125	100					100
Storage Blk Time (%)	1	0	0	3			0	0
Queuing Penalty (veh)	1	0	1	5			0	0

Intersection: 26: I-84 WB Ramp & Button Bridge Road, Interval #2

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	134	102	120	186	197	99	154	119
Average Queue (ft)	71	48	51	79	88	47	38	41
95th Queue (ft)	120	85	99	145	153	90	97	101
Link Distance (ft)	1919			277	277	180	180	
Upstream Blk Time (%)					0		0	
Queuing Penalty (veh)					0		1	
Storage Bay Dist (ft)		125	100					100
Storage Blk Time (%)	1	0	1	2			0	1
Queuing Penalty (veh)	1	0	3	3			1	1

Intersection: 26: I-84 WB Ramp & Button Bridge Road, All Intervals

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	134	114	132	200	206	106	155	119
Average Queue (ft)	73	49	53	81	89	46	35	40
95th Queue (ft)	121	86	100	146	153	87	90	98
Link Distance (ft)	1919			277	277	180	180	
Upstream Blk Time (%)					0		0	
Queuing Penalty (veh)					0		0	
Storage Bay Dist (ft)		125	100					100
Storage Blk Time (%)	1	0	0	2			0	0
Queuing Penalty (veh)	1	0	2	3			1	1

Intersection: 32: Historic Columbia River Hwy & Button Bridge Road, Interval #1

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	1207	126	42	40	853	160	352	76
Average Queue (ft)	921	126	25	29	665	23	209	74
95th Queue (ft)	1479	128	50	52	1167	128	388	79
Link Distance (ft)	1316		510		1272		1693	
Upstream Blk Time (%)	11				0			
Queuing Penalty (veh)	0				0			
Storage Bay Dist (ft)		100		25		175		50
Storage Blk Time (%)	88	1	8	2	84		62	11
Queuing Penalty (veh)	223	5	5	0	4		127	40

Intersection: 32: Historic Columbia River Hwy & Button Bridge Road, Interval #2

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	1335	126	58	41	1194	200	378	86
Average Queue (ft)	1050	122	20	30	976	34	193	75
95th Queue (ft)	1637	156	47	51	1490	159	378	85
Link Distance (ft)	1316		510		1272		1693	
Upstream Blk Time (%)	29				21			
Queuing Penalty (veh)	0				0			
Storage Bay Dist (ft)		100		25		175		50
Storage Blk Time (%)	90	1	7	1	91	0	57	12
Queuing Penalty (veh)	212	4	4	0	5	0	109	38

Intersection: 32: Historic Columbia River Hwy & Button Bridge Road, All Intervals

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	1339	126	63	43	1204	200	435	86
Average Queue (ft)	1019	123	21	30	901	32	197	75
95th Queue (ft)	1606	153	48	51	1457	152	381	84
Link Distance (ft)	1316		510		1272		1693	
Upstream Blk Time (%)	25				16			
Queuing Penalty (veh)	0				0			
Storage Bay Dist (ft)		100		25		175		50
Storage Blk Time (%)	89	1	7	1	90	0	58	12
Queuing Penalty (veh)	215	4	4	0	4	0	114	39

Intersection: 36: I-84 EB Ramp & Button Bridge Road, Interval #1

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	L	LT	R	T	TR	L	T
Maximum Queue (ft)	144	162	85	142	177	105	168
Average Queue (ft)	93	100	51	103	125	63	94
95th Queue (ft)	147	158	88	151	183	105	172
Link Distance (ft)		1849		1693	1693	277	277
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	300		300				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 36: I-84 EB Ramp & Button Bridge Road, Interval #2

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	L	LT	R	T	TR	L	T
Maximum Queue (ft)	151	153	88	156	199	108	190
Average Queue (ft)	75	89	48	94	110	60	86
95th Queue (ft)	125	135	79	149	177	97	167
Link Distance (ft)		1849		1693	1693	277	277
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)	300		300				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 36: I-84 EB Ramp & Button Bridge Road, All Intervals

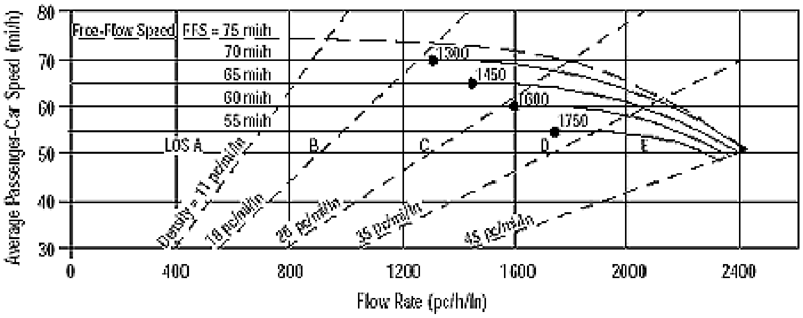
Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	L	LT	R	T	TR	L	T
Maximum Queue (ft)	160	169	94	162	199	121	190
Average Queue (ft)	79	92	48	96	113	61	88
95th Queue (ft)	132	142	82	150	179	99	168
Link Distance (ft)		1849		1693	1693	277	277
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)	300		300				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Nework Summary

Network wide Queuing Penalty, Interval #1: 3128
Network wide Queuing Penalty, Interval #2: 2870
Network wide Queuing Penalty, All Intervals: 2935

2031 Existing Conditions
I-84 Freeway Analysis

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information / Site Information

Analyst	DKS Associates	Highway/Direction of Travel	I-84 WB
Agency or Company	DKS Associates	From/To	West of Exit 62
Date Performed	9/27/2007	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Sunday

Project Description Hood River IAMP

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	2370 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	15
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	0.90	Up/Down %	

Calculate Flow Adjustments

f_p	0.90	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.930

Speed Inputs / Calc Speed Adj and FFS

Lane Width	12.0	ft	f_{LW}	0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	f_{LC}	0.0	mi/h
Interchange Density	0.50	I/mi	f_{ID}	0.0	mi/h
Number of Lanes, N	2		f_N	4.5	mi/h
FFS (measured)		mi/h	FFS	65.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h			

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1573	pc/h/ln
S	65.4	mi/h
D = v_p / S	24.1	pc/mi/ln
LOS	C	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	mi/h
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

FREEWAY WEAVING WORKSHEET

General Information

Analyst	DKS Associate
Agency/Company	DKS
Date Performed	9/10/2007
Analysis Time Period	PM Peak 4:00-5:00

Site Information

Freeway/Dir of Travel	I-84 EB
Weaving Seg Location	Exit 63-64
Jurisdiction	ODOT
Analysis Year	2031 Sunday

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	3
Weaving seg length, L (ft)	1140
Terrain	Level

Weaving type	A
Volume ratio, VR	0.49
Weaving ratio, R	0.29

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	f_p	v
Vo1	709	0.90	15	0	1.5	1.2	0.930	0.90	940
Vo2	113	0.94	1	0	1.5	1.2	0.995	0.90	134
Vw1	618	0.94	4	0	1.5	1.2	0.980	0.90	745
Vw2	252	0.94	1	0	1.5	1.2	0.995	0.90	299
Vw				1044	Vnw				1074
V									2118

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.15	0.00
b (Exhibit 24-6)			4.00	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			1.76	0.26
Weaving and non-weaving speeds, Si (mi/h)			34.95	58.80

Number of lanes required for unconstrained operation, Nw 1.43
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	44.00
Weaving segment density, D (pc/mi/ln)	16.05
Level of service, LOS	B
Capacity of base condition, c_b (pc/h)	4618
Capacity as a 15-minute flow rate, c (veh/h)	3866
Capacity as a full-hour volume, c_h (veh/h)	3569

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

FREEWAY WEAVING WORKSHEET

General Information

Analyst	DKS Associate
Agency/Company	DKS
Date Performed	9/10/2007
Analysis Time Period	PM Peak 4:00-5:00

Site Information

Freeway/Dir of Travel	I-84 WB
Weaving Seg Location	Exit 63-64
Jurisdiction	ODOT
Analysis Year	2031 Sunday

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	3
Weaving seg length, L (ft)	1210
Terrain	Level
Weaving type	A
Volume ratio, VR	0.31
Weaving ratio, R	0.42

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	f_p	v
Vo1	1585	0.90	15	0	1.5	1.2	0.930	0.90	2103
Vo2	204	0.97	2	0	1.5	1.2	0.990	0.90	236
Vw1	371	0.94	1	0	1.5	1.2	0.995	0.90	440
Vw2	516	0.97	3	0	1.5	1.2	0.985	0.90	599
Vw				1039	Vnw				2339
V									3378

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)	0.15	0.00		
b (Exhibit 24-6)	2.20	4.00		
c (Exhibit 24-6)	0.97	1.30		
d (Exhibit 24-6)	0.80	0.75		
Weaving intensity factor, Wi	0.84	0.46		
Weaving and non-weaving speeds, Si (mi/h)	44.83	52.61		

Number of lanes required for unconstrained operation, Nw	1.13
Maximum number of lanes, Nw (max)	1.40

☑ If Nw < Nw(max) unconstrained operation ☐ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	49.95
Weaving segment density, D (pc/mi/ln)	22.54
Level of service, LOS	C
Capacity of base condition, c_b (pc/h)	5452
Capacity as a 15-minute flow rate, c (veh/h)	4564
Capacity as a full-hour volume, c_h (veh/h)	4219

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst2	DKS Associates	Freeway/Dir of Travel	I-84 Exit 64 EB on-ramp
Agency or Company	DSK Associates	Junction	I-84/Button Bridge Rd
Date Performed	9/10/2007	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Sunday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
☐ Yes ☐ On		☐ Yes ☐ On
☐ No ☐ Off		☐ No ☐ Off
L_{up} = ft		L_{down} = ft
V_u = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	900	0.90	Level	15	0	0.930	0.90	1194
Ramp	280	0.96	Level	1	0	0.995	0.90	326
UpStream								
DownStream								

Merge Areas	Diverge Areas

Estimation of v_{12} (Merge Areas)

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation 0

V_{12}= 1194 pc/h

Estimation of v_{12} (Diverge Areas)

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation

V_{12} = pc/h

Capacity Checks (Merge Areas)

	Actual	Maximum	LOS F?
V_{FO}	1520	See Exhibit 25-7	No
V_{R12}	1520	4600:All	No

Capacity Checks (Diverge Areas)

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F) (Merge Areas)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 13.1 (pc/ m/ln)

LOS = B (Exhibit 25-4)

Level of Service Determination (if not F) (Diverge Areas)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation (Merge Areas)

M_S = 0.293 (Exibit 25-19)

S_R= 58.3 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 58.3 mph (Exhibit 25-14)

Speed Estimation (Diverge Areas)

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst2	DKS Associates	Freeway/Dir of Travel	I-84 Exit 63 WB on-ramp
Agency or Company	DSK Associates	Junction	I-84/2nd Street
Date Performed	9/10/2007	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Sunday

Site Information

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 1810 ft

Vu = 570 veh/h

Terrain Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2060	0.90	Level	15	0	0.930	0.90	2734
Ramp	305	0.94	Level	2	0	0.990	0.90	364
UpStream	570	0.94	Level	3	0	0.985	0.90	684
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation 0

V_{12}= 2734 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3098	See Exhibit 25-7	No
V_{R12}	3098	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$$

D_R = 26.0 (pc/ m/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.369 (Exibit 25-19)

S_R= 56.5 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 56.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DKS Associates	Freeway/Dir of Travel	I-84 Exit 63 EB off-ramp
Agency or Company	DSK Associates	Junction	I-84/2nd Street
Date Performed	9/10/2007	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Sunday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
☐ Yes ☐ On ☑ No ☐ Off		☑ Yes ☑ On ☐ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = 1815 ft
Vu = veh/h	Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = 405 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1705	0.90	Level	15	0	0.930	1.00	2037
Ramp	490	0.94	Level	1	0	0.995	1.00	524
UpStream								
DownStream	405	0.94	Level	2	0	0.990	1.00	435

Merge Areas	Diverge Areas
Estimation of v_{12}	**Estimation of v_{12}**
$V_{12} = V_F\ (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM}= using Equation	P_{FD} =1.000 using Equation 0
V_{12}= pc/h	V_{12} = 2037 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2037	4700	No
V_{12}	2037	4400:All	No
$V_{FO} = V_F - V_R$	1513	4700	No
V_R	524	2000	No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$	$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = (pc/ mi /ln)	D_R = 20.2 (pc/ mi /ln)
LOS = (Exhibit 25-4)	LOS= C (Exhibit 25-4)

Speed Estimation	Speed Estimation
M_S = (Exibit 25-19)	D_s = 0.475 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 54.1 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= N/A mph (Exhibit 25-19)
S= mph (Exhibit 25-14)	S = 54.1 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst2	DKS Associates
Agency or Company	DSK Associates
Date Performed	9/27/2007
Analysis Time Period	PM Peak 4:00-5:00

Site Information

Freeway/Dir of Travel	I-84 Exit 62 WB On-Ramp
Junction	I-84/Cascade Avenue
Jurisdiction	ODOT
Analysis Year	2031 Sunday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 1750 ft

V_u = 480 veh/h

Terrain Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1885	0.90	Level	15	0	0.930	0.90	2502
Ramp	485	0.90	Level	2	0	0.990	0.90	605
UpStream	480	0.90	Level	3	0	0.985	0.90	601
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation 0

V_{12}= 2502 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	3107	See Exhibit 25-7	No
V_{R12}	3107	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 26.1 (pc/ m/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.371 (Exibit 25-19)

S_R= 56.5 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 56.5 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	DKS Associates	Freeway/Dir of Travel	I-84 Exit 62 WB off-ramp
Agency or Company	DSK Associates	Junction	I-84/Cascade Avenue
Date Performed	9/27/2007	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Sunday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = 1750 ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = 485 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	$v=V/PHF\ f_{HV}\ f_p$
Freeway	2365	0.90	Level	15	0	0.930	0.90	3139
Ramp	480	0.90	Level	2	0	0.990	0.90	599
UpStream								
DownStream	485	0.90	Level	2	0	0.990	0.90	605

Merge Areas	Diverge Areas
Estimation of v_{12}	***Estimation of v_{12}***
$V_{12} = V_F\ (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM}= using Equation	P_{FD} = 1.000 using Equation 0
V_{12}= pc/h	V_{12} = 3139 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	3139	4700	No
V_{12}	3139	4400:All	No
$V_{FO} = V_F - V_R$	2540	4700	No
V_R	599	2000	No

Level of Service Determination (if not F)

Merge	Diverge
$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$	$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = (pc/ mi /ln)	D_R = 28.9 (pc/ mi /ln)
LOS = (Exhibit 25-4)	LOS= D (Exhibit 25-4)

Speed Estimation

Merge	Diverge
M_S = (Exibit 25-19)	D_s = 0.482 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 53.9 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= N/A mph (Exhibit 25-19)
S= mph (Exhibit 25-14)	S = 53.9 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst2	DKS Associates
Agency or Company	DSK Associates
Date Performed	9/27/2007
Analysis Time Period	PM Peak 4:00-5:00

Site Information

Freeway/Dir of Travel	I-84 Exit 62 EB On-Ramp
Junction	I-84/Cascade Avenue
Jurisdiction	ODOT
Analysis Year	2031 Sunday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 2100 ft

V_u = 375 veh/h

Terrain Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	955	0.90	Level	15	0	0.930	0.90	1267
Ramp	750	0.97	Level	3	0	0.985	0.90	872
UpStream	375	0.97	Level	3	0	0.985	0.90	436
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation 0

V_{12}= 1267 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2139	See Exhibit 25-7	No
V_{R12}	2139	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 18.0 (pc/ m/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.312 (Exibit 25-19)

S_R= 57.8 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 57.8 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET			
General Information		***Site Information***	
Analyst	DKS Associates	Freeway/Dir of Travel	I-84 Exit 62 EB off-ramp
Agency or Company	DSK Associates	Junction	I-84/Cascade Avenue
Date Performed	9/27/2007	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Sunday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = 2100 ft
Vu = veh/h	Sketch (show lanes, L_A, L_D,V_R,V_f)	VD = 750 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1330	0.90	Level	15	0	0.930	0.90	1765
Ramp	375	0.97	Level	3	0	0.985	0.90	436
UpStream								
DownStream	750	0.97	Level	3	0	0.985	0.90	872

Merge Areas	Diverge Areas
Estimation of v_{12}	***Estimation of v_{12}***
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM}= using Equation	P_{FD} =1.000 using Equation 0
V_{12}= pc/h	V_{12} = 1765 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1765	4700	No
V_{12}	1765	4400:All	No
$V_{FO} = V_F - V_R$	1329	4700	No
V_R	436	2000	No

Level of Service Determination (if not F)	***Level of Service Determination (if not F)***
$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$	$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$
D_R = (pc/ mi /ln)	D_R = 17.5 (pc/ mi /ln)
LOS = (Exhibit 25-4)	LOS= B (Exhibit 25-4)
Speed Estimation	***Speed Estimation***
M_S = (Exibit 25-19)	D_s = 0.467 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 54.3 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= N/A mph (Exhibit 25-19)
S= mph (Exhibit 25-14)	S = 54.3 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		***Site Information***	
Analyst	DKS Associates	Freeway/Dir of Travel	I-84 Exit 64 WB off-ramp
Agency or Company	DSK Associates	Junction	I-84/Button Bridge Rd
Date Performed	9/27/2007	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Sunday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = 1630 ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = 710 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	2215	0.90	Level	15	0	0.930	0.90	2940
Ramp	295	0.97	Level	4	0	0.980	0.90	345
UpStream								
DownStream	710	0.97	Level	5	0	0.976	0.90	834

Merge Areas	Diverge Areas
Estimation of v_{12}	***Estimation of v_{12}***
$V_{12} = V_F\ (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM}= using Equation	P_{FD} = 1.000 using Equation 0
V_{12}= pc/h	V_{12} = 2940 pc/h

Capacity Checks (Merge Areas)

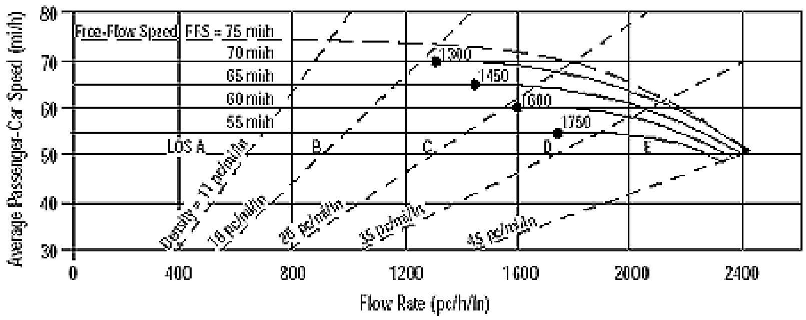
	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Capacity Checks (Diverge Areas)

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2940	4700	No
V_{12}	2940	4400:All	No
$V_{FO} = V_F - V_R$	2595	4700	No
V_R	345	2000	No

Merge Areas	Diverge Areas
Level of Service Determination (if not F)	***Level of Service Determination (if not F)***
$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$	$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = (pc/ mi /ln)	D_R = 28.3 (pc/ mi /ln)
LOS = (Exhibit 25-4)	LOS= D (Exhibit 25-4)
Speed Estimation	***Speed Estimation***
M_S = (Exibit 25-19)	D_s = 0.459 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 54.4 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= N/A mph (Exhibit 25-19)
S= mph (Exhibit 25-14)	S = 54.4 mph (Exhibit 25-15)

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information		***Site Information***	
Analyst	DKS Associates	Highway/Direction of Travel	I-84 WB
Agency or Company	DKS Associates	From/To	West of Exit 62
Date Performed	2/25/2009	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Weekday

Project Description Hood River IAMP

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs			
Volume, V	1435 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	15
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	0.90	Up/Down %	

Calculate Flow Adjustments			
f_p	0.90	E_R	1.2
E_T	1.5	f_{HV} = $1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.930

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	12.0	ft	f_{LW}	0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	f_{LC}	0.0	mi/h
Interchange Density	0.50	I/mi	f_{ID}	0.0	mi/h
Number of Lanes, N	2		f_N	4.5	mi/h
FFS (measured)		mi/h	FFS	65.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	952	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h
S	65.5	mi/h	S	mi/h
D = v_p / S	14.5	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	B		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
V - Hourly volume	D - Density	E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 23-12	f_N - Exhibit 23-6
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7
DDHV - Directional design hour volume			

FREEWAY WEAVING WORKSHEET

General Information

Analyst	DKS Associate
Agency/Company	DKS
Date Performed	9/10/2007
Analysis Time Period	PM Peak 4:00-5:00

Site Information

Freeway/Dir of Travel	I-84 EB
Weaving Seg Location	Exit 63-64
Jurisdiction	ODOT
Analysis Year	2031 Weekday

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	3
Weaving seg length, L (ft)	1140
Terrain	Level
Weaving type	A
Volume ratio, VR	0.53
Weaving ratio, R	0.34

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	f_p	v
Vo1	700	0.90	15	0	1.5	1.2	0.930	0.90	929
Vo2	80	0.94	1	0	1.5	1.2	0.995	0.90	95
Vw1	625	0.94	4	0	1.5	1.2	0.980	0.90	753
Vw2	320	0.94	1	0	1.5	1.2	0.995	0.90	380
Vw				1133	Vnw				1024
V									2157

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)			0.15	0.00
b (Exhibit 24-6)			4.00	4.00
c (Exhibit 24-6)			0.97	1.30
d (Exhibit 24-6)			0.80	0.75
Weaving intensity factor, Wi			1.87	0.29
Weaving and non-weaving speeds, Si (mi/h)			34.13	57.79

Number of lanes required for unconstrained operation, Nw 1.50
Maximum number of lanes, Nw (max) 1.40

☐ If Nw < Nw(max) unconstrained operation ☑ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	42.37
Weaving segment density, D (pc/mi/ln)	16.97
Level of service, LOS	B
Capacity of base condition, c_b (pc/h)	4618
Capacity as a 15-minute flow rate, c (veh/h)	3866
Capacity as a full-hour volume, c_h (veh/h)	3571

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

FREEWAY WEAVING WORKSHEET

General Information

Analyst	DKS Associate
Agency/Company	DKS
Date Performed	2/25/2009
Analysis Time Period	PM Peak 4:00-5:00

Site Information

Freeway/Dir of Travel	I-84 WB
Weaving Seg Location	Exit 63-64
Jurisdiction	ODOT
Analysis Year	2031 Weekday

Inputs

Freeway free-flow speed, S_{FF} (mi/h)	65
Weaving number of lanes, N	3
Weaving seg length, L (ft)	1210
Terrain	Level
Weaving type	A
Volume ratio, VR	0.43
Weaving ratio, R	0.39

Conversions to pc/h Under Base Conditions

(pc/h)	V	PHF	Truck %	RV %	E_T	E_R	f_{HV}	f_p	v
Vo1	948	0.90	15	0	1.5	1.2	0.930	0.90	1258
Vo2	168	0.97	2	0	1.5	1.2	0.990	0.90	194
Vw1	362	0.94	1	0	1.5	1.2	0.995	0.90	430
Vw2	567	0.97	3	0	1.5	1.2	0.985	0.90	659
Vw				1089	Vnw				1452
V									2541

Weaving and Non-Weaving Speeds

	Unconstrained		Constrained	
	Weaving (i = w)	Non-Weaving (i = nw)	Weaving (i = w)	Non-Weaving (= nw)
a (Exhibit 24-6)	0.15	0.00		
b (Exhibit 24-6)	2.20	4.00		
c (Exhibit 24-6)	0.97	1.30		
d (Exhibit 24-6)	0.80	0.75		
Weaving intensity factor, Wi	0.78	0.45		
Weaving and non-weaving speeds, Si (mi/h)	45.94	52.81		

Number of lanes required for unconstrained operation, Nw 1.35

Maximum number of lanes, Nw (max) 1.40

☑ If Nw < Nw(max) unconstrained operation ☐ if Nw > Nw (max) constrained operation

Weaving Segment Speed, Density, Level of Service, and Capacity

Weaving segment speed, S (mi/h)	49.63
Weaving segment density, D (pc/mi/ln)	17.07
Level of service, LOS	B
Capacity of base condition, c_b (pc/h)	4813
Capacity as a 15-minute flow rate, c (veh/h)	4029
Capacity as a full-hour volume, c_h (veh/h)	3756

Notes

a. Weaving segments longer than 2500 ft. are treated as isolated merge and diverge areas using the procedures of Chapter 25, "Ramps and Ramp Junctions".
b. Capacity constrained by basic freeway capacity.
c. Capacity occurs under constrained operating conditions.
d. Three-lane Type A segments do not operate well at volume ratios greater than 0.45. Poor operations and some local queuing are expected in such cases.
e. Four-lane Type A segments do not operate well at volume ratios greater than 0.35. Poor operations and some local queuing are expected in such cases.
f. Capacity constrained by maximum allowable weaving flow rate: 2,800 pc/h (Type A), 4,000 (Type B), 3,500 (Type C).
g. Five-lane Type A segments do not operate well at volume ratios greater than 0.20. Poor operations and some local queuing are expected in such cases.
h. Type B weaving segments do not operate well at volume ratios greater than 0.80. Poor operations and some local queuing are expected in such cases.
i. Type C weaving segments do not operate well at volume ratios greater than 0.50. Poor operations and some local queuing are expected in such cases.

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst2	DKS Associates	Freeway/Dir of Travel	I-84 Exit 64 EB on-ramp
Agency or Company	DSK Associates	Junction	I-84/Button Bridge Rd
Date Performed	2/25/2009	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Weekday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
Yes On No Off L_{up} = ft Vu = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D,V_R,V_f)	Yes On No Off L_{down} = ft VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1020	0.90	Level	15	0	0.930	0.90	1354
Ramp	355	0.96	Level	1	0	0.995	0.90	413
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\ (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation 0

V_{12}= 1354 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1767	See Exhibit 25-7	No
V_{R12}	1767	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 15.0 (pc/ m/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.298 (Exibit 25-19)

S_R= 58.1 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 58.1 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst2	DKS Associates
Agency or Company	DSK Associates
Date Performed	2/25/2009
Analysis Time Period	PM Peak 4:00-5:00

Site Information

Freeway/Dir of Travel	I-84 Exit 63 WB on-ramp
Junction	I-84/2nd Street
Jurisdiction	ODOT
Analysis Year	2031 Weekday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 1810 ft

Vu = 530 veh/h

Terrain Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D, V_R, V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	$v=V/PHF\ f_{HV}\ f_p$
Freeway	1515	0.90	Level	15	0	0.930	0.90	2011
Ramp	290	0.94	Level	2	0	0.990	0.90	346
UpStream	530	0.94	Level	3	0	0.985	0.90	636
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\ (P_{FM})$$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation 0

V_{12}= 2011 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2357	See Exhibit 25-7	No
V_{R12}	2357	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = 20.3 (pc/ m/ln)

LOS = C (Exhibit 25-4)

Speed Estimation

M_S = 0.324 (Exibit 25-19)

S_R= 57.6 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 57.6 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DKS Associates	Freeway/Dir of Travel	I-84 Exit 63 EB off-ramp
Agency or Company	DSK Associates	Junction	I-84/2nd Street
Date Performed	2/25/2009	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Weekday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
☐ Yes ☐ On ☑ No ☐ Off L_{up} = ft Vu = veh/h	S_{FF} = 65.0 mph S_{FR} = 35.0 mph Sketch (show lanes, L_A, L_D, V_R, V_f)	☑ Yes ☑ On ☐ No ☐ Off L_{down} = 1815 ft VD = 400 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1850	0.90	Level	15	0	0.930	1.00	2210
Ramp	525	0.94	Level	1	0	0.995	1.00	561
UpStream								
DownStream	400	0.94	Level	2	0	0.990	1.00	430

Merge Areas	Diverge Areas
Estimation of v_{12}	**Estimation of v_{12}**
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM}= using Equation	P_{FD} =1.000 using Equation 0
V_{12}= pc/h	V_{12} = 2210 pc/h

Capacity Checks (Merge)

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Capacity Checks (Diverge)

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2210	4700	No
V_{12}	2210	4400:All	No
$V_{FO} = V_F - V_R$	1649	4700	No
V_R	561	2000	No

Level of Service Determination (if not F)	Level of Service Determination (if not F)
$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$	$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$
D_R = (pc/ mi /ln)	D_R = 21.7 (pc/ mi /ln)
LOS = (Exhibit 25-4)	LOS= C (Exhibit 25-4)

Speed Estimation	Speed Estimation
M_S = (Exibit 25-19)	D_s = 0.478 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 54.0 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= N/A mph (Exhibit 25-19)
S= mph (Exhibit 25-14)	S = 54.0 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst2	DKS Associates
Agency or Company	DSK Associates
Date Performed	2/25/2009
Analysis Time Period	PM Peak 4:00-5:00

Site Information

Freeway/Dir of Travel	I-84 Exit 62 WB On-Ramp
Junction	I-84/Cascade Avenue
Jurisdiction	ODOT
Analysis Year	2031 Weekday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 1750 ft

Vu = 705 veh/h

Terrain Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

VD = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1100	0.90	Level	15	0	0.930	0.90	1460
Ramp	335	0.90	Level	2	0	0.990	0.90	418
UpStream	705	0.90	Level	3	0	0.985	0.90	883
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation 0

V_{12}= 1460 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	1878	See Exhibit 25-7	No
V_{R12}	1878	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 16.6 (pc/ m/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.309 (Exibit 25-19)

S_R= 57.9 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 57.9 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FI}=V_F		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET			
General Information		***Site Information***	
Analyst	DKS Associates	Freeway/Dir of Travel	I-84 Exit 62 WB off-ramp
Agency or Company	DSK Associates	Junction	I-84/Cascade Avenue
Date Performed	2/25/2009	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Weekday
Project Description	Hood River IAMP		

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = 1750 ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = 335 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1805	0.90	Level	15	0	0.930	0.90	2396
Ramp	705	0.90	Level	2	0	0.990	0.90	879
UpStream								
DownStream	335	0.90	Level	2	0	0.990	0.90	418

Merge Areas	Diverge Areas
Estimation of v_{12}	***Estimation of v_{12}***
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM}= using Equation	P_{FD} = 1.000 using Equation 0
V_{12}= pc/h	V_{12} = 2396 pc/h

Capacity Checks (Merge)

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Capacity Checks (Diverge)

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2396	4700	No
V_{12}	2396	4400:All	No
$V_{FO} = V_F - V_R$	1517	4700	No
V_R	879	2000	No

Level of Service Determination (if not F)	***Level of Service Determination (if not F)***
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$	$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$
D_R = (pc/ mi /ln)	D_R = 22.5 (pc/ mi /ln)
LOS = (Exhibit 25-4)	LOS= C (Exhibit 25-4)
Speed Estimation	***Speed Estimation***
M_S = (Exibit 25-19)	D_s = 0.507 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 53.3 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= N/A mph (Exhibit 25-19)
S= mph (Exhibit 25-14)	S = 53.3 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst2	DKS Associates	Freeway/Dir of Travel	I-84 Exit 62 EB On-Ramp
Agency or Company	DSK Associates	Junction	I-84/Cascade Avenue
Date Performed	2/25/2009	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Weekday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp

☑ Yes ☐ On

☐ No ☑ Off

L_{up} = 2100 ft

V_u = 235 veh/h

Terrain Level

S_{FF} = 65.0 mph S_{FR} = 35.0 mph

Sketch (show lanes, L_A, L_D,V_R,V_f)

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1005	0.90	Level	15	0	0.930	0.90	1334
Ramp	845	0.97	Level	3	0	0.985	0.90	982
UpStream	235	0.97	Level	3	0	0.985	0.90	273
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM}= 1.000 using Equation 0

V_{12}= 1334 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}	2316	See Exhibit 25-7	No
V_{R12}	2316	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 19.3 (pc/ m/ln)

LOS = B (Exhibit 25-4)

Speed Estimation

M_S = 0.319 (Exibit 25-19)

S_R= 57.7 mph (Exhibit 25-19)

S_0= N/A mph (Exhibit 25-19)

S= 57.7 mph (Exhibit 25-14)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = using Equation

V_{12} = pc/h

Capacity Checks

	Actual	Maximum	LOS F?
$V_{FI}=V_F$		See Exhibit 25-14	
V_{12}		4400:All	
$V_{FO} = V_F - V_R$		See Exhibit 25-14	
V_R		See Exhibit 25-3	

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/ m/ln)

LOS= (Exhibit 25-4)

Speed Estimation

D_s = (Exhibit 25-19)

S_R= mph (Exhibit 25-19)

S_0= mph (Exhibit 25-19)

S = mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		**Site Information**	
Analyst	DKS Associates	Freeway/Dir of Travel	I-84 Exit 62 EB off-ramp
Agency or Company	DSK Associates	Junction	I-84/Cascade Avenue
Date Performed	2/25/2009	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Weekday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = 2100 ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = 845 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	v=V/PHF f_{HV} f_p
Freeway	1240	0.90	Level	15	0	0.930	0.90	1646
Ramp	235	0.97	Level	3	0	0.985	0.90	273
UpStream								
DownStream	845	0.97	Level	3	0	0.985	0.90	982

Merge Areas	Diverge Areas
Estimation of v_{12}	***Estimation of v_{12}***
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM}= using Equation	P_{FD} =1.000 using Equation 0
V_{12}= pc/h	V_{12} = 1646 pc/h

Capacity Checks (Merge)

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

Capacity Checks (Diverge)

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	1646	4700	No
V_{12}	1646	4400:All	No
$V_{FO} = V_F - V_R$	1373	4700	No
V_R	273	2000	No

Level of Service Determination (if not F)	***Level of Service Determination (if not F)***
$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$	$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = (pc/ mi /ln)	D_R = 16.5 (pc/ mi /ln)
LOS = (Exhibit 25-4)	LOS= B (Exhibit 25-4)
Speed Estimation	***Speed Estimation***
M_S = (Exibit 25-19)	D_s = 0.453 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 54.6 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= N/A mph (Exhibit 25-19)
S= mph (Exhibit 25-14)	S = 54.6 mph (Exhibit 25-15)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	DKS Associates	Freeway/Dir of Travel	I-84 Exit 64 WB off-ramp
Agency or Company	DSK Associates	Junction	I-84/Button Bridge Rd
Date Performed	2/25/2009	Jurisdiction	ODOT
Analysis Time Period	PM Peak 4:00-5:00	Analysis Year	2031 Weekday

Project Description Hood River IAMP

Inputs

Upstream Adj Ramp	Terrain Level	Downstream Adj Ramp
☐ Yes ☐ On		☑ Yes ☑ On
☑ No ☐ Off		☐ No ☐ Off
L_{up} = ft	S_{FF} = 65.0 mph S_{FR} = 35.0 mph	L_{down} = 1630 ft
Vu = veh/h	Sketch (show lanes, L_A, L_D, V_R, V_f)	VD = 735 veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	Truck	%Rv	f_{HV}	f_p	$v=V/PHF\ f_{HV}\ f_p$
Freeway	1605	0.90	Level	15	0	0.930	0.90	2130
Ramp	295	0.97	Level	4	0	0.980	0.90	345
UpStream								
DownStream	735	0.97	Level	5	0	0.976	0.90	863

Merge Areas	Diverge Areas
Estimation of v_{12}	***Estimation of v_{12}***
$V_{12} = V_F\ (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 25-2 or 25-3)	L_{EQ} = (Equation 25-8 or 25-9)
P_{FM}= using Equation	P_{FD} =1.000 using Equation 0
V_{12}= pc/h	V_{12} = 2130 pc/h

Capacity Checks

	Actual	Maximum	LOS F?
V_{FO}		See Exhibit 25-7	
V_{R12}		4600:All	

	Actual	Maximum	LOS F?
$V_{FI}=V_F$	2130	4700	No
V_{12}	2130	4400:All	No
$V_{FO} = V_F - V_R$	1785	4700	No
V_R	345	2000	No

Level of Service Determination (if not F)	*Level of Service Determination (if not F)*
$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$	$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$
D_R = (pc/ mi /ln)	D_R = 21.3 (pc/ mi /ln)
LOS = (Exhibit 25-4)	LOS= C (Exhibit 25-4)

Speed Estimation	*Speed Estimation*
M_S = (Exibit 25-19)	D_s = 0.459 (Exhibit 25-19)
S_R= mph (Exhibit 25-19)	S_R= 54.4 mph (Exhibit 25-19)
S_0= mph (Exhibit 25-19)	S_0= N/A mph (Exhibit 25-19)
S= mph (Exhibit 25-14)	S = 54.4 mph (Exhibit 25-15)

APPENDIX I

Technical Memorandum #5: Alternatives Analysis

DKS Associates
TRANSPORTATION SOLUTIONS

Technical Memorandum #5

DATE: November 5, 2009

TO: Hood River IAMPs Project Team

FROM: John Bosket, PE

SUBJECT: **Hood River Interchange Area Management Plans (IAMPs) Alternatives Analysis** P05001-011

Existing and future transportation system deficiencies within the interchange areas were previously identified in other memoranda. The purpose of this memorandum is document the development and evaluation of alternatives for improving those deficiencies and providing safe and efficient operation through each of the interchanges.

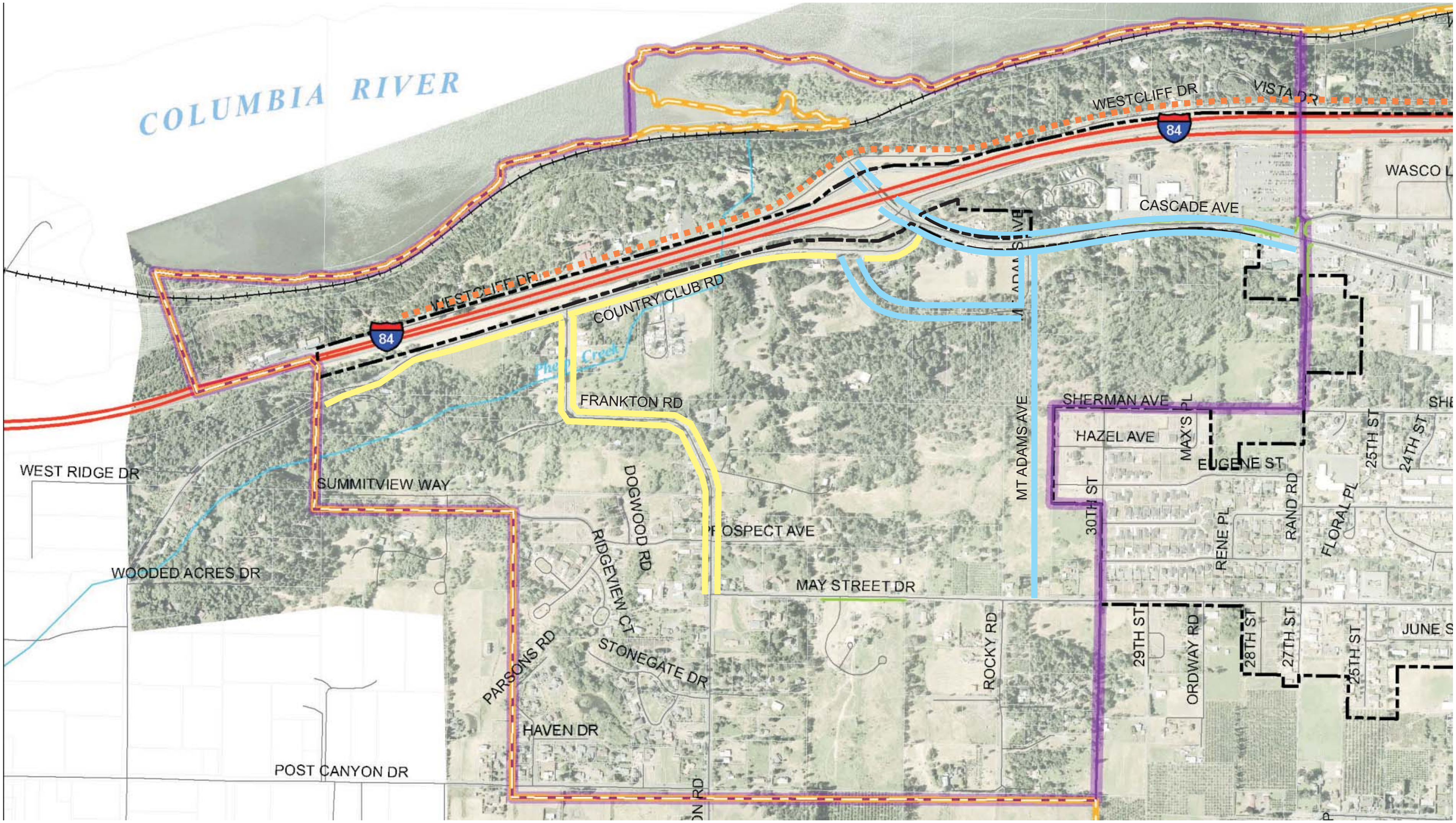
Improvement alternatives were developed to address transportation deficiencies noted under No Build conditions in the planning horizon year of 2031 for pedestrian, bicycle, and motor vehicle modes of travel. An emphasis was placed on providing lower cost options that focused on demand management and refinements to the existing transportation system in addition to traditional higher cost roadway projects to add capacity.

Pedestrian Facilities

Pedestrian facility enhancements were primarily targeted at filling gaps and providing a complete network to maximize the potential to encourage trip making by non-motorized modes of travel. With the pedestrian facility needs previously identified in the Existing Conditions and Future Needs technical memoranda, recommended improvements are described below.

Exit 62 Interchange Area

It is assumed that the roadway improvement projects identified later in this memorandum along Cascade Avenue, Mt. Adams Avenue, and Country Club Road (including the potentially realigned section) would include sidewalks. With these facilities in place, remaining needs can be met with the following projects (illustrated in Figure 1):



Hood River Interchange Area Management Plans

Figure 1 Recommended Pedestrian Facilities Exit 62 Study Area

LEGEND

- Study Area
- City Limit
- UGB
- Parcel Boundary
- Railroad
- Stream

Existing

- Sidewalk
- Multi-Use Path

Future

- Sidewalk Part of Road Project
- Infill/New Sidewalk
- Multi-Use Path

feet

0 400 800 1,200

1 inch equals 1,000 feet

DKS Associates

TRANSPORTATION SOLUTIONS

- Construct sidewalk along the south side of Country Club Road between the eastern terminus (Cascade Avenue under existing alignment or to the newly constructed segment connecting to Mt. Adams Avenue if realigned) and the urban growth boundary to the west.

  If Country Club Road is realigned to Mt. Adams Avenue, sidewalk construction for that segment is assumed to occur as part of that project. While sidewalk should be provided on both sides of Country Club Road in the realigned section, topography may make this infeasible. At a minimum, sidewalk should be constructed along the north side of this section, which is adjacent to existing and future development. As part of the realignment project, sidewalk should also be constructed along the existing section of Country Club Road between the realigned section and Cascade Avenue with a bicycle/pedestrian accessway provided between the new cul-de-sac and Cascade Avenue.

- Construct sidewalk along Frankton Road between Country Club Road and May Street.

The projects identified above are not intended to represent all pedestrian needs within the Exit 62 study area, but rather to accommodate walking trips near and through the interchange within a reasonable distance (assumed to be up to one mile in length). Other pedestrian facilities within the Exit 62 study area may be identified in the City of Hood River Transportation System Plan.

Exits 63 & 64 Interchange Area

With many pedestrian facilities already in place, including both sidewalks and multi-use trails, and others planned to be constructed as part of the Exit 64 Interchange Reconstruction project, additional recommended projects include (illustrated in Figure 2):

- Construct sidewalk along both sides of OR 35/Button Bridge Road between State Street (Historic Columbia River Highway) and Button Bridge, as well as on the south side of OR 35/Button Bridge Road between Button Bridge and the Exit 64 interchange. The construction of sidewalk between State Street and Button Bridge could be included as part of the proposed OR 35/ State Street intersection improvement project.

- Explore the feasibility of constructing a multi-use trail under the I-84/Hood River Bridge and along the east side of the Hood River to connect Port Marina Park with State Street without requiring travel through the Exit 64 interchange. There are two potential alignments:

    1. Direct connection between the existing bike/pedestrian bridge over the Hood River and State Street following the existing informal dirt walking path along the eastern bank of the Hood River. This trail would pass under the I-84/Hood River Bridge as well as under the Union Pacific Railroad Bridge. While most of this corridor is over publicly-owned land, the segment between the I-84/Hood River Bridge and the Union Pacific Railroad Bridge passes over private land. Therefore, the acquisition of land or an easement would be necessary to complete this alignment.

Hood River Interchange Area Management Plans

Figure 2 Recommended Pedestrian Facilities Exits 63-64 Study Area

LEGEND

- Study Area
- City Limit
- UGB
- Parcel Boundary
- Railroad

Existing

- Sidewalk
- Multi-Use Path
- Pedestrian Bridge

Future

- Sidewalk Part of Road Project
- Infill/New Sidewalk
- Potential Trail Alignment

0 400 800 1,200 feet

1 inch equals 1,000 feet

DKS Associates
TRANSPORTATION SOLUTIONS

2. Connection between the existing bike/pedestrian bridge over the Hood River and the public frontage road (Dock Road) along the south side of I-84 that connects to OR 35 near the north end of Button Bridge. This trail would pass under the I-84/Hood River Bridge, but not under the Union Pacific Railroad Bridge. All land required to accommodate this corridor is under public ownership. To complete this route, additional sidewalk should be constructed along at least one side of Dock Road.

For either trail alignment, key design issues such as vertical clearance (10-foot minimum) under the bridges and location of the flood plain must be addressed.

Bicycle Facilities

Much like the pedestrian facilities, bicycle facility enhancements were primarily targeted at filling gaps and providing a complete network to maximize the potential to encourage trip making by non-motorized modes of travel. With the bicycle facility needs previously identified in the Existing Conditions and Future Needs technical memoranda, recommended improvements are described below.

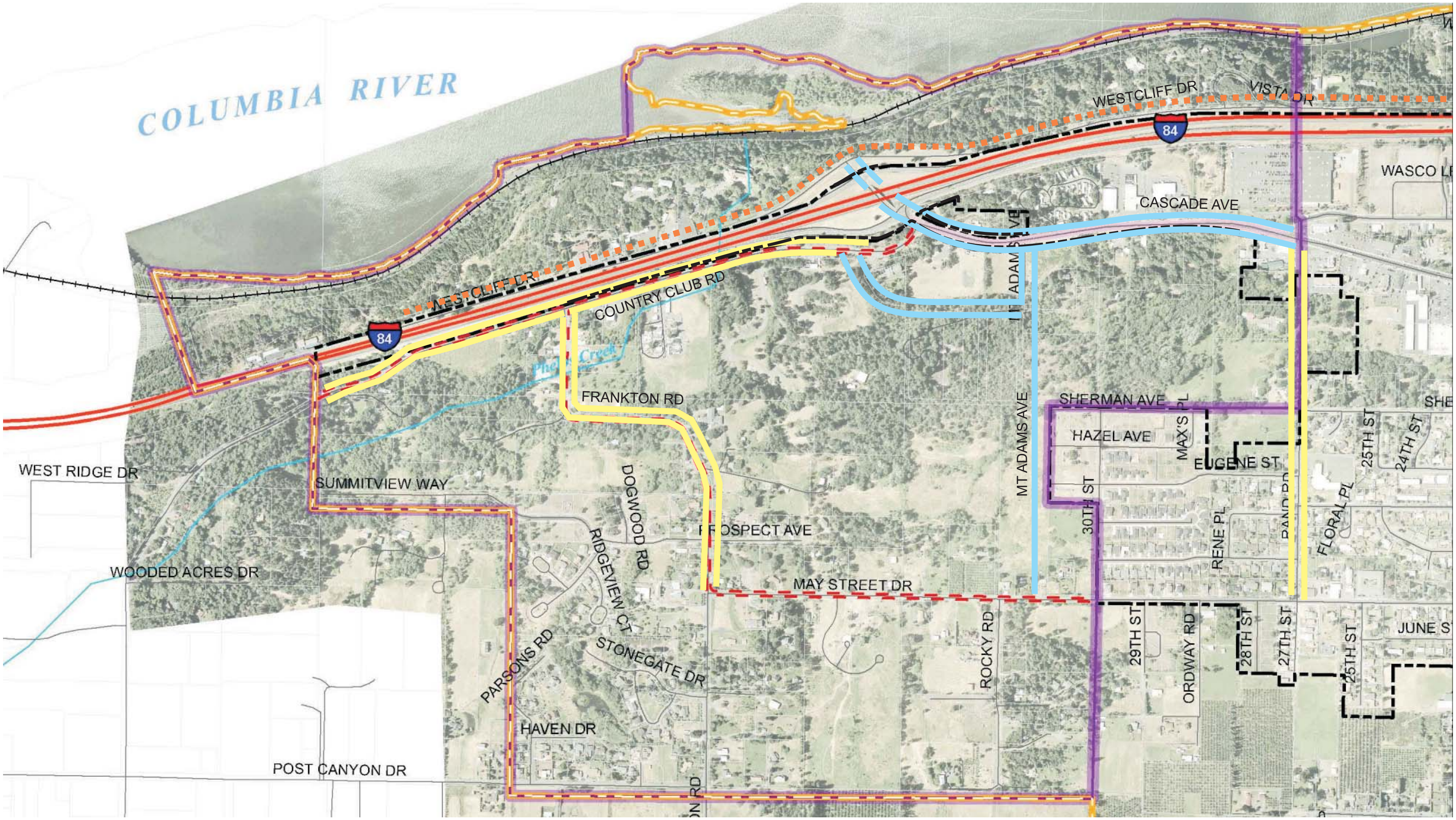
Exit 62 Interchange Area

It is assumed that the roadway improvement projects identified later in this memorandum along Cascade Avenue, Mt. Adams Avenue, and Country Club Road (including the potentially realigned section) would include bicycle lanes. With these facilities in place, remaining needs can be met with the following projects (illustrated in Figure 3):

- Infill bicycle lanes along Frankton Road between Country Club Road and May Street as opportunities arise.
- Infill bicycle lanes along Rand Road between Cascade Avenue and May Street as opportunities arise. Bicycle lane construction along Rand Road has been identified as a long-range project in the City of Hood River Transportation System Plan.
- Construct bike lanes along Country Club Road between the eastern terminus (Cascade Avenue under existing alignment or to the newly constructed segment connecting to Mt. Adams Avenue if realigned) and the urban growth boundary. If Country Club Road is realigned to Mt. Adams Avenue, bicycle lane construction for that segment is assumed to occur as part of that project.

Exits 63 & 64 Interchange Area

With many bicycle facilities already in place and others planned to be constructed as part of the Exit 64 Interchange Reconstruction project, additional recommended projects include (illustrated in Figure 4):



Hood River Interchange Area Management Plans

Figure 3 Recommended Bicycle Facilities Exit 62 Study Area

LEGEND

- Study Area
- City Limit
- UGB
- Parcel Boundary
- Railroad
- Stream

Existing

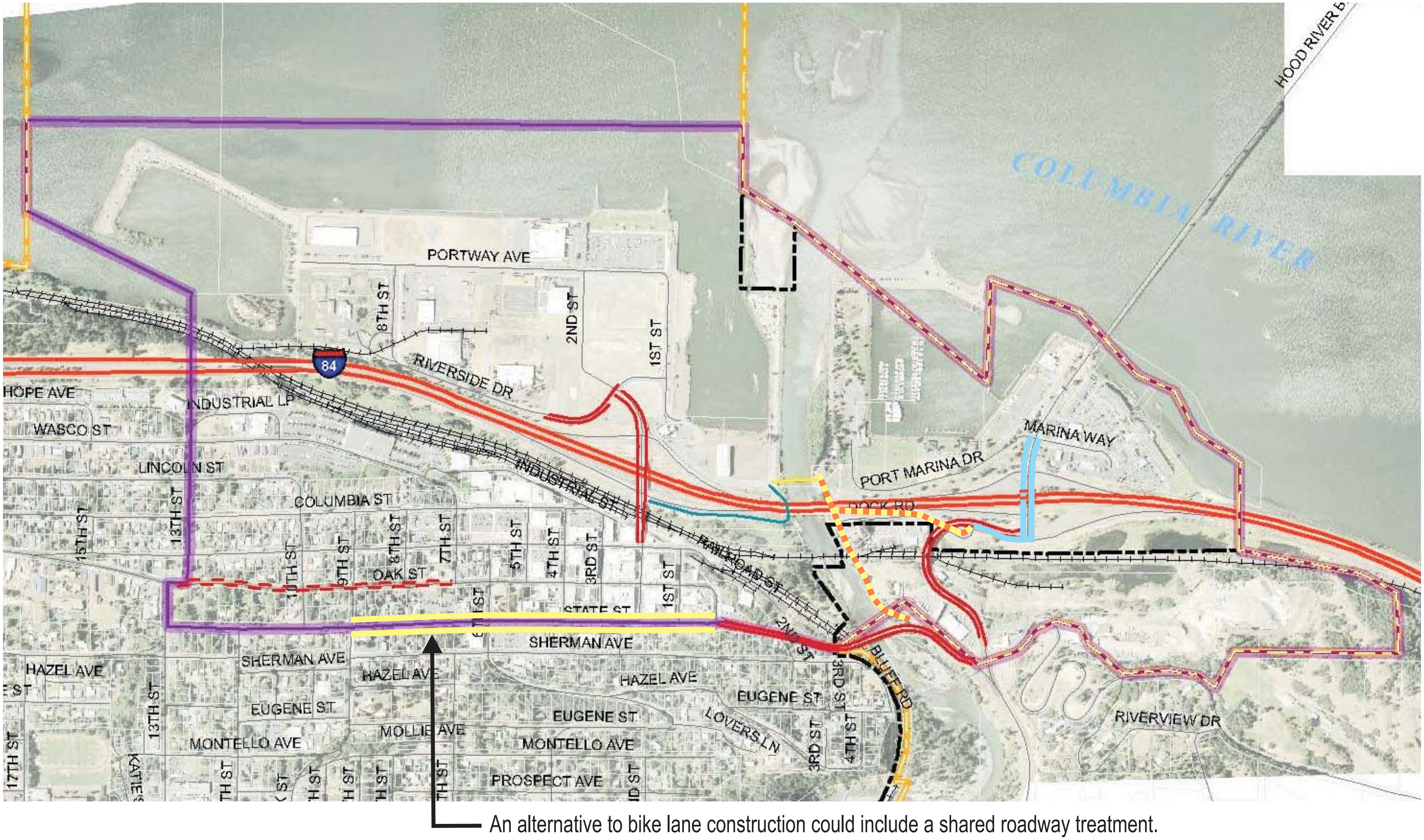
- Partial Shoulder Bikeway

Future

- Bike Lane Part of Road Project
- Infill/New Bike Lane
- Multi-Use Path

feet
0 400 800 1,200
1 inch equals 1,000 feet

DKS Associates
TRANSPORTATION SOLUTIONS



Hood River Interchange Area Management Plans

Figure 4 Recommended Bicycle Facilities Exits 63-64 Study Area

LEGEND

- Study Area
- City Limit
- UGB
- Parcel Boundary
- Railroad

Existing

- Shoulder Bikeway
- Partial Shoulder Bikeway
- Multi-Use Path
- Pedestrian Bridge

Future

- Bike Lane Part of Road Project
- Infill/New Bike Lane
- Potential Trail Alignment

0 400 800 1,200 feet

1 inch equals 1,000 feet

DKS Associates
TRANSPORTATION SOLUTIONS

- Provisions for safe bicycle travel are needed through the downtown. The construction of bicycle lanes along State Street between 9th Street and Front Street has been identified as a short-range project in the City of Hood River Transportation System Plan. Should this project not occur, an alternative could be to designate a bicycle route through the downtown where bicycles would share the roadway with motor vehicles. This would require a route where speeds are no greater than 25 mph and daily traffic volumes are less than 3,000 vehicles per day.
- Bicycle travel would also benefit from the proposed multi-use trail recommended for pedestrians between Port Marina Park and State Street along the eastern bank of the Hood River.

Motor Vehicle Facilities

Roadway improvements were primarily focused on mitigating intersection operations to comply with mobility standards and addressing queuing problems noted through the interchanges and freeway ramps. Within each interchange area, a range of potential solutions were analyzed to provide options for addressing transportation deficiencies that might result in trade-offs in impacts to property, the environment, and construction costs.

Exit 62 Interchange Area

As outlined in the Future (2031) No Build analysis, all study intersections within the Exit 62 study area will fail to comply with mobility standards during the weekday p.m. peak hour with the exception of the intersection of Westcliff Drive at Cascade Avenue. However, during the Sunday p.m. peak hour, only the I-84 ramp terminals with Cascade Avenue fail to comply with mobility standards. Alternatives to improve the operations at the study intersections were developed and compared with the No-Build scenarios to gauge the level of improvement they would provide. Each one is described below.

- **Alternative 0: No Build** – The No Build alternative was previously analyzed as part of the Future Needs assessment. By comparing it along side of the improvement alternatives developed, it can be used as a baseline to gauge the impacts associated with each concept. As previously noted, the No Build scenario assumed that the existing intersection on Cascade Avenue at Country Club Road would be removed and that Country Club Road would be realigned to connect to the future Mt. Adams Avenue extension. However, it should be noted that the project to realign Country Club Road is being reconsidered as part of this study. In addition, the intersections on Cascade Avenue at Mt. Adams Avenue and Rand Road were both assumed to be signalized as planned in the Transportation System Plan.

- **Alternative 1: Cascade Avenue Capacity Enhancements with Traffic Signal at Existing Country Club Road Intersection** – This alternative added capacity enhancements within the study area where needed to address known deficiencies, but assumed that the existing intersection on Cascade Avenue at Country Club Road would be signalized and would remain in its current location rather than being realigned to Mt.

Adams Avenue. The basis of this alternative was to determine if the Country Club Road realignment would be necessary to achieve adequate traffic operations in the interchange area.

- **Alternative 2: Frankton Road Overpass** – An alternative that included an overpass of I-84 to the west of the Exit 62 interchange at Frankton Road was proposed as a potential way to rebalance the traffic demand on the interchange and take pressure off of Cascade Avenue. If enough relief could be provided for Cascade Avenue, widening of the Historic Columbia River Highway (Cascade Avenue) could be avoided. This scenario also assumed that the existing intersection on Cascade Avenue at Country Club Road would be signalized and would remain in its current location rather than being realigned to Mt. Adams Avenue.

- **Alternative 3: Cascade Avenue Capacity Enhancements with Realigned Country Club Road** – This alternative started with the No Build scenario and added capacity to the interchange and Cascade Avenue as needed to mitigate intersection operations and eliminate queue spillback problems. As in the No Build scenario, the intersection on Cascade Avenue at Country Club Road was assumed to be removed, with Country Club Road realigned to connect to Mt. Adams Avenue.

- **Alternative 4: Cascade Avenue Capacity Enhancements with Exit 62 Roundabout Interchange** – Alternative 4 provides another option for retaining the existing Country Club Road alignment and intersection with Cascade Avenue. However, it differs from Alternative 1 in that is uses roundabouts in the Exit 62 interchange area instead of traffic signals in an attempt to reduce conflicts presented by the closely spaced intersections with Westcliff Drive and Country Club Road. Beyond the interchange, this alternative included similar improvements along Cascade Avenue from Country Club Road through Rand Road as assumed in Alternative 3.

For each alternative, the operational analysis was first conducted during the weekday p.m. peak hour only because that time period experienced worse conditions than the Sunday p.m. peak hour. The Sunday peak was only examined for alternatives that first proved to be viable during the weekday peak.

As capacity enhancements were added to each alternative, it was found that intersection mobility standards could be met at all locations. However, queue spillback into adjacent intersections and down into the freeway mainline was a common problem among all alternatives and became the critical factor in determining whether an alternative could function adequately. In the end, only Alternative 3 could provide adequate intersection operations while experiencing the fewest number of queue spillback incidents and no queuing onto the freeway mainline. Table 1 displays the results of the queuing analysis at the study area intersections for each alternative. By examining the operational simulation and queuing results from Table 1, several factors were identified that help define the success or failure of each alternative.

Alternative 1: This alternative included signalization of the I-84 eastbound ramp terminal, as well as the Cascade Avenue/Country Club Road intersection, which are in very close proximity (just under 100 feet apart). While this arrangement creates a difficult environment to efficiently and safely guide traffic through the intersections, that issue is overshadowed by the problem created by the close proximity of the Country Club Road intersection to the I-84 westbound ramp terminal.

With a heavy left turn demand from the freeway to Cascade Avenue coupled with the heavy demand to turn right from Cascade Avenue to Country Club Road, the roughly 450-foot distance between these intersections is simply not adequate to allow for acceptable lane balance and utilization. Even with two left turn lanes provided on the westbound ramp, the inside left turn lane is underutilized because of the difficulty in changing lanes in the short distance to access Country Club Road. The vehicles that attempt this maneuver end up blocking lanes temporarily while trying to merge into the right lane on Cascade Avenue. This, along with the poor westbound off-ramp lane balance, results in queue spillback problems that reach the freeway mainline.

Therefore, this is a clear indication that the close proximity of the Country Club Road intersection to the I-84 interchange presents a significant operational problem and does not allow for acceptable operations under signalized control. As such, this alternative is not recommended.

Alternative 2: The intent of the Frankton Road overpass was to provide an alternate route to Cascade Avenue and potentially lessen impacts to the Historic Columbia River Highway. While this overpass did draw approximately 500 vehicles away from Cascade Avenue during the weekday p.m. peak hour, the overall impact on traffic operations was relatively minor. In fact, even with the overpass in place, the same amount of widening and capacity improvements along Cascade Avenue were needed as shown in Alternative 3.

Also, while the operational analysis for this alternative was originally conducted under the assumption that the existing intersection on Cascade Avenue at Country Club Road would remain in its current location, a sensitivity analysis was performed to assess whether the relocation of Country Club Road to Mt. Adams Avenue would improve operations. Again, operations were improved with Country Club Road relocated, but the improvements needed to Cascade Avenue were the same as those for Alternative 3.

Because the Frankton Road overpass does not appear to offer significant improvements over what would be provided by Alternative 3 and would not lessen potential widening impacts to the Historic Columbia River Highway, this alternative is not recommended.

Alternative 3: This alternative does not include the Frankton Road overpass, which was found to provide little benefit, but does include the Country Club Road realignment to Mt. Adams Avenue, which was found to be critical for queue management in the interchange area. As shown in Table 1, it was the only alternative that was able to provide adequate intersection operations while experiencing the fewest number of queue spillback incidents and no queuing onto the freeway mainline.

Therefore, this alternative is recommended for further consideration, with additional details described below. A conceptual sketch of the improvements included as part of this alternative is provided in Figure 5.

Alternative 4: The use of roundabouts at the Exit 62 interchange ramp terminals on Cascade Avenue was considered to provide an operational alternative to traffic signals and to accommodate, rather than realign, Country Club Road. Because Westcliff Drive and Country Club Road are very close to the Exit 62 interchange ramp terminals, each roundabout was designed to incorporate them as part of the interchange (i.e., each roundabout includes five approaches). The additional improvements needed along Cascade Avenue to the east were found to be the same as those developed for Alternative 3. This concept has been illustrated in Figure 6.

To accommodate future traffic volumes in the year 2031, dual lane roundabouts were needed at each ramp terminal. Also, to comfortably accommodate interstate trucks with trailers, each roundabout was assumed to have an inscribed diameter (curb to curb) of approximately 200 feet. The larger diameter also helped to accommodate the extra approach lanes from Westcliff Drive and Country Club Road. However, even at this size, the short distance between approaches could make signing difficult.

Even at this size, these roundabout configurations were not quite able to provide sufficient capacity at the ramp terminals in the year 2031 (maximum peak hour v/c ratio experienced was 0.75 compared to standard of 0.70) and queuing between intersections was again a problem. The critical approach queues for both the weekday and Sunday peak hours were the I-84 westbound off-ramp, the eastbound and westbound queues between the ramp terminals, and the westbound queue on Cascade Avenue from the I-84 eastbound ramp/Country Club Road roundabout (see Table 1).

The I-84 westbound ramp could be reconstructed to safely accommodate the long queues projected, but the length of both off-ramp queues could be significantly increased by the queue spillback shown to occur between the roundabouts in each direction of travel (more than three times the available storage). Also, the westbound queue on Cascade Avenue leading into the I-84 eastbound ramp/Country Club Road roundabout is estimated to reach all of the way to the signalized intersection with Mt. Adams Avenue, which could severely limit the effective capacity of that intersection.

Therefore, while the Exit 62 roundabout concept can geometrically accommodate the Westcliff Drive and Country Club Road approaches, it falls short of meeting mobility standards at the ramp terminals and experiences queue spillback that could affect safety and operations through the interchange and freeway.

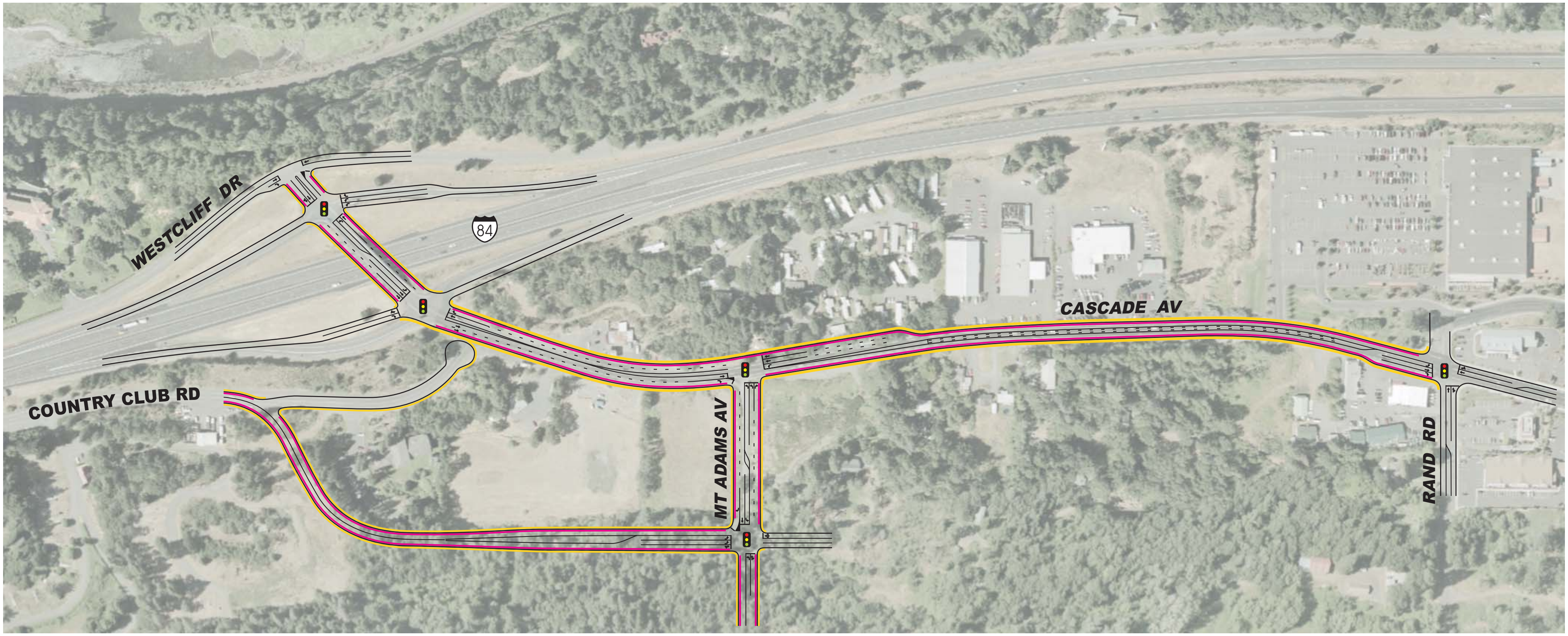
Given that only Alternative 3 was able to comply with intersection mobility standards while also accommodating vehicle queues, it remains as the only operationally adequate alternative for the Exit 62 study area. Therefore, further description of this alternative is provided below.

Table 1: 95th Percentile Vehicle Queues for Exit 62 Interchange Area Alternatives (Year 2031)

Intersection Movement	Available Storage Existing Condition (Improved Condition)	Alternative 0 (No Build)		Alternative 1	Alternative 2	Alternative 3		Alternative 4
		Sunday	Weekday	Weekday	Weekday	Weekday	Sunday	Weekday
Westcliff Drive at Cascade Avenue								
EBT	(>1,500')	-	-	1,475'	1,325'	1,350'	425'	-
EBTH-R	>1,500'	25'	75'	-	-	-	-	-
EBR	(400')	-	-	200'	400'	225'	225'	-
WBLT	>2,500'	75'	75'	1,175'	2,150'	300'	150'	-
NBL	125'	25'	25'	75'	100'	125'	100'	-
NBR	50' (125')	**75'**	50'	25'	50'	25'	25'	-
I-84 WB Ramp at Cascade Avenue								
WBL	(600')	-	-	**1,350' ***	**2,650' ***	600'	250'	-
WBLR	400'	**800'**	**800'**	-	-	-	-	-
WBR	(300')	-	-	300'	**2,675' ***	175'	100'	-
NBL	(325')	-	-	275'	150'	250'	**350'**	-
NBLT	325'	250'	250'	-	-	-	-	-
NBT	(325')	-	-	250'	275'	225'	225'	-
SBT	(125')	-	-	50'	125'	**175'**	**200'**	-
SBTH-R	125'	50'	50'	75'	100'	-	-	-
SBR	(125')	-	-	-	-	75'	75'	-
Westcliff EB	(375')	-	-	-	-	-	-	375'
Westcliff WB	(325')	-	-	-	-	-	-	325'
I-84 WB ramp	(675')	-	-	-	-	-	-	675'
Cascade NB	(200')	-	-	-	-	-	-	**850'**
I-84 EB Ramp at Cascade Avenue								
EBLT	(575')	-	-	**1,350' ***	-	75'	175'	-
EBLT-TH	575'	450'	225'	-	**1,825' ***	-	-	-
EBR	(400')	-	-	350'	-	150'	175'	-
NBT	100' (800')	**175'**	**175'**	**925'**	**1,125'**	425'	625'	-
NBR	50' (800')	**350'**	**150'**	**100'**	**100'**	550'	525'	-
SBL	(325')	-	-	150'	225'	200'	175'	-
SBLT	325'	100'	100'	-	-	-	-	-
SBT	(325')	-	-	**375'**	**350'**	250'	200'	-
Cascade SB	(200')	-	-	-	-	-	-	**975'**
I-84 EB ramp	(325')	-	-	-	-	-	-	325'
Country Club	(475')	-	-	-	-	-	-	475'
Cascade NB	(675')	-	-	-	-	-	-	675'
Cascade Avenue at Country Club Road								

Intersection Movement	Available Storage Existing Condition (Improved Condition)	Alternative 0 (No Build)		Alternative 1	Alternative 2	Alternative 3		Alternative 4
		Sunday	Weekday	Weekday	Weekday	Weekday	Sunday	Weekday
EBT	100’	-	-	75’	**150’**	-	-	-
EBR	(100’)	-	-	50’	50’	-	-	-
WBL	(425’)	-	-	225’	425’	-	-	-
WBT	700’	-	-	**850’**	**1,050’**	-	-	-
NBL	> 2,000’	-	-	1,900’	1,500’	-	-	-
NBR	25’ (200’)	-	-	150’	**1,575’**	-	-	-
Cascade Avenue at Mt. Adams Avenue								
EBT	(700’)	300’	625’	200’	-	400’	275’	200’
EBTH-R	(700’)	-	-	-	375’	-	-	-
EBR	(700’)	150’	200’	75’	-	275’	100’	75’
WBL	(350’)	150’	150’	25’	50’	**425’**	125’	25’
WBT	(1,900’)	**2,250’**	**2,150’**	**2,300’**	**2,275’**	175’	200’	**2,300’**
NBL	(475’)	125’	150’	225’	350’	375’	350’	225’
NBR	(475’)	**1,150’**	**1,200’**	400’	**1,175’**	300’	200’	400’
Cascade Avenue at Rand Road								
EBL	200’	125’	125’	100’	75’	150’	100’	100’
EBT	(1,900’)	-	-	350’	350’	975’	300’	350’
EBTH-R	1,900’	275’	400’	-	-	-	--	-
EBR	(225’)	-	-	125’	150’	225’	150’	125’
WBL	225’	200’	200’	200’	200’	200’	175’	200’
WBTH-R	1,800’	975’	1,025’	1,000’	1,050’	1,075	675’	1,000’
NBL	(225’)	-	-	**500’**	**375’**	225’	200’	**500’**
NBLT	1,100’	500’	**1,550’**	-	-	-	-	-
NBTH-R	(1,100’)	-	-	325’	300’	**1,275’**	275’	325’
NBR	125’	**175’**	**175’**	-	-	-	-	-
SBL	(75’)	-	-	**225’**	**375’**	**200’**	**150’**	**225’**
SBLT	75’	**175’**	**550’**	-	-	-	-	-
SBTH-R	(>500’)	-	-	225’	375’	200’	150’	225’
SBR	>500’	100’	100’	-	-	-	-	-

NBL=Northbound Left *NBT=Northbound Through* *NBR=Northbound Right*
NBLT=Northbound Left/Through *NBTH-R=Northbound Through/Right*
SBL=Southbound Left *SBT=Southbound Through* *SBR=Southbound Right*
SBLT=Southbound Left/Through *SBTH-R=Southbound Through/Right*
EBL=Eastbound Left *EBT=Eastbound Through* *EBR=Eastbound Right*
EBLT=Eastbound Left/Through *EBTH-R=Eastbound Through/Right*
WBL=Westbound Left *WBT=Westbound Through* *WBR=Westbound Right*
WBLT=Westbound Left/Through *WBTH-R=Westbound Through/Right*
** While ramp will be reconstructed, the queue storage required would not be practical.*



LEGEND

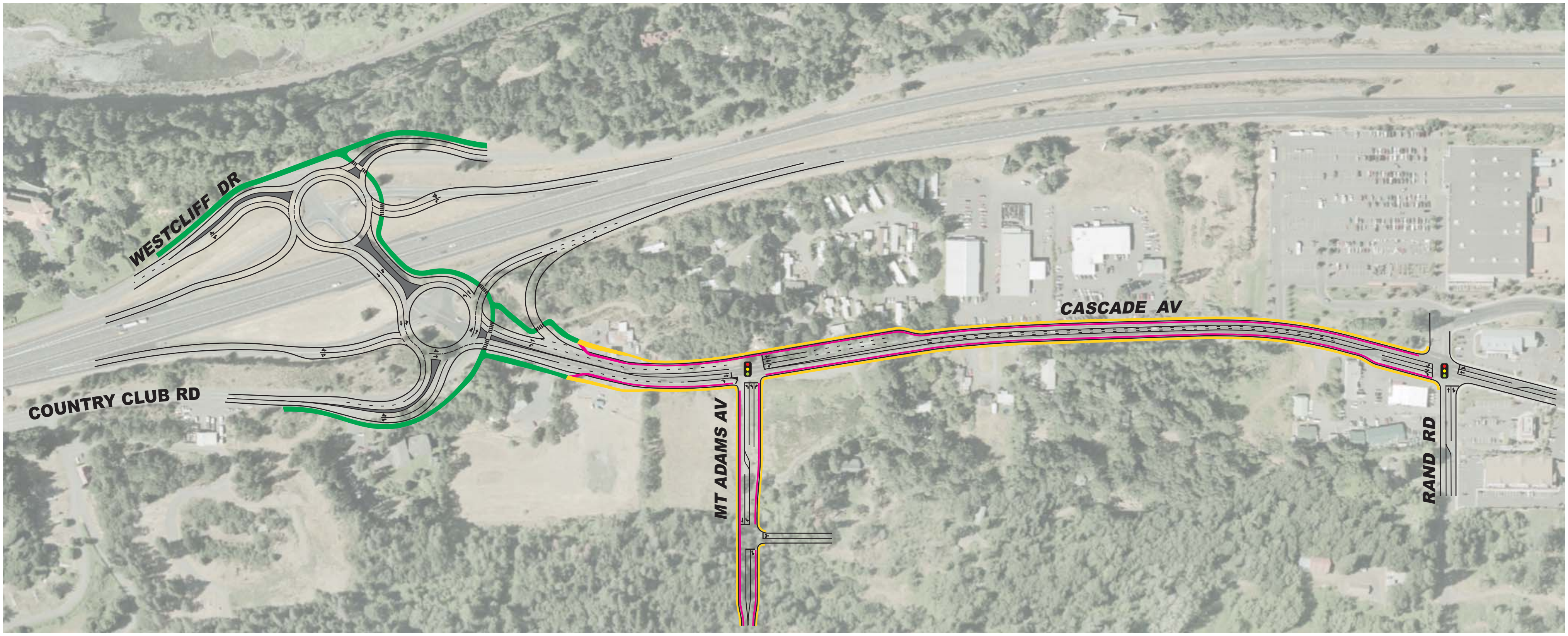
- Bike Lane
- Sidewalk
- Signalized Intersection

DKS Associates
TRANSPORTATION SOLUTIONS

NO SCALE

Figure 5

Exit 62 Alternative 3: Cascade Avenue Capacity Enhancements with Realigned Country Club Road



LEGEND

- Bike Lane
- Sidewalk
- Multi-Use Path
- Signalized Intersection

DKS *Associates*
TRANSPORTATION SOLUTIONS

NO SCALE

Figure 6

Exit 62 Alternative 4: Cascade Avenue Capacity Enhancements with Exit 62 Roundabout Interchange

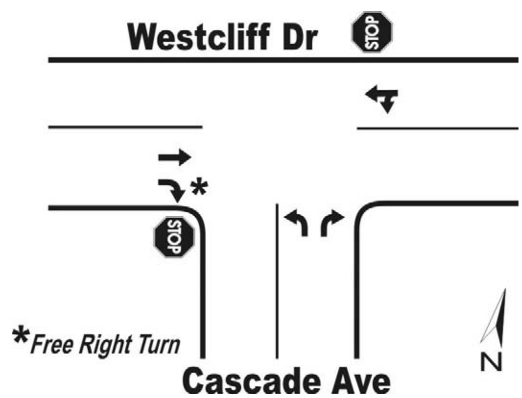
Alternative 3: Cascade Avenue/ Westcliff Drive Improvements

The intersection of Cascade Avenue at Westcliff Drive was projected to operate adequately under the future No Build scenario during the weekday p.m. and Sunday p.m. peak hours. However, modifications are recommended to ensure northbound queues do not interfere with signal operations at the I-84 westbound ramp terminal. While this intersection is proposed to remain under stop control, improvements to the lane configurations and modification of the existing stop control are proposed as follows (illustrated below):

Northbound: left turn lane, right turn lane

Westbound: shared left turn/ through lane

Eastbound: through lane, right turn lane (free right turn)



Key elements include the uncontrolled northbound movements away from the interchange to avoid queuing conflicts that could impact the ramp terminals and the provision of the free eastbound right turn lane to accommodate high demands. Intersection operations with these improvements in place are shown in Table 2. Again, the improvements made were intended to provide for compatibility with the nearby traffic signal. While the intersection is shown to operate at LOS F during the weekday p.m. peak hour, this issue is not related to the intersection itself, but is caused by the proximity to the I-84 westbound ramp terminal signal which can limit the number of vehicles that can enter Cascade Avenue from Westcliff Drive.

Table 2: Cascade Avenue/ Westcliff Drive Intersection Operations (2031)

Scenario	LOS	Delay (sec)	v/c ratio	Mobility Standard
Alternative 0 (No Build) Sunday PM Peak Hour	B	14.5	0.15	0.90
Alternative 0 (No Build) Weekday PM Peak Hour	C	18.2	0.27	0.90
Alternative 3 Sunday PM Peak Hour	D	27.0	0.35	0.80*
Alternative 3 Weekday PM Peak Hour	F	58.5	0.62	0.80*

** A lower v/c ratio is required, per the Highway Design Manual, for Build Alternatives*
Highlighted values do not meet mobility standards.
LOS = Level of Service
Delay = Average vehicle delay (seconds)
v/c = Volume to Capacity Ratio

Alternative 3: Cascade Avenue/ I-84 EB and WB Ramps Improvements

Under No Build conditions, both I-84 ramp terminals with Cascade Avenue were assumed to remain unsignalized, as there are currently no plans to improve these intersections. The recommended improvements include signalization of both ramp terminals and widening and lengthening of the eastbound and westbound off-ramps. In addition, to accommodate the turn lane requirements at these intersections, the I-84 overcrossing structure would need to be replaced with a wider five-lane bridge, plus bike lanes and sidewalks. The intersection operations under this scenario are shown in Table 3, with an illustration of the intersection lane configurations provided below.

Cascade Avenue at I-84 WB Ramps

Northbound: left turn lane, through lane

Southbound: through lane, shared through/right lane

Westbound: two left turn lanes, right turn lane

Cascade Avenue at I-84 EB Ramps

Northbound: through lane, right turn lane

Southbound: left turn lane, two through lanes

Eastbound: shared left/through lane, right turn lane

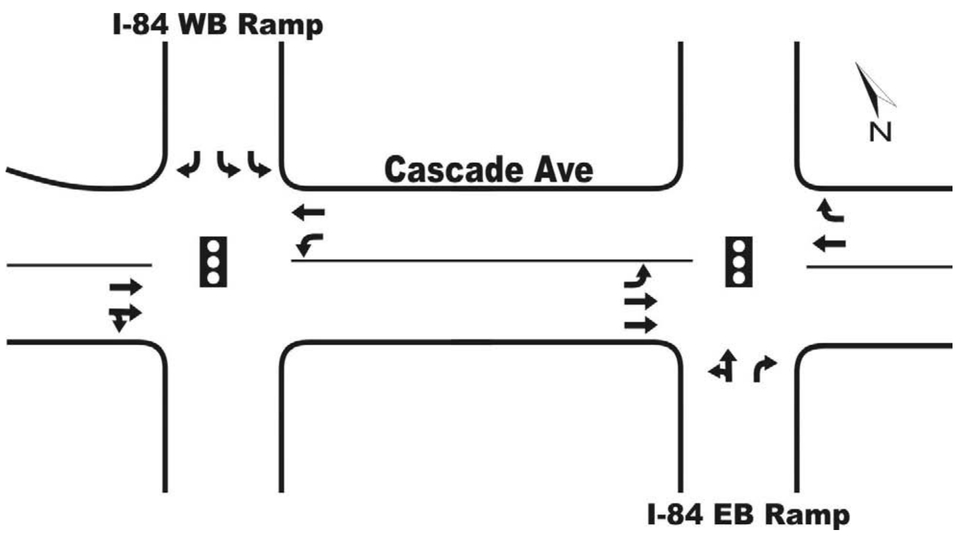


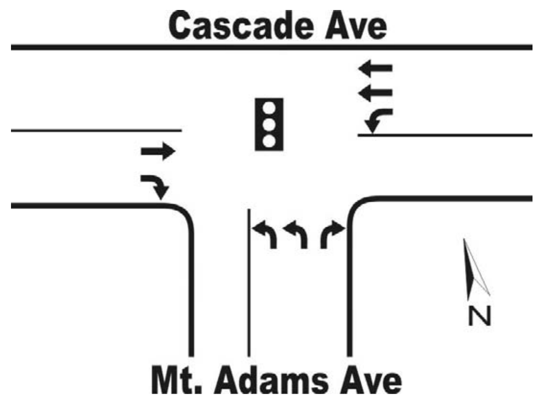
Table 3: Cascade Avenue/ I-84 Ramp Intersection Operations (2031)

Scenario	LOS	Delay (sec)	v/c ratio	Mobility Standard
Eastbound Ramp Terminal				
Alternative 0 (No Build) Sunday PM Peak Hour	A/F	>60.0	>1.00	0.85
Alternative 0 (No Build) Weekday PM Peak Hour	A/F	>60.0	>1.00	0.85
Alternative 3 Sunday PM Peak Hour	C	30.2	0.58	0.80*
Alternative 3 Weekday PM Peak Hour	C	26.0	0.53	0.80*
Westbound Ramp Terminal				
Alternative 0 (No Build) Sunday PM Peak Hour	A/F	>60.0	>1.00	0.85
Alternative 0 (No Build) Weekday PM Peak Hour	A/F	>60.0	>1.00	0.85
Alternative 3 Sunday PM Peak Hour	C	21.7	0.66	0.80*
Alternative 3 Weekday PM Peak Hour	C	24.2	0.67	0.80*

** A lower v/c ratio is required, per the Highway Design Manual, for Build Alternatives*
Highlighted values do not meet mobility standards.
LOS = Level of Service
Delay = Average vehicle delay (seconds)
v/c = Volume to Capacity Ratio

Alternative 3: Cascade Avenue/ Mt. Adams Avenue Improvements

The intersection on Cascade Avenue at Mt. Adams Avenue is expected to operate with an unacceptable v/c ratio as a signalized intersection by the year 2031. To mitigate this, the recommended lane configurations for each intersection approach include (illustrated at right, with operational analysis shown in Table 4):



Northbound: two left turn lanes, right turn lane

Westbound: left turn lane, two through lanes

Eastbound: through lane, channelized right turn lane under yield control

A key element of the proposed improvements includes the construction of a separate eastbound right turn lane that is channelized and operates with yield control. The use of yield control maximizes the capacity of this movement, but as an alternative, it could also function adequately if signalized with right turn overlap phasing (i.e., eastbound right turn would have a green light at the same time as the northbound left turn).

Table 4: Cascade Avenue/ Mt Adams Intersection Operations (2031)

Scenario	LOS	Delay (sec)	v/c ratio	Mobility Standard
Alternative 0 (No Build) Sunday PM Peak Hour	C	25.6	0.90	0.90
Alternative 0 (No Build) Weekday PM Peak Hour	C	35.0	**0.96**	0.90
Alternative 3 Sunday PM Peak Hour	C	30.2	0.51	0.80*
Alternative 3 Weekday PM Peak Hour	B	19.0	0.70	0.80*

** A lower v/c ratio is required, per the Highway Design Manual, for Build Alternatives*
Highlighted values do not meet mobility standards.
LOS = Level of Service
Delay = Average vehicle delay (seconds)
v/c = Volume to Capacity Ratio

Alternative 3: Country Club Road/ Mt. Adams Avenue Improvements

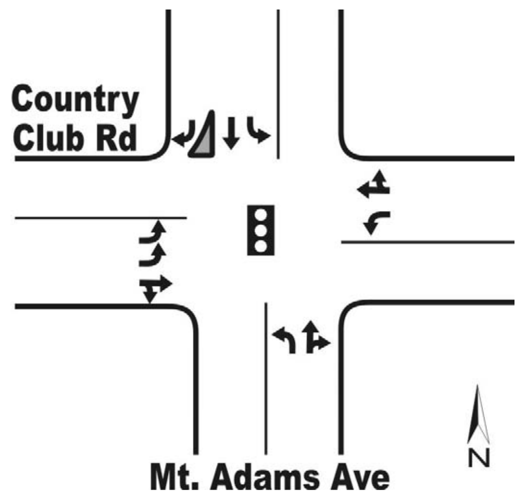
The proposed realignment of Country Club Road will create a new intersection with the future Mt. Adams Avenue extension. To maintain acceptable operations, this intersection would be signalized and would require the following lane configurations (illustrated below):

Northbound: left turn lane, shared through/right turn lane

Southbound: left turn lane, through lane, channelized right turn lane under yield control

Westbound: left turn lane, shared through/right turn lane

Eastbound: two left turn lanes, shared through/right turn lane



A key element of this improvement is the channelized southbound right turn lane that operates under yield control. The use of yield control was implemented to maximize capacity for the high demand movement and was critical for avoiding queue spillback into Cascade Avenue. As this intersection was not previously analyzed under No Build conditions, only operations under the proposed improvements are shown in Table 5.

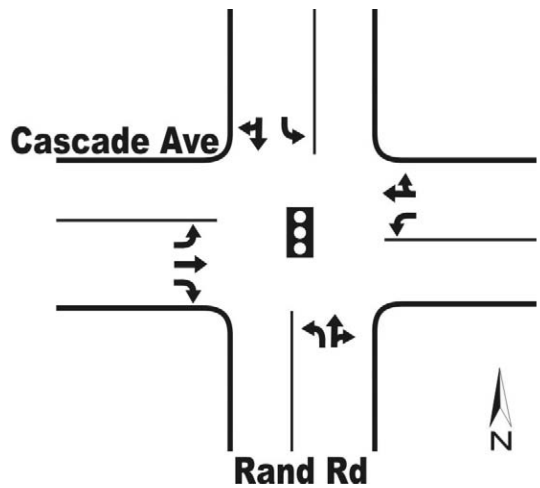
Table 5: Country Club Road/ Mt Adams Intersection Operations (2031)

Scenario	LOS	Delay (sec)	v/c ratio	Mobility Standard
Alternative 3 Sunday PM Peak Hour	B	17.3	0.45	C
Alternative 3 Weekday PM Peak Hour	B	16.3	0.61	C

Highlighted values do not meet mobility standards.
LOS = Level of Service
Delay = Average vehicle delay (seconds)
v/c = Volume to Capacity Ratio

Alternative 3: Cascade Avenue/ Rand Road Improvements

The intersection on Cascade Avenue at Rand Road is already planned to have a traffic signal by 2031, but additional improvements to the intersection lane configurations are required to achieve compliance with mobility standards (see Table 6). Recommended lane configurations for each intersection approach include (illustrated at right):



- Northbound: left turn lane, shared through/right turn lane
- Westbound: left turn lane, shared through/right turn lane
- Southbound: left turn lane, shared through/right turn lane
- Eastbound: left turn lane, through lane, right turn lane

Key elements of the proposed improvements include the construction of a separate eastbound right turn lane to serve high volumes of traffic destined to the south and modification of the north and south approaches to include separate left turn lanes, which would allow for greater flexibility in signal phasing. However, the modifications to the north and south approaches may require some road realignment to ensure the opposing through lanes are appropriately aligned.

Table 6: Cascade Avenue/ Rand Road Intersection Operations (2031)

Scenario	LOS	Delay (sec)	v/c ratio	Mobility Standard
Alternative 0 (No Build) Sunday PM Peak Hour	B	20.9	0.78	0.90
Alternative 0 (No Build) Weekday PM Peak Hour	D	37.5	1.05	0.90
Alternative 3 Sunday PM Peak Hour	B	16.1	0.74	0.80*
Alternative 3 Weekday PM Peak Hour	C	20.4	0.77	0.80*

** A lower v/c ratio is required, per the Highway Design Manual, for Build Alternatives*
Highlighted values do not meet mobility standards.
LOS = Level of Service
Delay = Average vehicle delay (seconds)
v/c = Volume to Capacity Ratio

Freeway Operations

The improvements proposed for the Exit 62 study area will increase the capacity of the transportation system, but will have only a small effect on the number of trips that enter and leave the freeway from this area. This is in part due to the additional capacity improvements being proposed in the Exit 63/64 study area, which help to balance traffic demands between interchanges along I-84. Given the influence of improvements at one interchange on the traffic demand realized at another, the analysis of freeway operations will be discussed following the description of proposed improvements in the Exit 63/64 study area.

Exits 63 & 64 Interchange Area

Under No Build conditions in the year 2031, the intersection of OR 35 at State Street was found failing to comply with mobility standards during both the weekday and Sunday peak hours. In addition, the intersection of 2nd Street at Oak Street fails during the Sunday peak hour and the intersection of 2nd Street at Riverside Drive fails during the weekday peak hour.

While the intersection of 2nd Street at Oak Street was only found to fail during the Sunday peak hour, the queues extending to the north from the traffic signal interfere with upstream intersections during both the weekday and Sunday peak hours. This queue spillback is significant enough to cause long queues on the I-84 ramps that extend back into or beyond the section of the ramp used for deceleration from freeway travel speeds. This creates a similar situation to what has been a common problem at the Exit 64 eastbound off-ramp (to be mitigated by the upcoming interchange reconstruction project), where ramp queues extend to the freeway and create safety and operational problems.

Alternatives to improve the operations at the study intersections and Exit 63 freeway off-ramps were developed and compared with the No-Build scenarios to gauge the level of improvement they would provide. Each one is described below.

OR 35/ State Street Intersection

This intersection is currently controlled as an all-way stop, with no further improvements planned through the year 2031. Alternatives to restore intersection operations to comply with mobility standards included the construction of a roundabout and the construction of a traffic signal with modified lane geometry. As discussed below, both options are operationally acceptable, but may have trade-offs in property impacts.

Roundabout

A typical single-lane roundabout with a right turn bypass on the eastbound approach (State Street to OR 35 southbound), similar to the configuration considered here in the past, was modeled at this intersection using the ODOT Transportation Planning Analysis Unit (TPAU) roundabout analysis methodology. However, it was found that by 2031, it would be nearly over capacity during the Sunday p.m. peak hour (v/c = 0.99). Therefore, a larger two-lane roundabout was analyzed to determine if adequate operations could be maintained. As shown in Table 7, adequate capacity would be provided for the Sunday and weekday p.m. peak hours with the larger roundabout illustrated in Figure 7.

Figure 7: Roundabout Concept Sketch – OR 35/ State St.

Roundabouts vary in size, commonly ranging from 150' to 200' in diameter, depending on factors such as design speeds, vehicle types, capacity needs, and accommodations for pedestrians. While intersection approaches for roundabouts are often more narrow than required for traffic signals due to the lack of added turning lanes, the footprint for the intersection itself is typically much larger and can be a constraint when right of way is limited.

As shown in Figure 7, the construction of a roundabout would have impacts to surrounding properties. Even with the approximately 200-foot diameter (curb to curb) roundabout shown shifted slightly to the south, it would continue to significantly impact the parking lot in the southeast quadrant. Also, while some property impacts can be avoided to the north by shifting the intersection to the south, added expense will be incurred due to associated road realignments and retaining walls to the west.

Table 7: OR 35/ State Street Intersection Operations (2031)

Scenario	LOS	Delay (sec)	v/c ratio	Mobility Standard
No Build Sunday PM Peak Hour	F	>60.0	**>1.00 (NB)**	0.80
No Build Weekday PM Peak Hour	F	>60.0	**>1.00 (NB)**	0.80
Roundabout Sunday PM Peak Hour	A	7.9	0.47	0.70*
Roundabout Weekday PM Peak Hour	A	8.1	0.49	0.70*
Traffic Signal Sunday PM Peak Hour	B	12.4	0.66	0.70*
Traffic Signal Weekday PM Peak Hour	B	18.7	0.66	0.70*

** A lower v/c ratio is required, per the Highway Design Manual, for Build Alternatives.*
Highlighted values do not meet mobility standards.
LOS = Level of Service
(xx) = Critical Movement
Delay = Average vehicle delay (seconds)
v/c = Volume to Capacity Ratio

The construction of a roundabout at this intersection was previously considered in the Exit 64 East Hood River Interchange Study.[1] It was noted that the Historic Columbia River Highway Advisory Committee felt that the roundabout provided the best option from an aesthetic standpoint, but was concerned about impacts to the parking lot in the southeast quadrant. It was also recognized that a roundabout may not be able to adapt to seasonal and event peak flows as easily as a traffic signal might. In conclusion, it was determined that both a roundabout and a traffic signal should be kept as viable alternatives for this intersection.

As another consideration, roundabouts are often viewed to be undesirable by truck drivers – even though they can be designed to comfortably accommodate large vehicles. Since there is a considerable amount of truck traffic passing through this intersection, feedback from local truck drivers should be obtained and used as part of the alternative selection process.

The construction of a roundabout may be favored by bicyclists, although both roundabouts and traffic signals can safely accommodate bicycle traffic. The added benefits provided by roundabouts are the lower travel speeds and the option to either travel within the circulating roadway or use the multi-use pathway around the perimeter.

[1] *East Hood River Interchange Study – Final Report*, Parsons Brinckerhoff Quade & Douglas, Inc., June 30, 2005.

Lastly, the two-lane roundabout configuration being considered is often viewed as being less pedestrian-friendly than single-lane configurations or standard traffic signals. In this configuration, where pedestrians must cross two lanes of free-flow traffic at a time, predictability of vehicle movements through the inner lane of the roundabout can be difficult. In addition, the line of sight for vehicles exiting from the inner lane may be obstructed by other vehicles in the outer lane, so that pedestrians waiting to cross the road cannot be seen.

Traffic Signal

A traffic signal would also provide sufficient capacity to allow for mobility standards to be met through 2031 (see Table 7). The construction of a traffic signal and associated turning lanes as recommended would also have right of way impacts. However, these impacts should be smaller than those associated with the roundabout (200-foot) alternative. Recommended lane configurations for each intersection approach include (see Figure 8):

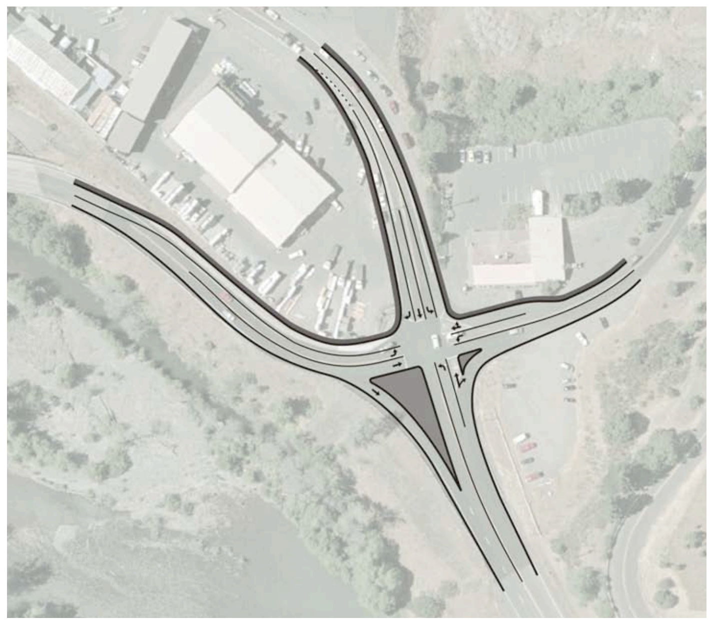
Northbound: left turn lane, shared through/right turn lane

Westbound: left turn lane, shared through/right turn lane

Southbound: left turn lane, through lane, right turn lane

Eastbound: left turn lane, through lane, right turn lane

Figure 8: Signalized Intersection Concept Sketch – OR 35/ State St.



Again, as discussed in the East Hood River Interchange Study, a traffic signal was recognized as a better operational solution, especially during seasonal and event peak traffic times when different timing plans could be implemented in response to changing demands. However, it was not acknowledged as a preferred alternative, with both the signal and roundabout options forwarded for further consideration.

2nd Street/ Riverside Drive Intersection

As outlined in the Future No Build analysis, the intersection of 2nd Street at Riverside Drive will fail to comply with mobility standards under the current all-way stop control. To mitigate the operational issues at this intersection, alternatives considered included conversion to two-way stop control (Riverside Drive would be stopped), installation of a traffic signal, or limiting turning movements to right-in and right-out only. A roundabout was not considered because of concerns regarding vehicle queuing conflicts with the traffic signal at the I-84 westbound ramps less than 400 feet away. Table 8 shows the results of the intersection operational analysis under each alternative treatment.

As shown in Table 8, this intersection will not operate acceptably under all-way or two-way stop control, primarily due to the heavy left turn demand from the east approach. However, the alternatives including signalization or right-in/right-out turn restrictions both comply with mobility standards.

Table 8: 2nd Street/ Riverside Drive Intersection Operations (2031)

Scenario	LOS	Delay (sec)	v/c ratio	Mobility Standard
All-Way Stop (No Build) Sunday PM Peak Hour	C	22.8	0.84 (WB)	0.90
All-Way Stop (No Build) Weekday PM Peak Hour	D	27.1	**0.92 (WB)**	0.90
Two-Way Stop (Riverside) Sunday PM Peak Hour	E	71.9	**1.48**	0.80*
Two-Way Stop (Riverside) Weekday PM Peak Hour	F	119.1	**2.05**	0.80*
Traffic Signal Sunday PM Peak Hour	D	39.6	0.67	0.80*
Traffic Signal Weekday PM Peak Hour	D	37.6	0.68	0.80*
Right-in/Right-out Sunday PM Peak Hour	B	14.5	0.38	0.80*
Right-in/Right-out Weekday PM Peak Hour	C	15.3	0.38	0.80*

**A lower v/c ratio is required, per the Highway Design Manual, for Build Alternatives.*
Highlighted values do not meet mobility standards.

While signalization or turn restrictions can both meet mobility standards at the 2nd Street/ Riverside Drive intersection, each alternative will result in secondary impacts that must be addressed. Signalization will cause vehicle queues that could interfere with the nearby I-84 westbound ramp terminals. Conversion to right-in, right-out turn movements only would eliminate such queuing problems, but would divert traffic to other intersections to the north, which may require additional improvements to operate adequately.

A queuing analysis of the 2^{nd} Street/ Riverside Drive intersection under signal control compared to right-in/right-out turn restrictions was completed to better understand the impacts of each alternative on the nearby intersections. As shown in Table 9, northbound queues under signal control equal or exceed the available storage length, which could prevent the I-84 westbound off-ramp traffic from clearing as needed. If converted to right-in/right-out movements only, the critical northbound movements would not experience delay or queuing.

Table 9: 2^{nd} Street/ Riverside Drive Queuing (2031)

Movement	Available Storage	95^{th} % Queue
Signalized		
EBLTR	1,300'	50'
WBLTR	275'	225'
NBL	100'	150'
NBTR	325'	325'
SBL	50'	50'
SBTR	400'	225'
Right-In/Right-Out		
WBR	275'	0'
EBR	1,300'	100'

Note: Shaded cells indicate 95^{th} percentile queue exceeds storage.

While conversion of the 2^{nd} Street/ Riverside Drive intersection to right-in/right-out movements only mitigates queuing concerns, it will also divert the displaced turning movements to the intersections along 2^{nd} Street at Anchor Way and Portway Avenue. If the Portway Avenue intersection is converted to all-way stop control (currently only 2^{nd} Street approach is stopped), both intersections will operate at level of service B, which complies with City of Hood River mobility standards.

In summary, failing operations at the 2^{nd} Street/ Riverside Drive intersection can be mitigated through either signalization or conversion to right-in/right-out movements only. However, only conversion to right-in/right-out movements can successfully avoid queuing conflicts with the I-84 westbound ramp terminal. Therefore, this improvement was assumed to be in place for the analysis of alternatives to mitigate congestion through the Exit 63 interchange. To accommodate the displaced turning movements, the intersection on 2^{nd} Street at Portway Avenue must be converted to all-way stop control as well.

What Happens if 1^{st} Street is Closed between Riverside Drive and Portway Avenue?

Restricting turn movements to right-in/right-out only at the 2^{nd} Street/ Riverside Drive intersection diverts trips from the east approach that want to return to the interchange up to Portway Avenue via 1^{st} Street. However, 1^{st} Street is under private ownership and its continued use in the future is uncertain. To assess how traffic circulation would be impacted by the removal of 1^{st} Street, a sub-area analysis of the waterfront transportation system was conducted, with findings described below.

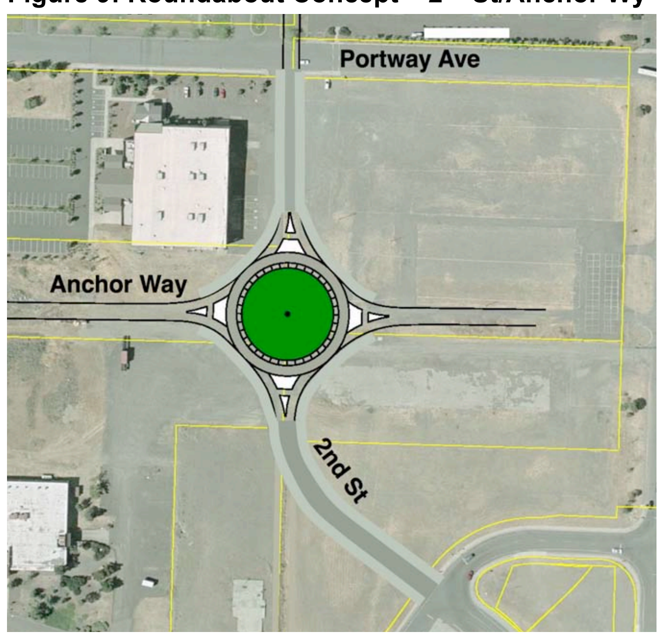
If 1^{st} Street is removed and the intersection of 2^{nd} Street/ Riverside Drive is converted to right-in/right-out movements only in the future to address failing operations, the ability to return to the interchange from the east approach of Riverside Drive, as well as the ability to enter the east approach of Riverside Drive from other areas of the waterfront, would be significantly limited. Traffic entering the east approach of Riverside Drive from the waterfront would be forced to travel south through the Exit 63 interchange, turn around in the downtown, and travel back through the Exit 63 interchange to make the right turn movement. Traffic exiting the east approach of Riverside Drive that is destined for the interchange or other areas south would likely travel north on 2nd Street, turn left into Anchor Way, travel to Riverside Drive, then turn right (southbound) onto 2nd Street.

To better accommodate the trips from the waterfront entering the east approach of Riverside Drive, southbound left turns into Riverside Drive could be allowed. This would have little to no impact on the intersection's ability to comply with mobility standards and would keep unnecessary trips from diverting through the Exit 63 interchange and the downtown.

While the route around Anchor Way back to Riverside Drive would be available for use by trips leaving the east approach of Riverside Drive destined for the south, the added traffic would degrade operations of the 2nd Street/ Anchor Way intersection and increase congestion along Anchor Way, which is primarily intended to serve local industrial properties rather than through trips. As many as 150 vehicles during the weekday p.m. peak hour would likely take this route even if 1st Street were left in place due to the turning restrictions applied at the 2nd Street/ Riverside Drive intersection, however, the closure of 1 Street would nearly double the volume of trips diverting around Anchor Way. Assuming a future east approach is added to the 2nd Street/ Anchor Way intersection as an access to new development, the added traffic from this diversion may result in long delays and failing levels of service for traffic leaving the development access. Furthermore, the added trips along Anchor Way may exceed the daily volume this roadway was intended to serve and would introduce a number of conflicts between passenger cars and large trucks entering and leaving the industrial properties.

The construction of a roundabout at the 2nd Street/ Anchor Way intersection would eliminate diversions through Anchor Way by providing the ability for U-turns to be made on 2nd Street and could provide adequate intersection operations (LOS B) to accommodate future development to the east. As an added benefit, a well-designed and landscaped median could act as an attractive gateway feature into the waterfront area, as well as establish a unique front door for future development to the east.

Figure 9: Roundabout Concept – 2nd St/Anchor Wy



Because of the importance of accommodating large trucks in this area, a roundabout design must allow for comfortable turning movements by interstate trucks with trailers. This may result in a larger roundabout with an inscribed diameter (curb to curb) of at least 190 feet, which would require additional right of way beyond the existing 2nd Street corridor (illustrated in Figure 9).

2nd Street/ Oak Street Intersection and 2nd Street Corridor

With poor operations at the 2nd Street/ Oak Street intersection resulting in queue spillback that creates hazardous conditions on the freeway, alternatives were aimed at improving the intersection as well as reducing ramp queues to acceptable levels. The initial set of alternatives analyzed includes:

- **Alternative 0: No Build** – The No Build alternative was previously analyzed as part of the Future Needs assessment. By comparing it along side of the improvement alternatives developed, it can be used as a baseline to gauge the impacts associated with each concept.
- **Alternative 1: 2nd Street at Oak Street Signal Modifications and Parking Removal** – The purpose of this alternative was to add capacity to the bottleneck created by the 2nd Street/ Oak Street intersection by adding turn lanes to the approaches. To avoid impacting adjacent buildings, the turn lanes were added by removing parking from each block surrounding the intersection.
- **Alternative 2: 8th Street Overcrossing** – This alternative includes the construction of an overpass over the Union Pacific Railroad and I-84 that connects Wasco Street on the south with 8th Street on the north. The overpass was proposed to provide a second access to the waterfront, which would remove traffic from the Exit 63 interchange area.
- **Alternative 3: State Street/ Oak Street Couplet** – This alternative includes the conversion of State Street and Oak Street to a one-way couplet between Front Street and 6th Street (e.g., westbound only on Oak Street and eastbound only on State Street). The north-south streets would remain as two-way roadways. The conversion of these streets to one-way operation would simplify signal operations along 2nd Street, potentially alleviating the future bottleneck. This alternative was not developed in detail and was only analyzed in concept to determine if it could have a significant benefit. Further study would be needed to define the specific limits of the couplet, provide a complete analysis of the traffic impacts through the downtown, and assess the potential property impacts.

With the individual intersections along 2nd Street being in close proximity, operational acceptability was measured both by the ability to comply with mobility standards as well as by the ability to minimize the impacts of queue spillback. The critical indicator of whether or not queues have been successfully managed is on the I-84 ramp terminals. Because of the significant safety hazard created by queuing vehicles back into the freeway mainline or into the lower portion of the ramp used for deceleration from freeway speeds, alternatives that could not maintain acceptable queues on the I-84 off-ramps were considered undesirable. Therefore, alternatives were first evaluated by the queuing that would be present between intersections and on the off-ramps. For each alternative, the operational analysis was first conducted during the weekday p.m. peak hour. The Sunday peak was only examined for alternatives that first proved to be viable during the weekday peak.

Table 10 displays the results of the queuing analysis for Alternatives 0 through 4. Note that the intersection on 2nd Street at Riverside Drive was assumed converted to right-in/ right-out only movements for Alternatives 1 through 4. Under this configuration, northbound queues are eliminated and cannot conflict with the I-84 westbound ramp terminals.

North of I-84, the intersections along 2nd Street at Portway Avenue, Anchor Way, and Riverside Drive operate well (1st Street assumed to be in use), with the only queuing problems experienced being associated with the southbound queue spillback from the 2nd Street/ Oak Street intersection. This is seen in the long southbound queues at Anchor Way and Riverside Drive, as well as in the long side street (eastbound and westbound) queues that occur when the intersections along 2nd Street are blocked. Between the three improvement alternatives, Alternatives 2 and 3 appear to be slightly more effective than Alternative 1 (adding turn lanes at 2nd Street/Oak Street), which has little impact on the southbound queues.

Table 10: 95th Percentile Queues for Alternatives 0-3 (2031 Weekday PM Peak)

Movement	Available Storage	Alt 0: No-Build	Alt 1: 2nd/Oak Parking Removal	Alt 2: 8th St Overcrossing	Alt 3: State/Oak Couplet
		Weekday	Weekday	Weekday	Weekday
2nd Street/ Portway Avenue					
EBTHRU-R	-	175'	125'	100'	100'
WBL-THRU	-	25'	275'	150'	150'
NBLR	300'	75'	150'	75'	150'
SBL-THRU-R	-	75'	75'	75'	75'
2nd Street/ Anchor Way					
EBLR	600'	1,300'	975'	125'	125'
NBLT	400'	50'	125'	75'	100'
SBTR	300'	375'	375'	100'	125'
2nd Street/ Riverside Drive					
EBLT	1,300'	950'	-	-	-
EBR	100' (1,300')	75'	1,775'	100'	1,675'
WBL-THRU-R	275'	475'	-	-	-
(WBR)	275'	-	-	-	25'
NBL	100'	175'	-	-	-
NBTHRU-R	325'	275'	-	-	-
SBL	50'	75'	-	-	-
SBTHRU-R	400'	400'	450'	375'	425'
2nd Street/ I-84 WB Ramps					
WBL-THRU	300'	1,750'	1,125'	1,150'	525'
WBR	200'	200	175'	200'	225'
NBL	150'	125'	125'	125'	100'
NBT	300'	350'	375'	200'	375'
SBT	325'	375'	300'	350'	300'
SBR	125'	125'	125'	125'	125'
2nd Street/ I-84 EB Ramps					
EBL-THRU	325'	2,500'	2,350'	500'	400'
EBR	275'	175'	175'	175'	225'
NBTR	300'	375'	325'	250'	375'

Movement	Available Storage	Alt 0: No-Build	Alt 1: 2nd/Oak Parking Removal	Alt 2: 8th St Overcrossing	Alt 3: State/Oak Couplet
		Weekday	Weekday	Weekday	Weekday
SBL	175'	150'	125'	150'	175'
SBT	300'	400'	450'	450'	450'
2nd Street/ Cascade Avenue					
EBR	225'	2,925'	775'	2,500'	125'
WBR	200'	100'	100'	75'	100'
NBTHRU-R	200'	175'	125'	125'	150'
SBTHRU-R	325'	350'	400'	400'	300'
2nd Street/ Oak Street					
EBL-THRU-R	200'	300'	-	100'	-
(EBL-THRU)	(200')	-	175'	-	-
(EBR)	(200')	-	50'	-	-
WBL-THRU-R	200'	450'	-	425'	-
(WBL)	(200')	-	-	-	50'
(WBL-THRU)	(200')	-	225'	-	-
(WBT)	(200')	-	-	-	225'
(WBTHRU-R)	(200')	-	-	-	250'
(WBR)	(200')	-	100'	-	-
NBL-THRU-R	200'	300'	-	275'	-
(NBL)	(200')	-	125'	-	50'
(NBTHRU-R)	(200')	-	225'	-	-
(NBT)	(200')	-	-	-	250'
SBL-THRU	200'	225'	300'	325'	-
(SBT)	(200')	-	-	-	225'
SBR	50'	100'	200'	100'	100'

Notes: Shaded cells indicate queues exceed available storage.
Movements/Storage Lengths in parentheses represent those associated with improvements

When examining the critical westbound movements at the I-84 westbound ramps and eastbound movements at the I-84 eastbound ramps, none of the alternatives can maintain acceptable ramp queue lengths. However, queues on the westbound ramp are significantly improved under all alternatives, with the State Street/ Oak Street Couplet providing the most benefit. The eastbound ramp queues are significantly improved by the 8th Street overcrossing and the couplet, with queues no longer reaching the I-84 mainline.

Looking south of the interchange, the long southbound queues on 2nd Street are still present, along with a number of other queues reaching one to two blocks in length – indicating that the 2nd Street/ Oak Street bottleneck is also affecting the downtown. However, the alternative that includes the State Street/ Oak Street couplet appears to be relatively effective at mitigating the downtown congestion, as best evidenced by the dramatic reduction in queuing on the eastbound approach at 2nd Street/ Cascade Avenue.

Given that none of these alternatives could mitigate the safety problems associated with the long I-84 off-ramp queues, the following new alternatives were developed using lessons learned from the analysis of the initial alternatives.

- **Alternative 4: 8th Street Overcrossing with Added 2nd Street Southbound Lane from I-84 EB to Oak Street** – This alternative (illustrated in Figure 10) includes the 8th Street Overcrossing (Alternative 2) as well as an added southbound travel lane on 2nd Street between the I-84 eastbound ramps and Oak Street. The added southbound lane would be created by widening the 2nd Street bridge to the east approximately 10 feet, removing all on-street parking between Cascade Avenue and Oak Street, and restriping the roadway to add a southbound lane that would drop as a right turn lane at Oak Street.

- **Alternative 5: Extended I-84 EB off-ramp with Added 2nd Street Southbound Lane from I-84 EB to Oak Street** – This alternative (illustrated in Figure 11) is similar to Alternative 4, but replaces the 8th Street Overcrossing with a new I-84 eastbound off-ramp of extended length (approximately 300 to 400 feet longer than the existing ramp).

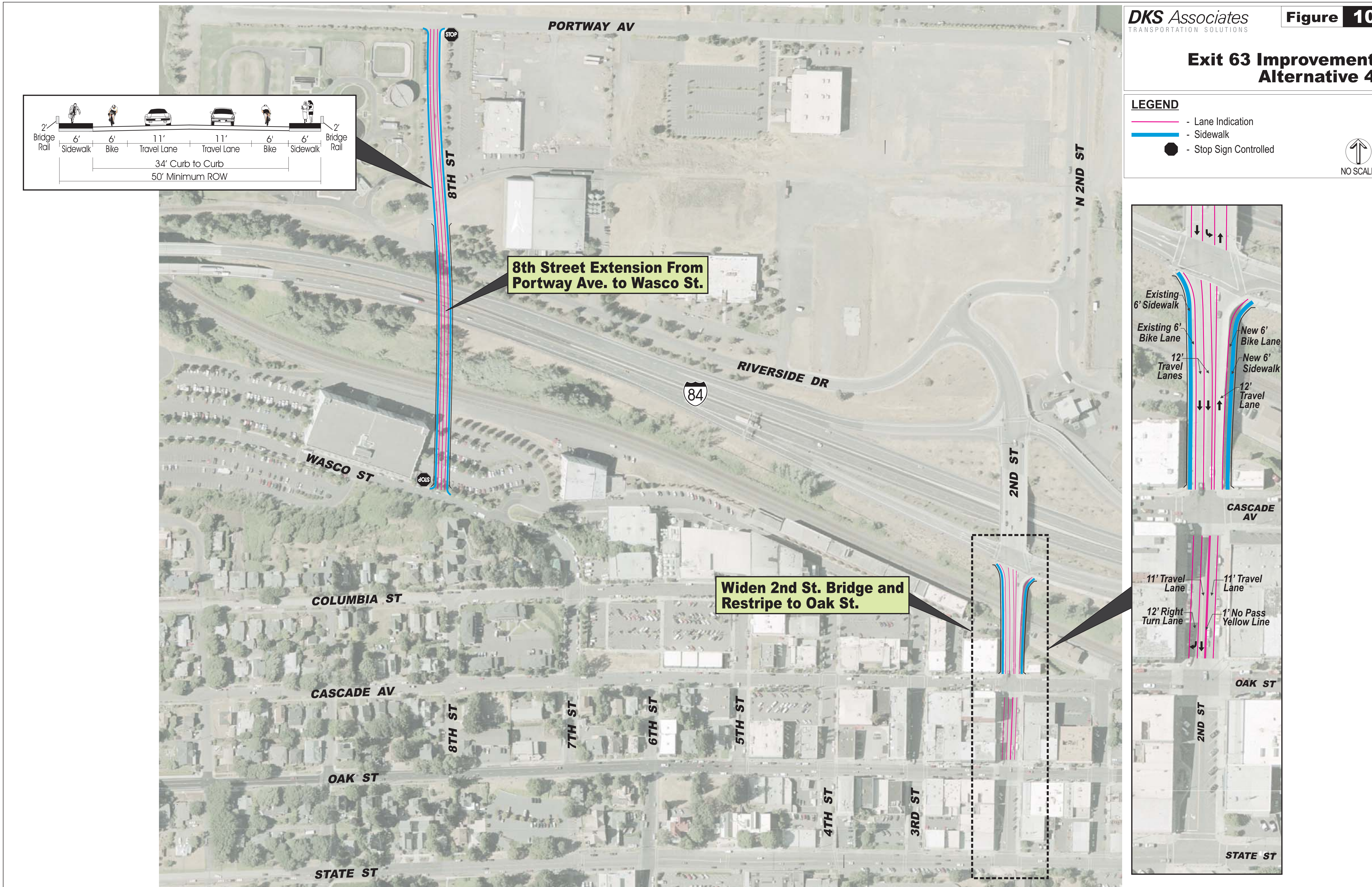
- **Alternative 6: Extended I-84 EB off-ramp with Added 2nd Street Southbound Lane from I-84 EB to Oak Street and State Street/ Oak Street Couplet** – Combines Alternative 5 with the couplet described in Alternative 3 (see Figure 12).

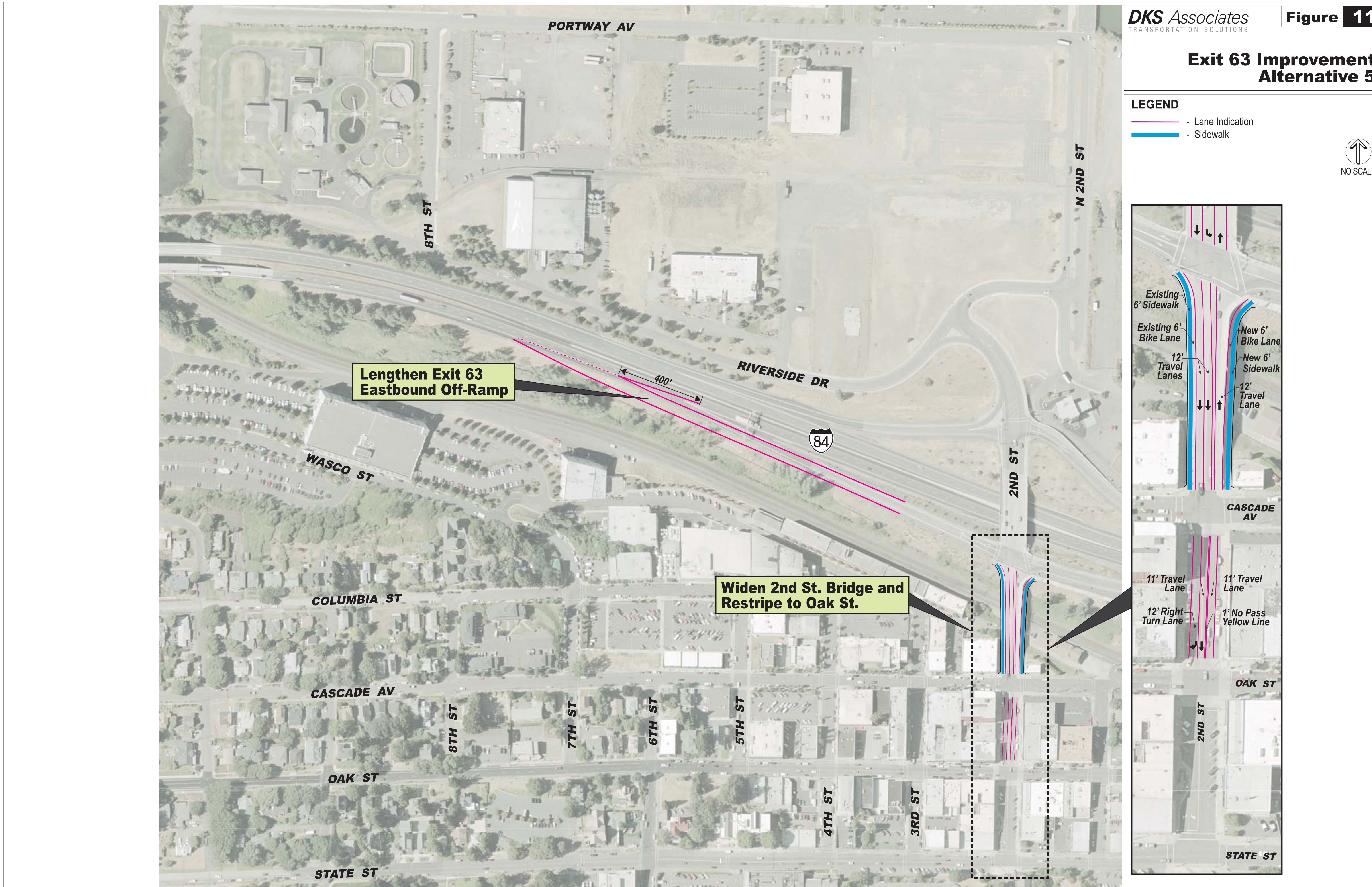
- **Alternative 7**: **Extended I-84 EB off-ramp with Added 2nd Street Southbound Lane from I-84 WB to Oak Street** – This alternative (illustrated in Figure 13) is similar to Alternative 5, but extends the length of the added southbound lane on 2nd Street over I-84 to the westbound ramp terminal. This not only provides more queue storage, but allows for accommodation of dual left turns from the westbound off-ramp as well.

Queuing results for Alternatives 4, 5, 6, and 7 are shown in Table 11. Note that in all of these alternatives the signal timing at the 2nd Street/ Oak Street intersection was modified to place a priority on clearing the interchange ramps. As a result, other movements in the downtown area experience more delay and longer queues. It was also assumed that the intersection of 2nd Street at Cascade Avenue would be restricted to right-in and right-out movements only as part of the No Build condition.

In general, the southbound queue spillback problem still occurs with these new alternatives in place, but the impact is slightly lessened. Queuing through intersections north of I-84 is similar to what was experienced under the previous alternatives. However, it is clear that the provision of a secondary access for the waterfront via the 8th Street overcrossing is beneficial for mitigating congestion in that area.

Only Alternative 7 is able to mitigate conditions so that off-ramp queues can be safely accommodated. The key feature allowing for this is the addition of dual left turn lanes from the I-84 westbound off-ramp and the added southbound lane on 2nd Street from the I-84 westbound off-ramp to Oak Street.


DKS Associates
TRANSPORTATION SOLUTIONS
Figure 10
Exit 63 Improvement Alternative 4
LEGEND
- Lane Indication
- Sidewalk
- Stop Sign Controlled
NO SCALE
2' Bridge Rail
6' Sidewalk
6' Bike
11' Travel Lane
11' Travel Lane
6' Bike
6' Sidewalk
2' Bridge Rail
34' Curb to Curb
50' Minimum ROW
8th Street Extension From Portway Ave. to Wasco St.
Widen 2nd St. Bridge and Restripe to Oak St.
PORTWAY AV
8TH ST
N 2ND ST
RIVERSIDE DR
84
WASCO ST
2ND ST
COLUMBIA ST
CASCADE AV
7TH ST
6TH ST
5TH ST
OAK ST
4TH ST
3RD ST
STATE ST
Existing 6' Sidewalk
Existing 6' Bike Lane
12' Travel Lanes
New 6' Bike Lane
New 6' Sidewalk
12' Travel Lane
CASCADE AV
11' Travel Lane
11' Travel Lane
12' Right Turn Lane
1' No Pass Yellow Line
OAK ST
2ND ST
STATE ST



DKS Associates
TRANSPORTATION SOLUTIONS
Figure 11
Exit 63 Improvement Alternative 5
LEGEND
- Lane Indication
- Sidewalk
NO SCALE
PORTWAY AV
8TH ST
N 2ND ST
RIVERSIDE DR
Lengthen Exit 63 Eastbound Off-Ramp
400'
84
WASCO ST
2ND ST
Widen 2nd St. Bridge and Restripe to Oak St.
COLUMBIA ST
CASCADE AV
OAK ST
STATE ST
7TH ST
6TH ST
5TH ST
4TH ST
3RD ST
Existing 6' Sidewalk
Existing 6' Bike Lane
12' Travel Lanes
New 6' Bike Lane
New 6' Sidewalk
12' Travel Lane
11' Travel Lane
12' Right Turn Lane
1' No Pass Yellow Line

DKS Associates
TRANSPORTATION SOLUTIONS

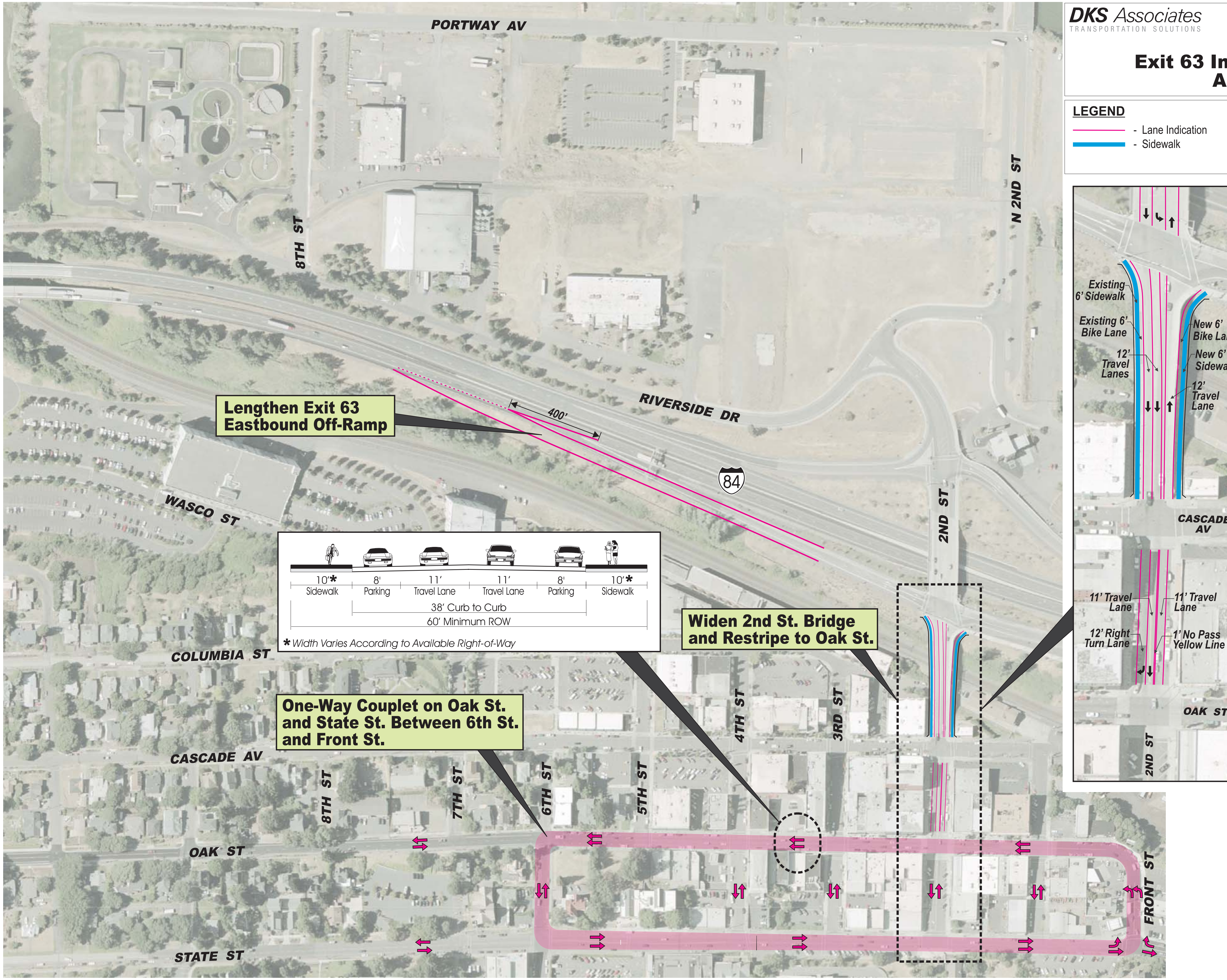
Figure 12

Exit 63 Improvement Alternative 6

LEGEND

- Lane Indication
- Sidewalk

NO SCALE



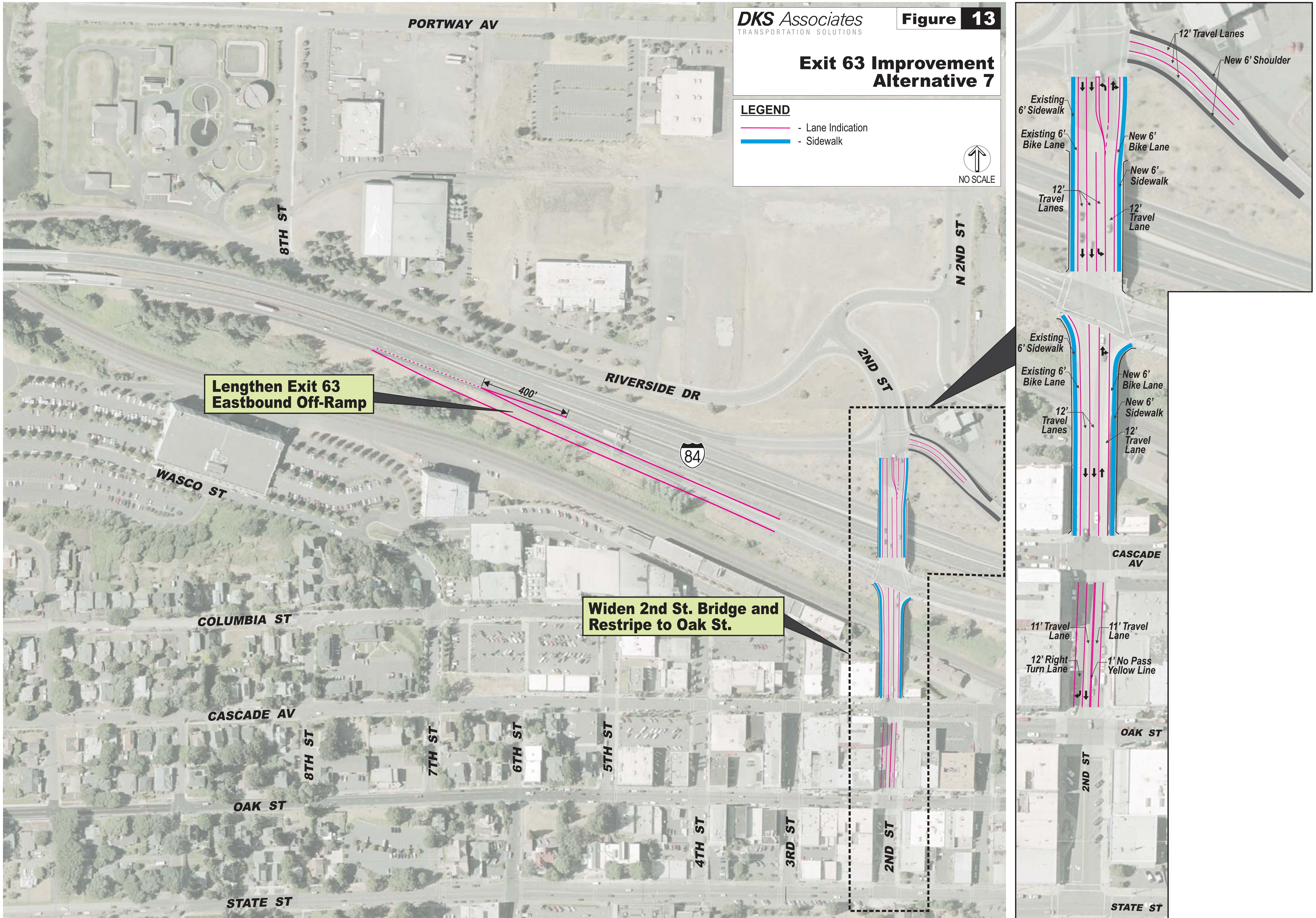

DKS Associates
TRANSPORTATION SOLUTIONS
Figure 13
Exit 63 Improvement Alternative 7
LEGEND
- Lane Indication
- Sidewalk
NO SCALE
PORTWAY AV
8TH ST
N 2ND ST
RIVERSIDE DR
2ND ST
Lengthen Exit 63 Eastbound Off-Ramp
400'
84
WASCO ST
Widen 2nd St. Bridge and Restripe to Oak St.
COLUMBIA ST
CASCADE AV
8TH ST
7TH ST
6TH ST
5TH ST
OAK ST
4TH ST
3RD ST
2ND ST
STATE ST
12' Travel Lanes
New 6' Shoulder
Existing 6' Sidewalk
Existing 6' Bike Lane
New 6' Bike Lane
New 6' Sidewalk
12' Travel Lanes
12' Travel Lane
Existing 6' Sidewalk
Existing 6' Bike Lane
New 6' Bike Lane
New 6' Sidewalk
12' Travel Lanes
12' Travel Lane
CASCADE AV
11' Travel Lane
11' Travel Lane
12' Right Turn Lane
1' No Pass Yellow Line
OAK ST
2ND ST
STATE ST

Table 11: 95th Percentile Queues for Alternatives 4, 5, 6, and 7 (2031 Weekday PM Peak)

Movement	Available Storage	Alt 0 (No-Build)	Alternative 4	Alternative 5	Alternative 6	Alternative 7
		Weekday	Weekday	Weekday	Weekday	Weekday
2nd Street/ Portway Avenue						
EBTHRU-R	-	175'	100'	100'	100'	100’
WBL-THRU	-	25'	150'	175'	175'	150’
NBLR	300’	75'	75'	150'	125'	125’
SBL-THRU-R	-	75'	75'	75'	75'	75’
2nd Street/ Anchor Way						
EBLR	600’	1,300'	100'	400'	150'	100’
NBLT	400’	50'	75'	125'	100'	100’
SBTR	300’	375'	50'	200'	100'	25’
2nd Street/ Riverside Drive						
EBLT	1,300’	950'	-	-	-	-
EBR	100' (1,300’)	75'	50'	1,450'	1,450'	250’
WBL-THRU-R	275’	475'	-	-	-	-
(WBR)	275’	-	-	-	25'	25’
NBL	100'	175'	-	-	-	-
NBTHRU-R	325'	275'	-	-	-	-
SBL	50’	75'	-	-	-	-
SBTHRU-R	400’	400'	275'	450'	400'	275’
2nd Street/ I-84 WB Ramps						
(WBL)	225’	-	-	-	-	175’
WBL-THRU	300'	1,750'	500'	450'	375'	175’
WBR	200' (250')	200	200'	175'	150'	125’
NBL	150'	125'	125'	125'	125'	100’
NBT	300'	350'	200'	350'	400'	325’
SBT	325'	375'	350'	325'	350'	350’
SBR	125'	125'	125'	125'	125'	125’
2nd Street/ I-84 EB Ramps						
EBL-THRU	325' (600')	2,500'	200'	475'	325'	450’
EBR	275' (500')	175'	125'	375'	175'	250’
NBTR	300'	375'	250'	350'	375'	350’
SBL	175'	150'	125'	125'	175'	125’
SBT	300'	400'	325'	425'	425'	250’
2nd Street/ Cascade Avenue						
EBR	225'	2,925'	300'	975'	100'	1,250’
WBR	200'	100'	50'	100'	100'	100’

Movement	Available Storage	Alt 0 (No-Build)	Alternative 4	Alternative 5	Alternative 6	Alternative 7
		Weekday	Weekday	Weekday	Weekday	Weekday
NBTHRU-R	200'	175'	50'	200'	175'	175'
SBTHRU	325'	-	-	-	-	350'
SBTHRU-R	325'	350'	125'	250'	150'	325'
2nd Street/ Oak Street						
EBL-THRU-R	200'	300'	100'	525'	-	525'
WBL-THRU-R	200'	450'	375'	600'	275'	575'
NBL-THRU-R	200'	300'	300'	300'	-	275'
(NBL-THRU)	(200')	-	-	-	275'	-
SBL-THRU	200'	225'	325'	325'	-	350'
(SBT)	(200')	-	-	-	150'	-
SBR	50' (200')	100'	200'	250'	200'	200'

Notes: Shaded cells indicate queues exceed available storage.
Movements/Storage Lengths in parentheses represent those associated with improvements

While the queues on the I-84 westbound off-ramp still exceed the available storage for Alternatives 4, 5, and 6, they are significantly shorter than under the previous alternatives and would not reach the freeway mainline. The key to this improvement was the added southbound lane on 2nd Street between the I-84 eastbound ramps and Oak Street, coupled with signal timing that prioritized the clearing of the off-ramps. The addition of the State Street/ Oak Street couplet in Alternative 6 provides further improvement, reducing the westbound off-ramp queue by another 75 feet. The ability to lengthen the off-ramp exists only in the eastbound direction because the westbound off-ramp is too close to the adjacent Exit 64 interchange ramp to be safely moved further east.

The queuing problems on the I-84 eastbound off-ramp are completely mitigated under each of the new alternatives. Through the analysis it was discovered that these queues could either be shortened by constructing the 8th Street overcrossing or the State/Oak couplet, or could be better accommodated by simply lengthening the eastbound off-ramp. In fact, Alternative 6 could be modified to remove the element that lengthens the eastbound off-ramp.

Queuing in the downtown is slightly improved along 2nd Street between the I-84 eastbound off-ramps and Oak Street, but is worse on the eastbound and westbound approaches attempting to circulate through the downtown or enter the interchange area. This is caused by the signal timing modifications that were necessary to minimize off-ramp queues, especially the westbound off-ramp, which continues to queue into the section of the ramp needed for vehicle deceleration. While these conditions may only occur during peak travel times, the implementation of the State Street/ Oak Street couplet could improve downtown mobility.

The queuing analysis performed for Alternatives 4, 5, 6, and 7 during the year 2031 was repeated for the Sunday p.m. peak hour, with the results shown in Table 12. As shown, performance during the Sunday peak is similar in many ways to that under the weekday peak. Queuing north of I-84 along 2nd Street is much like it was during the weekday peak, with the only issues being those related to the southbound queue spillback from the 2nd Street/ Oak Street bottleneck.

Similar results were found at the I-84 ramp terminals as well. The eastbound off-ramp queue can be mitigated under any of the three alternatives considered, but the westbound off-ramp queue can only be mitigated under Alternative 7. However, the westbound off-ramp queues under Alternatives 4, 5, and 6 are shortened to 500 feet or less, which would be within the deceleration section of the ramp, but would not encroach upon the freeway mainline.

In the downtown area, queuing results were again similar to those during the weekday peak in many areas. However, the level of queuing and congestion for eastbound traffic at the 2nd Street/ Oak Street intersection was significantly longer under Alternatives 4, 5, and 7. This may be due to the signal timing modifications that were necessary to clear the I-84 ramp queues. While such signal timing will be necessary during peak travel times to avoid hazardous conditions created by long off-ramp queues into the freeway, they will degrade mobility through the downtown at the same time.

While the need to operate the 2nd Street/ Oak Street signal to prioritize ramp movements would only occur during peak travel times, the creation of a couplet along Oak Street and State Street may be an option to preserve mobility through the downtown. Because the analysis of such a couplet was only focused on its potential impact on the Exit 63 interchange, a comprehensive study of the impacts of a couplet through the downtown should be completed if this alternative is pursued.

Table 12: 95th Percentile Queues for Alternatives 4, 5, 6, and 7 (2031 Sunday PM Peak)

Movement	Available Storage	Alt 0 (No-Build)	Alternative 4	Alternative 5	Alternative 6	Alternative 7
		Sunday	Sunday	Sunday	Sunday	Sunday
2nd Street/ Portway Avenue						
EBTHRU-R	-	250'	100'	100'	100'	100’
WBL-THRU	-	450'	175'	175'	200'	175’
NBLR	300’	350'	75'	125'	150'	125’
SBL-THRU-R	-	400'	75'	75'	75'	75’
2nd Street/ Anchor Way						
EBLR	600’	1,150'	100'	75'	75'	75’
NBLT	400’	75'	75'	100'	125'	100’
SBTR	300’	475'	25'	125'	100'	25’
2nd Street/ Riverside Drive						
EBLT	1,300’	150'	-	-	-	-
EBR	100' (1,300’)	75'	100'	250’	275’	100’

Movement	Available Storage	Alt 0 (No-Build)	Alternative 4	Alternative 5	Alternative 6	Alternative 7
		Sunday	Sunday	Sunday	Sunday	Sunday
WBL-THRU-R	275’	475'	-	-	-	-
(WBR)	275’	-	50'	25'	25'	25’
NBL	100'	150'	-	-	-	-
NBTHRU-R	325'	250'	-	-	-	-
SBL	50’	75'	-	-	-	-
SBTHRU-R	400’	400'	125'	375'	350'	125’
2nd Street/ I-84 WB Ramps						
(WBL)	225’	-	-	-	-	200’
WBL-THRU	300'	1,700'	475'	500'	450'	200’
WBR	200' (250')	200'	200'	175'	175'	125’
NBL	150'	125'	125'	125'	150'	100’
NBT	300'	300'	125'	300'	350’	225’
SBT	325'	375'	300'	350'	350'	325’
SBR	125'	125'	125'	125'	125'	125’
2nd Street/ I-84 EB Ramps						
EBL-THRU	325' (600')	2,425'	100'	250'	250'	250’
EBR	275' (500')	175'	150'	200'	225'	200’
NBTR	300'	300'	200'	175'	325'	200’
SBL	175'	150'	125'	150'	175'	150’
SBT	300'	400'	225'	425'	350'	250’
2nd Street/ Cascade Avenue						
EBR	225'	1,500'	275'	125'	75'	125’
WBR	200'	100'	75'	75'	100'	100’
NBTHRU-R	200'	75'	100'	100'	100'	100’
(SBTHRU)	325’	-	-	-	-	175’
SBTHRU-R	325'	325'	225'	125'	200'	175’
2nd Street/ Oak Street						
EBL-THRU-R	200'	2,850’	2,450’	2,775’	-	2,725
WBL-THRU-R	200'	275’	475’	500’	275’	425’
NBL-THRU-R	200'	300’	300’	275’	-	275’
(NBL-THRU)	(200')	-	-	-	275’	-
SBL-THRU	200'	225’	350’	300	-	325’
(SBT)	(200')	-	-	-	150’	-
SBR	50' (200')	100’	200’	225’	200’	225’

Notes: Shaded cells indicate queues exceed available storage.
Movements/Storage Lengths in parentheses represent those associated with improvements

Intersection operational analysis results for each alternative during the 2031 Weekday and Sunday p.m. peak hours are provided in Tables 13 and 14, respectively. Alternative 4, which included the 8th Street overcrossing, performs the best with all intersections through the 2nd Street corridor meeting mobility standards by the largest margin. Alternative 6 also performs well, with all intersections meeting mobility standards, but with higher v/c ratios at the I-84 ramp terminals than under Alternative 4.

Intersection operations under Alternative 5 are similar to the No Build condition in many cases. The 2nd Street/Riverside Drive intersection has been mitigated through conversion to right-in/right-out turning movements only. However, the critical intersections along 2nd Street at the I-84 ramp terminals and at Oak Street show little or no improvement over the No Build condition. This is because the main difference between Alternative 5 as compared to Alternatives 4 and 6 is that the improvements included are purely for queue management, which has little impact on traffic demand or intersection capacity calculations.

Finally, Alternative 7 shows similar results as Alternative 5, but yields better operations through the interchange ramp terminals. However, the intersection at 2nd Street at Oak Street still fails to meet mobility standards.

In summary, southbound queue spillback through the 2nd Street corridor will occur under all alternatives considered – starting at the 2nd Street/ Oak Street bottleneck and extending beyond Riverside Drive. This condition is similar to what will occur at the Exit 64 interchange. While this level of congestion will result in additional delay for motorists, the corridors can operate safely as long as the I-84 off-ramp queues can be managed to stay out of the freeway mainline and the section of the ramp needed for deceleration from freeway speeds.

Only Alternative 7 is able to mitigate this congestion so that both the I-84 eastbound and westbound off-ramp queues can be safely stored. Alternatives 4, 5, and 6 are all effective at mitigating the I-84 eastbound off-ramp queues. They are all also able to keep the I-84 westbound off-ramp queues from reaching the freeway mainline – a substantial improvement over No Build conditions. However, none of them can mitigate the westbound queues to the degree necessary to keep them out of the section of the off-ramp needed for deceleration from freeway speeds, which will shorten the available stopping distance for traffic exiting the freeway. Among the three alternatives, Alternative 6 (including the downtown couplet) results in the shortest westbound off-ramp queues, at an average of more than 50 feet shorter than Alternatives 4 or 5.

Unlike the eastbound off-ramp, the westbound off-ramp cannot be lengthened to increase the available queue storage because of the existing proximity to the westbound on-ramp from Exit 64. Moving these ramps closer together would shorten the weaving distance between them and could potentially create a hazardous situation. Additionally, lengthening the westbound off-ramp would impact the bridge over the Hood River, requiring either bridge widening or a new structure, which would significantly increase the cost of such an improvement.

To help manage these off-ramp queues, it may be necessary to implement a signal timing plan for the intersections along 2nd Street (Oak Street through the I-84 Westbound off-ramp) during peak travel periods that prioritizes movements away from the interchanges. While this would help avoid a dangerous situation on the freeway, it would have negative impacts on the downtown and could cause a significant amount of congestion as vehicles attempting the access the interchange or simply circulate across 2nd Street are giving less green time at the 2nd Street/ Oak Street signal.

Table 13: Alternatives Intersection Operations (2031 Weekday PM Peak)

Intersection	Mobility Standard	Alternative 0 (No Build)			Alternative 4			Alternative 5			Alternative 6			Alternative 7		
		LOS	Delay (sec)	v/c	LOS	Delay (sec)	v/c	LOS	Delay (sec)	v/c	LOS	Delay (sec)	v/c	LOS	Delay (sec)	v/c
2nd St/ Portway Ave	C / C	B	10.9	0.22	B	11.8	0.54	B	14.0	0.59	B	14.1	0.59	B	14.0	0.59
2nd St/ Anchor Wy	C / C	B	10.5	0.19	B	13.1	0.26	B	14.7	0.29	B	14.1	0.25	B	14.7	0.29
2nd St/ Riverside Dr	0.90 / 0.80	E	40.6	0.94	B	12.2	0.03	C	15.7	0.26	C	16.1	0.31	C	15.7	0.26
2nd St/ I-84 WB	0.85 / 0.70	C	20.2	0.74	B	18.3	0.59	C	21.1	0.75*	B	16.1	0.67	B	15.2	0.60
2nd St/ I-84 EB	0.85 / 0.70	B	18.9	0.81	B	11.3	0.57	B	17.0	0.80*	B	17.9	0.78*	B	15.4	0.75*
2nd St/ Cascade Ave	0.90 / 0.80	F	>60.0	>1.00	C	15.4	0.31	C	19.2	0.40	C	15.7	0.43	C	15.1	0.28
2nd St/ Oak St	0.90 / 0.80	B	14.6	0.83	B	13.3	0.74	B	17.0	0.81*	B	16.4	0.56	B	17.2	0.81*

Table 14: Alternatives Intersection Operations (2031 Sunday PM Peak)

Intersection	Mobility Standard	Alternative 0 (No Build)			Alternative 4			Alternative 5			Alternative 6			Alternative 7		
		LOS	Delay (sec)	v/c	LOS	Delay (sec)	v/c	LOS	Delay (sec)	v/c	LOS	Delay (sec)	v/c	LOS	Delay (sec)	v/c
2nd St/ Portway Ave	C / C	B	12.7	0.28	B	13.4	0.62	C	15.5	0.69	C	15.2	0.68	C	15.5	0.69
2nd St/ Anchor Wy	C / C	B	10.4	0.10	B	11.6	0.15	B	13.8	0.15	B	13.1	0.13	B	13.8	0.15
2nd St/ Riverside Dr	0.90 / 0.80	D	29.0	0.84	B	11.7	0.06	B	14.4	0.19	B	14.5	0.20	B	14.4	0.19
2nd St/ I-84 WB	0.85 / 0.70	C	20.1	0.71	B	18.6	0.54	B	15.3	0.64	B	16.4	0.63	B	12.5	0.50
2nd St/ I-84 EB	0.85 / 0.70	B	14.7	0.68	B	9	0.44	B	14.7	0.67	B	14.1	0.64	B	13.7	0.57
2nd St/ Cascade Ave	0.90 / 0.80	E	47.8	0.65	B	13.2	0.15	C	15.5	0.20	B	14.0	0.17	B	14.4	0.17
2nd St/ Oak St	0.90 / 0.80	C	27.6	0.96	C	21.1	0.79	C	33.7	0.96	B	18.0	0.60	C	32.6	0.96

Notes: Shaded cells indicate mobility standard is not met.
Different mobility standards apply to No Build vs. Build scenarios. (#/#) = (No Build/Build) mobility standard
* No Build mobility standard applied to intersections not mitigated to address insufficient capacity.

The creation of a couplet in the downtown may be able to offset some of this congestion. The analysis of the couplet alternative performed for this study was limited to the impacts through the interchange along 2nd Street and did not include a comprehensive assessment of the impacts on the downtown itself. If Alternative 6 (including the downtown couplet) is to be pursued further, a thorough evaluation of the impacts to the downtown must be completed, addressing issues such as: the exact alignment of the one-way roadways, impacts on parking, bicycle/pedestrian circulation, and private property, traffic control changes required, and operational impacts on the surrounding city street network.

Given that Alternatives 4, 5, and 6 can not mitigate the I-84 westbound off-ramp queues to the desired level, it is recommended that if any of these alternatives is chosen that it be supplemented with traffic management and demand management strategies. Additionally, even if Alternative 7 is chosen, supplementation with these strategies could provide further improvements or act as interim enhancements until the ultimate improvements can be made. The traffic management strategy is aimed at improving safety by providing advanced warning to approaching freeway traffic when long ramp queues are present. The traffic demand management (TDM) strategies are aimed at reducing the forecasted traffic volumes during the peak travel periods. Both are described further below.

Transportation Management Strategy

This strategy is focused on mitigating the potential safety hazard that could be created by the long Exit 63 westbound off-ramp queue. It can be used either as interim enhancement until further improvements can be made, or could supplement any alternative selected. While this queue is not projected to reach the freeway mainline, for Alternatives 4, 5, and 6, it is projected to encroach upon the section of the off-ramp needed for deceleration from freeway travel speeds, which may not provide exiting vehicles with adequate stopping distance. Because Alternative 7 can successfully mitigate ramp queuing problems, there would be no need to employ this strategy as anything other than an interim improvement.

The fundamental element of this strategy is improving the awareness of approaching drivers on the freeway, which may result in lower travel speeds or increased reaction time if the off-ramp is obstructed. This will occur through detection of congestion on the off-ramp, assessment of the condition, and provision of advanced warning.

Long ramp queues extending into the deceleration section of the off-ramp would be detected by induction loops placed in the pavement (similar to those used at traffic signals). When long queues are detected, an alert would be sent to ODOT's Traffic Management Operations Center (TMOC), where operators could visually assess the degree of the potential problem through cameras installed in the interchange area. Should it be determined that conditions warrant such action, operators could display a message on the existing variable message sign on I-84 westbound, just east of the Exit 64 interchange that warns drivers of congestion ahead.

The installation of cameras in this area was previously planned through the ODOT Region 1 Intelligent Transportation Systems Plan and may be included as part of the Exit 64 interchange construction project. Therefore, the cost to implement this strategy may be relatively low.

Transportation Demand Management (TDM)

In contrast to other alternatives that rely on funding and constructing physical infrastructure improvements to add capacity, Transportation Demand Management (TDM) considers reducing trips to make existing capacity last longer through a wide range of strategies aimed at changing driver behavior. Table 15 lists several common TDM strategies.

Research has shown that a comprehensive set of complementary policies implemented over a large geographic area can have an effect on the number of vehicle miles traveled to/from that area.[2] However, the same research indicates that for TDM measures to be effective, they should go beyond the low-cost, uncontroversial measures commonly used such as carpooling, transportation coordinators/associations, priority parking spaces, etc.

To be effective, the application of TDM strategies should provide a wide range of options to appeal to various users. Many TDM strategies are most effective when applied to employment-based trips. However, in the Exit 63 interchange area, the need for reduced demand to manage congestion and queuing is present during both the weekday p.m. peak period as well as during the Sunday p.m. peak period. Therefore, a range of strategies must be considered that will encourage reduced trip-making on weekdays as well as on weekends. Strategies that may be more effective on weekends include: reduced availability of parking, charging a fee for parking, and provision of a complete network of facilities for walking and biking.

The nature of implementing TDM strategies is somewhat different than the more familiar projects involving construction to add capacity or better manage traffic flows. It takes time and resources to work with stakeholders and the affected communities to identify the right combination of TDM strategies, as well as to effectively implement the TDM plan over time. Also, unlike construction projects that provide relief immediately after implementation, it can often take years to realize the full potential of some TDM strategies where a change in driver behavior is required. Therefore, the process of developing and implementing an area-wide or city-wide TDM program should begin well before the transportation problems they are aimed at addressing occur.

To pursue this strategy, it is recommended that the City of Hood River work with area stakeholders such as ODOT, Hood River County, the Port of Hood River, the cities of Bingen and White Salmon, and major employers in the area to develop a TDM program. Key elements of this effort may include: strategies that would be most effective in this area, potential funding sources, means of program implementation and enforcement, and educational and outreach efforts needed to encourage changes in behavior.

---

[2] *The Potential for Land Use Demand Management Policies to Reduce Automobile Trips*, ODOT, by ECO Northwest, June 1992.

Table 15: Transportation Demand Management Strategies

Strategy	Description	Potential Trip Reduction
Telecommuting	Employees perform regular work duties at home or at a work center closer to home, rather than commuting from home to work. This can be full time or on selected workdays. This can require computer equipment to be most effective.	82-91% (Full Time) 14-36% (1-2 day/wk)
Compressed Work Week	Schedule where employees work their regular scheduled number of hours in fewer days per week.	7-9% (9 day/80 hr) 16-18% (4 day/40 hr) 32-36% (3 day/36 hr)
Alternative Mode Subsidy	For employees that commute to work by modes other than driving alone, the employer provides a monetary bonus to the employee.	21-34% (full subsidy of cost, high alternative modes) 2-4% (half subsidy of cost, medium alternative modes)
Cash Out Employee Parking	An employer that has been subsidizing parking (free parking) discontinues the subsidy and charges all employees for parking. An amount equivalent to the previous subsidy is then provided to each employee, who then can decide which mode of travel to use (with subsidy above the cost of a monthly transit pass, those employees would realize monetary gain for using transit).	8-20% (high transit services available) 5-9% (medium transit services available) 2-4% (low transit services available)
Provide Vanpools	Employees that live near each other are organized into a vanpool for their trip to work. The employer may subsidize the cost of operation and maintaining the van.	15-25% (company provided van with fee) 30-40% (subsidized van)
Bicycle Program	Employers provide support services to those employees that bicycle to work. Examples include: safe/secure bicycle storage, shower facilities and subsidy of commute bicycle purchase.	0-10%
Reduced Parking or Toll Costs for HOVs	In areas where parking is not free, a reduced (or waived) fee is charged for HOVs (High Occupancy Vehicles). Similarly, reduced fees could be applied to HOVs on facilities that are tolled.	1-3%
On-site Rideshare Matching	Employees who are interested in carpooling or vanpooling provide information to a transportation coordinator regarding their work hours, availability of a vehicle and place of residence. The coordinator then matches employees who can reasonably rideshare together.	1-2%
Gift/Awards for Alternative Mode Use	Employees are offered the opportunity to receive a gift or an award for using modes other than driving alone.	0-3%
Walking Program	Provide support services for those who walk to work. This could include buying walking shoes or providing lockers and showers.	0-3%
Company Cars for Business Travel	Employees are allowed to use company cars for business-related travel during the day	0-1%
Guaranteed Ride Home Program	A company owned or leased vehicle is provided in the case of an emergency for employees that use alternative modes.	1-3%
Time off with Pay for Alternative Mode Use	Employees are offered time off with pay as an incentive to use alternative modes.	1-2%

Source: G*uidance for Estimating Trip Reductions from Commute Options*, Oregon Department of Environmental Quality, August 1996.

Freeway Operations

As noted previously, the improvements associated with the alternatives proposed do not have a significant impact on the number of trips that attempt to enter or leave the freeway interchanges. However, freeway operations surrounding the interchanges was performed to confirm that either the freeway would operate acceptably under all alternatives or would at least experience no significant change in operations.

Tables 16 and 17 present the freeway operational analysis results for alternatives, along with those previously reported for the No Build condition in 2031. Because it was the only operationally acceptable alternative, only Alternative 3 was analyzed for the Exit 62 study area. For the Exit 63/64 study area, Alternatives 4, 5, 6, and 7 were analyzed.

As shown, in all cases, the alternatives have little or no impact on freeway operations. The I-84 westbound off-ramp diverge at Exit 62 is the only movement that fails to comply with ODOT mobility standards, but this is also true under the No Build condition.

Table 16: Future (2031) Weekday PM Peak Hour I-84 Operational Analysis

Location	Direction	Mobility Standard (v/c)	No-Build		Exit 62 Alt. 3 with Exit 63/64 Alt. 4		Exit 62 Alt. 3 with Exit 63/64 Alt. 5 or 7		Exit 62 Alt. 3 with Exit 63/64 Alt. 6	
			LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c
Basic Freeway Analysis										
West of Exit 62	WB	0.70	B	0.40	B	0.37	B	0.40	B	0.40
Weaving Analysis										
Exit 63-64	WB	0.70	B	0.49	B	0.53	B	0.49	B	0.53
	EB	0.70	B	0.44	C	0.56	B	0.44	B	0.55
Merging & Diverging Analysis										
Exit 62	EB Off-ramp Diverge	0.70	B	0.37	B	0.37	B	0.37	B	0.37
	EB On-ramp Merge	0.70	B	0.51	B	0.51	B	0.51	B	0.51
	WB Off-ramp Diverge	0.70	C	0.55	C	0.52	C	0.55	C	0.55
	WB On-ramp Merge	0.70	B	0.40	B	0.38	B	0.40	B	0.40
Exit 63	WB On-ramp Merge	0.70	C	0.52	B	0.49	C	0.52	C	0.52
	EB Off-ramp Diverge	0.70	C	0.51	C	0.51	C	0.51	C	0.51
Exit 64	WB Off-ramp Diverge	0.70	C	0.48	C	0.48	C	0.48	C	0.48
	EB On-ramp Merge	0.70	B	0.38	B	0.44	B	0.38	B	0.39

Table 17: Future (2031) Sunday PM Peak Hour I-84 Operational Analysis

Location	Direction	Mobility Standard (v/c)	No-Build		Exit 62 Alt. 3 with Exit 63/64 Alt. 4		Exit 62 Alt. 3 with Exit 63/64 Alt. 5 or 7		Exit 62 Alt. 3 with Exit 63/64 Alt. 6	
			LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c
Basic Freeway Analysis										
West of Exit 62	WB	0.70	C	0.67	C	0.64	C	0.67	C	0.67
Weaving Analysis										
Exit 63-64	WB	0.70	C	0.62	C	0.61	C	0.62	C	0.61
	EB	0.70	B	0.48	B	0.55	B	0.48	B	0.53
Merging & Diverging Analysis										
Exit 62	EB Off-ramp Diverge	0.70	B	0.37	B	0.40	B	0.40	B	0.40
	EB On-ramp Merge	0.70	B	0.48	B	0.48	B	0.48	B	0.48
	WB Off-ramp Diverge	0.70	D	0.72	D	0.70	D	0.72	D	0.73
	WB On-ramp Merge	0.70	C	0.67	C	0.65	C	0.67	C	0.67
Exit 63	WB On-ramp Merge	0.70	C	0.68	C	0.66	C	0.68	C	0.68
	EB Off-ramp Diverge	0.70	C	0.48	C	0.47	C	0.48	C	0.48
Exit 64	WB Off-ramp Diverge	0.70	D	0.67	D	0.67	D	0.67	D	0.67
	EB On-ramp Merge	0.70	B	0.33	B	0.41	B	0.33	B	0.34

Notes: Shaded cells indicate mobility standard is not met.

I-84 Frontage Road and Exit 63/64 Split Diamond Interchange

The I-84 Frontage Road and Exit 63/64 Split Diamond Interchange projects were originally proposed as a means to remove local trips passing between the Exit 63 and Exit 64 interchanges from I-84 mainline. The operational impacts of each of these alternatives has been analyzed and described in the *Revised Draft Forecast Traffic Conditions*[3] technical memorandum produced as part of the Hood River Frontage Road Feasibility Study and Split Diamond Interchange Analysis effort. Each project is described below.

I-84 Frontage Road

The frontage road concept was developed to remove local trips from I-84 by providing an alternate route. The proposed frontage road would connect the waterfront with Port Marina Park via a two-lane road paralleling I-84 to the north. This would also provide a second access to the waterfront, potentially removing trips from the Exit 63 interchange.

Because of the low design speed of the frontage road and the out-of-direction travel and delay that would be experienced to travel between the frontage road and the downtown area, the frontage road is generally only used by drivers with an origin or destination near the ends of the frontage road itself (i.e., the waterfront, Port Marina Park, Interstate Bridge, and Marina Way commercial district). With usage varying according to the quality of access to 2nd Street, projected weekday p.m. peak hour volumes on the frontage road range from 125 to 200 vehicles per hour. This would equate to a high-volume local street or a low-volume collector street. The reduction in local trips from the freeway mainline was estimated at 13 to 16%. Operationally, the frontage road has little effect on the surrounding transportation system, with minor negative impacts on the 2nd Street corridor through the Exit 63 interchange.

In summary, the I-84 frontage road improves connectivity for local traffic with trip origins or destinations in the immediate vicinity, but does not significantly benefit I-84 or the interchanges at Exits 63 and 64.

Exit 63/64 Split Diamond Interchange

The construction of a split diamond interchange would link Exits 63 and 64 by removing the on and off-ramps between these interchanges and replacing them with collector-distributor roadways paralleling each side of I-84 that join the ramp terminal intersections at 2nd Street and Button Bridge Road. This alternative was primarily focused on removing local trips from the freeway and eliminating weaving maneuvers on I-84 between the closely spaced interchanges.

To relieve some of the congestion that would be caused by combining the eastbound and westbound on-ramps, additional slip off-ramps were proposed to connect into the collector-distributor roads. However, even with these added ramps, all four ramp terminals at the Exit 63 and 64 interchanges fail to meet mobility standards, with the Exit 63 ramp terminals operating with volume to capacity ratios greater than 1.0.

The added delay at the Exit 63 and 64 ramp terminals causes a diversion of approximately 110 vehicles per hour during the weekday p.m. peak through the downtown and around Button Junction (OR 35/ State Street intersection). While the impact of this diversion on the OR 35/ State

[3] *Revised Draft Forecast Traffic Conditions Technical Memorandum*, Hood River Frontage Road Feasibility Study and Split Diamond Interchange Analysis, HNTB Corporation, June 1, 2009.

Street intersection is minor, it results in a reduction of capacity at the already failing 2nd Street/ Oak Street intersection of approximately 20%.

In summary, while a split diamond interchange including Exits 63 and 64 would remove weaving and local trips from the freeway mainline, it will not function adequately without substantial improvements such as a new five-lane overcrossing at 2nd Street with additional turn lanes at the ramp terminals. However, the need for a project of this magnitude may not be realized by the year 2031. Therefore, the immediate focus should be on mitigating the forecasted congestion along 2nd Street and the bottleneck at the intersection with Oak Street. Unless these issues are resolved through other improvements, the effectiveness of long-range projects needed beyond 2031, such as a split diamond interchange or a higher capacity Interstate Bridge, will be limited.

Planning-Level Cost Estimates

Planning-level cost estimates were developed for operationally acceptable alternatives considered (Tables 18 and 19). While it remains operationally flawed with queue spillback problems, the roundabout interchange for Exit 62 was also included for comparison purposes. These estimates are intended to support long-range project programming and are based on available data sets and field observations, without the benefit of detailed surveys to accurately define potential environmental impacts, geological constraints, drainage needs, right of way impacts, and other factors that could affect construction costs. Therefore, as projects are developed in more detail in the future, the estimated costs should be updated.

Table 18: Exit 62 Area Planning-Level Cost Estimates for Proposed Alternatives (2009 Dollars)

Improvement Project		Estimated Cost
Exit 62 Study Area		
Pedestrian Projects		
Construct sidewalk along the south side of Country Club Rd.		$400,000
Construct sidewalk along Frankton Rd.		$515,000
Bicycle Projects		
Construct bicycle lanes along Country Club Rd.		$365,000
Construct bicycle lanes along Frankton Rd.		$235,000
Construct bicycle lanes along Rand Rd.		$43,000
Motor Vehicle Projects		
Alternative 3: Cascade Avenue Capacity Enhancements with Realigned Country Club Road		$27,700,000
Potential Phases:	*Exit 62 Interchange Reconstruction*	*$20,800,000*
	Country Club Rd. Realignment (includes Mt. Adams Ave. between Cascade Ave. and Country Club Rd.)	*$4,800,000*
	Widen Cascade Avenue from Exit 62 to Rand Rd.	*$3,300,000*
Alternative 4: Cascade Avenue Capacity Enhancements with Exit 62 Roundabout Interchange		$39,500,000
Potential Phases:	*Exit 62 Interchange Reconstruction*	*$35,800,000*
	Widen Cascade Avenue from Exit 62 to Rand Rd.	*$4,800,000*

Table 19: Exit 63/64 Area Planning-Level Cost Estimates for Proposed Alternatives (2009 Dollars)

Improvement Project	Estimated Cost
Exit 63/64 Study Area	
Pedestrian Projects	
Construct sidewalk on south side of OR 35 from Button Bridge to Exit 64	$28,000
Construct Multi-use trail from State St. to Port Marina Dr. (includes sidewalk to OR 35)	$498,000
Bicycle Projects	
Provide for Bicycle Accommodations on State St.	$18,000
Motor Vehicle Projects	
Alternative 4: 8th St. Overcrossing with Added 2nd St. SB Lane from I-84 EB to Oak St.	$42,500,000
Alternative 5: Extended I-84 EB off-ramp with Added 2nd St. SB Lane from I-84 EB to Oak St.	$6,500,000
Alternative 6: Extended I-84 EB off-ramp with Added 2nd St. SB Lane from I-84 EB to Oak St. and State St./ Oak St. Couplet	$8,600,000
Alternative 7: Extended I-84 EB off-ramp with Added 2nd St. SB Lane from I-84 WB to Oak St.	$8,000,000
OR 35/ State St. Traffic Signal	$1,100,000
OR 35/ State St. Roundabout	$4,100,000
2nd St./ Anchor Way Roundabout (option if 1st St. is removed)	$1,300,000
Exit 63/64 Ramp Queue Detection	$230,000

Appendix

- Intersection Operations Analysis Worksheets
- Updated Recommended Alternatives Intersection Operational Analysis Worksheets
- Technical Memorandum #5 Addendum #1

Intersection Operations Analysis Worksheets

Updated Recommended Alternatives Intersection Operations Analysis Worksheets

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	5	365	70	15	295	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
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	0.85		1.00	0.99	
Flt Protected	1.00	1.00		0.96	0.95	
Satd. Flow (prot)	1800	1443		1729	1576	
Flt Permitted	1.00	1.00		0.96	0.95	
Satd. Flow (perm)	1800	1443		1729	1576	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	6	429	82	18	347	18
RTOR Reduction (vph)	0	380	0	0	2	0
Lane Group Flow (vph)	6	49	0	100	363	0
Heavy Vehicles (%)	0%	6%	0%	0%	8%	14%
Turn Type		Prot	Split			
Protected Phases	3	3	7	7	2 8	
Permitted Phases						
Actuated Green, G (s)	12.5	12.5		13.7	71.8	
Effective Green, g (s)	12.5	12.5		13.7	71.8	
Actuated g/C Ratio	0.11	0.11		0.12	0.65	
Clearance Time (s)	4.0	4.0		4.0		
Vehicle Extension (s)	3.0	3.0		3.0		
Lane Grp Cap (vph)	205	164		215	1029	
v/s Ratio Prot	0.00	c0.03		c0.06	c0.23	
v/s Ratio Perm						
v/c Ratio	0.03	0.30		0.47	0.35	
Uniform Delay, d1	43.4	44.7		44.7	8.6	
Progression Factor	1.00	1.00		1.00	0.27	
Incremental Delay, d2	0.3	4.6		1.6	0.2	
Delay (s)	43.6	49.3		46.3	2.5	
Level of Service	D	D		D	A	
Approach Delay (s)	49.2			46.3	2.5	
Approach LOS	D			D	A	

Intersection Summary			
HCM Average Control Delay	29.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	0	0	620	0	80	0	380	55	270	230	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)				4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor				0.97		1.00		0.95		1.00	1.00	
Frt				1.00		0.85		0.98		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				3130		1404		3297		1644	1731	
Flt Permitted				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)				3130		1404		3297		1644	1731	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	0	729	0	94	0	447	65	318	271	0
RTOR Reduction (vph)	0	0	0	0	0	68	0	10	0	0	0	0
Lane Group Flow (vph)	0	0	0	729	0	26	0	502	0	318	271	0
Heavy Vehicles (%)	0%	0%	0%	6%	0%	9%	0%	2%	0%	4%	4%	0%
Turn Type				custom		custom				Split		
Protected Phases								7 3		2	2	
Permitted Phases				8		8						
Actuated Green, G (s)				30.8		30.8		30.2		37.0	37.0	
Effective Green, g (s)				30.8		30.8		30.2		37.0	37.0	
Actuated g/C Ratio				0.28		0.28		0.27		0.34	0.34	
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)				876		393		905		553	582	
v/s Ratio Prot								c0.15		c0.19	0.16	
v/s Ratio Perm				c0.23		0.02						
v/c Ratio				0.83		0.07		0.55		0.58	0.47	
Uniform Delay, d1				37.2		29.1		34.1		30.0	28.7	
Progression Factor				1.00		1.00		0.80		1.38	1.39	
Incremental Delay, d2				6.8		0.1		0.5		4.1	2.5	
Delay (s)				44.0		29.1		27.7		45.5	42.5	
Level of Service				D		C		C		D	D	
Approach Delay (s)		0.0			42.3			27.7			44.1	
Approach LOS		A			D			C			D	

Intersection Summary			
HCM Average Control Delay	39.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	20	5	185	0	0	0	130	870	0	0	480	695
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1566	1457				1449	3257			1698	1485
Flt Permitted		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1566	1457				1449	3257			1698	1485
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)	21	5	195	0	0	0	137	916	0	0	505	732
RTOR Reduction (vph)	0	0	180	0	0	0	0	0	0	0	0	234
Lane Group Flow (vph)	0	26	15	0	0	0	137	916	0	0	505	498
Heavy Vehicles (%)	13%	0%	5%	0%	0%	0%	18%	5%	0%	0%	6%	3%
Turn Type	Perm		Perm				Prot					Perm
Protected Phases		4					1	6			2	
Permitted Phases	4		4									2
Actuated Green, G (s)		8.4	8.4				15.6	93.6			74.0	74.0
Effective Green, g (s)		8.4	8.4				15.6	93.6			74.0	74.0
Actuated g/C Ratio		0.08	0.08				0.14	0.85			0.67	0.67
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)		120	111				205	2771			1142	999
v/s Ratio Prot							c0.09	0.28			0.30	
v/s Ratio Perm		0.02	0.01									c0.34
v/c Ratio		0.22	0.13				0.67	0.33			0.44	0.50
Uniform Delay, d1		47.7	47.4				44.7	1.7			8.4	8.9
Progression Factor		1.00	1.00				1.03	1.38			0.67	2.00
Incremental Delay, d2		0.9	0.6				5.7	0.2			1.0	1.4
Delay (s)		48.6	48.0				51.8	2.6			6.6	19.1
Level of Service		D	D				D	A			A	B
Approach Delay (s)		48.0			0.0			9.0			14.0	
Approach LOS		D			A			A			B	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	440	615	315	650	525	355
Ideal Flow (vphpl)	1800	1800	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	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1765	1500	1676	1765	3252	1500
Flt Permitted	1.00	1.00	0.32	1.00	0.95	1.00
Satd. Flow (perm)	1765	1500	572	1765	3252	1500
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	463	647	332	684	553	374
RTOR Reduction (vph)	0	82	0	0	0	272
Lane Group Flow (vph)	463	565	332	684	553	102
Turn Type		pm+ov	pm+pt			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	52.9	82.9	72.0	72.0	30.0	30.0
Effective Green, g (s)	52.9	82.9	72.0	72.0	30.0	30.0
Actuated g/C Ratio	0.48	0.75	0.65	0.65	0.27	0.27
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)	849	1185	526	1155	887	409
v/s Ratio Prot	0.26	0.13	c0.09	0.39	c0.17	
v/s Ratio Perm		0.25	c0.33			0.07
v/c Ratio	0.55	0.48	0.63	0.59	0.62	0.25
Uniform Delay, d1	20.1	5.2	11.0	10.7	35.1	31.2
Progression Factor	0.74	0.20	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.4	1.3	2.5	0.8	3.3	1.5
Delay (s)	17.3	2.4	13.5	11.5	38.3	32.7
Level of Service	B	A	B	B	D	C
Approach Delay (s)	8.6			12.2	36.1	
Approach LOS	A			B	D	

Intersection Summary			
HCM Average Control Delay	18.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	485	200	180	550	65	220	70	165	165	85	195
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.89		1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1379	1765	1530	1676	1740		1710	1588		1644	1579	
Flt Permitted	0.26	1.00	1.00	0.22	1.00		0.45	1.00		0.51	1.00	
Satd. Flow (perm)	384	1765	1530	390	1740		811	1588		886	1579	
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)	47	505	208	188	573	68	229	73	172	172	89	203
RTOR Reduction (vph)	0	0	95	0	4	0	0	84	0	0	81	0
Lane Group Flow (vph)	47	505	113	188	637	0	229	161	0	172	211	0
Heavy Vehicles (%)	24%	2%	0%	2%	2%	0%	0%	0%	2%	4%	0%	3%
Turn Type	pm+pt		Perm	pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	33.9	31.9	31.9	45.3	39.3		28.1	28.1		28.1	28.1	
Effective Green, g (s)	33.9	31.9	31.9	45.3	39.3		28.1	28.1		28.1	28.1	
Actuated g/C Ratio	0.42	0.39	0.39	0.56	0.48		0.35	0.35		0.35	0.35	
Clearance Time (s)	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	
Lane Grp Cap (vph)	184	692	600	366	840		280	548		306	545	
v/s Ratio Prot	0.01	0.29		c0.06	c0.37			0.10			0.13	
v/s Ratio Perm	0.10		0.07	0.23			c0.28			0.19		
v/c Ratio	0.26	0.73	0.19	0.51	0.76		0.82	0.29		0.56	0.39	
Uniform Delay, d1	15.3	21.1	16.2	12.0	17.2		24.3	19.4		21.7	20.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	3.9	0.2	1.2	4.0		16.7	0.3		2.4	0.5	
Delay (s)	16.0	24.9	16.4	13.2	21.1		41.0	19.7		24.0	20.6	
Level of Service	B	C	B	B	C		D	B		C	C	
Approach Delay (s)		22.1			19.3			30.0			21.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	81.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	445	5	5	20	10	80	250	355	20	65	125	740
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.87		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1676	1632		1676	1530		1676	1750		1676	1765	1500
Flt Permitted	0.40	1.00		0.75	1.00		0.54	1.00		0.52	1.00	1.00
Satd. Flow (perm)	713	1632		1325	1530		948	1750		922	1765	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)	484	5	5	22	11	87	272	386	22	71	136	804
RTOR Reduction (vph)	0	3	0	0	81	0	0	2	0	0	0	248
Lane Group Flow (vph)	484	7	0	22	17	0	272	406	0	71	136	556
Turn Type	pm+pt			Perm			pm+pt			Perm		pm+ov
Protected Phases	7	4			8		5	2			6	7
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	41.6	41.6		5.9	5.9		41.1	41.1		23.6	23.6	55.3
Effective Green, g (s)	41.6	41.6		5.9	5.9		41.1	41.1		23.6	23.6	55.3
Actuated g/C Ratio	0.46	0.46		0.07	0.07		0.45	0.45		0.26	0.26	0.61
Clearance Time (s)	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
Lane Grp Cap (vph)	664	749		86	100		538	793		240	459	981
v/s Ratio Prot	c0.25	0.00			0.01		0.08	c0.23			0.08	c0.20
v/s Ratio Perm	c0.08			0.02			0.15			0.08		0.17
v/c Ratio	0.73	0.01		0.26	0.17		0.51	0.51		0.30	0.30	0.57
Uniform Delay, d1	18.9	13.3		40.3	40.1		16.4	17.7		26.9	26.9	10.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.0	0.0		1.6	0.8		0.8	2.4		3.1	1.6	0.8
Delay (s)	22.9	13.4		41.9	40.9		17.2	20.0		30.0	28.5	11.3
Level of Service	C	B		D	D		B	C		C	C	B
Approach Delay (s)		22.7			41.1			18.9			14.9	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 1: Westcliff Drive & Cascade Ave

Movement	EB	EB	WB	NW
Directions Served	T	R	LT	LR
Maximum Queue (ft)	58	141	102	66
Average Queue (ft)	12	89	59	31
95th Queue (ft)	91	169	114	76
Link Distance (ft)	1267		1142	73
Upstream Blk Time (%)				2
Queuing Penalty (veh)				6
Storage Bay Dist (ft)		150		
Storage Blk Time (%)		3		
Queuing Penalty (veh)		0		

Intersection: 2: I-84 WB Ramp & Cascade Ave

Movement	WB	WB	WB	SE	SE	NW	NW
Directions Served	L	L	R	T	TR	L	T
Maximum Queue (ft)	250	296	133	89	145	244	231
Average Queue (ft)	188	194	38	66	113	186	158
95th Queue (ft)	278	357	154	102	172	289	264
Link Distance (ft)		1152		73	73	308	308
Upstream Blk Time (%)				15	30	1	1
Queuing Penalty (veh)				32	64	2	2
Storage Bay Dist (ft)	250		250				
Storage Blk Time (%)	1	3	0				
Queuing Penalty (veh)	4	12	0				

Intersection: 3: I-84 EB Ramp & Cascade Ave

Movement	EB	EB	SE	SE	SE	NW	NW	B18	B18
Directions Served	LT	R	L	T	T	T	R	T	T
Maximum Queue (ft)	68	96	158	157	163	177	149	32	12
Average Queue (ft)	30	60	113	58	56	85	81	6	2
95th Queue (ft)	78	117	184	205	200	213	180	53	30
Link Distance (ft)	1392			308	308	192	192	548	548
Upstream Blk Time (%)				1	0	2	0		
Queuing Penalty (veh)				2	1	12	2		
Storage Bay Dist (ft)		150	150						
Storage Blk Time (%)		1	8						
Queuing Penalty (veh)		0	37						

Intersection: 4: Cascade Ave & Mt Adams Ave

Movement	EB	EB	B18	WB	WB	NB	NB	NB
Directions Served	T	R	T	L	T	L	L	R
Maximum Queue (ft)	195	86	4	165	261	202	222	168
Average Queue (ft)	104	33	1	101	174	160	159	109
95th Queue (ft)	210	104	9	180	290	218	244	195
Link Distance (ft)	548	548	192	362	362		412	412
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)						200		
Storage Blk Time (%)						1	1	
Queuing Penalty (veh)						4	4	

Intersection: 5: Cascade Ave & Rand Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (ft)	73	448	138	141	479	148	197	141	205
Average Queue (ft)	31	276	67	96	333	105	100	94	108
95th Queue (ft)	84	576	154	170	618	170	205	155	220
Link Distance (ft)		1452			836		1178		428
Upstream Blk Time (%)					0				
Queuing Penalty (veh)					0				
Storage Bay Dist (ft)	150		150	125		150		150	
Storage Blk Time (%)		16	0	5	24	5	2	2	3
Queuing Penalty (veh)		40	0	31	44	11	4	6	5

Intersection: 12: Mt Adams Ave &

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	T	R
Maximum Queue (ft)	235	83	37	71	148	201	81	159	244
Average Queue (ft)	179	18	18	41	91	119	43	78	113
95th Queue (ft)	276	127	47	82	162	229	98	186	275
Link Distance (ft)		1227		1176	696	696		412	412
Upstream Blk Time (%)								0	
Queuing Penalty (veh)								0	
Storage Bay Dist (ft)	250		250				150		
Storage Blk Time (%)	1							1	
Queuing Penalty (veh)	0							1	

Network Summary

Network wide Queuing Penalty: 326

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	5	305	45	10	260	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
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	0.85		1.00	0.97	
Flt Protected	1.00	1.00		0.96	0.96	
Satd. Flow (prot)	1800	1443		1729	1545	
Flt Permitted	1.00	1.00		0.96	0.96	
Satd. Flow (perm)	1800	1443		1729	1545	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	6	359	53	12	306	71
RTOR Reduction (vph)	0	292	0	0	8	0
Lane Group Flow (vph)	6	67	0	65	369	0
Heavy Vehicles (%)	0%	6%	0%	0%	8%	14%
Turn Type		Prot	Split			
Protected Phases	3	3	7	7	2 8	
Permitted Phases						
Actuated Green, G (s)	20.5	20.5		8.2	69.3	
Effective Green, g (s)	20.5	20.5		8.2	69.3	
Actuated g/C Ratio	0.19	0.19		0.07	0.63	
Clearance Time (s)	4.0	4.0		4.0		
Vehicle Extension (s)	3.0	3.0		3.0		
Lane Grp Cap (vph)	335	269		129	973	
v/s Ratio Prot	0.00	c0.05		c0.04	c0.24	
v/s Ratio Perm						
v/c Ratio	0.02	0.25		0.50	0.38	
Uniform Delay, d1	36.5	38.2		48.9	9.9	
Progression Factor	1.00	1.00		1.00	0.22	
Incremental Delay, d2	0.1	2.2		3.1	0.2	
Delay (s)	36.6	40.4		52.0	2.4	
Level of Service	D	D		D	A	
Approach Delay (s)	40.3			52.0	2.4	
Approach LOS	D			D	A	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	0	0	415	0	75	0	280	70	405	245	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)				4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor				0.97		1.00		0.95		1.00	1.00	
Frt				1.00		0.85		0.97		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				3130		1404		3189		1644	1731	
Flt Permitted				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)				3130		1404		3189		1644	1731	
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)	0	0	0	461	0	83	0	311	78	450	272	0
RTOR Reduction (vph)	0	0	0	0	0	68	0	20	0	0	0	0
Lane Group Flow (vph)	0	0	0	461	0	15	0	369	0	450	272	0
Heavy Vehicles (%)	0%	0%	0%	6%	0%	9%	0%	2%	12%	4%	4%	0%
Turn Type				custom		custom				Split		
Protected Phases								7 3		2	2	
Permitted Phases				8		8						
Actuated Green, G (s)				20.4		20.4		32.7		44.9	44.9	
Effective Green, g (s)				20.4		20.4		32.7		44.9	44.9	
Actuated g/C Ratio				0.19		0.19		0.30		0.41	0.41	
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)				580		260		948		671	707	
v/s Ratio Prot								c0.12		c0.27	0.16	
v/s Ratio Perm				c0.15		0.01						
v/c Ratio				0.79		0.06		0.39		0.67	0.38	
Uniform Delay, d1				42.8		36.9		30.7		26.5	22.9	
Progression Factor				1.00		1.00		0.75		0.80	0.76	
Incremental Delay, d2				7.4		0.1		0.2		4.6	1.4	
Delay (s)				50.2		37.0		23.2		25.9	18.9	
Level of Service				D		D		C		C	B	
Approach Delay (s)		0.0			48.2			23.2			23.3	
Approach LOS		A			D			C			C	

Intersection Summary			
HCM Average Control Delay	31.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	50	5	290	0	0	0	115	580	0	0	600	640
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1539	1457				1449	3257			1698	1485
Flt Permitted		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1539	1457				1449	3257			1698	1485
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)	53	5	305	0	0	0	121	611	0	0	632	674
RTOR Reduction (vph)	0	0	277	0	0	0	0	0	0	0	0	223
Lane Group Flow (vph)	0	58	28	0	0	0	121	611	0	0	632	451
Heavy Vehicles (%)	13%	0%	5%	0%	0%	0%	18%	5%	0%	0%	6%	3%
Turn Type	Perm		Perm				Prot					Perm
Protected Phases		4					1	6			2	
Permitted Phases	4		4									2
Actuated Green, G (s)		10.0	10.0				14.4	92.0			73.6	73.6
Effective Green, g (s)		10.0	10.0				14.4	92.0			73.6	73.6
Actuated g/C Ratio		0.09	0.09				0.13	0.84			0.67	0.67
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)		140	132				190	2724			1136	994
v/s Ratio Prot							c0.08	0.19			c0.37	
v/s Ratio Perm		0.04	0.02									0.30
v/c Ratio		0.41	0.21				0.64	0.22			0.56	0.45
Uniform Delay, d1		47.2	46.3				45.3	1.8			9.6	8.6
Progression Factor		1.00	1.00				1.18	0.85			0.82	2.24
Incremental Delay, d2		2.0	0.8				5.5	0.2			1.5	1.2
Delay (s)		49.2	47.1				58.9	1.7			9.4	20.5
Level of Service		D	D				E	A			A	C
Approach Delay (s)		47.5			0.0			11.1			15.1	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	355	515	160	710	520	230
Ideal Flow (vphpl)	1800	1800	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	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1765	1500	1676	1765	3252	1500
Flt Permitted	1.00	1.00	0.42	1.00	0.95	1.00
Satd. Flow (perm)	1765	1500	743	1765	3252	1500
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	374	542	168	747	547	242
RTOR Reduction (vph)	0	98	0	0	0	172
Lane Group Flow (vph)	374	444	168	747	547	70
Turn Type		pm+ov	pm+pt			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	58.1	90.1	70.0	70.0	32.0	32.0
Effective Green, g (s)	58.1	90.1	70.0	70.0	32.0	32.0
Actuated g/C Ratio	0.53	0.82	0.64	0.64	0.29	0.29
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)	932	1283	540	1123	946	436
v/s Ratio Prot	0.21	0.10	0.02	c0.42	c0.17	
v/s Ratio Perm		0.20	0.18			0.05
v/c Ratio	0.40	0.35	0.31	0.67	0.58	0.16
Uniform Delay, d1	15.5	2.5	9.1	12.6	33.2	29.0
Progression Factor	0.65	33.16	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.7	0.3	1.5	2.6	0.8
Delay (s)	11.4	84.0	9.4	14.1	35.8	29.8
Level of Service	B	F	A	B	D	C
Approach Delay (s)	54.3			13.3	34.0	
Approach LOS	D			B	C	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	295	120	150	520	60	260	60	100	135	55	55
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.91		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1379	1765	1530	1676	1741		1710	1611		1644	1640	
Flt Permitted	0.30	1.00	1.00	0.41	1.00		0.68	1.00		0.63	1.00	
Satd. Flow (perm)	434	1765	1530	730	1741		1230	1611		1090	1640	
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)	42	307	125	156	542	62	271	62	104	141	57	57
RTOR Reduction (vph)	0	0	76	0	4	0	0	60	0	0	35	0
Lane Group Flow (vph)	42	307	49	156	600	0	271	106	0	141	79	0
Heavy Vehicles (%)	24%	2%	0%	2%	2%	0%	0%	0%	2%	4%	0%	3%
Turn Type	pm+pt		Perm	pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	29.1	27.1	27.1	38.9	32.9		22.3	22.3		22.3	22.3	
Effective Green, g (s)	29.1	27.1	27.1	38.9	32.9		22.3	22.3		22.3	22.3	
Actuated g/C Ratio	0.42	0.39	0.39	0.56	0.48		0.32	0.32		0.32	0.32	
Clearance Time (s)	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	
Lane Grp Cap (vph)	210	691	599	517	828		396	519		351	528	
v/s Ratio Prot	0.01	0.17		c0.03	c0.34			0.07			0.05	
v/s Ratio Perm	0.08		0.03	0.14			c0.22			0.13		
v/c Ratio	0.20	0.44	0.08	0.30	0.73		0.68	0.20		0.40	0.15	
Uniform Delay, d1	12.5	15.5	13.2	8.0	14.5		20.4	17.0		18.3	16.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.5	0.1	0.3	3.2		4.8	0.2		0.8	0.1	
Delay (s)	13.0	16.0	13.3	8.3	17.7		25.2	17.2		19.0	16.8	
Level of Service	B	B	B	A	B		C	B		B	B	
Approach Delay (s)		15.0			15.8			22.2			18.0	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	69.2	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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	400	5	5	20	10	50	130	300	10	50	100	525
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.88		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1676	1632		1676	1545		1676	1756		1676	1765	1500
Flt Permitted	0.42	1.00		0.75	1.00		0.61	1.00		0.56	1.00	1.00
Satd. Flow (perm)	741	1632		1325	1545		1074	1756		984	1765	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)	435	5	5	22	11	54	141	326	11	54	109	571
RTOR Reduction (vph)	0	3	0	0	51	0	0	1	0	0	0	197
Lane Group Flow (vph)	435	7	0	22	14	0	141	336	0	54	109	374
Turn Type	pm+pt			Perm			pm+pt			Perm		pm+ov
Protected Phases	7	4			8		5	2			6	7
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	38.2	38.2		5.7	5.7		44.9	44.9		31.1	31.1	59.6
Effective Green, g (s)	38.2	38.2		5.7	5.7		44.9	44.9		31.1	31.1	59.6
Actuated g/C Ratio	0.42	0.42		0.06	0.06		0.49	0.49		0.34	0.34	0.65
Clearance Time (s)	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
Lane Grp Cap (vph)	603	684		83	97		594	865		336	603	1047
v/s Ratio Prot	c0.23	0.00			0.01		0.03	c0.19			0.06	0.11
v/s Ratio Perm	c0.08			0.02			0.09			0.05		0.14
v/c Ratio	0.72	0.01		0.27	0.15		0.24	0.39		0.16	0.18	0.36
Uniform Delay, d1	20.9	15.4		40.7	40.4		12.9	14.5		20.9	21.1	7.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.2	0.0		1.7	0.7		0.2	1.3		1.0	0.7	0.2
Delay (s)	25.1	15.4		42.4	41.1		13.1	15.8		21.9	21.7	7.3
Level of Service	C	B		D	D		B	B		C	C	A
Approach Delay (s)		24.9			41.4			15.0			10.5	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	91.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	5	305	45	10	260	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
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	0.85		1.00	0.97	
Flt Protected	1.00	1.00		0.96	0.96	
Satd. Flow (prot)	1800	1443		1729	1545	
Flt Permitted	1.00	1.00		0.96	0.96	
Satd. Flow (perm)	1800	1443		1729	1545	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	6	359	53	12	306	71
RTOR Reduction (vph)	0	292	0	0	8	0
Lane Group Flow (vph)	6	67	0	65	369	0
Heavy Vehicles (%)	0%	6%	0%	0%	8%	14%
Turn Type		Prot	Split			
Protected Phases	3	3	7	7	2 8	
Permitted Phases						
Actuated Green, G (s)	20.5	20.5		8.2	69.3	
Effective Green, g (s)	20.5	20.5		8.2	69.3	
Actuated g/C Ratio	0.19	0.19		0.07	0.63	
Clearance Time (s)	4.0	4.0		4.0		
Vehicle Extension (s)	3.0	3.0		3.0		
Lane Grp Cap (vph)	335	269		129	973	
v/s Ratio Prot	0.00	c0.05		c0.04	c0.24	
v/s Ratio Perm						
v/c Ratio	0.02	0.25		0.50	0.38	
Uniform Delay, d1	36.5	38.2		48.9	9.9	
Progression Factor	1.00	1.00		1.00	0.22	
Incremental Delay, d2	0.1	2.2		3.1	0.2	
Delay (s)	36.6	40.4		52.0	2.4	
Level of Service	D	D		D	A	
Approach Delay (s)	40.3			52.0	2.4	
Approach LOS	D			D	A	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	0	0	415	0	75	0	280	70	405	245	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)				4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor				0.97		1.00		0.95		1.00	1.00	
Frt				1.00		0.85		0.97		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				3130		1404		3189		1644	1731	
Flt Permitted				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)				3130		1404		3189		1644	1731	
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)	0	0	0	461	0	83	0	311	78	450	272	0
RTOR Reduction (vph)	0	0	0	0	0	68	0	20	0	0	0	0
Lane Group Flow (vph)	0	0	0	461	0	15	0	369	0	450	272	0
Heavy Vehicles (%)	0%	0%	0%	6%	0%	9%	0%	2%	12%	4%	4%	0%
Turn Type				custom		custom				Split		
Protected Phases								7 3		2	2	
Permitted Phases				8		8						
Actuated Green, G (s)				20.4		20.4		32.7		44.9	44.9	
Effective Green, g (s)				20.4		20.4		32.7		44.9	44.9	
Actuated g/C Ratio				0.19		0.19		0.30		0.41	0.41	
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)				580		260		948		671	707	
v/s Ratio Prot								c0.12		c0.27	0.16	
v/s Ratio Perm				c0.15		0.01						
v/c Ratio				0.79		0.06		0.39		0.67	0.38	
Uniform Delay, d1				42.8		36.9		30.7		26.5	22.9	
Progression Factor				1.00		1.00		0.75		0.80	0.76	
Incremental Delay, d2				7.4		0.1		0.2		4.6	1.4	
Delay (s)				50.2		37.0		23.2		25.9	18.9	
Level of Service				D		D		C		C	B	
Approach Delay (s)		0.0			48.2			23.2			23.3	
Approach LOS		A			D			C			C	

Intersection Summary			
HCM Average Control Delay	31.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	50	5	290	0	0	0	115	580	0	0	600	640
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1539	1457				1449	3257			1698	1485
Flt Permitted		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1539	1457				1449	3257			1698	1485
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)	53	5	305	0	0	0	121	611	0	0	632	674
RTOR Reduction (vph)	0	0	277	0	0	0	0	0	0	0	0	223
Lane Group Flow (vph)	0	58	28	0	0	0	121	611	0	0	632	451
Heavy Vehicles (%)	13%	0%	5%	0%	0%	0%	18%	5%	0%	0%	6%	3%
Turn Type	Perm		Perm				Prot					Perm
Protected Phases		4					1	6			2	
Permitted Phases	4		4									2
Actuated Green, G (s)		10.0	10.0				14.4	92.0			73.6	73.6
Effective Green, g (s)		10.0	10.0				14.4	92.0			73.6	73.6
Actuated g/C Ratio		0.09	0.09				0.13	0.84			0.67	0.67
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)		140	132				190	2724			1136	994
v/s Ratio Prot							c0.08	0.19			c0.37	
v/s Ratio Perm		0.04	0.02									0.30
v/c Ratio		0.41	0.21				0.64	0.22			0.56	0.45
Uniform Delay, d1		47.2	46.3				45.3	1.8			9.6	8.6
Progression Factor		1.00	1.00				1.18	0.85			0.82	2.24
Incremental Delay, d2		2.0	0.8				5.5	0.2			1.5	1.2
Delay (s)		49.2	47.1				58.9	1.7			9.4	20.5
Level of Service		D	D				E	A			A	C
Approach Delay (s)		47.5			0.0			11.1			15.1	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	355	515	160	710	520	230
Ideal Flow (vphpl)	1800	1800	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	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1765	1500	1676	1765	3252	1500
Flt Permitted	1.00	1.00	0.42	1.00	0.95	1.00
Satd. Flow (perm)	1765	1500	743	1765	3252	1500
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	374	542	168	747	547	242
RTOR Reduction (vph)	0	98	0	0	0	172
Lane Group Flow (vph)	374	444	168	747	547	70
Turn Type		pm+ov	pm+pt			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	58.1	90.1	70.0	70.0	32.0	32.0
Effective Green, g (s)	58.1	90.1	70.0	70.0	32.0	32.0
Actuated g/C Ratio	0.53	0.82	0.64	0.64	0.29	0.29
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)	932	1283	540	1123	946	436
v/s Ratio Prot	0.21	0.10	0.02	c0.42	c0.17	
v/s Ratio Perm		0.20	0.18			0.05
v/c Ratio	0.40	0.35	0.31	0.67	0.58	0.16
Uniform Delay, d1	15.5	2.5	9.1	12.6	33.2	29.0
Progression Factor	0.65	33.16	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.7	0.3	1.5	2.6	0.8
Delay (s)	11.4	84.0	9.4	14.1	35.8	29.8
Level of Service	B	F	A	B	D	C
Approach Delay (s)	54.3			13.3	34.0	
Approach LOS	D			B	C	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	295	120	150	520	60	260	60	100	135	55	55
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.91		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1379	1765	1530	1676	1741		1710	1611		1644	1640	
Flt Permitted	0.30	1.00	1.00	0.41	1.00		0.68	1.00		0.63	1.00	
Satd. Flow (perm)	434	1765	1530	730	1741		1230	1611		1090	1640	
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)	42	307	125	156	542	62	271	62	104	141	57	57
RTOR Reduction (vph)	0	0	76	0	4	0	0	60	0	0	35	0
Lane Group Flow (vph)	42	307	49	156	600	0	271	106	0	141	79	0
Heavy Vehicles (%)	24%	2%	0%	2%	2%	0%	0%	0%	2%	4%	0%	3%
Turn Type	pm+pt		Perm	pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	29.1	27.1	27.1	38.9	32.9		22.3	22.3		22.3	22.3	
Effective Green, g (s)	29.1	27.1	27.1	38.9	32.9		22.3	22.3		22.3	22.3	
Actuated g/C Ratio	0.42	0.39	0.39	0.56	0.48		0.32	0.32		0.32	0.32	
Clearance Time (s)	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	
Lane Grp Cap (vph)	210	691	599	517	828		396	519		351	528	
v/s Ratio Prot	0.01	0.17		c0.03	c0.34			0.07			0.05	
v/s Ratio Perm	0.08		0.03	0.14			c0.22			0.13		
v/c Ratio	0.20	0.44	0.08	0.30	0.73		0.68	0.20		0.40	0.15	
Uniform Delay, d1	12.5	15.5	13.2	8.0	14.5		20.4	17.0		18.3	16.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.5	0.1	0.3	3.2		4.8	0.2		0.8	0.1	
Delay (s)	13.0	16.0	13.3	8.3	17.7		25.2	17.2		19.0	16.8	
Level of Service	B	B	B	A	B		C	B		B	B	
Approach Delay (s)		15.0			15.8			22.2			18.0	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	69.2	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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	400	5	5	20	10	50	130	300	10	50	100	525
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.88		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1676	1632		1676	1545		1676	1756		1676	1765	1500
Flt Permitted	0.42	1.00		0.75	1.00		0.61	1.00		0.56	1.00	1.00
Satd. Flow (perm)	741	1632		1325	1545		1074	1756		984	1765	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)	435	5	5	22	11	54	141	326	11	54	109	571
RTOR Reduction (vph)	0	3	0	0	51	0	0	1	0	0	0	197
Lane Group Flow (vph)	435	7	0	22	14	0	141	336	0	54	109	374
Turn Type	pm+pt			Perm			pm+pt			Perm		pm+ov
Protected Phases	7	4			8		5	2			6	7
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	38.2	38.2		5.7	5.7		44.9	44.9		31.1	31.1	59.6
Effective Green, g (s)	38.2	38.2		5.7	5.7		44.9	44.9		31.1	31.1	59.6
Actuated g/C Ratio	0.42	0.42		0.06	0.06		0.49	0.49		0.34	0.34	0.65
Clearance Time (s)	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
Lane Grp Cap (vph)	603	684		83	97		594	865		336	603	1047
v/s Ratio Prot	c0.23	0.00			0.01		0.03	c0.19			0.06	0.11
v/s Ratio Perm	c0.08			0.02			0.09			0.05		0.14
v/c Ratio	0.72	0.01		0.27	0.15		0.24	0.39		0.16	0.18	0.36
Uniform Delay, d1	20.9	15.4		40.7	40.4		12.9	14.5		20.9	21.1	7.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.2	0.0		1.7	0.7		0.2	1.3		1.0	0.7	0.2
Delay (s)	25.1	15.4		42.4	41.1		13.1	15.8		21.9	21.7	7.3
Level of Service	C	B		D	D		B	B		C	C	A
Approach Delay (s)		24.9			41.4			15.0			10.5	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	91.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	35	165	315	25	0	230	0	55	0	40	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
Hourly flow rate (vph)	0	39	183	350	28	0	256	0	61	0	44	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	222	378	317	50
Volume Left (vph)	0	350	256	0
Volume Right (vph)	183	0	61	6
Hadj (s)	-0.46	0.22	0.08	-0.03
Departure Headway (s)	5.2	5.6	5.7	6.2
Degree Utilization, x	0.32	0.59	0.50	0.09
Capacity (veh/h)	631	615	585	478
Control Delay (s)	10.6	16.2	14.4	9.8
Approach Delay (s)	10.6	16.2	14.4	9.8
Approach LOS	B	C	B	A

Intersection Summary			
Delay	14.0		
HCM Level of Service	B		
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	140	55	280	510	10
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)	5	147	58	295	537	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume	953	542	547			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	953	542	547			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	73	94			
cM capacity (veh/h)	271	540	1022			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	153	353	547
Volume Left	5	58	0
Volume Right	147	0	11
cSH	522	1022	1700
Volume to Capacity	0.29	0.06	0.32
Queue Length 95th (ft)	30	4	0
Control Delay (s)	14.7	1.9	0.0
Lane LOS	B	A	
Approach Delay (s)	14.7	1.9	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	110	0	0	0	0	335	310	0	650	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	116	0	0	0	0	353	326	0	684	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								343				
pX, platoon unblocked												
vC, conflicting volume	1037	1363	684	1153	1037	353	684			679		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1037	1363	684	1153	1037	353	684			679		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.4			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	100	100	74	100	100	100	100			100		
cM capacity (veh/h)	211	149	452	130	233	696	795			923		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total	116	0	353	326	684
Volume Left	0	0	0	0	0
Volume Right	116	0	0	326	0
cSH	452	1700	1700	1700	1700
Volume to Capacity	0.26	0.00	0.21	0.19	0.40
Queue Length 95th (ft)	25	0	0	0	0
Control Delay (s)	15.7	0.0	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	15.7	0.0	0.0		0.0
Approach LOS	C	A			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	410	0	120	70	525	0	0	550	210
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			1.00	1.00
Frt				1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1624	1624	1530	1629	1698			1667	1224
Flt Permitted				0.95	0.95	1.00	0.32	1.00			1.00	1.00
Satd. Flow (perm)				1624	1624	1530	555	1698			1667	1224
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	0	0	432	0	126	74	553	0	0	579	221
RTOR Reduction (vph)	0	0	0	0	0	98	0	0	0	0	0	47
Lane Group Flow (vph)	0	0	0	216	216	28	74	553	0	0	579	174
Heavy Vehicles (%)	4%	0%	7%	0%	0%	0%	5%	6%	0%	0%	8%	25%
Turn Type				Split		Perm	pm+pt					Perm
Protected Phases				4	4		1	6			2	
Permitted Phases						4	6					2
Actuated Green, G (s)				15.2	15.2	15.2	46.3	46.3			37.5	37.5
Effective Green, g (s)				15.7	15.7	15.7	46.3	46.3			37.5	37.5
Actuated g/C Ratio				0.22	0.22	0.22	0.66	0.66			0.54	0.54
Clearance Time (s)				4.5	4.5	4.5	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
Lane Grp Cap (vph)				364	364	343	441	1123			893	656
v/s Ratio Prot				c0.13	0.13		0.01	c0.33			c0.35	
v/s Ratio Perm						0.02	0.10					0.14
v/c Ratio				0.59	0.59	0.08	0.17	0.49			0.65	0.27
Uniform Delay, d1				24.3	24.3	21.5	9.7	6.0			11.6	8.8
Progression Factor				1.00	1.00	1.00	1.03	1.08			1.00	1.00
Incremental Delay, d2				2.6	2.6	0.1	0.1	1.0			3.6	1.0
Delay (s)				26.9	26.9	21.6	10.2	7.4			15.2	9.8
Level of Service				C	C	C	B	A			B	A
Approach Delay (s)		0.0			25.7			7.8			13.7	
Approach LOS		A			C			A			B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	305	5	225	0	0	0	0	290	370	110	850	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	0.95	
Frt		1.00	0.85					0.92		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1716	1485					1602		1629	3288	
Flt Permitted		0.95	1.00					1.00		0.21	1.00	
Satd. Flow (perm)		1716	1485					1602		364	3288	
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)	321	5	237	0	0	0	0	305	389	116	895	0
RTOR Reduction (vph)	0	0	132	0	0	0	0	62	0	0	0	0
Lane Group Flow (vph)	0	326	105	0	0	0	0	632	0	116	895	0
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	5%	3%	5%	4%	0%
Turn Type	Split		Perm							pm+pt		
Protected Phases	8	8						6		5	2	
Permitted Phases			8							2		
Actuated Green, G (s)		15.9	15.9					38.3		45.6	45.6	
Effective Green, g (s)		16.4	16.4					38.3		45.6	45.6	
Actuated g/C Ratio		0.23	0.23					0.55		0.65	0.65	
Clearance Time (s)		4.5	4.5					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		402	348					877		297	2142	
v/s Ratio Prot		c0.19						c0.39		0.02	c0.27	
v/s Ratio Perm			0.07							0.24		
v/c Ratio		0.81	0.30					0.72		0.39	0.42	
Uniform Delay, d1		25.3	22.1					11.8		8.0	5.8	
Progression Factor		1.00	1.00					0.79		1.12	1.26	
Incremental Delay, d2		11.7	0.5					4.1		0.8	0.5	
Delay (s)		37.1	22.6					13.5		9.7	7.9	
Level of Service		D	C					B		A	A	
Approach Delay (s)		31.0			0.0			13.5			8.1	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	160	0	0	65	0	595	15	0	700	375
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	168	0	0	68	0	626	16	0	737	395
Pedestrians		23			22			23			2	
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		2			2			2			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								254			365	
pX, platoon unblocked	0.92	0.92	0.88	0.92	0.92	0.86	0.88			0.86		
vC, conflicting volume	1662	1621	612	1216	1811	658	1155			664		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1192	1148	290	707	1354	522	906			529		
tC, single (s)	7.6	6.5	6.9	7.5	6.5	6.9	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	100	100	72	100	100	84	100			100		
cM capacity (veh/h)	101	178	599	202	134	426	651			840		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	168	68	642	491	640
Volume Left	0	0	0	0	0
Volume Right	168	68	16	0	395
cSH	599	426	1700	1700	1700
Volume to Capacity	0.28	0.16	0.38	0.29	0.38
Queue Length 95th (ft)	29	14	0	0	0
Control Delay (s)	13.3	15.1	0.0	0.0	0.0
Lane LOS	B	C			
Approach Delay (s)	13.3	15.1	0.0	0.0	
Approach LOS	B	C			

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	10	30	25	195	110	110	415	30	220	295	345
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0			4.0			4.0			4.0	4.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes		0.98			0.98			1.00			1.00	0.92
Flpb, ped/bikes		0.99			1.00			1.00			0.99	1.00
Frt		0.97			0.95			0.99			1.00	0.85
Flt Protected		0.97			1.00			0.99			0.98	1.00
Satd. Flow (prot)		1634			1661			1745			1647	1394
Flt Permitted		0.41			0.97			0.82			0.62	1.00
Satd. Flow (perm)		688			1620			1437			1048	1394
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)	89	11	32	26	205	116	116	437	32	232	311	363
RTOR Reduction (vph)	0	17	0	0	26	0	0	3	0	0	0	103
Lane Group Flow (vph)	0	115	0	0	321	0	0	582	0	0	543	260
Confl. Peds. (#/hr)	19		28	28		19	19		19	28		28
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	6%	6%	1%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)		16.3			16.3			45.7			45.7	45.7
Effective Green, g (s)		16.3			16.3			45.7			45.7	45.7
Actuated g/C Ratio		0.23			0.23			0.65			0.65	0.65
Clearance Time (s)		4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		160			377			938			684	910
v/s Ratio Prot												
v/s Ratio Perm		0.17			c0.20			0.41			c0.52	0.19
v/c Ratio		0.72			0.85			0.62			0.79	0.29
Uniform Delay, d1		24.7			25.7			7.1			8.8	5.2
Progression Factor		1.00			1.00			1.00			0.57	0.13
Incremental Delay, d2		14.4			16.6			3.1			8.8	0.8
Delay (s)		39.1			42.3			10.2			13.8	1.4
Level of Service		D			D			B			B	A
Approach Delay (s)		39.1			42.3			10.2			8.9	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	5	150	210	5	80	130	890	180	60	595	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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		1.00	0.95	1.00	1.00	0.95	
Frt		0.89		1.00	0.86		1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.99		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1530		1676	1546		1613	3353	1530	1710	3332	
Flt Permitted		0.95		0.59	1.00		0.35	1.00	1.00	0.22	1.00	
Satd. Flow (perm)		1462		1046	1546		592	3353	1530	396	3332	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	31	5	155	216	5	82	134	918	186	62	613	31
RTOR Reduction (vph)	0	114	0	0	60	0	0	0	95	0	6	0
Lane Group Flow (vph)	0	77	0	216	27	0	134	918	91	62	638	0
Heavy Vehicles (%)	0%	25%	4%	2%	0%	0%	6%	2%	0%	0%	2%	0%
Turn Type	Perm			Perm			pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)		15.9		15.9	15.9		36.1	29.3	29.3	27.7	24.9	
Effective Green, g (s)		15.9		15.9	15.9		36.1	29.3	29.3	27.7	24.9	
Actuated g/C Ratio		0.27		0.27	0.27		0.60	0.49	0.49	0.46	0.41	
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)		387		277	410		479	1637	747	244	1383	
v/s Ratio Prot					0.02		c0.03	c0.27		0.01	0.19	
v/s Ratio Perm		0.05		c0.21			0.13		0.06	0.11		
v/c Ratio		0.20		0.78	0.07		0.28	0.56	0.12	0.25	0.46	
Uniform Delay, d1		17.1		20.4	16.5		8.1	10.8	8.3	14.7	12.7	
Progression Factor		1.00		1.00	1.00		0.56	0.63	0.64	1.00	1.00	
Incremental Delay, d2		0.3		13.0	0.1		0.3	1.3	0.3	0.6	1.1	
Delay (s)		17.4		33.4	16.6		4.9	8.1	5.6	15.2	13.8	
Level of Service		B		C	B		A	A	A	B	B	
Approach Delay (s)		17.4			28.6			7.4			13.9	
Approach LOS		B			C			A			B	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	155	0	140	165	1060	0	0	355	600
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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
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)					1676	1485	1513	3386			3226	1515
Flt Permitted					0.95	1.00	0.47	1.00			1.00	1.00
Satd. Flow (perm)					1676	1485	746	3386			3226	1515
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	0	0	163	0	147	174	1116	0	0	374	632
RTOR Reduction (vph)	0	0	0	0	0	75	0	0	0	0	0	309
Lane Group Flow (vph)	0	0	0	0	163	72	174	1116	0	0	374	323
Heavy Vehicles (%)	0%	0%	0%	2%	0%	3%	13%	1%	0%	0%	6%	1%
Turn Type				Perm		Perm	pm+pt					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Actuated Green, G (s)					11.0	11.0	41.0	41.0			30.7	30.7
Effective Green, g (s)					11.0	11.0	41.0	41.0			30.7	30.7
Actuated g/C Ratio					0.18	0.18	0.68	0.68			0.51	0.51
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)					307	272	590	2314			1651	775
v/s Ratio Prot							0.03	c0.33			0.12	
v/s Ratio Perm					0.10	0.05	0.17					0.21
v/c Ratio					0.53	0.26	0.29	0.48			0.23	0.42
Uniform Delay, d1					22.2	21.0	3.6	4.5			8.1	9.1
Progression Factor					1.00	1.00	0.41	0.40			0.46	1.43
Incremental Delay, d2					1.8	0.5	0.2	0.6			0.3	1.5
Delay (s)					23.9	21.5	1.7	2.4			4.1	14.5
Level of Service					C	C	A	A			A	B
Approach Delay (s)		0.0			22.8			2.3			10.6	
Approach LOS		A			C			A			B	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	630	0	170	0	0	0	0	595	170	170	340	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00					0.95		1.00	1.00	
Frt	1.00	1.00	0.85					0.97		1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1608	1608	1485					3241		1676	1748	
Flt Permitted	0.95	0.95	1.00					1.00		0.25	1.00	
Satd. Flow (perm)	1608	1608	1485					3241		443	1748	
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)	685	0	185	0	0	0	0	647	185	185	370	0
RTOR Reduction (vph)	0	0	132	0	0	0	0	40	0	0	0	0
Lane Group Flow (vph)	342	343	53	0	0	0	0	792	0	185	370	0
Heavy Vehicles (%)	1%	2%	3%	2%	2%	2%	0%	2%	2%	2%	3%	0%
Turn Type	Split		Perm							pm+pt		
Protected Phases	4	4						2		1	6	
Permitted Phases			4							6		
Actuated Green, G (s)	17.3	17.3	17.3					24.6		34.7	34.7	
Effective Green, g (s)	17.3	17.3	17.3					24.6		34.7	34.7	
Actuated g/C Ratio	0.29	0.29	0.29					0.41		0.58	0.58	
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)	464	464	428					1329		382	1011	
v/s Ratio Prot	0.21	c0.21						c0.24		c0.05	0.21	
v/s Ratio Perm			0.04							0.23		
v/c Ratio	0.74	0.74	0.12					0.60		0.48	0.37	
Uniform Delay, d1	19.3	19.3	15.8					13.8		12.9	6.8	
Progression Factor	1.00	1.00	1.00					1.00		0.80	0.86	
Incremental Delay, d2	6.0	6.1	0.1					2.0		0.9	1.0	
Delay (s)	25.3	25.4	15.9					15.8		11.2	6.8	
Level of Service	C	C	B					B		B	A	
Approach Delay (s)		23.3			0.0			15.8			8.3	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	16.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	380	20	240	10	20	65	195	305	5	35	295	195
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.86		1.00	0.89		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1693	1551		1710	1594		1693	1592		1710	1748	1515
Flt Permitted	0.46	1.00		0.59	1.00		0.30	1.00		0.56	1.00	1.00
Satd. Flow (perm)	824	1551		1064	1594		533	1592		1014	1748	1515
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)	400	21	253	11	21	68	205	321	5	37	311	205
RTOR Reduction (vph)	0	160	0	0	61	0	0	1	0	0	0	150
Lane Group Flow (vph)	400	114	0	11	28	0	205	325	0	37	311	55
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	1%	13%	0%	0%	3%	1%
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	32.6	28.0		8.4	7.8		35.8	29.7		22.6	20.5	20.5
Effective Green, g (s)	32.6	28.0		8.4	7.8		35.8	29.7		22.6	20.5	20.5
Actuated g/C Ratio	0.43	0.37		0.11	0.10		0.47	0.39		0.30	0.27	0.27
Clearance Time (s)	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
Lane Grp Cap (vph)	588	568		122	163		421	619		319	469	407
v/s Ratio Prot	c0.19	0.07		0.00	0.02		c0.07	0.20		0.00	c0.18	
v/s Ratio Perm	c0.11			0.01			0.16			0.03		0.04
v/c Ratio	0.68	0.20		0.09	0.17		0.49	0.53		0.12	0.66	0.14
Uniform Delay, d1	16.6	16.5		30.5	31.3		13.4	17.9		19.4	24.9	21.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.2	0.2		0.3	0.5		0.9	0.8		0.2	3.5	0.2
Delay (s)	19.8	16.7		30.8	31.8		14.3	18.7		19.5	28.4	21.4
Level of Service	B	B		C	C		B	B		B	C	C
Approach Delay (s)		18.6			31.7			17.0			25.2	
Approach LOS		B			C			B			C	

Intersection Summary			
HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	76.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 1: Portway Ave & 2nd Street

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	107	147	122	58
Average Queue (ft)	51	68	64	27
95th Queue (ft)	84	111	102	51
Link Distance (ft)	976	728	349	318
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Industrial St & 2nd Street

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	98	125	2
Average Queue (ft)	45	33	0
95th Queue (ft)	75	84	2
Link Distance (ft)	972	366	349
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Riverside Drive & 2nd Street

Movement	EB	SB
Directions Served	R	TR
Maximum Queue (ft)	155	236
Average Queue (ft)	56	46
95th Queue (ft)	120	173
Link Distance (ft)	1481	366
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: I-84 WB Ramp & 2nd Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	R
Maximum Queue (ft)	169	144	131	102	292	289	90
Average Queue (ft)	97	82	44	41	121	194	70
95th Queue (ft)	153	128	90	91	247	325	118
Link Distance (ft)	1470	1470			352	267	
Upstream Blk Time (%)					0	4	
Queuing Penalty (veh)					0	33	
Storage Bay Dist (ft)			125	90			65
Storage Blk Time (%)		1	0	0	7	21	1
Queuing Penalty (veh)		1	0	2	5	45	5

Intersection: 5: I-84 EB Ramp & 2nd Street

Movement	EB	EB	NB	SB	SB	SB
Directions Served	LT	R	TR	L	T	T
Maximum Queue (ft)	365	238	302	114	220	224
Average Queue (ft)	189	83	164	62	111	106
95th Queue (ft)	337	205	296	113	199	182
Link Distance (ft)	1961		296		352	352
Upstream Blk Time (%)			1		0	0
Queuing Penalty (veh)			6		0	0
Storage Bay Dist (ft)		1000		90		
Storage Blk Time (%)				2	8	
Queuing Penalty (veh)				8	9	

Intersection: 6: Cascade Ave & 2nd Street

Movement	EB	WB	NB	SB	SB
Directions Served	R	R	TR	T	TR
Maximum Queue (ft)	614	74	172	316	315
Average Queue (ft)	244	36	33	90	81
95th Queue (ft)	689	67	126	277	260
Link Distance (ft)	2394	272	196	296	296
Upstream Blk Time (%)			1	3	2
Queuing Penalty (veh)			6	14	10
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Oak Street & 2nd Street

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	230	432	266	294	256
Average Queue (ft)	115	218	217	218	100
95th Queue (ft)	249	396	301	326	227
Link Distance (ft)	2366	459	228	196	196
Upstream Blk Time (%)		1	36	25	1
Queuing Penalty (veh)		0	0	109	4
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Network Summary

Network wide Queuing Penalty: 256

Intersection: 8: Marina Way & Button Bridge Road

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	164	275	100	141	201	201	150	116	184	416
Average Queue (ft)	75	128	48	68	92	118	47	42	64	185
95th Queue (ft)	138	235	106	121	176	200	127	85	136	346
Link Distance (ft)	409	346			180	180			1443	1443
Upstream Blk Time (%)		0			1	1				
Queuing Penalty (veh)		0			4	8				
Storage Bay Dist (ft)			75	125			125	125		
Storage Blk Time (%)		24	1	1	2	4	0	0	1	
Queuing Penalty (veh)		20	1	3	2	8	0	0	0	

Intersection: 10: I-84 EB Ramp & Button Bridge Road

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	L	LT	R	T	TR	L	T
Maximum Queue (ft)	246	289	138	242	275	206	207
Average Queue (ft)	123	140	54	133	158	96	97
95th Queue (ft)	205	230	105	209	244	168	173
Link Distance (ft)		1849		591	591	277	277
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	300		300				
Storage Blk Time (%)	0	0	0				
Queuing Penalty (veh)	0	0	0				

Intersection: 11: Historic Columbia River Hwy & Button Bridge Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	T	R
Maximum Queue (ft)	412	192	47	126	174	401	87	356	185
Average Queue (ft)	202	38	10	51	103	145	22	152	54
95th Queue (ft)	345	126	35	95	180	314	54	268	125
Link Distance (ft)	1310	1310	515	515		1266		1044	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)					150		250		250
Storage Blk Time (%)					2	5	0	1	0
Queuing Penalty (veh)					8	10	0	2	0

Intersection: 26: I-84 WB Ramp & Button Bridge Road

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	259	150	117	231	243	114	179	124
Average Queue (ft)	106	78	54	74	97	35	38	68
95th Queue (ft)	200	144	100	166	193	85	111	131
Link Distance (ft)	1919			277	277	180	180	
Upstream Blk Time (%)				0	0		0	
Queuing Penalty (veh)				0	1		1	
Storage Bay Dist (ft)		125	100					100
Storage Blk Time (%)	5	1	1	2			0	2
Queuing Penalty (veh)	7	2	3	3			1	3

Network Summary

Network wide Queuing Penalty: 88

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	35	110	370	35	0	180	0	65	0	80	10
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)	0	39	122	411	39	0	200	0	72	0	89	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	161	450	272	100
Volume Left (vph)	0	411	200	0
Volume Right (vph)	122	0	72	11
Hadj (s)	-0.42	0.22	0.02	-0.03
Departure Headway (s)	5.4	5.5	5.8	6.2
Degree Utilization, x	0.24	0.69	0.44	0.17
Capacity (veh/h)	593	628	566	491
Control Delay (s)	10.1	19.9	13.4	10.4
Approach Delay (s)	10.1	19.9	13.4	10.4
Approach LOS	B	C	B	B

Intersection Summary			
Delay	15.5		
HCM Level of Service	C		
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	65	50	240	555	5
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)	5	68	53	253	584	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume	945	587	589			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	945	587	589			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	87	95			
cM capacity (veh/h)	275	510	986			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	74	305	589
Volume Left	5	53	0
Volume Right	68	0	5
cSH	480	986	1700
Volume to Capacity	0.15	0.05	0.35
Queue Length 95th (ft)	13	4	0
Control Delay (s)	13.8	2.0	0.0
Lane LOS	B	A	
Approach Delay (s)	13.8	2.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	85	0	0	5	0	285	260	0	620	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	89	0	0	5	0	300	274	0	653	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								343				
pX, platoon unblocked												
vC, conflicting volume	958	1226	653	1042	953	300	653			574		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	958	1226	653	1042	953	300	653			574		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.4			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	100	100	81	100	100	99	100			100		
cM capacity (veh/h)	237	180	471	168	261	744	818			1009		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	89	5	300	274	653	0
Volume Left	0	0	0	0	0	0
Volume Right	89	5	0	274	0	0
cSH	471	744	1700	1700	1700	1700
Volume to Capacity	0.19	0.01	0.18	0.16	0.38	0.00
Queue Length 95th (ft)	17	1	0	0	0	0
Control Delay (s)	14.4	9.9	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	14.4	9.9	0.0		0.0	
Approach LOS	B	A				

Intersection Summary				
Average Delay	1.0			
Intersection Capacity Utilization	46.7%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	430	5	120	100	425	0	0	480	225
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			1.00	1.00
Frt				1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1624	1630	1530	1629	1698			1667	1224
Flt Permitted				0.95	0.95	1.00	0.42	1.00			1.00	1.00
Satd. Flow (perm)				1624	1630	1530	723	1698			1667	1224
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	0	0	453	5	126	105	447	0	0	505	237
RTOR Reduction (vph)	0	0	0	0	0	97	0	0	0	0	0	49
Lane Group Flow (vph)	0	0	0	231	227	29	105	447	0	0	505	188
Heavy Vehicles (%)	4%	0%	7%	0%	0%	0%	5%	6%	0%	0%	8%	25%
Turn Type				Perm		Perm	Perm					Perm
Protected Phases					4			6			2	
Permitted Phases				4		4	6					2
Actuated Green, G (s)				16.7	16.7	16.7	49.8	49.8			49.8	49.8
Effective Green, g (s)				17.2	17.2	17.2	49.8	49.8			49.8	49.8
Actuated g/C Ratio				0.23	0.23	0.23	0.66	0.66			0.66	0.66
Clearance Time (s)				4.5	4.5	4.5	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
Lane Grp Cap (vph)				372	374	351	480	1127			1107	813
v/s Ratio Prot								0.26			c0.30	
v/s Ratio Perm				c0.14	0.14	0.02	0.15					0.15
v/c Ratio				0.62	0.61	0.08	0.22	0.40			0.46	0.23
Uniform Delay, d1				26.0	25.9	22.7	5.0	5.7			6.1	5.0
Progression Factor				1.00	1.00	1.00	0.59	0.57			1.00	1.00
Incremental Delay, d2				3.2	2.8	0.1	0.9	0.9			1.4	0.7
Delay (s)				29.2	28.7	22.8	3.8	4.2			7.4	5.7
Level of Service				C	C	C	A	A			A	A
Approach Delay (s)		0.0			27.6			4.1			6.9	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM Average Control Delay	12.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	210	5	290	0	0	0	0	315	300	145	765	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	0.95	
Frt		1.00	0.85					0.93		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1716	1485					1616		1629	3288	
Flt Permitted		0.95	1.00					1.00		0.35	1.00	
Satd. Flow (perm)		1716	1485					1616		595	3288	
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)	221	5	305	0	0	0	0	332	316	153	805	0
RTOR Reduction (vph)	0	0	175	0	0	0	0	40	0	0	0	0
Lane Group Flow (vph)	0	226	130	0	0	0	0	608	0	153	805	0
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	5%	3%	5%	4%	0%
Turn Type	Perm		Perm							Perm		
Protected Phases		8						6			2	
Permitted Phases	8		8							2		
Actuated Green, G (s)		14.4	14.4					52.1		52.1	52.1	
Effective Green, g (s)		14.9	14.9					52.1		52.1	52.1	
Actuated g/C Ratio		0.20	0.20					0.69		0.69	0.69	
Clearance Time (s)		4.5	4.5					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		341	295					1123		413	2284	
v/s Ratio Prot								c0.38			0.24	
v/s Ratio Perm		0.13	0.09							0.26		
v/c Ratio		0.66	0.44					0.54		0.37	0.35	
Uniform Delay, d1		27.7	26.4					5.6		4.7	4.6	
Progression Factor		1.00	1.00					1.02		1.76	1.83	
Incremental Delay, d2		4.8	1.1					1.5		2.4	0.4	
Delay (s)		32.5	27.5					7.2		10.7	8.9	
Level of Service		C	C					A		B	A	
Approach Delay (s)		29.6			0.0			7.2			9.2	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	80	0	0	75	0	540	20	0	695	360
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	84	0	0	79	0	568	21	0	732	379
Pedestrians		23			22			23			2	
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		2			2			2			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								254			365	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92	0.88	0.92			0.88		
vC, conflicting volume	1604	1556	601	1074	1734	603	1134			611		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1271	1218	382	695	1413	478	963			488		
tC, single (s)	7.6	6.5	6.9	7.5	6.5	6.9	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	100	100	84	100	100	83	100			100		
cM capacity (veh/h)	88	161	543	242	123	464	644			888		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	84	79	589	488	623
Volume Left	0	0	0	0	0
Volume Right	84	79	21	0	379
cSH	543	464	1700	1700	1700
Volume to Capacity	0.16	0.17	0.35	0.29	0.37
Queue Length 95th (ft)	14	15	0	0	0
Control Delay (s)	12.8	14.4	0.0	0.0	0.0
Lane LOS	B	B			
Approach Delay (s)	12.8	14.4	0.0	0.0	
Approach LOS	B	B			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis | Hood River
7: Oak Street & 2nd Street | Recomended Alternative Exit 63 - Sunday

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	210	210	40	20	305	65	45	285	25	180	215	380
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0			4.0			4.0			4.0	4.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes		0.99			0.99			1.00			1.00	0.92
Flpb, ped/bikes		0.99			1.00			1.00			0.99	1.00
Frt		0.99			0.98			0.99			1.00	0.85
Flt Protected		0.98			1.00			0.99			0.98	1.00
Satd. Flow (prot)		1713			1729			1746			1638	1387
Flt Permitted		0.58			0.97			0.92			0.64	1.00
Satd. Flow (perm)		1022			1678			1608			1076	1387
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)	221	221	42	21	321	68	47	300	26	189	226	400
RTOR Reduction (vph)	0	4	0	0	8	0	0	5	0	0	0	129
Lane Group Flow (vph)	0	480	0	0	402	0	0	368	0	0	415	271
Confl. Peds. (#/hr)	19		28	28		19	19		19	28		28
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	6%	6%	1%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)		32.8			32.8			34.2			34.2	34.2
Effective Green, g (s)		32.8			32.8			34.2			34.2	34.2
Actuated g/C Ratio		0.44			0.44			0.46			0.46	0.46
Clearance Time (s)		4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		447			734			733			491	632
v/s Ratio Prot												
v/s Ratio Perm		c0.47			0.24			0.23			c0.39	0.20
v/c Ratio		1.07			0.55			0.50			0.85	0.43
Uniform Delay, d1		21.1			15.6			14.4			18.1	13.8
Progression Factor		1.00			1.00			1.00			0.64	0.31
Incremental Delay, d2		63.8			0.8			2.5			15.5	2.0
Delay (s)		84.9			16.5			16.8			27.1	6.2
Level of Service		F			B			B			C	A
Approach Delay (s)		84.9			16.5			16.8			16.8	
Approach LOS		F			B			B			B	

Intersection Summary			
HCM Average Control Delay	32.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	15	215	270	15	60	250	610	255	40	560	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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		1.00	0.95	1.00	1.00	0.95	
Frt		0.88		1.00	0.88		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1511		1676	1583		1613	3353	1530	1710	3331	
Flt Permitted		0.98		0.53	1.00		0.42	1.00	1.00	0.26	1.00	
Satd. Flow (perm)		1484		940	1583		716	3353	1530	462	3331	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	21	15	222	278	15	62	258	629	263	41	577	31
RTOR Reduction (vph)	0	149	0	0	42	0	0	0	146	0	6	0
Lane Group Flow (vph)	0	109	0	278	35	0	258	629	117	41	602	0
Heavy Vehicles (%)	0%	25%	4%	2%	0%	0%	6%	2%	0%	0%	2%	0%
Turn Type	Perm			Perm			pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)		19.8		19.8	19.8		26.6	26.6	26.6	17.2	17.2	
Effective Green, g (s)		19.8		19.8	19.8		26.6	26.6	26.6	17.2	17.2	
Actuated g/C Ratio		0.33		0.33	0.33		0.44	0.44	0.44	0.29	0.29	
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)		490		310	522		482	1486	678	166	955	
v/s Ratio Prot					0.02		c0.10	0.19		0.01	c0.18	
v/s Ratio Perm		0.07		c0.30			0.14		0.08	0.06		
v/c Ratio		0.22		0.90	0.07		0.54	0.42	0.17	0.25	0.63	
Uniform Delay, d1		14.5		19.1	13.8		13.8	11.4	10.1	16.1	18.6	
Progression Factor		1.00		1.00	1.00		0.73	0.66	1.09	1.00	1.00	
Incremental Delay, d2		0.2		26.5	0.1		1.1	0.8	0.5	0.8	3.1	
Delay (s)		14.8		45.6	13.8		11.2	8.4	11.5	16.9	21.8	
Level of Service		B		D	B		B	A	B	B	C	
Approach Delay (s)		14.8			38.7			9.7			21.5	
Approach LOS		B			D			A			C	

Intersection Summary			
HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	120	0	170	170	945	0	0	510	535
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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
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)					1676	1485	1513	3386			3226	1515
Flt Permitted					0.95	1.00	0.44	1.00			1.00	1.00
Satd. Flow (perm)					1676	1485	697	3386			3226	1515
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	0	0	126	0	179	179	995	0	0	537	563
RTOR Reduction (vph)	0	0	0	0	0	102	0	0	0	0	0	261
Lane Group Flow (vph)	0	0	0	0	126	77	179	995	0	0	537	302
Heavy Vehicles (%)	0%	0%	0%	2%	0%	3%	13%	1%	0%	0%	6%	1%
Turn Type				Perm		Perm	pm+pt					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Actuated Green, G (s)					9.8	9.8	42.2	42.2			32.2	32.2
Effective Green, g (s)					9.8	9.8	42.2	42.2			32.2	32.2
Actuated g/C Ratio					0.16	0.16	0.70	0.70			0.54	0.54
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)					274	243	572	2381			1731	813
v/s Ratio Prot							0.03	c0.29			0.17	
v/s Ratio Perm					0.08	0.05	0.19					0.20
v/c Ratio					0.46	0.32	0.31	0.42			0.31	0.37
Uniform Delay, d1					22.7	22.1	4.0	3.7			7.7	8.0
Progression Factor					1.00	1.00	0.49	0.58			0.57	1.11
Incremental Delay, d2					1.2	0.8	0.3	0.5			0.4	1.1
Delay (s)					23.9	22.9	2.2	2.6			4.8	10.0
Level of Service					C	C	A	A			A	B
Approach Delay (s)		0.0			23.3			2.6			7.5	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	555	0	235	0	0	0	0	560	135	135	495	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95	1.00					0.95		1.00	1.00	
Frt	1.00	1.00	0.85					0.97		1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1608	1608	1485					3255		1676	1748	
Flt Permitted	0.95	0.95	1.00					1.00		0.30	1.00	
Satd. Flow (perm)	1608	1608	1485					3255		529	1748	
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)	603	0	255	0	0	0	0	609	147	147	538	0
RTOR Reduction (vph)	0	0	184	0	0	0	0	30	0	0	0	0
Lane Group Flow (vph)	301	302	71	0	0	0	0	726	0	147	538	0
Heavy Vehicles (%)	1%	2%	3%	2%	2%	2%	0%	2%	2%	2%	3%	0%
Turn Type	Split		Perm							pm+pt		
Protected Phases	4	4						2		1	6	
Permitted Phases			4							6		
Actuated Green, G (s)	16.7	16.7	16.7					26.6		35.3	35.3	
Effective Green, g (s)	16.7	16.7	16.7					26.6		35.3	35.3	
Actuated g/C Ratio	0.28	0.28	0.28					0.44		0.59	0.59	
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)	448	448	413					1443		401	1028	
v/s Ratio Prot	0.19	c0.19						0.22		0.03	c0.31	
v/s Ratio Perm			0.05							0.19		
v/c Ratio	0.67	0.67	0.17					0.50		0.37	0.52	
Uniform Delay, d1	19.2	19.2	16.4					12.0		9.8	7.3	
Progression Factor	1.00	1.00	1.00					1.00		0.72	0.71	
Incremental Delay, d2	3.9	4.0	0.2					1.3		0.6	1.8	
Delay (s)	23.2	23.2	16.6					13.2		7.6	7.1	
Level of Service	C	C	B					B		A	A	
Approach Delay (s)		21.2			0.0			13.2			7.2	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	295	30	200	10	35	35	235	370	10	30	405	290
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.87		1.00	0.93		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1693	1566		1710	1665		1693	1591		1710	1748	1515
Flt Permitted	0.44	1.00		0.61	1.00		0.33	1.00		0.53	1.00	1.00
Satd. Flow (perm)	776	1566		1094	1665		596	1591		948	1748	1515
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)	311	32	211	11	37	37	247	389	11	32	426	305
RTOR Reduction (vph)	0	145	0	0	35	0	0	1	0	0	0	168
Lane Group Flow (vph)	311	98	0	11	39	0	247	399	0	32	426	137
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	1%	13%	0%	0%	3%	1%
Turn Type	pm+pt			Perm			pm+pt			Perm		Perm
Protected Phases	7	4			8		5	2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	33.4	33.4		7.0	7.0		64.6	64.6		47.7	47.7	47.7
Effective Green, g (s)	33.4	33.4		7.0	7.0		64.6	64.6		47.7	47.7	47.7
Actuated g/C Ratio	0.32	0.32		0.07	0.07		0.61	0.61		0.45	0.45	0.45
Clearance Time (s)	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
Lane Grp Cap (vph)	438	493		72	110		497	970		427	787	682
v/s Ratio Prot	c0.15	0.06			0.02		c0.06	0.25			c0.24	
v/s Ratio Perm	c0.07			0.01			0.24			0.03		0.09
v/c Ratio	0.71	0.20		0.15	0.36		0.50	0.41		0.07	0.54	0.20
Uniform Delay, d1	30.6	26.5		46.7	47.4		11.6	10.8		16.6	21.2	17.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.4	0.2		1.0	2.0		0.8	1.3		0.3	2.7	0.7
Delay (s)	35.9	26.7		47.7	49.4		12.4	12.1		16.9	23.9	18.3
Level of Service	D	C		D	D		B	B		B	C	B
Approach Delay (s)		31.9			49.1			12.2			21.3	
Approach LOS		C			D			B			C	

Intersection Summary			
HCM Average Control Delay	22.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	106.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 1: Portway Ave & 2nd Street

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	85	156	122	74
Average Queue (ft)	43	72	55	36
95th Queue (ft)	69	127	92	60
Link Distance (ft)	976	726	349	318
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Industrial St & 2nd Street

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	67	110
Average Queue (ft)	32	27
95th Queue (ft)	57	73
Link Distance (ft)	972	365
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Riverside Drive & 2nd Street

Movement	EB	WB	SB
Directions Served	R	R	T
Maximum Queue (ft)	73	21	168
Average Queue (ft)	29	3	22
95th Queue (ft)	58	16	106
Link Distance (ft)	1467	417	365
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			2
Queuing Penalty (veh)			0

Intersection: 4: I-84 WB Ramp & 2nd Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	R
Maximum Queue (ft)	191	202	140	112	302	284	90
Average Queue (ft)	108	96	47	47	89	163	69
95th Queue (ft)	165	160	103	100	206	298	117
Link Distance (ft)	1470	1470			352	267	
Upstream Blk Time (%)					0	2	
Queuing Penalty (veh)					0	16	
Storage Bay Dist (ft)			125	90			65
Storage Blk Time (%)		2	0	2	5	17	1
Queuing Penalty (veh)		3	0	7	5	38	4

Intersection: 5: I-84 EB Ramp & 2nd Street

Movement	EB	EB	NB	SB	SB	SB
Directions Served	LT	R	TR	L	T	T
Maximum Queue (ft)	225	182	191	114	225	219
Average Queue (ft)	119	84	60	72	108	105
95th Queue (ft)	196	147	139	124	189	176
Link Distance (ft)	1961		296		352	352
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		1000		90		
Storage Blk Time (%)				6	6	
Queuing Penalty (veh)				24	9	

Intersection: 6: Cascade Ave & 2nd Street

Movement	EB	WB	NB	SB	SB
Directions Served	R	R	TR	T	TR
Maximum Queue (ft)	119	69	103	196	210
Average Queue (ft)	46	32	10	22	30
95th Queue (ft)	93	57	54	106	126
Link Distance (ft)	2394	272	196	296	296
Upstream Blk Time (%)			0	0	0
Queuing Penalty (veh)			0	0	1
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Oak Street & 2nd Street

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	2380	408	244	279	228
Average Queue (ft)	2214	190	141	165	101
95th Queue (ft)	2830	340	240	274	189
Link Distance (ft)	2366	459	228	196	196
Upstream Blk Time (%)	65	0	3	8	1
Queuing Penalty (veh)	0	0	0	32	2
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Network Summary

Network wide Queuing Penalty: 141

Intersection: 8: Marina Way & Button Bridge Road

Movement	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	TR	L	T	T	R	L	T	TR
Maximum Queue (ft)	202	347	100	150	232	202	150	94	304	442
Average Queue (ft)	85	175	51	114	96	102	58	33	108	227
95th Queue (ft)	158	320	117	169	200	175	128	73	246	415
Link Distance (ft)	409	346			180	180			1443	1443
Upstream Blk Time (%)		2			3	1				
Queuing Penalty (veh)		0			14	4				
Storage Bay Dist (ft)			75	125			125	125		
Storage Blk Time (%)		39	1	9	1	2	0	0	2	
Queuing Penalty (veh)		29	2	28	3	6	0	0	1	

Intersection: 9: I-84 WB Ramp & Button Bridge Road

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	T	T	T	R
Maximum Queue (ft)	200	147	124	250	264	143	199	125
Average Queue (ft)	74	70	73	96	112	48	57	61
95th Queue (ft)	143	127	126	211	221	109	135	129
Link Distance (ft)	1919			277	277	180	180	
Upstream Blk Time (%)				0	0	0	0	
Queuing Penalty (veh)				2	1	0	2	
Storage Bay Dist (ft)		125	100					100
Storage Blk Time (%)	1	1	3	4			1	1
Queuing Penalty (veh)	3	1	14	6			5	4

Intersection: 10: I-84 EB Ramp & Button Bridge Road

Movement	EB	EB	EB	NB	NB	SB	SB
Directions Served	L	LT	R	T	TR	L	T
Maximum Queue (ft)	214	200	170	230	269	216	297
Average Queue (ft)	111	119	77	124	142	76	140
95th Queue (ft)	183	184	137	209	235	151	250
Link Distance (ft)		1850		454	454	277	277
Upstream Blk Time (%)						0	0
Queuing Penalty (veh)						0	1
Storage Bay Dist (ft)	300		300				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 11: Historic Columbia River Hwy & Button Bridge Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	T	R
Maximum Queue (ft)	456	248	48	148	263	343	188	713	275
Average Queue (ft)	220	33	9	57	124	151	26	259	119
95th Queue (ft)	386	156	34	111	216	277	95	513	271
Link Distance (ft)	1665	1665	514	514	1265	1265		1168	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)							250		250
Storage Blk Time (%)								6	0
Queuing Penalty (veh)								21	1

Network Summary

Network wide Queuing Penalty: 148

Technical Memorandum #5 – Addendum #1

DKS Associates
TRANSPORTATION SOLUTIONS

Technical Memorandum #5 – Addendum #1

DATE: November 18, 2010

TO: Hood River IAMPs Project Team

FROM: John Bosket, PE

SUBJECT: **Hood River Interchange Area Management Plans (IAMPs)**
Alternatives Analysis – Cascade Ave./ Westcliff Dr. P05001-011

The Draft Hood River I-84 Exit 62 Interchange Area Management Plan (IAMP) recommends improvements to the transportation system surrounding the Exit 62 interchange that include signalization of the I-84 westbound ramp terminal on Cascade Avenue, with the intersection on Cascade Avenue at Westcliff Drive remaining under stop control. Because of the proximity of these two intersections (approximately 100 feet apart), the currently used stop control configuration at the Cascade Avenue intersection with Westcliff Drive was modified to provide free movements away from the interchange to avoid queue spillback into the ramp terminals.

While this works well for interchange operations, the intersection on Cascade Avenue with Westcliff Drive would operate at a level of service F during the weekday p.m. peak hour in the year 2031, and would not meet City of Hood River mobility standards. Therefore, the City has requested an alternative improvement at this location. This addendum to Technical Memorandum #5 provides an alternative improvement for the Cascade Avenue/ Westcliff Drive intersection that both meets City mobility standards and allows for adequate interchange operations.

Proposed Cascade Avenue/ Westcliff Drive Improvement

It is assumed that any proposed improvement to the Cascade Avenue/ Westcliff Drive intersection meet at least two criteria:

1. **It must allow for compliance with City of Hood River and ODOT mobility standards.**

   The intersection is under ODOT jurisdiction, but future development will be required to comply with City of Hood River mobility standards as well. ODOT's mobility standard (from the 2003 Highway Design Manual) requires a maximum volume to capacity ratio of 0.80. The City of Hood River's mobility standard requires a level of service C or better.

2. **It must not compromise safe and efficient operation of the I-84 westbound ramp terminal.**

   Being so close to the I-84 westbound ramp terminal, which will be signalized in the future, there is a high potential for vehicular conflicts between these intersections. A key concern will be avoiding queue spillback problems between the intersections that could block traffic movements. Another concern relates to the potential for turning conflicts between the closely-spaced intersections. When the Cascade Avenue/ Westcliff Drive intersection is under stop control, drivers on Westcliff Drive must select gaps in traffic before entering or crossing Cascade Avenue. However, as phases change at the traffic signal at the I-84 westbound ramp terminal, gaps in traffic for Westcliff Drive drivers can also change unexpectedly.

A variety of configurations were tested using stop control on different movements of the Cascade Avenue/ Westcliff Drive intersection. However, every alternative tested either failed to meet City mobility standards (level of service E or worse) or experienced queue spillback problems that blocked intersection approaches and resulted in long delays. Roundabouts were previously considered in Technical Memorandum #5, but could not provide adequate operations.

Therefore, the proposed alternative is to include the Cascade Avenue/ Westcliff Drive intersection as part of the Cascade Avenue/ I-84 westbound traffic signal. For this analysis, protected turns and split phasing were used, along with a 110-second cycle length.

As shown in Table 1 on the following page, this alternative would allow for compliance with ODOT and City mobility standards at nearly every intersection through the year 2031 during both the weekday and Sunday p.m. peak hours. The exception is the intersection on Cascade Avenue with the I-84 westbound ramp terminal, which operates at a level of service D during the weekday p.m. peak hour. Four potential ways to mitigate this include:

- *Reduce the cycle length to 90 seconds.* While this will enable the intersection to operate at a level of service C, meeting the City's mobility standard, the intersection v/c ratio will increase to 0.67 and would no longer meet ODOT's mobility standard.

- *Add a second northbound left turn lane from Cascade Avenue to the I-84 westbound on-ramp.* While this would add capacity to the intersection, it would add considerable cost to the interchange improvement, including on-ramp widening for a second receiving lane and possibly an additional lane on the overcrossing structure.

- *Amend the City's mobility standard to allow a level of service D.* This action could apply to only the intersection in question or could be applied citywide. Consideration for citywide application should be conducted through the ongoing Transportation System Plan update process.

- *Apply for a design exception from ODOT to allow non-compliance with the Highway Design Manual mobility standard.* Given that this intersection is projected to operate very well, within 3% of the mobility standard out to the year 2031, the request for non-compliance with mobility standards may be reasonable to avoid additional construction costs. Furthermore, the 1999 Oregon Highway Plan mobility standard, which will be applied to future development proposals, allows for a v/c ratio as high as 0.85 at this intersection. Therefore, a significant buffer would still remain to absorb future traffic growth through the planning horizon.

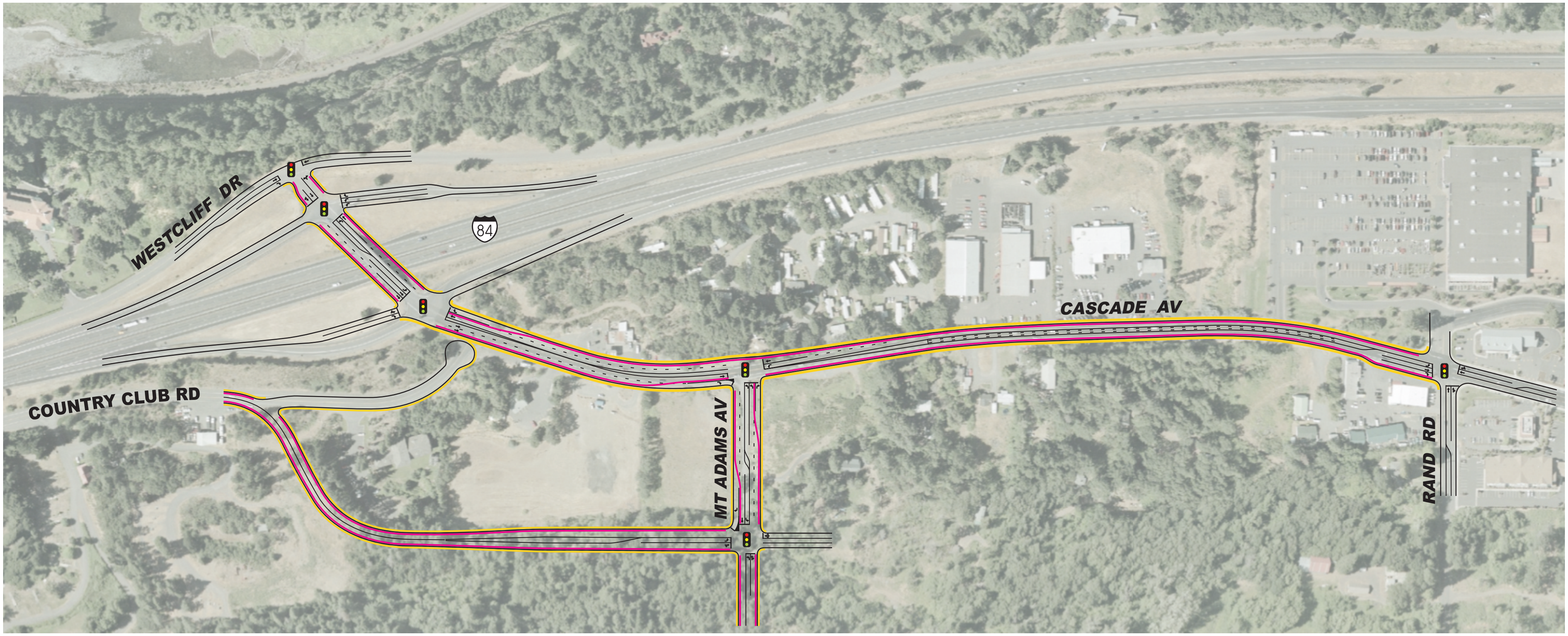
Given the small margin for additional improvement needed, the added cost of the additional left turn lane may not be justified. Therefore, the recommended course of action is to apply for a design exception from ODOT's Highway Design Manual mobility standard. This is recommended over amending the City's mobility standard, because the lower City mobility standard could continue to be applied to future development proposals, providing additional protection. However, it should be noted that an amendment of the citywide mobility standard to allow a level of service D during the peak hour may still be considered through the Transportation System Plan update process regardless of this decision.

Table 1: Intersection Operations in 2031 with the Intersections on Cascade Avenue at Westcliff Drive and the I-84 Westbound Ramp Terminal Operating under Signal Control (110" cycle length)

Intersection	Level of Service (LOS)	Delay (sec)	Volume to Capacity Ratio (v/c)	City Mobility Standard (LOS)	ODOT HDM Mobility Standard (v/c)
Weekday PM Peak Hour					
Cascade Ave/ Westcliff Dr	C	29.9	0.36	C	0.80
Cascade Ave/ I-84 WB	**D**	39.0	0.65	C	0.65
Cascade Ave/ I-84 EB	B	14.9	0.50	C	0.65
Cascade Ave/ Mt Adams Ave	B	18.1	0.62	C	0.80
Cascade Ave/ Rand Rd	C	22.6	0.79	C	0.80
Mt Adams Ave/ Country Club Rd	B	19.1	0.66	C	N/A
Sunday PM Peak Hour					
Cascade Ave/ Westcliff Dr	C	23.6	0.36	C	0.80
Cascade Ave/ I-84 WB	C	31.5	0.60	C	0.65
Cascade Ave/ I-84 EB	B	18.8	0.55	C	0.65
Cascade Ave/ Mt Adams Ave	C	33.9	0.64	C	0.80
Cascade Ave/ Rand Rd	B	17.3	0.70	C	0.80
Mt Adams Ave/ Country Club Rd	B	17.0	0.53	C	N/A

This alternative is also able to manage queues between these intersections in a manner that avoids blockage of movements and keeps off-ramp queues from extending beyond the length of the ramp reserved for queue storage (95th percentile off-ramp queues of 375 feet on the westbound off-ramp and 150 feet on the eastbound off-ramp by the year 2031). Some queue spillback was reported during the Sunday p.m. peak hour for the northbound left turn from Cascade Avenue to I-84 westbound, but it had no significant impact on operations at adjacent intersections.

Analysis worksheets have been attached providing additional detail for the capacity (Synchro) and queuing (SimTraffic) analysis conducted.



LEGEND

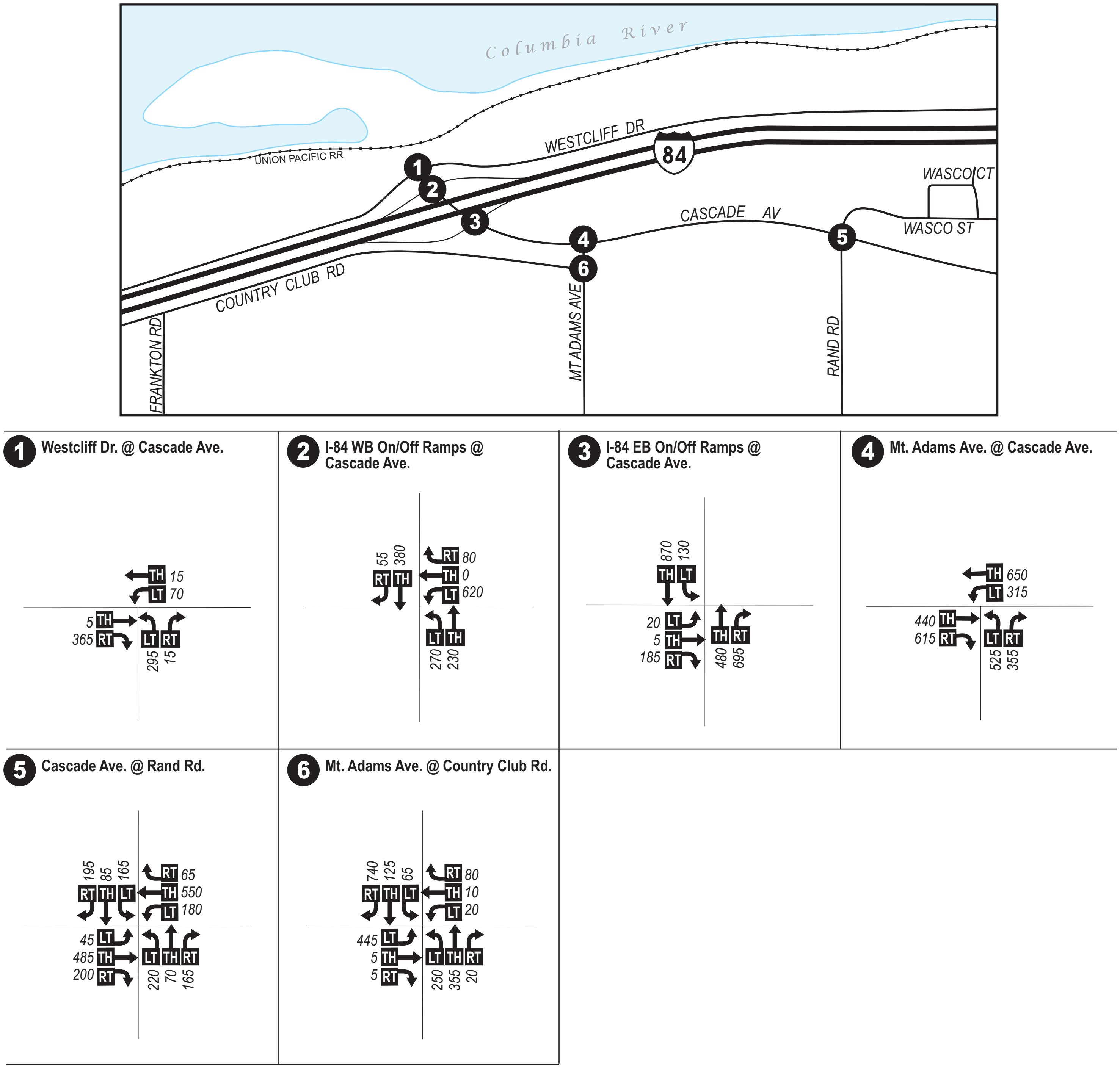
- Bike Lane
- Sidewalk
- Signalized Intersection

DKS Associates
TRANSPORTATION SOLUTIONS

NO SCALE

Figure 7

I-84 Exit 62
Interchange Area Management Plan
Motor Vehicle Network Improvements



I-84 Exit 62
Interchange Area Management Plan

Figure 5 2031 Weekday PM Peak Hour Traffic Volumes

LEGEND

0 - Study Intersection & Number

RT 00 - Right Turn Movement Traffic Volume

TH 00 - Through Movement Traffic Volume

LT 00 - Left Turn Movement Traffic Volume

DKS Associates
TRANSPORTATION SOLUTIONS

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	5	365	70	15	295	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
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	0.85		1.00	0.99	
Flt Protected	1.00	1.00		0.96	0.95	
Satd. Flow (prot)	1800	1443		1729	1576	
Flt Permitted	1.00	1.00		0.96	0.95	
Satd. Flow (perm)	1800	1443		1729	1576	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	6	429	82	18	347	18
RTOR Reduction (vph)	0	380	0	0	2	0
Lane Group Flow (vph)	6	49	0	100	363	0
Heavy Vehicles (%)	0%	6%	0%	0%	8%	14%
Turn Type		Prot	Split			
Protected Phases	3	3	7	7	2 8	
Permitted Phases						
Actuated Green, G (s)	12.5	12.5		13.7	71.8	
Effective Green, g (s)	12.5	12.5		13.7	71.8	
Actuated g/C Ratio	0.11	0.11		0.12	0.65	
Clearance Time (s)	4.0	4.0		4.0		
Vehicle Extension (s)	3.0	3.0		3.0		
Lane Grp Cap (vph)	205	164		215	1029	
v/s Ratio Prot	0.00	c0.03		c0.06	c0.23	
v/s Ratio Perm						
v/c Ratio	0.03	0.30		0.47	0.35	
Uniform Delay, d1	43.4	44.7		44.7	8.6	
Progression Factor	1.00	1.00		1.00	0.27	
Incremental Delay, d2	0.3	4.6		1.6	0.2	
Delay (s)	43.6	49.3		46.3	2.5	
Level of Service	D	D		D	A	
Approach Delay (s)	49.2			46.3	2.5	
Approach LOS	D			D	A	

Intersection Summary			
HCM Average Control Delay	29.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	0	0	620	0	80	0	380	55	270	230	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)				4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor				0.97		1.00		0.95		1.00	1.00	
Frt				1.00		0.85		0.98		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				3130		1404		3297		1644	1731	
Flt Permitted				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)				3130		1404		3297		1644	1731	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	0	729	0	94	0	447	65	318	271	0
RTOR Reduction (vph)	0	0	0	0	0	68	0	10	0	0	0	0
Lane Group Flow (vph)	0	0	0	729	0	26	0	502	0	318	271	0
Heavy Vehicles (%)	0%	0%	0%	6%	0%	9%	0%	2%	0%	4%	4%	0%
Turn Type				custom		custom				Split		
Protected Phases								7 3		2	2	
Permitted Phases				8		8						
Actuated Green, G (s)				30.8		30.8		30.2		37.0	37.0	
Effective Green, g (s)				30.8		30.8		30.2		37.0	37.0	
Actuated g/C Ratio				0.28		0.28		0.27		0.34	0.34	
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)				876		393		905		553	582	
v/s Ratio Prot								c0.15		c0.19	0.16	
v/s Ratio Perm				c0.23		0.02						
v/c Ratio				0.83		0.07		0.55		0.58	0.47	
Uniform Delay, d1				37.2		29.1		34.1		30.0	28.7	
Progression Factor				1.00		1.00		0.80		1.38	1.39	
Incremental Delay, d2				6.8		0.1		0.5		4.1	2.5	
Delay (s)				44.0		29.1		27.7		45.5	42.5	
Level of Service				D		C		C		D	D	
Approach Delay (s)		0.0			42.3			27.7			44.1	
Approach LOS		A			D			C			D	

Intersection Summary			
HCM Average Control Delay	39.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	20	5	185	0	0	0	130	870	0	0	480	695
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1566	1457				1449	3257			1698	1485
Flt Permitted		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1566	1457				1449	3257			1698	1485
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)	21	5	195	0	0	0	137	916	0	0	505	732
RTOR Reduction (vph)	0	0	180	0	0	0	0	0	0	0	0	234
Lane Group Flow (vph)	0	26	15	0	0	0	137	916	0	0	505	498
Heavy Vehicles (%)	13%	0%	5%	0%	0%	0%	18%	5%	0%	0%	6%	3%
Turn Type	Perm		Perm				Prot					Perm
Protected Phases		4					1	6			2	
Permitted Phases	4		4									2
Actuated Green, G (s)		8.4	8.4				15.6	93.6			74.0	74.0
Effective Green, g (s)		8.4	8.4				15.6	93.6			74.0	74.0
Actuated g/C Ratio		0.08	0.08				0.14	0.85			0.67	0.67
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)		120	111				205	2771			1142	999
v/s Ratio Prot							c0.09	0.28			0.30	
v/s Ratio Perm		0.02	0.01									c0.34
v/c Ratio		0.22	0.13				0.67	0.33			0.44	0.50
Uniform Delay, d1		47.7	47.4				44.7	1.7			8.4	8.9
Progression Factor		1.00	1.00				1.03	1.38			0.67	2.00
Incremental Delay, d2		0.9	0.6				5.7	0.2			1.0	1.4
Delay (s)		48.6	48.0				51.8	2.6			6.6	19.1
Level of Service		D	D				D	A			A	B
Approach Delay (s)		48.0			0.0			9.0			14.0	
Approach LOS		D			A			A			B	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	440	615	315	650	525	355
Ideal Flow (vphpl)	1800	1800	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	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1765	1500	1676	1765	3252	1500
Flt Permitted	1.00	1.00	0.32	1.00	0.95	1.00
Satd. Flow (perm)	1765	1500	572	1765	3252	1500
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	463	647	332	684	553	374
RTOR Reduction (vph)	0	82	0	0	0	272
Lane Group Flow (vph)	463	565	332	684	553	102
Turn Type		pm+ov	pm+pt			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	52.9	82.9	72.0	72.0	30.0	30.0
Effective Green, g (s)	52.9	82.9	72.0	72.0	30.0	30.0
Actuated g/C Ratio	0.48	0.75	0.65	0.65	0.27	0.27
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)	849	1185	526	1155	887	409
v/s Ratio Prot	0.26	0.13	c0.09	0.39	c0.17	
v/s Ratio Perm		0.25	c0.33			0.07
v/c Ratio	0.55	0.48	0.63	0.59	0.62	0.25
Uniform Delay, d1	20.1	5.2	11.0	10.7	35.1	31.2
Progression Factor	0.74	0.20	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.4	1.3	2.5	0.8	3.3	1.5
Delay (s)	17.3	2.4	13.5	11.5	38.3	32.7
Level of Service	B	A	B	B	D	C
Approach Delay (s)	8.6			12.2	36.1	
Approach LOS	A			B	D	

Intersection Summary			
HCM Average Control Delay	18.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	485	200	180	550	65	220	70	165	165	85	195
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.89		1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1379	1765	1530	1676	1740		1710	1588		1644	1579	
Flt Permitted	0.26	1.00	1.00	0.22	1.00		0.45	1.00		0.51	1.00	
Satd. Flow (perm)	384	1765	1530	390	1740		811	1588		886	1579	
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)	47	505	208	188	573	68	229	73	172	172	89	203
RTOR Reduction (vph)	0	0	95	0	4	0	0	84	0	0	81	0
Lane Group Flow (vph)	47	505	113	188	637	0	229	161	0	172	211	0
Heavy Vehicles (%)	24%	2%	0%	2%	2%	0%	0%	0%	2%	4%	0%	3%
Turn Type	pm+pt		Perm	pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	33.9	31.9	31.9	45.3	39.3		28.1	28.1		28.1	28.1	
Effective Green, g (s)	33.9	31.9	31.9	45.3	39.3		28.1	28.1		28.1	28.1	
Actuated g/C Ratio	0.42	0.39	0.39	0.56	0.48		0.35	0.35		0.35	0.35	
Clearance Time (s)	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	
Lane Grp Cap (vph)	184	692	600	366	840		280	548		306	545	
v/s Ratio Prot	0.01	0.29		c0.06	c0.37			0.10			0.13	
v/s Ratio Perm	0.10		0.07	0.23			c0.28			0.19		
v/c Ratio	0.26	0.73	0.19	0.51	0.76		0.82	0.29		0.56	0.39	
Uniform Delay, d1	15.3	21.1	16.2	12.0	17.2		24.3	19.4		21.7	20.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	3.9	0.2	1.2	4.0		16.7	0.3		2.4	0.5	
Delay (s)	16.0	24.9	16.4	13.2	21.1		41.0	19.7		24.0	20.6	
Level of Service	B	C	B	B	C		D	B		C	C	
Approach Delay (s)		22.1			19.3			30.0			21.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	81.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	445	5	5	20	10	80	250	355	20	65	125	740
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.87		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1676	1632		1676	1530		1676	1750		1676	1765	1500
Flt Permitted	0.40	1.00		0.75	1.00		0.54	1.00		0.52	1.00	1.00
Satd. Flow (perm)	713	1632		1325	1530		948	1750		922	1765	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)	484	5	5	22	11	87	272	386	22	71	136	804
RTOR Reduction (vph)	0	3	0	0	81	0	0	2	0	0	0	248
Lane Group Flow (vph)	484	7	0	22	17	0	272	406	0	71	136	556
Turn Type	pm+pt			Perm			pm+pt			Perm		pm+ov
Protected Phases	7	4			8		5	2			6	7
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	41.6	41.6		5.9	5.9		41.1	41.1		23.6	23.6	55.3
Effective Green, g (s)	41.6	41.6		5.9	5.9		41.1	41.1		23.6	23.6	55.3
Actuated g/C Ratio	0.46	0.46		0.07	0.07		0.45	0.45		0.26	0.26	0.61
Clearance Time (s)	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
Lane Grp Cap (vph)	664	749		86	100		538	793		240	459	981
v/s Ratio Prot	c0.25	0.00			0.01		0.08	c0.23			0.08	c0.20
v/s Ratio Perm	c0.08			0.02			0.15			0.08		0.17
v/c Ratio	0.73	0.01		0.26	0.17		0.51	0.51		0.30	0.30	0.57
Uniform Delay, d1	18.9	13.3		40.3	40.1		16.4	17.7		26.9	26.9	10.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.0	0.0		1.6	0.8		0.8	2.4		3.1	1.6	0.8
Delay (s)	22.9	13.4		41.9	40.9		17.2	20.0		30.0	28.5	11.3
Level of Service	C	B		D	D		B	C		C	C	B
Approach Delay (s)		22.7			41.1			18.9			14.9	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 1: Westcliff Drive & Cascade Ave

Movement	EB	EB	WB	NW
Directions Served	T	R	LT	LR
Maximum Queue (ft)	58	141	102	66
Average Queue (ft)	12	89	59	31
95th Queue (ft)	91	169	114	76
Link Distance (ft)	1267		1142	73
Upstream Blk Time (%)				2
Queuing Penalty (veh)				6
Storage Bay Dist (ft)		150		
Storage Blk Time (%)		3		
Queuing Penalty (veh)		0		

Intersection: 2: I-84 WB Ramp & Cascade Ave

Movement	WB	WB	WB	SE	SE	NW	NW
Directions Served	L	L	R	T	TR	L	T
Maximum Queue (ft)	250	296	133	89	145	244	231
Average Queue (ft)	188	194	38	66	113	186	158
95th Queue (ft)	278	357	154	102	172	289	264
Link Distance (ft)		1152		73	73	308	308
Upstream Blk Time (%)				15	30	1	1
Queuing Penalty (veh)				32	64	2	2
Storage Bay Dist (ft)	250		250				
Storage Blk Time (%)	1	3	0				
Queuing Penalty (veh)	4	12	0				

Intersection: 3: I-84 EB Ramp & Cascade Ave

Movement	EB	EB	SE	SE	SE	NW	NW	B18	B18
Directions Served	LT	R	L	T	T	T	R	T	T
Maximum Queue (ft)	68	96	158	157	163	177	149	32	12
Average Queue (ft)	30	60	113	58	56	85	81	6	2
95th Queue (ft)	78	117	184	205	200	213	180	53	30
Link Distance (ft)	1392			308	308	192	192	548	548
Upstream Blk Time (%)				1	0	2	0		
Queuing Penalty (veh)				2	1	12	2		
Storage Bay Dist (ft)		150	150						
Storage Blk Time (%)		1	8						
Queuing Penalty (veh)		0	37						

Intersection: 4: Cascade Ave & Mt Adams Ave

Movement	EB	EB	B18	WB	WB	NB	NB	NB
Directions Served	T	R	T	L	T	L	L	R
Maximum Queue (ft)	195	86	4	165	261	202	222	168
Average Queue (ft)	104	33	1	101	174	160	159	109
95th Queue (ft)	210	104	9	180	290	218	244	195
Link Distance (ft)	548	548	192	362	362		412	412
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)						200		
Storage Blk Time (%)						1	1	
Queuing Penalty (veh)						4	4	

Intersection: 5: Cascade Ave & Rand Road

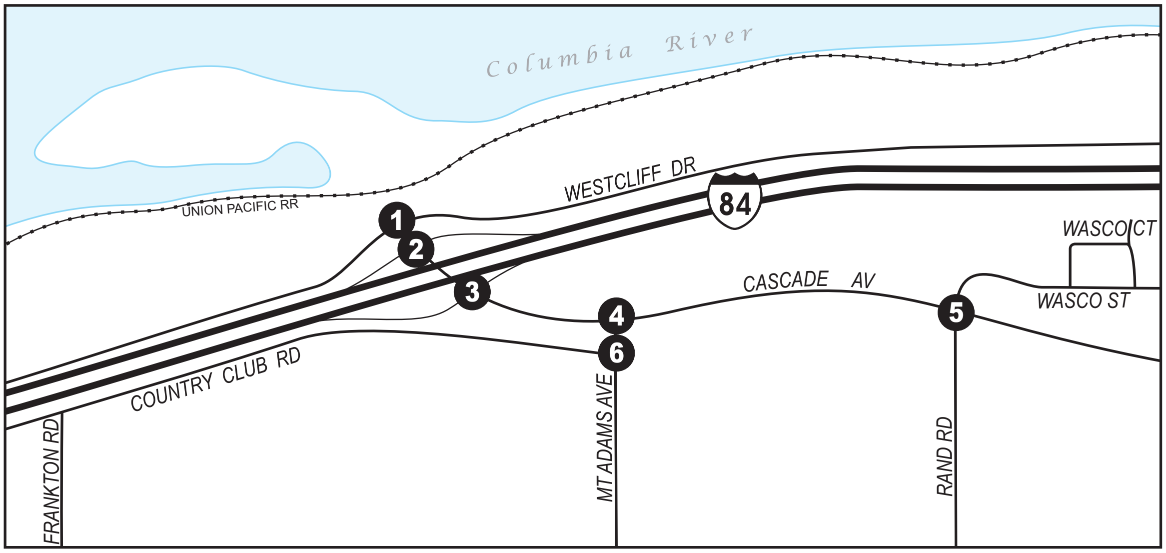
Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (ft)	73	448	138	141	479	148	197	141	205
Average Queue (ft)	31	276	67	96	333	105	100	94	108
95th Queue (ft)	84	576	154	170	618	170	205	155	220
Link Distance (ft)		1452			836		1178		428
Upstream Blk Time (%)					0				
Queuing Penalty (veh)					0				
Storage Bay Dist (ft)	150		150	125		150		150	
Storage Blk Time (%)		16	0	5	24	5	2	2	3
Queuing Penalty (veh)		40	0	31	44	11	4	6	5

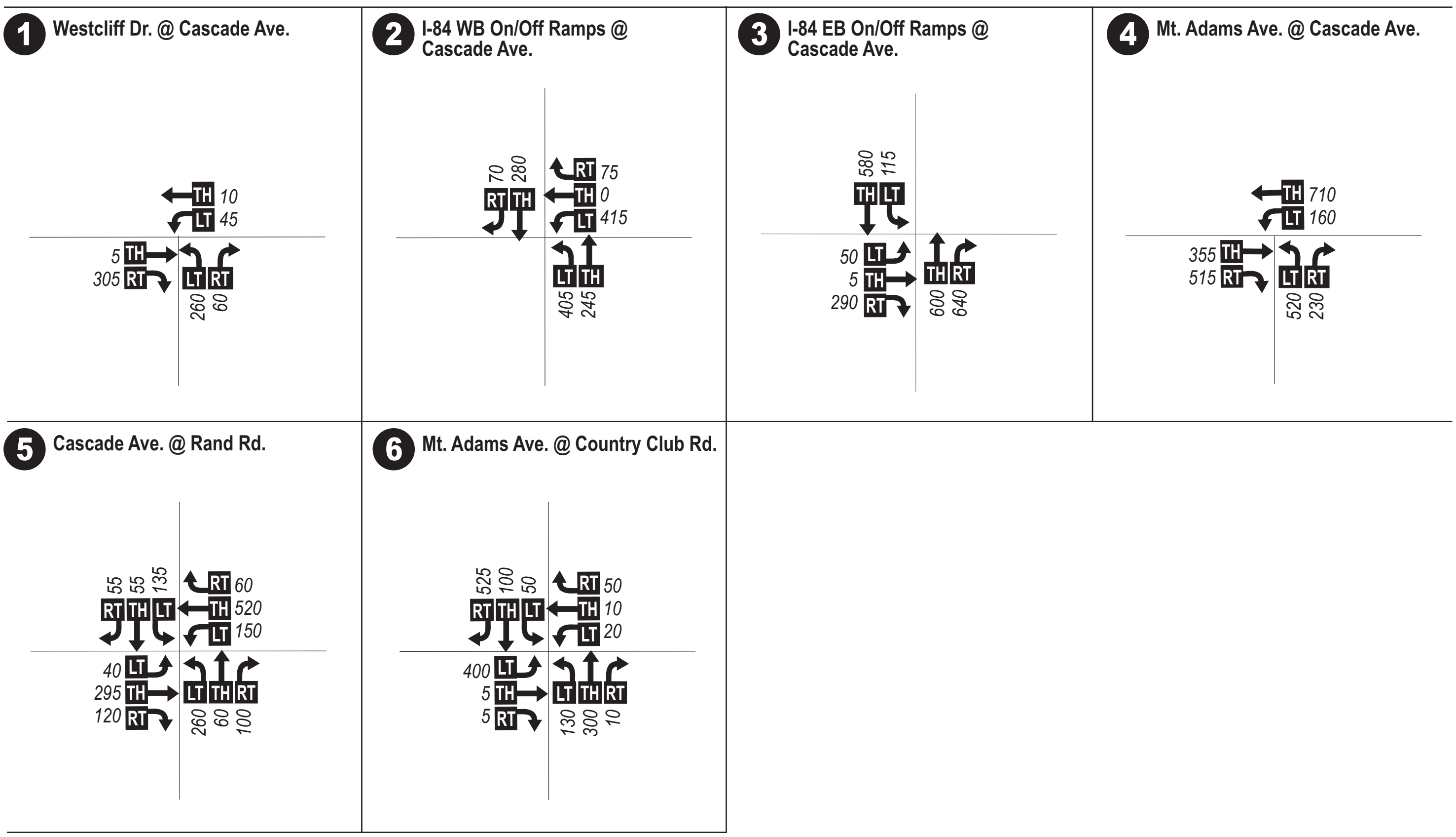
Intersection: 12: Mt Adams Ave &

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	T	R
Maximum Queue (ft)	235	83	37	71	148	201	81	159	244
Average Queue (ft)	179	18	18	41	91	119	43	78	113
95th Queue (ft)	276	127	47	82	162	229	98	186	275
Link Distance (ft)		1227		1176	696	696		412	412
Upstream Blk Time (%)								0	
Queuing Penalty (veh)								0	
Storage Bay Dist (ft)	250		250				150		
Storage Blk Time (%)	1							1	
Queuing Penalty (veh)	0							1	

Network Summary

Network wide Queuing Penalty: 326





I-84 Exit 62
Interchange Area Management Plan

Figure 6 2031 Sunday PM Peak Hour Traffic Volumes

LEGEND

0 - Study Intersection & Number
RT 00 - Right Turn Movement Traffic Volume
TH 00 - Through Movement Traffic Volume
LT 00 - Left Turn Movement Traffic Volume

DKS Associates
TRANSPORTATION SOLUTIONS

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Volume (vph)	5	305	45	10	260	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
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	0.85		1.00	0.97	
Flt Protected	1.00	1.00		0.96	0.96	
Satd. Flow (prot)	1800	1443		1729	1545	
Flt Permitted	1.00	1.00		0.96	0.96	
Satd. Flow (perm)	1800	1443		1729	1545	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	6	359	53	12	306	71
RTOR Reduction (vph)	0	292	0	0	8	0
Lane Group Flow (vph)	6	67	0	65	369	0
Heavy Vehicles (%)	0%	6%	0%	0%	8%	14%
Turn Type		Prot	Split			
Protected Phases	3	3	7	7	2 8	
Permitted Phases						
Actuated Green, G (s)	20.5	20.5		8.2	69.3	
Effective Green, g (s)	20.5	20.5		8.2	69.3	
Actuated g/C Ratio	0.19	0.19		0.07	0.63	
Clearance Time (s)	4.0	4.0		4.0		
Vehicle Extension (s)	3.0	3.0		3.0		
Lane Grp Cap (vph)	335	269		129	973	
v/s Ratio Prot	0.00	c0.05		c0.04	c0.24	
v/s Ratio Perm						
v/c Ratio	0.02	0.25		0.50	0.38	
Uniform Delay, d1	36.5	38.2		48.9	9.9	
Progression Factor	1.00	1.00		1.00	0.22	
Incremental Delay, d2	0.1	2.2		3.1	0.2	
Delay (s)	36.6	40.4		52.0	2.4	
Level of Service	D	D		D	A	
Approach Delay (s)	40.3			52.0	2.4	
Approach LOS	D			D	A	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	0	0	415	0	75	0	280	70	405	245	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)				4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor				0.97		1.00		0.95		1.00	1.00	
Frt				1.00		0.85		0.97		1.00	1.00	
Flt Protected				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)				3130		1404		3189		1644	1731	
Flt Permitted				0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)				3130		1404		3189		1644	1731	
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)	0	0	0	461	0	83	0	311	78	450	272	0
RTOR Reduction (vph)	0	0	0	0	0	68	0	20	0	0	0	0
Lane Group Flow (vph)	0	0	0	461	0	15	0	369	0	450	272	0
Heavy Vehicles (%)	0%	0%	0%	6%	0%	9%	0%	2%	12%	4%	4%	0%
Turn Type				custom		custom				Split		
Protected Phases								7 3		2	2	
Permitted Phases				8		8						
Actuated Green, G (s)				20.4		20.4		32.7		44.9	44.9	
Effective Green, g (s)				20.4		20.4		32.7		44.9	44.9	
Actuated g/C Ratio				0.19		0.19		0.30		0.41	0.41	
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)				580		260		948		671	707	
v/s Ratio Prot								c0.12		c0.27	0.16	
v/s Ratio Perm				c0.15		0.01						
v/c Ratio				0.79		0.06		0.39		0.67	0.38	
Uniform Delay, d1				42.8		36.9		30.7		26.5	22.9	
Progression Factor				1.00		1.00		0.75		0.80	0.76	
Incremental Delay, d2				7.4		0.1		0.2		4.6	1.4	
Delay (s)				50.2		37.0		23.2		25.9	18.9	
Level of Service				D		D		C		C	B	
Approach Delay (s)		0.0			48.2			23.2			23.3	
Approach LOS		A			D			C			C	

Intersection Summary			
HCM Average Control Delay	31.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	50	5	290	0	0	0	115	580	0	0	600	640
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	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			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1539	1457				1449	3257			1698	1485
Flt Permitted		0.96	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1539	1457				1449	3257			1698	1485
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)	53	5	305	0	0	0	121	611	0	0	632	674
RTOR Reduction (vph)	0	0	277	0	0	0	0	0	0	0	0	223
Lane Group Flow (vph)	0	58	28	0	0	0	121	611	0	0	632	451
Heavy Vehicles (%)	13%	0%	5%	0%	0%	0%	18%	5%	0%	0%	6%	3%
Turn Type	Perm		Perm				Prot					Perm
Protected Phases		4					1	6			2	
Permitted Phases	4		4									2
Actuated Green, G (s)		10.0	10.0				14.4	92.0			73.6	73.6
Effective Green, g (s)		10.0	10.0				14.4	92.0			73.6	73.6
Actuated g/C Ratio		0.09	0.09				0.13	0.84			0.67	0.67
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)		140	132				190	2724			1136	994
v/s Ratio Prot							c0.08	0.19			c0.37	
v/s Ratio Perm		0.04	0.02									0.30
v/c Ratio		0.41	0.21				0.64	0.22			0.56	0.45
Uniform Delay, d1		47.2	46.3				45.3	1.8			9.6	8.6
Progression Factor		1.00	1.00				1.18	0.85			0.82	2.24
Incremental Delay, d2		2.0	0.8				5.5	0.2			1.5	1.2
Delay (s)		49.2	47.1				58.9	1.7			9.4	20.5
Level of Service		D	D				E	A			A	C
Approach Delay (s)		47.5			0.0			11.1			15.1	
Approach LOS		D			A			B			B	

Intersection Summary			
HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	355	515	160	710	520	230
Ideal Flow (vphpl)	1800	1800	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	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1765	1500	1676	1765	3252	1500
Flt Permitted	1.00	1.00	0.42	1.00	0.95	1.00
Satd. Flow (perm)	1765	1500	743	1765	3252	1500
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	374	542	168	747	547	242
RTOR Reduction (vph)	0	98	0	0	0	172
Lane Group Flow (vph)	374	444	168	747	547	70
Turn Type		pm+ov	pm+pt			Perm
Protected Phases	4	2	3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	58.1	90.1	70.0	70.0	32.0	32.0
Effective Green, g (s)	58.1	90.1	70.0	70.0	32.0	32.0
Actuated g/C Ratio	0.53	0.82	0.64	0.64	0.29	0.29
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)	932	1283	540	1123	946	436
v/s Ratio Prot	0.21	0.10	0.02	c0.42	c0.17	
v/s Ratio Perm		0.20	0.18			0.05
v/c Ratio	0.40	0.35	0.31	0.67	0.58	0.16
Uniform Delay, d1	15.5	2.5	9.1	12.6	33.2	29.0
Progression Factor	0.65	33.16	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.7	0.3	1.5	2.6	0.8
Delay (s)	11.4	84.0	9.4	14.1	35.8	29.8
Level of Service	B	F	A	B	D	C
Approach Delay (s)	54.3			13.3	34.0	
Approach LOS	D			B	C	

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	295	120	150	520	60	260	60	100	135	55	55
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.91		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1379	1765	1530	1676	1741		1710	1611		1644	1640	
Flt Permitted	0.30	1.00	1.00	0.41	1.00		0.68	1.00		0.63	1.00	
Satd. Flow (perm)	434	1765	1530	730	1741		1230	1611		1090	1640	
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)	42	307	125	156	542	62	271	62	104	141	57	57
RTOR Reduction (vph)	0	0	76	0	4	0	0	60	0	0	35	0
Lane Group Flow (vph)	42	307	49	156	600	0	271	106	0	141	79	0
Heavy Vehicles (%)	24%	2%	0%	2%	2%	0%	0%	0%	2%	4%	0%	3%
Turn Type	pm+pt		Perm	pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	29.1	27.1	27.1	38.9	32.9		22.3	22.3		22.3	22.3	
Effective Green, g (s)	29.1	27.1	27.1	38.9	32.9		22.3	22.3		22.3	22.3	
Actuated g/C Ratio	0.42	0.39	0.39	0.56	0.48		0.32	0.32		0.32	0.32	
Clearance Time (s)	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	
Lane Grp Cap (vph)	210	691	599	517	828		396	519		351	528	
v/s Ratio Prot	0.01	0.17		c0.03	c0.34			0.07			0.05	
v/s Ratio Perm	0.08		0.03	0.14			c0.22			0.13		
v/c Ratio	0.20	0.44	0.08	0.30	0.73		0.68	0.20		0.40	0.15	
Uniform Delay, d1	12.5	15.5	13.2	8.0	14.5		20.4	17.0		18.3	16.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.5	0.1	0.3	3.2		4.8	0.2		0.8	0.1	
Delay (s)	13.0	16.0	13.3	8.3	17.7		25.2	17.2		19.0	16.8	
Level of Service	B	B	B	A	B		C	B		B	B	
Approach Delay (s)		15.0			15.8			22.2			18.0	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	69.2	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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	400	5	5	20	10	50	130	300	10	50	100	525
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	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	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.93		1.00	0.88		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1676	1632		1676	1545		1676	1756		1676	1765	1500
Flt Permitted	0.42	1.00		0.75	1.00		0.61	1.00		0.56	1.00	1.00
Satd. Flow (perm)	741	1632		1325	1545		1074	1756		984	1765	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)	435	5	5	22	11	54	141	326	11	54	109	571
RTOR Reduction (vph)	0	3	0	0	51	0	0	1	0	0	0	197
Lane Group Flow (vph)	435	7	0	22	14	0	141	336	0	54	109	374
Turn Type	pm+pt			Perm			pm+pt			Perm		pm+ov
Protected Phases	7	4			8		5	2			6	7
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	38.2	38.2		5.7	5.7		44.9	44.9		31.1	31.1	59.6
Effective Green, g (s)	38.2	38.2		5.7	5.7		44.9	44.9		31.1	31.1	59.6
Actuated g/C Ratio	0.42	0.42		0.06	0.06		0.49	0.49		0.34	0.34	0.65
Clearance Time (s)	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
Lane Grp Cap (vph)	603	684		83	97		594	865		336	603	1047
v/s Ratio Prot	c0.23	0.00			0.01		0.03	c0.19			0.06	0.11
v/s Ratio Perm	c0.08			0.02			0.09			0.05		0.14
v/c Ratio	0.72	0.01		0.27	0.15		0.24	0.39		0.16	0.18	0.36
Uniform Delay, d1	20.9	15.4		40.7	40.4		12.9	14.5		20.9	21.1	7.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.2	0.0		1.7	0.7		0.2	1.3		1.0	0.7	0.2
Delay (s)	25.1	15.4		42.4	41.1		13.1	15.8		21.9	21.7	7.3
Level of Service	C	B		D	D		B	B		C	C	A
Approach Delay (s)		24.9			41.4			15.0			10.5	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	91.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 1: Westcliff Drive & Cascade Ave

Movement	EB	EB	WB	NW
Directions Served	T	R	LT	LR
Maximum Queue (ft)	15	83	98	67
Average Queue (ft)	4	57	53	32
95th Queue (ft)	20	92	117	78
Link Distance (ft)	1267		1142	73
Upstream Blk Time (%)				2
Queuing Penalty (veh)				6
Storage Bay Dist (ft)		150		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: I-84 WB Ramp & Cascade Ave

Movement	WB	WB	WB	SE	SE	NW	NW
Directions Served	L	L	R	T	TR	L	T
Maximum Queue (ft)	194	196	46	89	144	300	184
Average Queue (ft)	142	134	22	62	94	227	112
95th Queue (ft)	212	209	57	100	162	357	210
Link Distance (ft)		1152		73	73	308	308
Upstream Blk Time (%)				12	17	4	1
Queuing Penalty (veh)				21	30	12	2
Storage Bay Dist (ft)	250		250				
Storage Blk Time (%)	0	0					
Queuing Penalty (veh)	0	0					

Intersection: 3: I-84 EB Ramp & Cascade Ave

Movement	EB	EB	SE	SE	SE	NW	NW	B18	B18
Directions Served	LT	R	L	T	T	T	R	T	T
Maximum Queue (ft)	108	113	159	91	49	236	172	37	2
Average Queue (ft)	61	69	104	33	20	163	106	12	0
95th Queue (ft)	135	126	189	122	79	290	199	53	5
Link Distance (ft)	1392			308	308	192	192	548	548
Upstream Blk Time (%)						6	0		
Queuing Penalty (veh)						35	2		
Storage Bay Dist (ft)		150	150						
Storage Blk Time (%)	1	0	9	0					
Queuing Penalty (veh)	2	0	25	0					

Intersection: 4: Cascade Ave & Mt Adams Ave

Movement	EB	EB	WB	WB	B22	NB	NB	NB
Directions Served	T	R	L	T	T	L	L	R
Maximum Queue (ft)	134	37	101	350	7	211	210	101
Average Queue (ft)	76	10	60	228	1	165	147	63
95th Queue (ft)	152	48	116	374	17	231	229	117
Link Distance (ft)	548	548	362	362	1452		412	412
Upstream Blk Time (%)				1				
Queuing Penalty (veh)				3				
Storage Bay Dist (ft)						200		
Storage Blk Time (%)						3	1	
Queuing Penalty (veh)						8	3	

Intersection: 5: Cascade Ave & Rand Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (ft)	74	224	111	123	367	170	202	102	72
Average Queue (ft)	27	137	44	68	240	123	85	63	44
95th Queue (ft)	81	274	126	138	430	187	224	117	90
Link Distance (ft)		1452			836		1178		428
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	150		150	125		150		150	
Storage Blk Time (%)		5		0	16	5	1	0	
Queuing Penalty (veh)		9		1	25	8	2	0	

Intersection: 12: Mt Adams Ave &

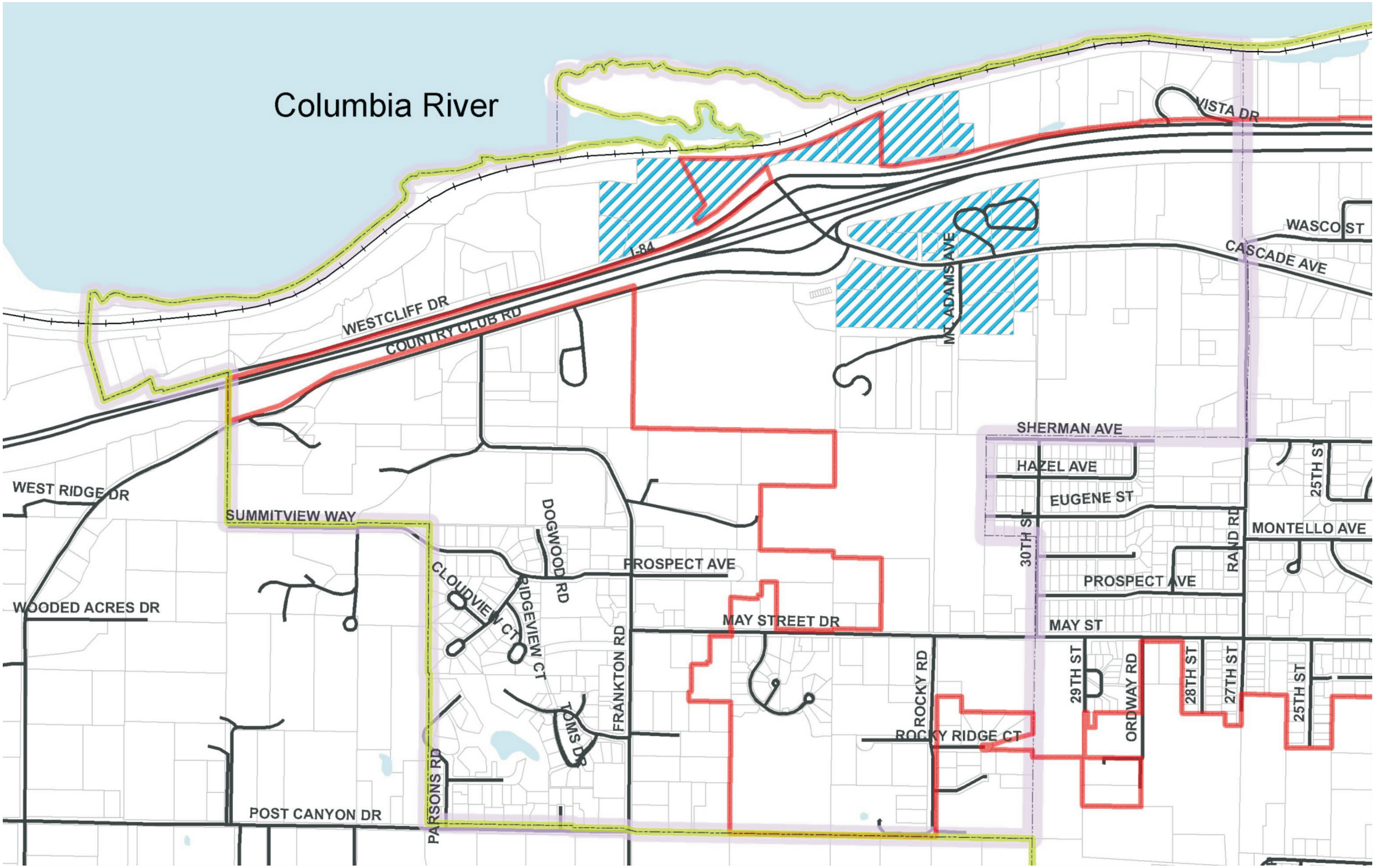
Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	T	R
Maximum Queue (ft)	220	83	28	51	84	176	57	90	73
Average Queue (ft)	167	20	13	34	51	99	32	42	21
95th Queue (ft)	251	135	40	64	91	195	69	98	82
Link Distance (ft)		1227		1176	696	696		412	412
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	250		250				150		
Storage Blk Time (%)	1							0	
Queuing Penalty (veh)	0							0	

Network Summary

Network wide Queuing Penalty: 193

APPENDIX J

Interchange Area Management Plan Overlay Zone Maps



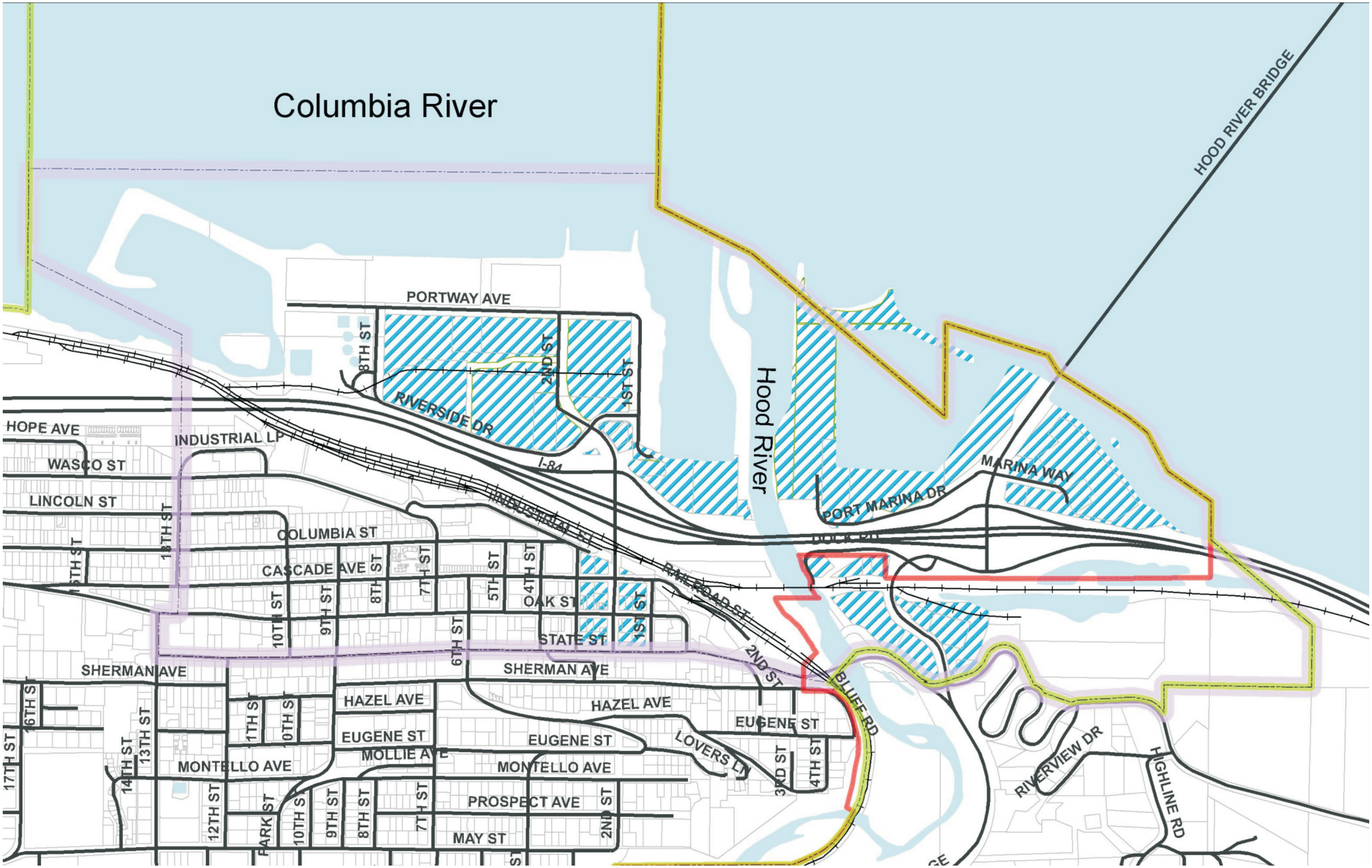
LEGEND

- City Limits
- Urban Growth Boundary
- Interchange Area Management Plan Overlay Zone
- Access Management Blocks
- Roadway
- Railroad
- Taxlots

NO SCALE

DKS Associates
TRANSPORTATION SOLUTIONS

I-84 Exit 62 Interchange Area Management Plan Overlay Zone



LEGEND

- City Limits
- Urban Growth Boundary
- Interchange Area Management Plan Overlay Zone
- Access Management Blocks
- Roadway
- Railroad
- Taxlots

NO SCALE

DKS *Associates*
TRANSPORTATION SOLUTIONS

I-84 Exit 63 & Exit 64 Interchange Area Management Plan Overlay Zone

APPENDIX K

Port of Hood River Waterfront Area Transportation Impact Analysis

GROUP MACKENZIE

TRANSPORTATION
IMPACT ANALYSIS

PORT OF HOOD RIVER WATERFRONT AREA

Hood River, Oregon

REGISTERED PROFESSIONAL
ENGINEER
18300 PE
Christopher M. Clemow
OREGON
JAN. 16, 1996
CHRISTOPHER M CLEMOW
RENEWS 31DEC2011

Prepared For
Port of Hood River

Completed On
March 14, 2011

Submittal To
City of Hood River

Project Number
2100290.01

TABLE OF CONTENTS Page #

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

This transportation impact analysis has been prepared for the Port of Hood River. This analysis evaluates impacts resulting from proposed development/redevelopment of Port property in the Hood River Waterfront area due to an assumed increased in economic development potential.

The property is bound by Riverside Drive to the south, and the Columbia and Hood Rivers on the other sides. Figure 1 is a vicinity map indicating the waterfront area.

PROJECT DESCRIPTION

The Port of Hood River is anticipating significant Waterfront area development/redevelopment resulting in an increased job production not contemplated in Agency transportation planning documents. The City of Hood River staff has indicated the existing Light Industrial (LI) and General Commercial (C-2) zones allow the anticipated land uses; however, the impact from the Port's assumed magnitude of development is not contemplated in the Interchange Area Management Plan (IAMP) currently being prepared by ODOT. As such, transportation impacts from this development need to be evaluated to determine if transportation infrastructure mitigation is needed to accommodate plan year operations.

To ensure assumptions and transportation analyses resulting from this effort are consistent with those used for the IAMP, the following materials and assumptions are used:

- Household, employment, trip generation and trip distribution data from the VISUM transportation model prepared by DKS Associates for ODOT and provided via email on December 2, 2010 was used for analysis.

- Traffic volumes from the *2031 Weekday Build Conditions Hood River IAMP* Synchro model were used for the current condition.

- Traffic volumes from the *2031 Weekday Build Conditions Hood River IAMP* Synchro model prepared by DKS Associates for ODOT was used for the current condition.

- ODOT-suggested analysis methodology was used to ensure results can be directly compared to IAMP findings. Specifically, the ODOT methodology indicates *"[ODOT will provide] trip rates for various land uses so [Group Mackenzie] can estimate the trips generated by whatever tax lots are included in the analysis. [These volumes can then be] backed out of the forecasted volumes created earlier. [Next, Group Mackenzie should] run a flow bundle from the TAZ that includes [the Port development/site] to get a trip distribution, calculate trips generated by the site under the assumed generic uses, subtract those trips from [the ODOT] post-processed forecast volumes using the distribution from the flow bundle, calculate the new trips generated by the [Port development/site], assign those back on top of the forecasted volumes using the distribution, and run the analysis."*

SCOPE OF REPORT

This analysis conforms to the ODOT *Analysis Procedures Manual* (APM) and City of Hood River requirements for a traffic study. Analysis includes a review of local intersection impacts. Based on a review of the applicable standards, and discussions with Hood River and ODOT staffs, the analysis study area is limited to the intersections located along the 2nd Street Corridor, including:

- 2nd Street/Portway Avenue
- 2nd Street/Anchor Way
- 2nd Street/Riverside Drive
- 2nd Street/US 84 WB Ramp Terminal
- 2nd Street/US 84 EB Ramp Terminal
- 2nd Street/Cascade Avenue
- 2nd Street/Oak Street (OR 30)

Operation analyses were performed for the weekday PM peak hour at the seven study intersections for the different plan year (2031) scenarios as follows:

- 2031 IAMP Model (Current Development)
- 2031 Proposed Development

II. FUTURE TRANSPORTATION IMPROVEMENTS

Future transportation improvements are identified in the February 25, 2009 Draft Hood River Interchange Area Management Plans (IAMPs) Future Needs Analysis and the November 5, 2009 Hood River IAMPs Alternatives Analysis prepared by DKS Associates. These improvements were identified through review of the City Transportation System Plan, County Transportation System Plan, ODOT's Statewide Improvement Program, projects conditioned on new development as mitigation, and projects identified through the IAMP analysis. These improvements are described as follows:

TABLE 1 – ASSUMED TRANSPORTATION IMPROVEMENTS FOR TRAFFIC FORECAST MODELING PURPOSES (2031)

Project Name	Project Description
Source:	ODOT 2008-2011 STIP
I-84: Exit 64 (Hood River) Bundle 224	• Replace Bridge #07398 and Exit 64 interchange improvements
Source:	Mitigation Conditioned on Approved Development
2nd Street/Cascade Avenue	• Restrict Cascade turning movements to right-in/right-out only
2nd Street/Oak Street	• Install traffic signal
Source:	Hood River IAMPs Alternatives Analysis
2nd Street/Riverside Drive	• Restrict Riverside turning movements to right-in/right-out only • Allow southbound left-turn movement • Convert to two-way stop-control with Riverside the minor roadway
2nd Street/Portway Avenue	• Convert to all-way stop-control
2nd Street/I-84 Westbound	• Add second westbound left-turn lane • Improvements assume a right-turn lane with 125 feet of storage, a shared through/left lane, and a left-turn lane with 200 feet of storage
2nd Street/I-84 Eastbound	• Lengthen off-ramp by 400 feet and provide a shared through/left lane and a right-turn lane with 250 feet of storage at the ramp terminal
2nd Street Improvements	• Widen 2nd Street overcrossings of I-84 and the Union Pacific Railroad to add a second southbound through lane • Remove parking on 2nd Street between Cascade Avenue and Oak Street and restripe roadway to provide a second southbound through lane, dropping as a right-turn lane at Oak Street

The above-referenced projects are more fully described in materials contained in the Appendix. Figure 2 presents the future 2031 intersection approach geometries and traffic control devices.

III. CURRENT AND PROPOSED DEVELOPMENT ASSUMPTIONS

DEVELOPMENT AREA

The Waterfront development/redevelopment area is defined by the August 14, 2009 Port of Hood River proposal to the Insitu RFI. The Waterfront area, as shown in Figure 1, is contained in portions of two transportation analysis zones (TAZs) described as follows:

- In **TAZ 128**, the Waterfront area is east of 2nd Street, west of 1st Street and south of Portway Avenue. Within this area, the majority of the property is zoned LI and a small portion south of Riverside Drive is zoned C-2.
- In **TAZ 116** the Waterfront area is limited to the "Expo Site". This area is zoned C-2.

CURRENT DEVELOPMENT ASSUMPTIONS

2031 Current Development assumptions for the TAZs were provided by DKS Associates and are presented in the following table:

TABLE 2 – 2031 CURRENT DEVELOPMENT – HOUSEHOLDS, EMPLOYEES AND TRIP GENERATION

Description	Households		Retail Employees		Service Employees		Other Employees		Total	
TAZ 128										
Total	0		44		60		168		272	
Outside Waterfront Area	0		24		37		48		109	
Inside Waterfront Area	0		20		23		120		163	
Approximate Trip Rate (Enter/Exit)	0.59	0.34	1.9	2.14	0.72	0.92	0.06	0.33		
Trips (Enter/Exit)	0	0	38	43	17	21	7	40	62	104
TAZ 116										
Inside Waterfront Area	0		38		59		76		173	
Approximate Trip Rate (Enter/Exit)	0.59	0.34	1.9	2.14	0.72	0.92	0.06	0.33		
Trips (Enter/Exit)	0	0	72	81	42	54	5	25	119	160
Waterfront Area										
Total Inside Waterfront Area	0		58		82		196		336	
Approximate Trip Rate (Enter/Exit)	0.59	0.34	1.9	2.14	0.72	0.92	0.06	0.33		
Trips (Enter/Exit)	0	0	110	124	59	75	12	65	181	264

CURRENT DEVELOPMENT TRAFFIC

Current Development traffic volumes are those from the *2031 Weekday Build Conditions Hood River IAMP* Synchro model and are illustrated in Figure 3.

PROPOSED DEVELOPMENT ASSUMPTIONS

The Proposed Development is assumed to represent the reasonable worst-case development scenario with respect to transportation impact. This scenario is generally consistent with the August 14, 2009 Port of Hood River proposal to the Insitu RFI. Assumptions in the Port proposal include land uses having 200,000 SF of office/research and development center/manufacturing support and 100,000 SF of manufacturing and warehousing. It is further estimated the development will have 850 employees.

2031 Proposed Development assumptions are presented in the following table:

TABLE 3 – 2031 PROPOSED DEVELOPMENT – HOUSEHOLDS, EMPLOYEES AND TRIP GENERATION										
Description	Households		Retail Employees		Service Employees		Other Employees		Total	
Waterfront Area										
Total Inside Waterfront Area	0		0		60		790		850	
Approximate Trip Rate (Enter/Exit)	0.59	0.34	1.9	2.14	0.72	0.92	0.06	0.33		
Trips (Enter/Exit)	0	0	0	0	43	55	47	261	90	316

The above-identified Proposed Development scenario is consistent with the Port of Hood River proposal to the Insitu RFI. This proposal does not contemplate retail land uses (or retail employees). Rather, the proposal contemplates office/research and development center, manufacturing and warehousing uses. Employees at these uses are predominantly characterized as "other" and have a low trip generation rate. Other development scenarios may have different trip generation impacts based on the number and type of employees.

NET NEW TRIP GENERATION

Using the above-defined assumptions, the Proposed Development scenario has a significantly greater number of employees (primarily characterized as "other") than does the Current Development scenario in the Waterfront area. However, because of employee type, the trip generation is not significantly different. The following table presents trip generation differences.

TABLE 4 – NET NEW TRIP GENERATION – WATERFRONT AREA										
Description	Households		Retail Employees		Service Employees		Other Employees		Total	
2031 Proposed Development Trips (Enter/Exit)	0	0	0	0	43	55	47	261	90	316
2031 Current Development Trips (Enter/Exit)	0	0	110	124	59	75	12	65	181	264
Net New Trips (Enter/Exit)	0	0	-110	-124	-16	-20	35	196	-91	52
Flow Bundle Factor (Enter/Exit) [1]									0.939	1.046
Net New Flow Bundle Trips (Enter/Exit) [1]									-85	54

[1] Based on TAZ 128 flow bundle data, actual trip generation is slightly different than identified. As such, 'calibrating factors' were used to determine net new trip generation for use in the flow bundle. ODOT/DKS flow bundle data is included in the appendix.

TRIP DISTRIBUTION AND TRAFFIC ASSIGNMENT

The ODOT-suggested trip distribution and traffic assignment methodology was used to ensure results can be directly compared to IAMP findings. Specifically, the flow bundle data from TAZ 128 was used to determine trip distribution for new traffic assigned onto the transportation system. ODOT/DKS flow bundle data is included in the Appendix.

Figure 4 illustrates trip distribution and traffic assignment for the Proposed Development condition.

PROPOSED DEVELOPMENT TRAFFIC

Proposed Development traffic volumes are the sum of the current development traffic volumes and the net new trip generation. Figure 5 illustrates the Proposed Development traffic volumes.

V. INTERSECTION AND ROADWAY ANALYSIS

OPERATION ANALYSIS DESCRIPTION

Intersection operation characteristics are generally defined by two measurements: volume-to-capacity (v/c) ratio and level-of-service (LOS). ODOT uses v/c ratio to determine intersection performance and the City of Hood River uses LOS.

ODOT Mobility Standards

Volume-to-capacity (v/c) ratio is a measurement of capacity used by a given traffic movement for an entire intersection. It is defined by the rate of traffic flow or traffic demand divided by the theoretical capacity. Mobility standards for intersections under ODOT jurisdiction in the 2nd Street corridor are based on ODOT's *1999 Oregon Highway Plan Including Amendments November 1999 through January 2006 (OHP)*.

2nd Street is classified as a District/Local Interest Roadway within an urban growth boundary for which the v/c ratio mobility standard is 0.90. The v/c ratio mobility standard for the ramp terminal intersections is 0.85.

City of Hood River Mobility Standards

LOS is a measure of the average control delay (in seconds) experienced by drivers at an intersection, and is described by a letter on the scale from 'A' to 'F.' LOS 'A' represents optimum operating conditions and minimum delay. LOS 'F' indicates over-capacity conditions causing unacceptable delay.

LOS 'C' is minimum mobility standard for intersections under City of Hood River jurisdiction in the 2nd Street corridor.

OPERATION ANALYSIS

Intersection capacity calculations were conducted using methodologies presented in the *2000 Highway Capacity Manual*. Synchro (Version 7) was used to prepare capacity and level-of-service calculations. Data output sheets from analyses are included in the Appendix.

Operation analyses were performed for the weekday PM peak hour at the study intersections for the different scenarios as follows:

- 2031 IAMP Model (Current Development) – Based on analysis contained in the *Exits 63 & 64 2031 NB – No SB Parking (Extended Queue) – Full Bridge Widening* Synchro model
- 2031 Proposed Development

The following table summarizes weekday PM peak hour study intersection operations.

TABLE 5 – INTERSECTION OPERATION ANALYSIS – PM PEAK HOUR

Intersection	Traffic Control	Mobility Standard		2031 Analysis Scenario	
				Current IAMP	Proposed Waterfront
2nd Street/ Portway Avenue	AWSC	LOS	C	B	B
2nd Street/ Anchor Way	TWSC	LOS	C	B	D
2nd Street/ Riverside Drive	TWSC RI/RO	v/c	0.90	0.26 (EBR)	0.28 (EBR)
2nd Street/ I-84 WB Ramp Terminal	Signal	v/c	0.85	0.60	0.62
2nd Street/ I-84 EB Ramp Terminal	Signal	v/c	0.85	0.74	0.68
2nd Street/ Cascade Avenue	TWSC RI/RO	v/c	0.90	0.28 (EBR)	0.25 (EBR)
2nd Street/ Oak Street (OR 30)	Signal [1]	v/c	0.90	0.81	0.81

[1] Intersection is assumed signalized as a condition of City land use approval for other development.

OPERATION ANALYSIS SUMMARY

All study intersections are anticipated to meet agency mobility standards in both scenarios with the following exceptions and notes:

The **2nd Street/Anchor Way** intersection is proposed to be converted to all-way stop-control as Waterfront area development occurs. With conversion to all-way stop-control, the intersection is anticipated to meet the City mobility standard in the Proposed Development scenario.

QUEUING ANALYSIS

Intersection queuing analysis was performed using SimTraffic. The software uses a modeled distribution of intersection approach volumes throughout the analysis period; therefore, results vary between individual analyses. Analyses were performed using the methodology identified in the ODOT Analysis Procedures Manual.

The resulting 95th percentile queue lengths (anticipated to be present 5% of the time (3 minutes) during the analysis hour) are presented in the following table. Queue lengths for the 2031 Current IAMP analysis scenario are based on input data from the *Exits 63 & 64 2031 NB – No SB Parking (Extended Queue) – Full Bridge Widening* Synchro model. Data output sheets from analyses are included in the appendix.

TABLE 6 – 95TH PERCENTILE QUEUING – PM PEAK HOUR

Intersection	Approach	Movement	Available Storage	2031 Analysis Scenario	
				Current IAMP	Proposed Waterfront
2nd Street/ Portway Avenue	EB	T,R	500+	75	75
	WB	L,T	500+	125	75
	NB	L,R	250	100	75
	SB	L,T,R	250	50	50
2nd Street/ Anchor Way	EB	L,R	500+	75	75
	WB	L,R	500+		100
	NB	L,T,R	500+	75	175
	SB	L,T,R	250	0	100
2nd Street/ Riverside Drive	EB	R	500	100	100
	NB	T	350	0	75
	SB	T,R	500+	175	25
2nd Street/ I-84 WB Ramp Terminal	WB	L	150	150	150
		L,T	500+	150	175
		R	150	100	75
	NB	L	100	100	75
		T	300	250	125
	SB	T	300	325	200
		R	50	125	100
2nd Street/ I-84 EB Ramp Terminal	EB	L,T	150	300	500
		R	500+	125	375
	NB	T,R	300	300	250
	SB	L	100	125	100
		T	300	175	175
		T	300	175	175
2nd Street/ Cascade Avenue	EB	R	200	475	350
	WB	R	200	75	75
	NB	L,T,R	200	100	50
	SB	T	300	225	200
		T,R	300	200	125
2nd Street/ Oak Street (OR 30)	EB	L,T,R	200	300	150
	WB	L,T,R	200	475	375
	NB	L,T,R	200	225	525
	SB	L,T	200	200	225
		R	200	200	175

QUEUING ANALYSIS SUMMARY

As previously noted, the Proposed Waterfront Development scenario has a significantly greater number of employees (primarily characterized as “other”) than does the Current Development scenario in the Waterfront area. However, because of employee type, the trip generation is not significantly different. In fact, entering trip generation is less, contributing to reduced queue lengths on several intersection approaches.

Similar to the August 11, 2009 Hood River IAMPs Alternatives Analysis prepared by DKS Associates, this study indicates all of the study intersections and approach geometries on 2nd Street are anticipated to accommodate vehicle queues with the following exceptions and notes:

The **2nd Street/I-84 WB Ramp Terminal** intersection queues are anticipated to exceed storage capacity for the southbound movements. Because the distance between the ramp terminal intersections is short, consideration needs to be given to future signal timing to prevent queues from blocking the upstream EB ramp terminal intersection.

The **2nd Street/Cascade Avenue** intersection queues are anticipated to exceed storage capacity for the eastbound right-turn movement. It is anticipated necessary storage can be provided by restriping the approach roadway.

The **2nd Street/Oak Street (OR 30)** intersection queues are anticipated to exceed storage capacity for the westbound, northbound and southbound movements. Because the distance between Oak Street and Cascade Avenue is short, consideration needs to be given to future signal timing to prevent queues from blocking the upstream intersection. It is also important to note there is significant pedestrian activity at the intersection not contemplated in either ODOT's IAMP analysis or this analysis.

VI. MITIGATION

The Proposed Waterfront Development scenario generates fewer entering trips and more exiting trips than does the Current Development scenario. As identified in the *Intersection and Roadway Analysis* section of this report, the Waterfront Development scenario has similar or less infrastructure impact than does the Current Development scenario. To mitigate future year impacts, the following is proposed:

The **2nd Street/Anchor Way** intersection is anticipated to exceed the City mobility standard in the Proposed Development scenario. To better facilitate traffic flows in the entire waterfront development area, and on 2nd Street, it is recommended an intersection improvement be considered. Preliminary analysis assuming all-way stop-control, or a higher form of traffic control such as a roundabout, indicates the City mobility standard can be met and approach queues accommodated.

It is noted specific 2nd Street/Anchor Way intersection improvements should be further evaluated as development occurs. Depending on future development patterns and trip generating characteristics, certain improvements will function better than others. It is also important to consider Transportation Demand Management (TDM) strategies to reduce peak traffic volumes allowing the intersection to operate at an acceptable mobility standard without extensive mitigation.

Multiple intersections are anticipated to have queues exceeding storage capacity in both the Proposed and Current Development scenarios. As identified in the *Hood River IAMPs Alternatives Analysis*, extensive analysis has been performed to determine the ability of alternative forms of mitigation to accommodate anticipated plan year vehicle queues. Overall, findings indicate that implementing specific signal timing plans and several major infrastructure projects are effective at shortening queues; however, none of the strategies can mitigate queues to a desired level. As such, findings contained in the *Hood River IAMPs Alternatives Analysis* recommend *"…that any mitigation alternative chosen be supplemented with the implementation of transportation demand management (TDM) strategies aimed at reducing the forecasted volumes during peak travel periods."* This finding is also supported by materials contained in this report.

It is further noted that as the primary land owner on the Hood River Waterfront, the Port of Hood River is in an excellent position to advocate for, and require TDM measures when new development is proposed. Trip reducing TDM measures can be developed concurrent with the Port's lease, sale and design standard review process for all new development.

VII. SUMMARY

Analysis contained in this report evaluates the potential Waterfront Development which represents the reasonable worst-case development scenario. This development includes land uses having 200,000 SF office/research and development center/manufacturing support, 100,000 SF of manufacturing and warehousing and 850 employees. This magnitude of Waterfront area development results in increased job density not contemplated in Agency transportation planning documents; however, anticipated trip generation is not substantially greater because of the employee type. This analysis indicates the potential Waterfront Development can be accommodated with the following Assumptions and Conclusions:

ASSUMPTIONS

1. Background materials and assumptions used for analysis are consistent with those used for the IAMP. ODOT-suggested methodology was used to ensure results can be directly compared to IAMP findings. This analysis conforms to the ODOT *Analysis Procedures Manual* (APM) and City of Hood River requirements for a traffic study.
2. Future transportation improvements will occur consistent with the February 25, 2009 Draft Hood River Interchange Area Management Plans (IAMPs) Future Needs Analysis and the August 11, 2009 Hood River IAMPs Alternatives Analysis prepared by DKS Associates.

CONCLUSIONS

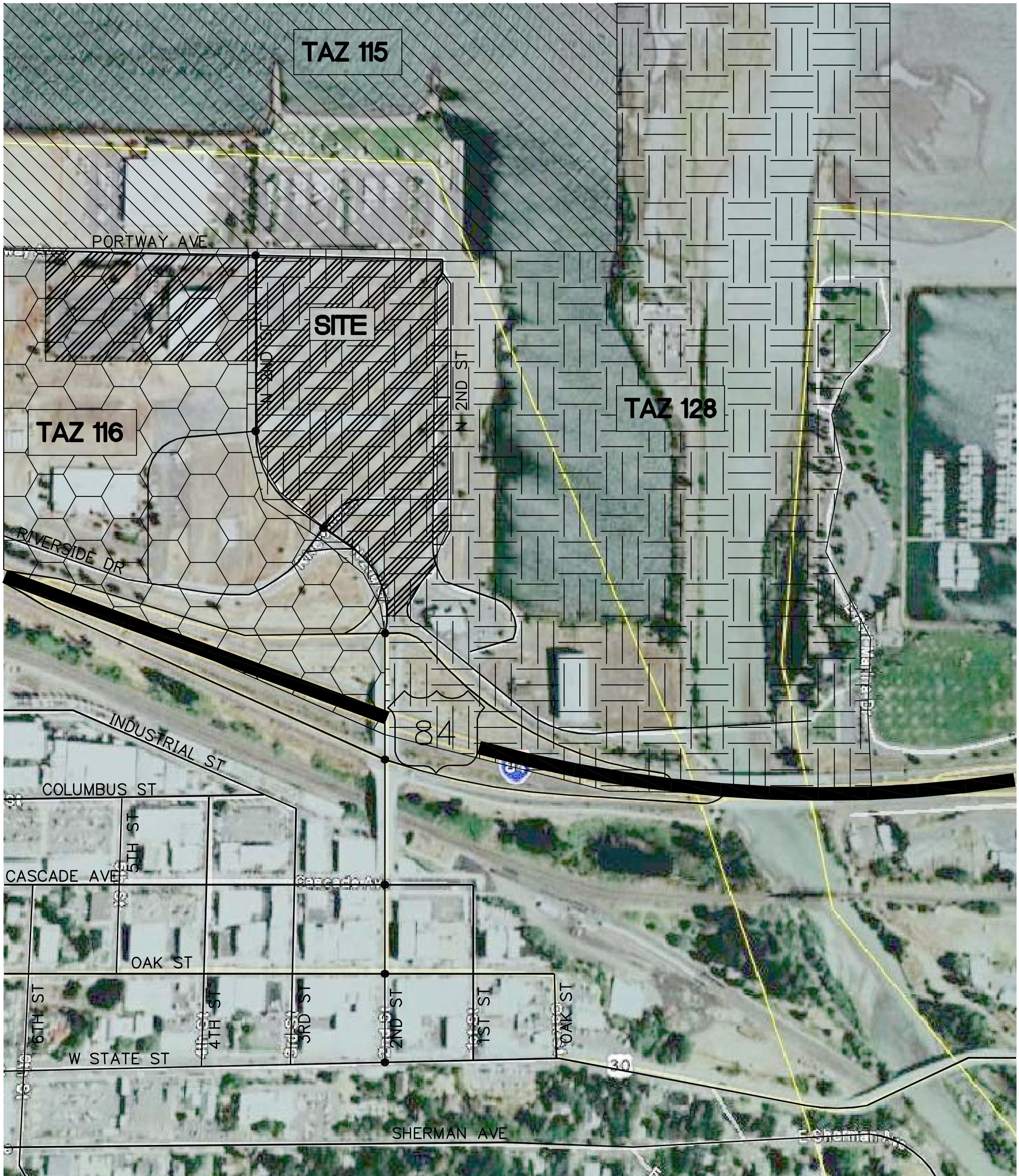
1. The potential Waterfront Development scenario is anticipated to generate 85 fewer entering and 54 more exiting trips during the PM peak hour compared to assumptions contained in the IAMP analysis.

2. Trip generation from the Waterfront Development scenario can be accommodated if the following mitigation steps are taken:
   a. Improvements to the 2nd Street/Anchor Way intersection will be necessary to meet the City of Hood River mobility standard and to better facilitate traffic flows. Analysis assuming all-way stop-control, or a higher form of traffic control such as a roundabout, indicates the City mobility standard can be met and approach queues accommodated.
   b. TDM strategies should be implemented to reduce peak traffic volumes at the 2nd Street/Anchor Way intersection to help operations meet an acceptable mobility standard.

   Note: Specific 2nd Street/Anchor Way intersection improvements should be further evaluated as development occurs. Depending on future development patterns and trip generating characteristics, certain improvements will function better than others.

c. Queuing impacts resulting from the potential Waterfront Development scenario at other intersections/ramps in the study area can be also mitigated by implementing TDM strategies. And consistent with findings contained in the Hood River IAMPs Alternatives Analysis, these strategies should be aimed at reducing the Waterfront Development volumes anticipated to occur during the peak travel periods to levels assumed in the IAMP analyses.

In summary, the existing Light Industrial (LI) zone allows the Waterfront Development (reasonable worst-case development) assumed land uses. Therefore, it is recommended the resulting impacts be contemplated in the Interchange Area Management Plan (IAMP) currently being prepared by ODOT. While future IAMP development assumptions may not specifically contemplate the Waterfront Development scenario, the development potential should be specifically acknowledged. Further, any IAMP-assumed infrastructure improvements and TDM measures deemed appropriate to mitigate impacts resulting from IAMP-assumed development should also be deemed appropriate to mitigate the Waterfront Development (reasonable-worst case development) scenario.



GROUP MACKENZIE

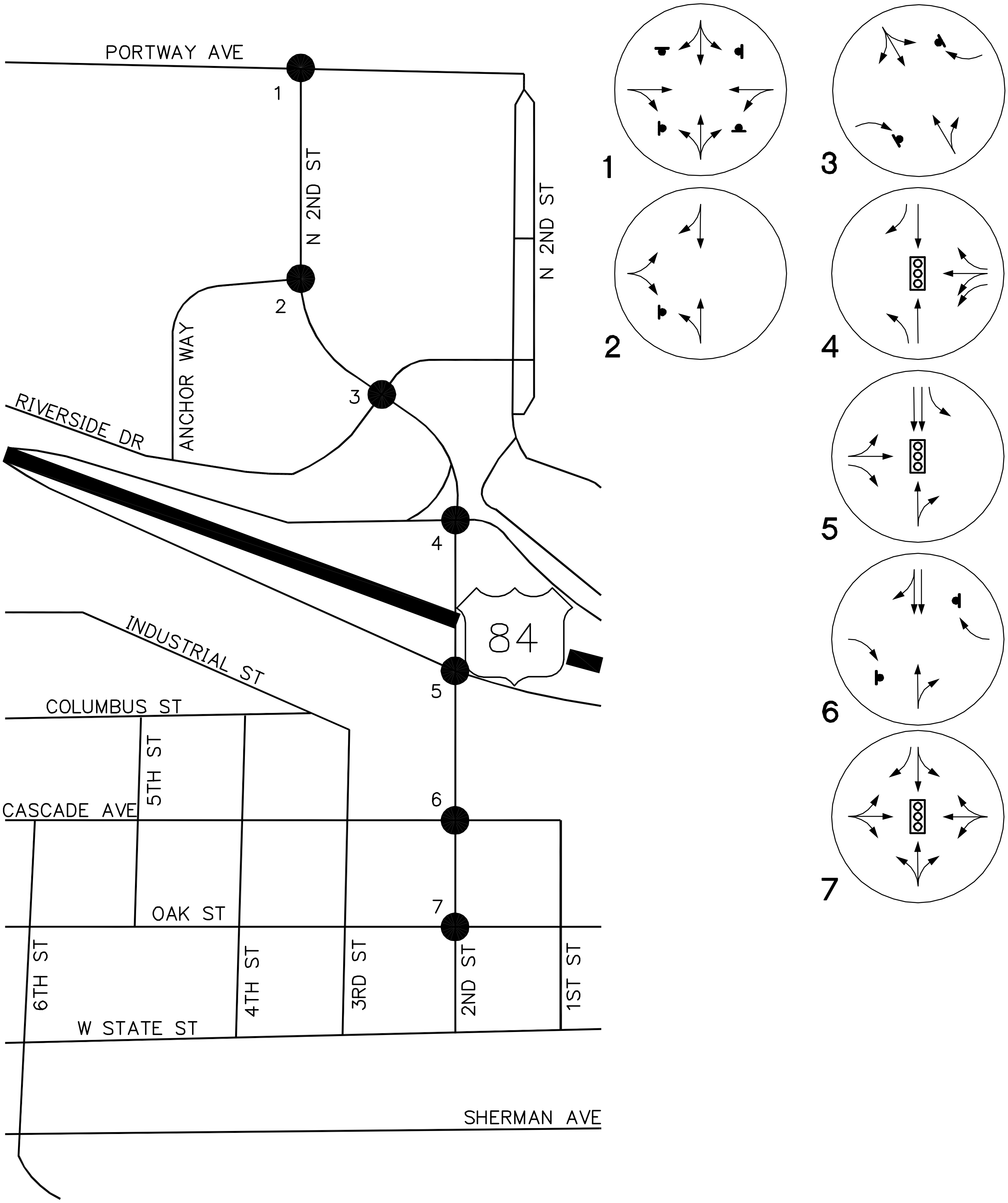
Portland OR 503.224.9560 · Vancouver WA 360.695.7879 · Seattle WA 206.749.9993

DATE: 01.27.11
DRAWN BY: MJD
CHECKED BY: CMC
JOB NO: 2100290.01

VICINITY MAP

INSITU DEVELOPMENT
PORT OF HOOD RIVER, OREGON

FIGURE 1



GROUP MACKENZIE

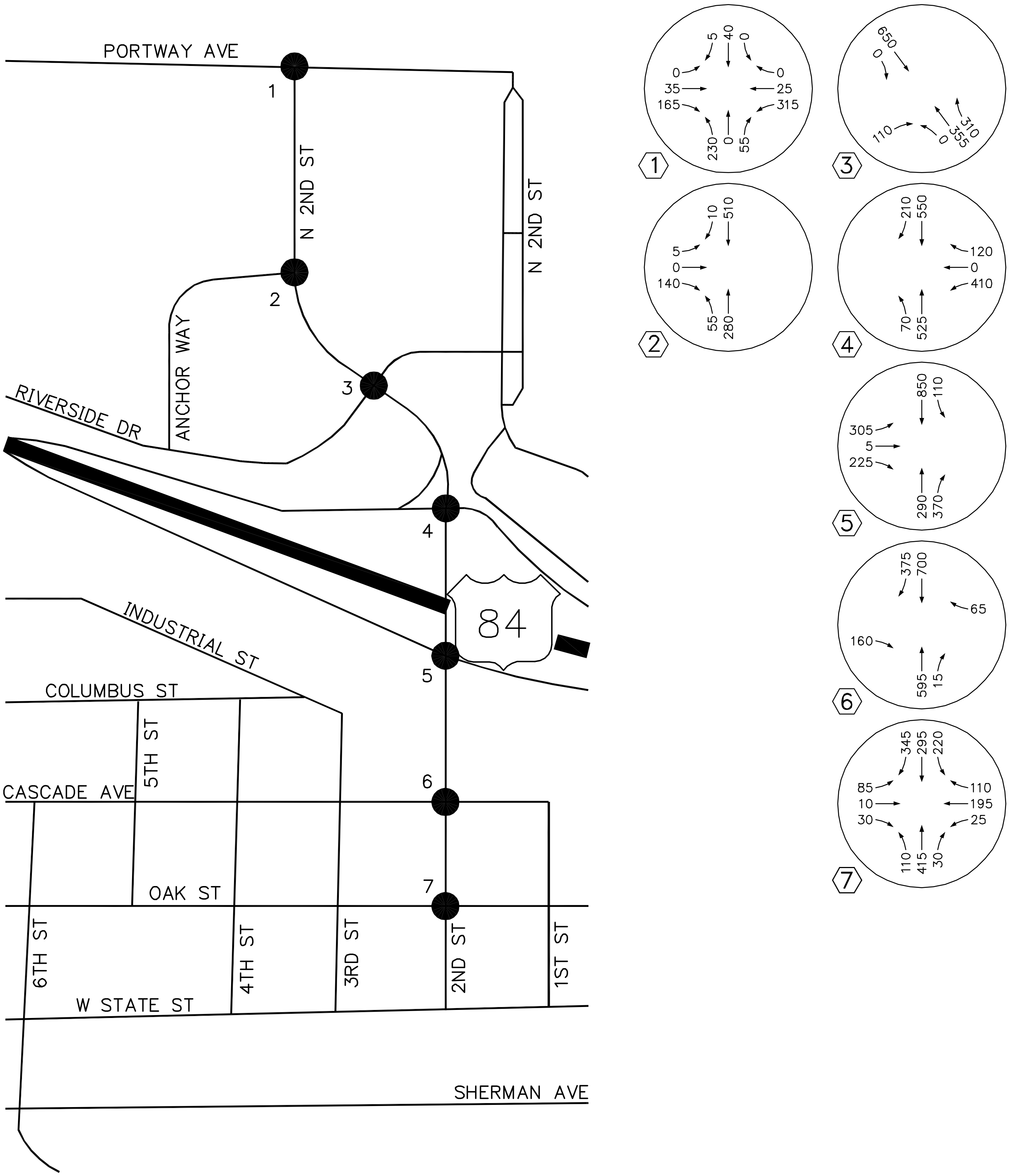
Portland OR 503.224.9560 Vancouver WA 360.695.7879 Seattle WA 206.749.9993

DATE: 01.27.11
DRAWN BY: MJD
CHECKED BY: CMC
JOB NO: 2100290.01

FUTURE INTERSECTION CONFIGURATON AND TRAFFIC CONTROL

INSITU DEVELOPMENT
PORT OF HOOD RIVER, OREGON

FIGURE 2



GROUP MACKENZIE

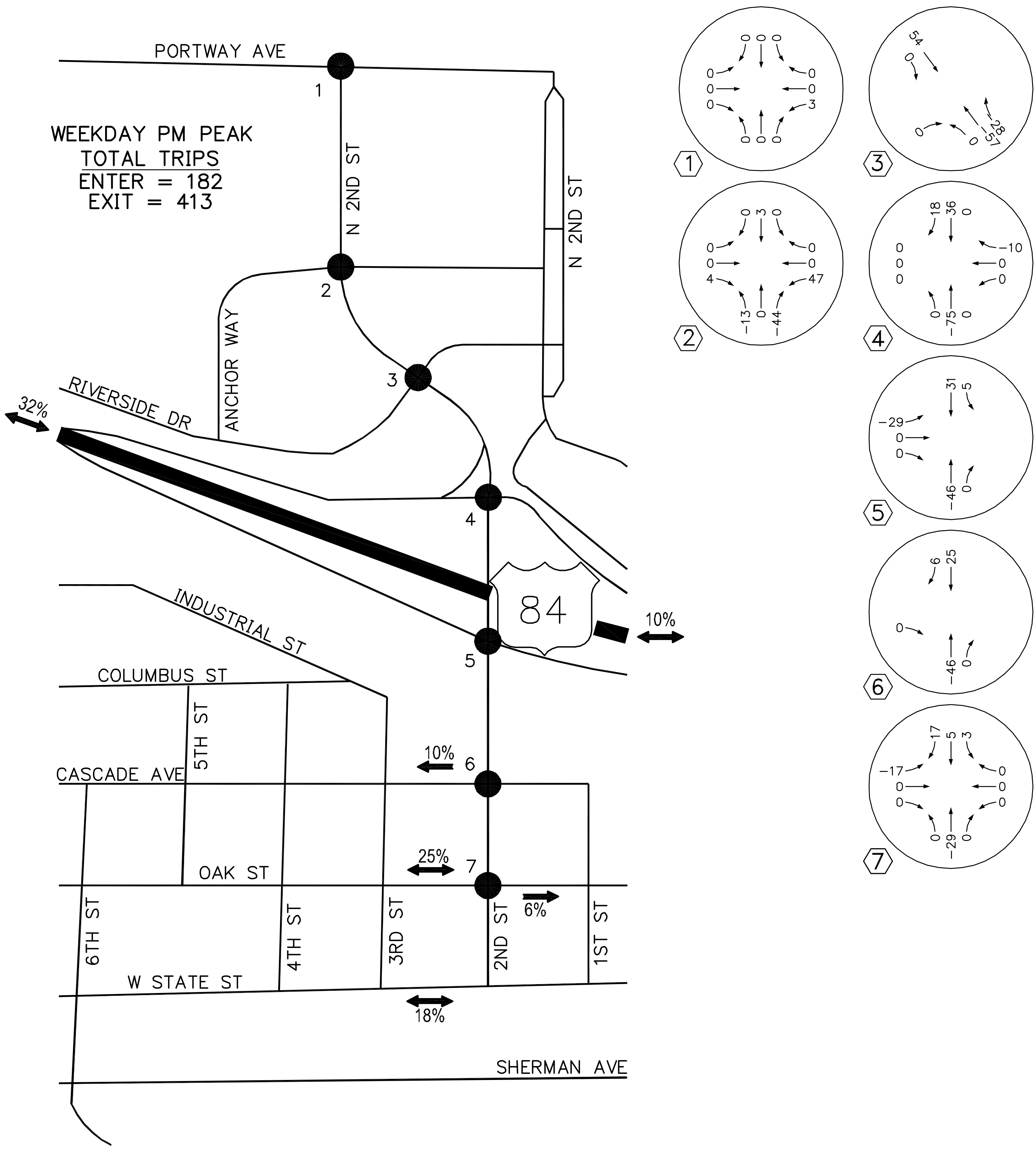
Portland OR 503.224.9560 Vancouver WA 360.695.7879 Seattle WA 206.749.9993

DATE: 01.27.11
DRAWN BY: MJD
CHECKED BY: CMC
JOB NO: 2100290.01

2031 WEEKDAY CURRENT DEVELOPMENT TRAFFIC VOLUMES

INSITU DEVELOPMENT
PORT OF HOOD RIVER, OREGON

FIGURE 3



GROUP MACKENZIE

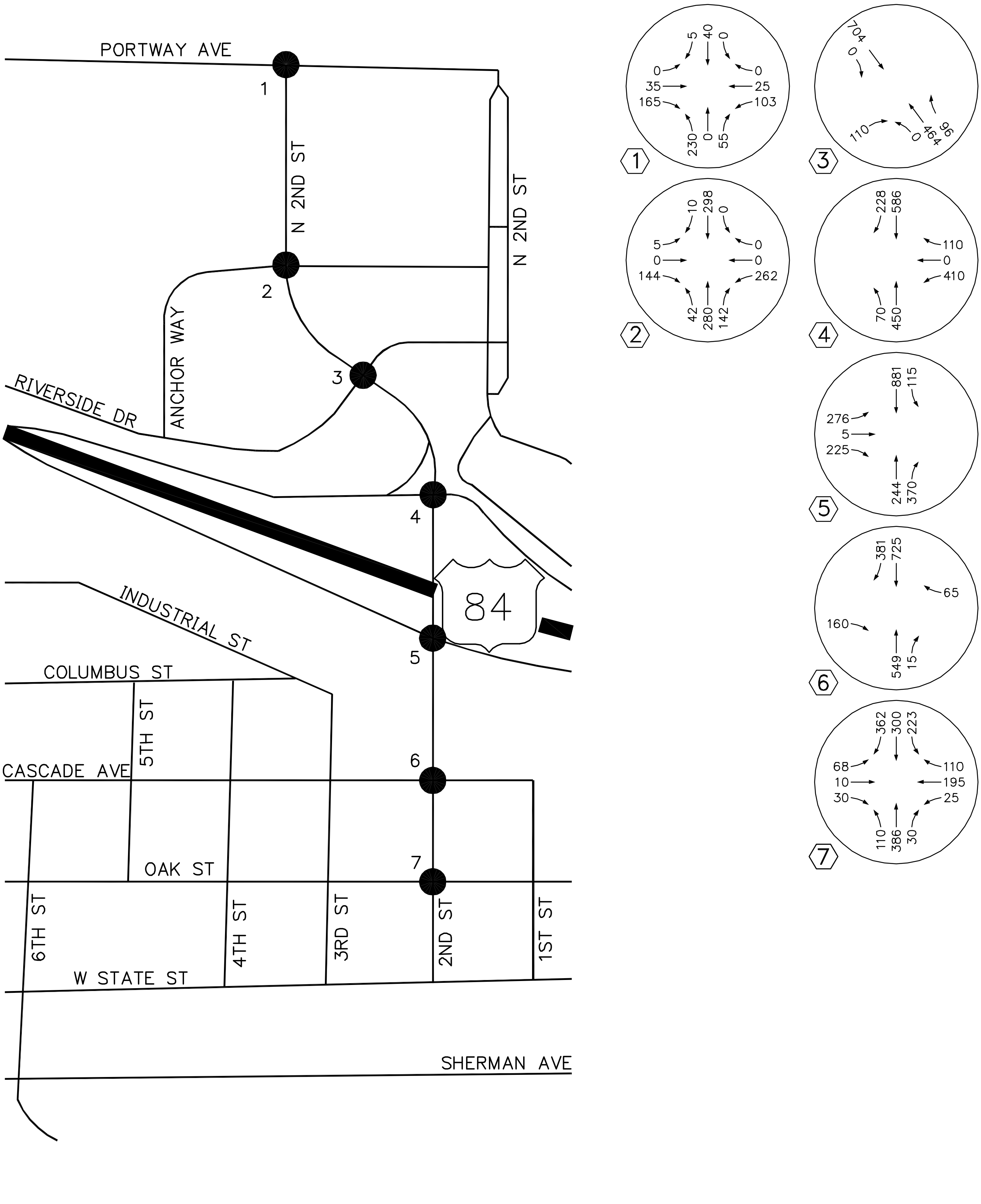
Portland OR 503.224.9560 Vancouver WA 360.695.7879 Seattle WA 206.749.9993

DATE: 01.27.11
DRAWN BY: MJD
CHECKED BY: CMC
JOB NO: 2100290.01

PROPOSED DEVELOPMENT TRIP DISTRIBUTION AND TRAFFIC ASSIGNMENT

INSITU DEVELOPMENT
PORT OF HOOD RIVER, OREGON

FIGURE 4



GROUP MACKENZIE

Portland OR 503.224.9560 · Vancouver WA 360.695.7879 · Seattle WA 206.749.9993

DATE: 01.27.11
DRAWN BY: MJD
CHECKED BY: CMC
JOB NO: 2100290.01

2031 WEEKDAY PROPOSED DEVELOPMENT TRAFFIC VOLUMES

INSITU DEVELOPMENT
PORT OF HOOD RIVER, OREGON

FIGURE 5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	35	165	103	25	0	230	0	55	0	40	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
Hourly flow rate (vph)	0	39	183	114	28	0	256	0	61	0	44	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	222	142	317	50
Volume Left (vph)	0	114	256	0
Volume Right (vph)	183	0	61	6
Hadj (s)	-0.46	0.19	0.08	-0.03
Departure Headway (s)	4.6	5.4	5.0	5.3
Degree Utilization, x	0.29	0.21	0.44	0.07
Capacity (veh/h)	717	617	689	610
Control Delay (s)	9.5	9.8	11.8	8.7
Approach Delay (s)	9.5	9.8	11.8	8.7
Approach LOS	A	A	B	A

Intersection Summary			
Delay	10.5		
HCM Level of Service	B		
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	5	0	144	262	0	0	42	280	142	0	298	10
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)	5	0	157	285	0	0	46	304	154	0	324	11

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	162	285	504	335
Volume Left (vph)	5	285	46	0
Volume Right (vph)	157	0	154	11
Hadj (s)	-0.54	0.23	-0.13	0.01
Departure Headway (s)	7.0	7.3	6.2	6.7
Degree Utilization, x	0.32	0.58	0.87	0.63
Capacity (veh/h)	442	460	559	496
Control Delay (s)	13.3	19.9	38.0	20.4
Approach Delay (s)	13.3	19.9	38.0	20.4
Approach LOS	B	C	E	C

Intersection Summary			
Delay	26.3		
HCM Level of Service	D		
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	110	0	0	0	0	464	96	0	704	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	116	0	0	0	0	488	101	0	741	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								364				
pX, platoon unblocked	0.91	0.91		0.91	0.91	0.91				0.91		
vC, conflicting volume	1229	1331	741	1345	1229	488	741			589		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1203	1314	741	1330	1203	388	741			499		
tC, single (s)	7.2	6.6	6.3	7.1	6.5	6.2	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	100	100	72	100	100	100	100			100		
cM capacity (veh/h)	144	141	410	85	166	597	843			915		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total	116	0	488	101	741
Volume Left	0	0	0	0	0
Volume Right	116	0	0	101	0
cSH	410	1700	1700	1700	1700
Volume to Capacity	0.28	0.00	0.29	0.06	0.44
Queue Length 95th (ft)	29	0	0	0	0
Control Delay (s)	17.2	0.0	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	17.2	0.0	0.0		0.0
Approach LOS	C	A			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	410	0	110	70	450	0	0	586	228
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			1.00	1.00
Frt				1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1624	1624	1530	1629	1698			1667	1224
Flt Permitted				0.95	0.95	1.00	0.30	1.00			1.00	1.00
Satd. Flow (perm)				1624	1624	1530	508	1698			1667	1224
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	0	0	432	0	116	74	474	0	0	617	240
RTOR Reduction (vph)	0	0	0	0	0	90	0	0	0	0	0	48
Lane Group Flow (vph)	0	0	0	216	216	26	74	474	0	0	617	192
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	5%	6%	0%	0%	8%	25%
Turn Type				Split		Perm	pm+pt					Perm
Protected Phases				4	4		1	6			2	
Permitted Phases						4	6					2
Actuated Green, G (s)				15.2	15.2	15.2	46.3	46.3			37.5	37.5
Effective Green, g (s)				15.7	15.7	15.7	46.3	46.3			37.5	37.5
Actuated g/C Ratio				0.22	0.22	0.22	0.66	0.66			0.54	0.54
Clearance Time (s)				4.5	4.5	4.5	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
Lane Grp Cap (vph)				364	364	343	413	1123			893	656
v/s Ratio Prot				c0.13	0.13		0.01	c0.28			c0.37	
v/s Ratio Perm						0.02	0.11					0.16
v/c Ratio				0.59	0.59	0.08	0.18	0.42			0.69	0.29
Uniform Delay, d1				24.3	24.3	21.4	10.7	5.6			12.0	8.9
Progression Factor				1.00	1.00	1.00	1.08	1.11			1.00	1.00
Incremental Delay, d2				2.6	2.6	0.1	0.2	0.8			4.4	1.1
Delay (s)				26.9	26.9	21.5	11.7	7.0			16.3	10.1
Level of Service				C	C	C	B	A			B	B
Approach Delay (s)		0.0			25.7			7.7			14.6	
Approach LOS		A			C			A			B	

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	98.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	276	5	225	0	0	0	0	244	370	115	881	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	0.95	
Frt		1.00	0.85					0.92		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1716	1485					1593		1629	3288	
Flt Permitted		0.95	1.00					1.00		0.25	1.00	
Satd. Flow (perm)		1716	1485					1593		422	3288	
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)	291	5	237	0	0	0	0	257	389	121	927	0
RTOR Reduction (vph)	0	0	125	0	0	0	0	73	0	0	0	0
Lane Group Flow (vph)	0	296	112	0	0	0	0	573	0	121	927	0
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	5%	3%	5%	4%	0%
Turn Type	Split		Perm							pm+pt		
Protected Phases	8	8						6		5	2	
Permitted Phases			8							2		
Actuated Green, G (s)		15.3	15.3					38.6		46.2	46.2	
Effective Green, g (s)		15.8	15.8					38.6		46.2	46.2	
Actuated g/C Ratio		0.23	0.23					0.55		0.66	0.66	
Clearance Time (s)		4.5	4.5					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		387	335					878		341	2170	
v/s Ratio Prot		c0.17						c0.36		0.02	c0.28	
v/s Ratio Perm			0.08							0.22		
v/c Ratio		0.76	0.34					0.65		0.35	0.43	
Uniform Delay, d1		25.4	22.7					11.0		7.0	5.6	
Progression Factor		1.00	1.00					0.76		1.16	1.28	
Incremental Delay, d2		8.7	0.6					3.1		0.6	0.5	
Delay (s)		34.1	23.3					11.5		8.7	7.7	
Level of Service		C	C					B		A	A	
Approach Delay (s)		29.3			0.0			11.5			7.8	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	98.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	160	0	0	65	0	549	15	0	725	381
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	168	0	0	68	0	578	16	0	763	401
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								226			353	
pX, platoon unblocked	0.94	0.94	0.88	0.94	0.94	0.87	0.88			0.87		
vC, conflicting volume	1618	1557	582	1136	1750	586	1164			594		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1131	1067	241	617	1272	455	905			464		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	75	100	100	86	100			100		
cM capacity (veh/h)	126	205	663	260	154	481	644			957		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	168	68	594	509	655
Volume Left	0	0	0	0	0
Volume Right	168	68	16	0	401
cSH	663	481	1700	1700	1700
Volume to Capacity	0.25	0.14	0.35	0.30	0.39
Queue Length 95th (ft)	25	12	0	0	0
Control Delay (s)	12.3	13.7	0.0	0.0	0.0
Lane LOS	B	B			
Approach Delay (s)	12.3	13.7	0.0	0.0	
Approach LOS	B	B			

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	68	10	30	25	195	110	110	386	30	228	300	362
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0			4.0			4.0			4.0	4.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes		0.98			0.98			1.00			1.00	0.92
Flpb, ped/bikes		0.99			1.00			1.00			0.99	1.00
Frt		0.96			0.95			0.99			1.00	0.85
Flt Protected		0.97			1.00			0.99			0.98	1.00
Satd. Flow (prot)		1626			1661			1743			1646	1394
Flt Permitted		0.46			0.97			0.80			0.63	1.00
Satd. Flow (perm)		776			1622			1417			1061	1394
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)	72	11	32	26	205	116	116	406	32	240	316	381
RTOR Reduction (vph)	0	20	0	0	26	0	0	3	0	0	0	103
Lane Group Flow (vph)	0	95	0	0	321	0	0	551	0	0	556	278
Confl. Peds. (#/hr)	19		28	28		19	19		19	28		28
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	6%	6%	1%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)		16.2			16.2			45.8			45.8	45.8
Effective Green, g (s)		16.2			16.2			45.8			45.8	45.8
Actuated g/C Ratio		0.23			0.23			0.65			0.65	0.65
Clearance Time (s)		4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		180			375			927			694	912
v/s Ratio Prot												
v/s Ratio Perm		0.12			c0.20			0.39			c0.52	0.20
v/c Ratio		0.53			0.86			0.59			0.80	0.30
Uniform Delay, d1		23.6			25.8			6.8			8.8	5.2
Progression Factor		1.00			1.00			1.00			0.62	0.14
Incremental Delay, d2		2.8			17.1			2.8			9.0	0.8
Delay (s)		26.3			42.9			9.6			14.5	1.5
Level of Service		C			D			A			B	A
Approach Delay (s)		26.3			42.9			9.6			9.2	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Intersection: 1: Portway Ave & 2nd Street

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	98	151	137	61
Average Queue (ft)	51	70	65	28
95th Queue (ft)	81	119	108	53
Link Distance (ft)	976	728	349	318
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Industrial St & 2nd Street

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	106	124	5
Average Queue (ft)	49	28	0
95th Queue (ft)	87	79	7
Link Distance (ft)	972	366	349
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Riverside Drive & 2nd Street

Movement	EB	SB
Directions Served	R	TR
Maximum Queue (ft)	120	261
Average Queue (ft)	48	42
95th Queue (ft)	94	168
Link Distance (ft)	1481	366
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: I-84 WB Ramp & 2nd Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	R
Maximum Queue (ft)	182	169	139	114	290	286	90
Average Queue (ft)	101	84	47	39	120	187	71
95th Queue (ft)	156	139	95	88	251	321	116
Link Distance (ft)	1470	1470			352	267	
Upstream Blk Time (%)					0	4	
Queuing Penalty (veh)					0	33	
Storage Bay Dist (ft)			125	90			65
Storage Blk Time (%)		1	0	0	6	20	1
Queuing Penalty (veh)		1	0	2	4	42	5

Intersection: 5: I-84 EB Ramp & 2nd Street

Movement	EB	EB	NB	SB	SB	SB
Directions Served	LT	R	TR	L	T	T
Maximum Queue (ft)	313	170	304	114	216	206
Average Queue (ft)	174	68	160	61	110	101
95th Queue (ft)	290	127	293	113	183	169
Link Distance (ft)	1961		296		352	352
Upstream Blk Time (%)			1		0	0
Queuing Penalty (veh)			6		0	0
Storage Bay Dist (ft)		1000		90		
Storage Blk Time (%)				1	6	
Queuing Penalty (veh)				5	7	

Intersection: 6: Cascade Ave & 2nd Street

Movement	EB	WB	NB	SB	SB
Directions Served	R	R	TR	T	TR
Maximum Queue (ft)	495	86	177	305	275
Average Queue (ft)	174	35	27	73	58
95th Queue (ft)	480	69	106	229	203
Link Distance (ft)	2394	272	196	296	296
Upstream Blk Time (%)			1	1	1
Queuing Penalty (veh)			4	4	5
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Oak Street & 2nd Street

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	284	399	256	294	256
Average Queue (ft)	150	253	227	222	97
95th Queue (ft)	303	468	292	328	225
Link Distance (ft)	2366	459	228	196	196
Upstream Blk Time (%)		6	41	25	1
Queuing Penalty (veh)		0	0	110	3
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Network Summary

Network wide Queuing Penalty: 232

Intersection: 1: Portway Ave & 2nd Street

Movement	EB	WB	NB	SB
Directions Served	TR	LT	LR	LTR
Maximum Queue (ft)	83	81	77	51
Average Queue (ft)	48	41	42	27
95th Queue (ft)	72	67	66	52
Link Distance (ft)	1820	1900	335	882
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Anchor Way & 2nd Street

Movement	EB	WB	NB	SB
Directions Served	LR	LR	LTR	LTR
Maximum Queue (ft)	87	126	221	141
Average Queue (ft)	45	63	101	61
95th Queue (ft)	72	102	174	102
Link Distance (ft)	1788	1926	383	335
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Riverside Drive & 2nd Street

Movement	EB	NB	NB	SB
Directions Served	R	T	R	TR
Maximum Queue (ft)	137	29	17	70
Average Queue (ft)	54	6	2	3
95th Queue (ft)	110	69	21	32
Link Distance (ft)	343	254		383
Upstream Blk Time (%)		2		
Queuing Penalty (veh)		11		
Storage Bay Dist (ft)			125	
Storage Blk Time (%)		2		
Queuing Penalty (veh)		2		

Intersection: 4: I-84 WB Ramp & 2nd Street

Movement	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	LT	R	L	T	T	R
Maximum Queue (ft)	217	203	80	101	221	275	163
Average Queue (ft)	110	97	37	35	62	93	23
95th Queue (ft)	161	169	80	74	163	193	96
Link Distance (ft)	859	859			295	254	
Upstream Blk Time (%)					2	0	
Queuing Penalty (veh)					9	3	
Storage Bay Dist (ft)			125	90			65
Storage Blk Time (%)		2	2	0	3	8	0
Queuing Penalty (veh)		2	3	1	2	19	2

Intersection: 5: I-84 EB Ramp & 2nd Street

Movement	EB	EB	NB	SB	SB	SB
Directions Served	LT	R	TR	L	T	T
Maximum Queue (ft)	534	380	284	145	208	194
Average Queue (ft)	257	117	133	46	99	98
95th Queue (ft)	498	374	260	96	166	163
Link Distance (ft)	3251		277		295	295
Upstream Blk Time (%)			2		0	0
Queuing Penalty (veh)			15		1	0
Storage Bay Dist (ft)		1000		90		
Storage Blk Time (%)	0	0		1	5	
Queuing Penalty (veh)	0	1		5	6	

Intersection: 6: Cascade Ave & 2nd Street

Movement	EB	WB	NB	SB	SB
Directions Served	R	R	TR	T	TR
Maximum Queue (ft)	312	98	97	267	214
Average Queue (ft)	107	39	8	60	23
95th Queue (ft)	346	75	61	197	129
Link Distance (ft)	2286	2173	173	277	277
Upstream Blk Time (%)			2	1	0
Queuing Penalty (veh)			9	6	2
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Oak Street & 2nd Street

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	LTR	LTR	LT	R
Maximum Queue (ft)	206	468	570	201	225
Average Queue (ft)	75	197	267	155	79
95th Queue (ft)	158	376	527	219	169
Link Distance (ft)	2254	2156	584	173	173
Upstream Blk Time (%)			4	13	1
Queuing Penalty (veh)			0	60	4
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Network Summary

Network wide Queuing Penalty: 164

• Can ri/ro work without secondary street? (i.e. Kt Ave?)

Table 9: 2nd Street/ Riverside Drive Queuing (2031)

Movement	Available Storage	95th % Queue
Signalized		
EBLTR	1,300'	50'
WBLTR	275'	225'
NBL	100'	150'
NBTR	325'	325'
SBL	50'	50'
SBTR	400'	225'
Right-In/Right-Out		
WBR	275'	0'
EBR	1,300'	100'

Note: Shaded cells indicate 95th percentile queue exceeds storage.

Trigger Point? why not 2-way stop

While conversion of the 2nd Street/ Riverside Drive intersection to right-in/right-out movements only mitigates queuing concerns, it will also divert the displaced turning movements to the intersections along 2nd Street at Anchor Way and Portway Avenue. If the Portway Avenue intersection is converted to all-way stop control (currently only 2nd Street approach is stopped), both intersections will operate at level of service B, which complies with City of Hood River mobility standards.

In summary, failing operations at the 2nd Street/ Riverside Drive intersection can be mitigated through either signalization or conversion to right-in/right-out movements only. However, only conversion to right-in/right-out movements can successfully avoid queuing conflicts with the I-84 westbound ramp terminal. Therefore, this improvement was assumed to be in place for the analysis of alternatives to mitigate congestion through the Exit 63 interchange. To accommodate the displaced turning movements, the intersection on 2nd Street at Portway Avenue must be converted to all-way stop control as well.

2nd Street/ Oak Street Intersection and 2nd Street Corridor

With poor operations at the 2nd Street/ Oak Street intersection resulting in queue spillback that creates hazardous conditions on the freeway, alternatives were aimed at improving the intersection as well as reducing ramp queues to acceptable levels. The initial set of alternatives analyzed includes:

- **Alternative 0: No Build** – The No Build alternative was previously analyzed as part of the Future Needs assessment. By comparing it along side of the improvement alternatives developed, it can be used as a baseline to gauge the impacts associated with each concept.
- **Alternative 1: 2nd Street at Oak Street Signal Modifications and Parking Removal** – The purpose of this alternative was to add capacity to the bottleneck created by the 2nd Street/ Oak Street intersection by adding turn lanes to the approaches. To avoid impacting

adjacent buildings, the turn lanes were added by removing parking from each block surrounding the intersection.

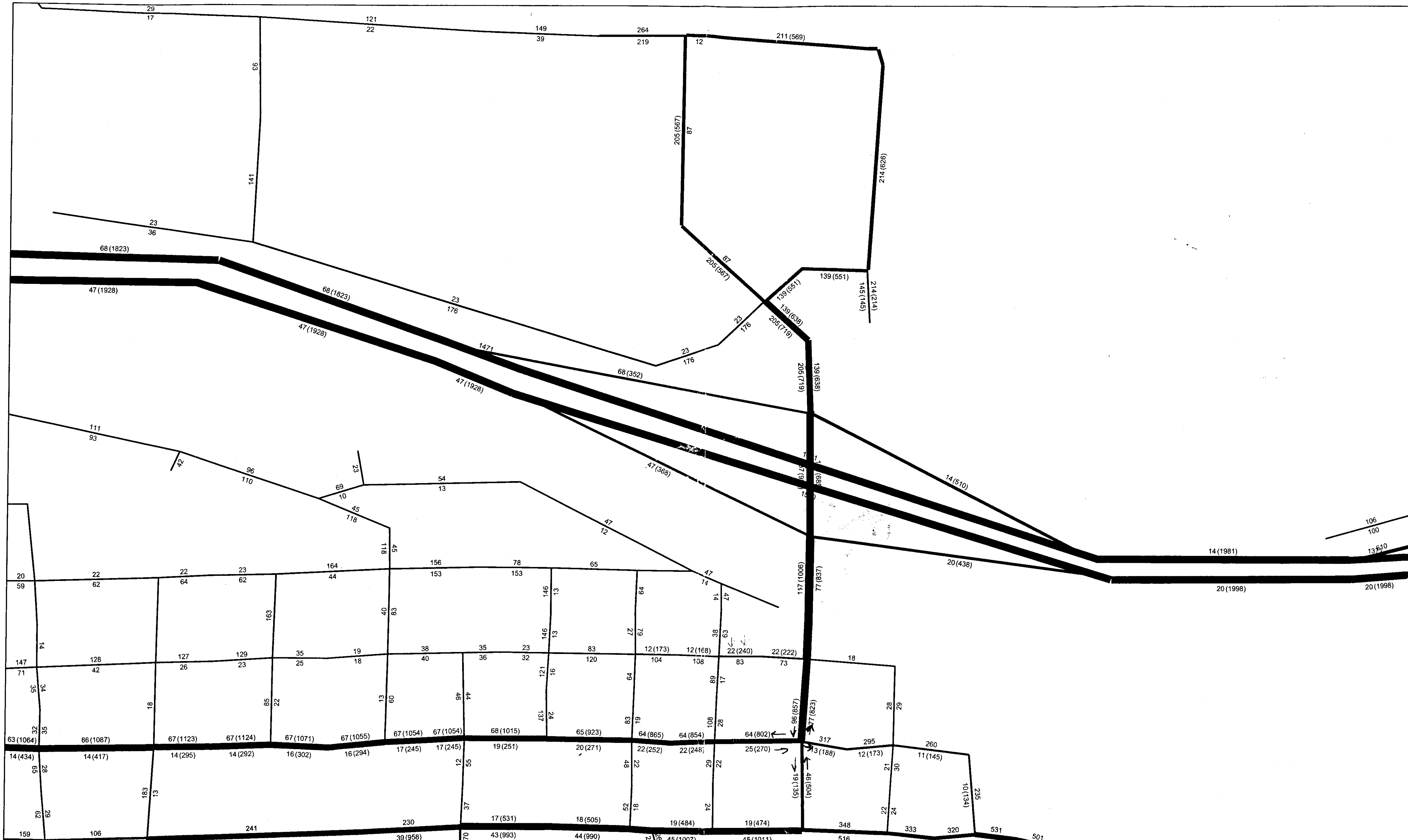
- **Alternative 2: 8th Street Overcrossing** – This alternative includes the construction of an overpass over the Union Pacific Railroad and I-84 that connects Wasco Street on the south with 8th Street on the north. The overpass was proposed to provide a second access to the waterfront, which would remove traffic from the Exit 63 interchange area.

- **Alternative 3: State Street/ Oak Street Couplet** – This alternative includes the conversion of State Street and Oak Street to a one-way couplet between Front Street and 6th Street (e.g., westbound only on Oak Street and eastbound only on State Street). The north-south streets would remain as two-way roadways. The conversion of these streets to one-way operation would simplify signal operations along 2nd Street, potentially alleviating the future bottleneck. This alternative was not developed in detail and was only analyzed in concept to determine if it could have a significant benefit. Further study would be needed to define the specific limits of the couplet, provide a complete analysis of the traffic impacts through the downtown, and assess the potential property impacts. yes! study

With the individual intersections along 2nd Street being in close proximity, operational acceptability was measured both by the ability to comply with mobility standards as well as by the ability to minimize the impacts of queue spillback. The critical indicator of whether or not queues have been successfully managed is on the I-84 ramp terminals. Because of the significant safety hazard created by queuing vehicles back into the freeway mainline or into the lower portion of the ramp used for deceleration from freeway speeds, alternatives that could not maintain acceptable queues on the I-84 off-ramps were considered undesirable. Therefore, alternatives were first evaluated by the queuing that would be present between intersections and on the off-ramps. For each alternative, the operational analysis was first conducted during the weekday p.m. peak hour. The Sunday peak was only examined for alternatives that first proved to be viable during the weekday peak.

Table 10 displays the results of the queuing analysis for Alternatives 0 through 4. Note that the intersection on 2nd Street at Riverside Drive was assumed converted to right-in/ right-out only movements for Alternatives 1 through 4. Under this configuration, northbound queues are eliminated and cannot conflict with the I-84 westbound ramp terminals.

North of I-84, the intersections along 2nd Street at Portway Avenue, Anchor Way, and Riverside Drive operate well, with the only queuing problems experienced being associated with the southbound queue spillback from the 2nd Street/ Oak Street intersection. This is seen in the long southbound queues at Anchor Way and Riverside Drive, as well as in the long side street (eastbound and westbound) queues that occur when the intersections along 2nd Street are blocked. Between the three improvement alternatives, Alternatives 2 and 3 appear to be slightly more effective than Alternative 1 (adding turn lanes at 2nd Street/Oak Street), which has little impact on the southbound queues.



Created on: 23.12.2010	HoodRiver_2031PM_TSP_PrelimAlts-w_IAMPprojects(assigned) MJD	1:3127
Hood River TSP Update	2031 PM Peak Hour Link Volumes and V/C, Intersection LOS	DKS Associates

The Port area east of 2^{nd} Street and south of Portway Avenue is TAZ 128.

The assumed land use for the TAZ and the approximate trip rate for each use is:

Scenario	**Households**	**Retail Emp**	**Service Emp**	**Other Emp**
2007	0	10	15	19
2031	0	44	60	168
Approximate Trip Rate (In/Out)	0.59/0.34	1.90/2.14	0.72/0.92	0.06/0.33

Region 1
2008-2011 Construction STIP
Modernization Project Criteria Summary Report

Contact Person:	Michael Ray
Phone Number:	(503) 731-8283
Project Name:	I-84: EXIT 64 – East Hood River Interchange Reconstruction
Key Number:	13956 (2006-2009 STIP: I-84 @ HWY 35 Interchange improvements) 15191, 14030 (2008-2011 STIP and 2006-2009 I-84 Bridge Bundle)
Project Location:	MP 64.44 – 64.45, I-84
Total Estimated Project Cost:	$9,766,000
Approved Funding:	'06-'09 STIP at $2.25 million OTIA III funds at $5.977 million
Proposed Funding:	'08-'11 STIP at $1.539 million

Project Description: This project is a combination of three smaller projects. The '06 –'09 STIP allocated $2.25 million to reconfigure the interchange ramps and widen the connection road through the interchange from 2 to five lanes, providing for left-turn refuge; and providing for a sidewalk on the east side (with room for a future sidewalk on the west side) and bike lanes. The Oregon Bridge Development Partners (OBDP) is rebuilding the overpass (#07398), lengthening the bridge carrying I-84 through the interchange as part of the OTIA III Bridge Repair and Replacement Project. The OBDP is providing $5.977 million. Region 1 is committing an additional $1.539 million to make the project complete. The OTIA III project was only to repair the overpass in-kind, not lengthen it to accommodate the new interchange design.

Project Eligibility

Consistency with existing plans: Refinement Study concluded in June 2005, with a recommended alternative. Need for the Refinement Study was identified in City of Hood River TSP. Need for the Study was also identified in the Hood River-Mt Hood OR 35 Corridor Study and in the SR 35 Columbia River Crossing Draft EIS. The 2006-2009 STIP allocated $2.25 million dollars for construction. This funding is to be combined with OTIA III Bridge Repair and Replacement funding and $1,539,000 in the 2008-2011 STIP for construction. Bid let date is targeted for November 2007.

Consistency with OHP Policy 1G, Action 1G.1: Project was identified as the recommended alternative in an ODOT-funded study to identify a fix to the interchange. The study was a follow-up to TSP and Corridor Planning in the Hood River vicinity. It looked at a wide range of options to provide an improved connection between I-84 and OR 35, consistent, considering the circumstances, with ODOT design, spacing and operational standards, and in consideration of cost, environmental constraints and the desire to improve safety and operations in the interchange area. The Refinement Study also identified a new local connection north of the Interstate. The Port of Hood River is moving this process forward. This local connection would connect the east and west sides of the Hood River eliminating the use of the Interstate as a local route between central Hood River and the Hood River-White Salmon Bridge area.

Project Prioritization

Project readiness and milestones completed: The project was identified through a study that considered planning-level constraints; known environmental constraints were avoided. The study and the local adoption process included numerous opportunities for input from citizen and agency stakeholders, and the recommended alternative was widely supported. The Project is eligible for a Categorical Exclusion.

Support of OHP policies:

Policy 1A -- Highway Classification: The project connects an Interstate Highway with a Statewide Highway and serves as an interstate connection between the states of Oregon and Washington. The reconfigured interchange moves in the direction of ODOT's access spacing, traffic operation, mobility and roadway design standards.

Policy 1B – Land Use: The project is within the City of Hood River. It is not within an area designated as special land use per the OHP. An IAMP with the City of Hood River will be prepared prior to construction of the interchange.

Policy 1C – Freight: Please see Freight Prioritization Criteria below.

Policy 1D – Scenic Byways: Exit 64 connects the Interstate system with the Historic Columbia River Highway and OR 35, which was recently designated as part of the Mt. Hood Scenic Byway. The Historic Columbia River Highway also has the "All American Road" designation.

Policy 1F – Mobility Standards: Based on planned land uses, the design of the project would maintain ODOT mobility standards.

Policy 1G – Major Improvements: Please see "Consistency with OHP Policy 1G" in eligibility criteria above.

Policy 2A – Partnership: The City of Hood River, Hood River County and the Port of Hood River support the project. The local jurisdictions provided staff support during the planning processes leading up to the recommended design.

Policy 2B – Off-System Improvements: the Port of Hood River is working in conjunction with the City of Hood River to create a local connection that will span the Hood River north of the Interstate. This connection would reduce the use of the Interstate as a local route.

Policy 2C – Interjurisdictional Transfer: There is a possibility that the City of Hood River, or the Port of Hood River might take possession of the section of a connecting road from Marina Way to the Hood River-White Salmon Bridge.

Policy 2D – Public Involvement: The Refinement Study and the planning that lead up to it went through numerous public processes.

Policy 2E – ITS: Not applicable.

Policy 2F – Traffic Safety: The project is being proposed in response to an existing safety problem. Currently, during high volume events on the Hood River Waterfront, traffic can back-up through the interchange, blocking the ramps in both directions. This leads to exiting traffic on the Interstate to stop in the through lanes. This is especially apparent in the eastbound off-ramp. Future traffic projections show LOS F on all legs of the interchange except for westbound on and at Marina Way. This project will return LOS to D, with volume to capacity maintained at .65.
Policy 2G – Rail and Highway Compatibility: The BNSF mainline run directly south of the interchange, however this project has no impact on the rail line.
Policy 3A – Access Management/Spacing Standards: Upon completion and prior to opening, access control lines would be put into place. There is currently one intersection (Marina Way) in the vicinity that does not meet ODOT Access Management/Spacing Standards. Because this intersection is the only access to the east Port of Hood River properties and a well developed commercial center, it is doubtful that the possibility exists to close it.
Policy 3B – Medians: Not applicable.
Policy 3C – Interchange Access Management Areas: An IAMP will be prepared prior to construction of the interchange.
Policy 4A – Efficiency of Freight Movement: Reconstruction of this interchange will facilitate the movement of freight. Aligning the eastbound ramps will reduce confusion. Widening the lower roadway will increase capacity and separate left-turning vehicles from through vehicles.
Policy 4B – Alternative Passenger Modes: The reconstructed interchange will include facilities for pedestrians and bicyclists.
Policy 4C – HOV Facilities: Not applicable.
Policy 4D – TDM: Not applicable.
Policy 4E – Park and Ride Facilities: Not applicable.
Policy 5A – Environmental Resources: The project was identified with consideration of planning-level environmental constraints. The project qualifies as a Categorical Exclusion.

Support of freight mobility: The project provides access for freight and other traffic from OR 35 and I-84 to the local network and the interchange provides access between the States of Oregon and Washington. I-84 and OR 35 are both designated freight system routes.

Leverage of other funds and benefits: It has not been determined whether other jurisdictions will contribute financially.

Support of additional ACT criteria: Not applicable.

Conditions of Approval:

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	35	165	315	25	0	230	0	55	0	40	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
Hourly flow rate (vph)	0	39	183	350	28	0	256	0	61	0	44	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	222	378	317	50
Volume Left (vph)	0	350	256	0
Volume Right (vph)	183	0	61	6
Hadj (s)	-0.46	0.22	0.08	-0.03
Departure Headway (s)	5.2	5.6	5.7	6.2
Degree Utilization, x	0.32	0.59	0.50	0.09
Capacity (veh/h)	631	615	585	478
Control Delay (s)	10.6	16.2	14.4	9.8
Approach Delay (s)	10.6	16.2	14.4	9.8
Approach LOS	B	C	B	A

Intersection Summary			
Delay	14.0		
HCM Level of Service	B		
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	140	55	280	510	10
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)	5	147	58	295	537	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				760		
pX, platoon unblocked						
vC, conflicting volume	953	542	547			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	953	542	547			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	73	94			
cM capacity (veh/h)	271	540	1022			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	153	353	547
Volume Left	5	58	0
Volume Right	147	0	11
cSH	522	1022	1700
Volume to Capacity	0.29	0.06	0.32
Queue Length 95th (ft)	30	4	0
Control Delay (s)	14.7	1.9	0.0
Lane LOS	B	A	
Approach Delay (s)	14.7	1.9	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	110	0	0	0	0	335	310	0	650	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	116	0	0	0	0	353	326	0	684	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								343				
pX, platoon unblocked												
vC, conflicting volume	1037	1363	684	1153	1037	353	684			679		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1037	1363	684	1153	1037	353	684			679		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.4			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	100	100	74	100	100	100	100			100		
cM capacity (veh/h)	211	149	452	130	233	696	795			923		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total	116	0	353	326	684
Volume Left	0	0	0	0	0
Volume Right	116	0	0	326	0
cSH	452	1700	1700	1700	1700
Volume to Capacity	0.26	0.00	0.21	0.19	0.40
Queue Length 95th (ft)	25	0	0	0	0
Control Delay (s)	15.7	0.0	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	15.7	0.0	0.0		0.0
Approach LOS	C	A			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	410	0	120	70	525	0	0	550	210
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lane Util. Factor				0.95	0.95	1.00	1.00	1.00			1.00	1.00
Frt				1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1624	1624	1530	1629	1698			1667	1224
Flt Permitted				0.95	0.95	1.00	0.32	1.00			1.00	1.00
Satd. Flow (perm)				1624	1624	1530	555	1698			1667	1224
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	0	0	432	0	126	74	553	0	0	579	221
RTOR Reduction (vph)	0	0	0	0	0	98	0	0	0	0	0	47
Lane Group Flow (vph)	0	0	0	216	216	28	74	553	0	0	579	174
Heavy Vehicles (%)	4%	0%	7%	0%	0%	0%	5%	6%	0%	0%	8%	25%
Turn Type				Split		Perm	pm+pt					Perm
Protected Phases				4	4		1	6			2	
Permitted Phases						4	6					2
Actuated Green, G (s)				15.2	15.2	15.2	46.3	46.3			37.5	37.5
Effective Green, g (s)				15.7	15.7	15.7	46.3	46.3			37.5	37.5
Actuated g/C Ratio				0.22	0.22	0.22	0.66	0.66			0.54	0.54
Clearance Time (s)				4.5	4.5	4.5	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
Lane Grp Cap (vph)				364	364	343	441	1123			893	656
v/s Ratio Prot				c0.13	0.13		0.01	c0.33			c0.35	
v/s Ratio Perm						0.02	0.10					0.14
v/c Ratio				0.59	0.59	0.08	0.17	0.49			0.65	0.27
Uniform Delay, d1				24.3	24.3	21.5	9.7	6.0			11.6	8.8
Progression Factor				1.00	1.00	1.00	1.03	1.08			1.00	1.00
Incremental Delay, d2				2.6	2.6	0.1	0.1	1.0			3.6	1.0
Delay (s)				26.9	26.9	21.6	10.2	7.4			15.2	9.8
Level of Service				C	C	C	B	A			B	A
Approach Delay (s)		0.0			25.7			7.8			13.7	
Approach LOS		A			C			A			B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	305	5	225	0	0	0	0	290	370	110	850	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0	
Lane Util. Factor		1.00	1.00					1.00		1.00	0.95	
Frt		1.00	0.85					0.92		1.00	1.00	
Flt Protected		0.95	1.00					1.00		0.95	1.00	
Satd. Flow (prot)		1716	1485					1602		1629	3288	
Flt Permitted		0.95	1.00					1.00		0.21	1.00	
Satd. Flow (perm)		1716	1485					1602		364	3288	
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)	321	5	237	0	0	0	0	305	389	116	895	0
RTOR Reduction (vph)	0	0	132	0	0	0	0	62	0	0	0	0
Lane Group Flow (vph)	0	326	105	0	0	0	0	632	0	116	895	0
Heavy Vehicles (%)	0%	0%	3%	0%	0%	0%	0%	5%	3%	5%	4%	0%
Turn Type	Split		Perm							pm+pt		
Protected Phases	8	8						6		5	2	
Permitted Phases			8							2		
Actuated Green, G (s)		15.9	15.9					38.3		45.6	45.6	
Effective Green, g (s)		16.4	16.4					38.3		45.6	45.6	
Actuated g/C Ratio		0.23	0.23					0.55		0.65	0.65	
Clearance Time (s)		4.5	4.5					4.0		4.0	4.0	
Vehicle Extension (s)		3.0	3.0					3.0		3.0	3.0	
Lane Grp Cap (vph)		402	348					877		297	2142	
v/s Ratio Prot		c0.19						c0.39		0.02	c0.27	
v/s Ratio Perm			0.07							0.24		
v/c Ratio		0.81	0.30					0.72		0.39	0.42	
Uniform Delay, d1		25.3	22.1					11.8		8.0	5.8	
Progression Factor		1.00	1.00					0.79		1.12	1.26	
Incremental Delay, d2		11.7	0.5					4.1		0.8	0.5	
Delay (s)		37.1	22.6					13.5		9.7	7.9	
Level of Service		D	C					B		A	A	
Approach Delay (s)		31.0			0.0			13.5			8.1	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	160	0	0	65	0	595	15	0	700	375
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	168	0	0	68	0	626	16	0	737	395
Pedestrians		23			22			23			2	
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		2			2			2			0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								254			365	
pX, platoon unblocked	0.92	0.92	0.88	0.92	0.92	0.86	0.88			0.86		
vC, conflicting volume	1662	1621	612	1216	1811	658	1155			664		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1192	1148	290	707	1354	522	906			529		
tC, single (s)	7.6	6.5	6.9	7.5	6.5	6.9	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.6	4.0	3.3	3.5	4.0	3.3	2.2			2.3		
p0 queue free %	100	100	72	100	100	84	100			100		
cM capacity (veh/h)	101	178	599	202	134	426	651			840		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	168	68	642	491	640
Volume Left	0	0	0	0	0
Volume Right	168	68	16	0	395
cSH	599	426	1700	1700	1700
Volume to Capacity	0.28	0.16	0.38	0.29	0.38
Queue Length 95th (ft)	29	14	0	0	0
Control Delay (s)	13.3	15.1	0.0	0.0	0.0
Lane LOS	B	C			
Approach Delay (s)	13.3	15.1	0.0	0.0	
Approach LOS	B	C			

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	10	30	25	195	110	110	415	30	220	295	345
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)		4.0			4.0			4.0			4.0	4.0
Lane Util. Factor		1.00			1.00			1.00			1.00	1.00
Frpb, ped/bikes		0.98			0.98			1.00			1.00	0.92
Flpb, ped/bikes		0.99			1.00			1.00			0.99	1.00
Frt		0.97			0.95			0.99			1.00	0.85
Flt Protected		0.97			1.00			0.99			0.98	1.00
Satd. Flow (prot)		1634			1661			1745			1647	1394
Flt Permitted		0.41			0.97			0.82			0.62	1.00
Satd. Flow (perm)		688			1620			1437			1048	1394
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)	89	11	32	26	205	116	116	437	32	232	311	363
RTOR Reduction (vph)	0	17	0	0	26	0	0	3	0	0	0	103
Lane Group Flow (vph)	0	115	0	0	321	0	0	582	0	0	543	260
Confl. Peds. (#/hr)	19		28	28		19	19		19	28		28
Heavy Vehicles (%)	0%	0%	0%	0%	0%	2%	0%	1%	0%	6%	6%	1%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)		16.3			16.3			45.7			45.7	45.7
Effective Green, g (s)		16.3			16.3			45.7			45.7	45.7
Actuated g/C Ratio		0.23			0.23			0.65			0.65	0.65
Clearance Time (s)		4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		160			377			938			684	910
v/s Ratio Prot												
v/s Ratio Perm		0.17			c0.20			0.41			c0.52	0.19
v/c Ratio		0.72			0.85			0.62			0.79	0.29
Uniform Delay, d1		24.7			25.7			7.1			8.8	5.2
Progression Factor		1.00			1.00			1.00			0.57	0.13
Incremental Delay, d2		14.4			16.6			3.1			8.8	0.8
Delay (s)		39.1			42.3			10.2			13.8	1.4
Level of Service		D			D			B			B	A
Approach Delay (s)		39.1			42.3			10.2			8.9	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			