South/North Land Use Final Order Amendment Boundary Map

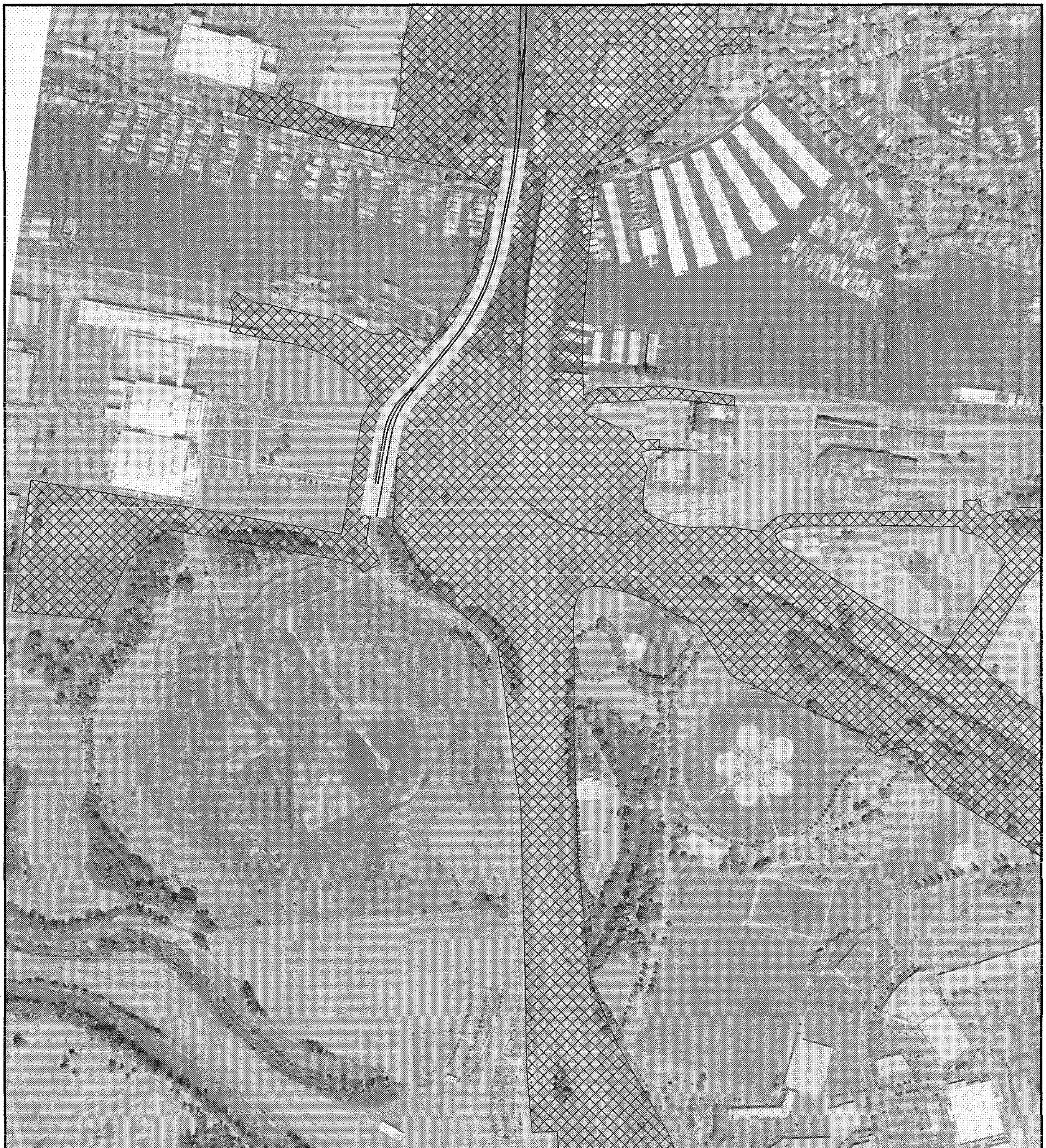
Figure 1.1

Columbia River Crossing Project

Light Rail Route
Light Rail Stations
Highway improvements
Potential Alignment
Potential Station Platform

METRO

Feet
0 200 400
1 inch equals 400 feet



South/North Land Use Final Order Amendment Boundary Map

Figure 1.2

Columbia River Crossing Project

Light Rail Route

Light Rail Stations

Highway improvements

Potential Alignment

Potential Station Platform

METRO

Feet
0 200 400
1 inch equals 400 feet

South/North Land Use Final Order Amendment Boundary Map

Figure 1.3

Columbia River Crossing Project

Light Rail Route

Light Rail Stations

Highway improvements

Potential Alignment

Potential Station Platform

METRO

Feet
0 200 400
1 inch equals 400 feet

South/North Land Use Final Order Amendment Boundary Map

Figure 2.1

Ruby Junction Operations and Maintenance Facility

Existing O&M

Potential O&M expansion

Potential Alignment

Potential Station Platform

Existing Light Rail

METRO

Feet 0 250 500

1 inch equals 500 feet

June 2008

Findings of Fact and Conclusions of Law

South/North Corridor Land Use Final Order
Columbia River Crossing Project

INITIAL DRAFT
7/14/11

<u>THIS DRAFT IS SUBJECT TO REVISION AND EXPANSION PRIOR TO FINAL METRO COUNCIL ACTION</u>

1. Introduction

1.1 Nature of the Metro Council's Action

This action adopts a Land Use Final Order (LUFO) for the Columbia River Crossing (CRC) Project, which is an element of the larger South/North Corridor Project. The action is taken pursuant to Oregon Laws 1996 (Special Session), Chapter 12 (referred to herein as "House Bill 3478" or "the Act"), which directs the Metro Council (Council) to issue LUFOs establishing the light rail route, stations, park-and-ride lots and maintenance facilities, and highway improvements for the South/North Project, including their locations (*i.e.* the boundaries within which these facilities and improvements may be located). [1,2]

This LUFO is the fifth in a series of LUFOs the Council has adopted for the South/North Project. The previously adopted LUFOs are as follows:

- On July 23, 1998, the Metro Council adopted Resolution No. 98-2673 (the 1998 LUFO), establishing the initial light rail route, stations, lots and maintenance facilities and the highway improvements, including their locations, for the South/North Project.

- On October 28, 1999, the Metro Council adopted Resolution No. 99-2853A (the 1999 LUFO), amending the 1998 LUFO to reflect revisions for that portion of the South/North Project extending from the Steel Bridge northward to the Portland Metropolitan Exposition Center (Expo Center), primarily along Interstate Avenue. The 1999 LUFO modified the northern light rail alignment; established, relocated or expanded light rail station locations along that alignment; and authorized park-and-ride lots at Portland International Raceway (PIR) and the Expo Center along the light rail route.

- On January 15, 2004, the Metro Council adopted Resolution No. 03-3372 (the 2004 LUFO), further amending the previous South/North LUFO resolutions to (1) establish the light rail route, stations and park-and-ride lots, including their locations, along the Interstate-205 right-of-way from the Gateway Transit Center to Clackamas Regional Center; (2) modify the route along the downtown Portland Transit Mall to extend light rail transit (LRT) to Portland State University (PSU) and establish, adjust or relocate station locations; (3) modify the 1998 LUFO for the segment from Portland to Milwaukie by revising the alignment and adding study areas; (4) remove the 1998 LUFO designations from Milwaukie to Clackamas Regional Center; and (5) complete

[1] Metro's Regional Transportation Plan shows northward extension of light rail to Clark County Washington. However, the Metro Council's jurisdiction is limited to the Oregon portion of the South/North Project.

[2] Section 1(18) of HB 3478 defines the "Project" as "the portion of the South/North MAX Light Rail Project within the Portland metropolitan area urban growth boundary including each segment thereof as set forth in the Phase I South North Corridor Project Locally Preferred Alternative Report, as may be amended from time to time or as may be modified in a Final Statement or the Full Funding Grant Agreement". The Columbia River Crossing Project extends the existing light rail alignment northward from the Expo Center to the Oregon/Washington state line. The Project also provides for highway improvements on and in the vicinity of Interstate 5 (I-5) between Victory Boulevard and the state line.

technical amendments to the 1999 LUFO alignment to reflect the final built configuration at certain stations consistent with the Full Funding Agreement Grant approved by the Federal Transit Administration.

- On July 25, 2008, the Metro Council adopted Resolution No. 08-3964 (the 2008 LUFO), amending the 1998 and 2004 South/North LUFOs as they relate to the segment of the South/North Project extending from Portland State University (PSU) in downtown Portland through SE Portland and downtown Milwaukie to SE Park Avenue in unincorporated Clackamas County. The 2008 LUFO realigned the light rail route between PSU and SE 7th Avenue; established the route from SE Tacoma Street to SE Park Avenue; relocated light rail stations or authorized new stations along the light rail route; and established the park-and-ride lots and highway improvements for the Portland to Milwaukie segment.

This 2011 South/North LUFO Amendment (the 2011 LUFO) amends the 1998 LUFO as it relates to the segment of the South/North Project in north Portland extending northward from the Expo Center and from the Interstate 5/Victory Boulevard Interchange to the Oregon/Washington state line on the Columbia River. This 2011 LUFO realigns the light rail route between the Expo Center and the Oregon/Washington state line westward from its alignment in the 1998 LUFO and it relocates the Hayden Island station west of its previous location. It also provides for the rail route to be accommodated on the lower tier of a new southbound Interstate 5 bridge. This 2011 LUFO also establishes a number of highway improvements for the Columbia River Crossing Segment of the South/North Project, including new northbound and southbound Interstate 5 bridges; widening of Interstate 5 in both directions between approximately N Victory Boulevard the Oregon/Washington state line on the Columbia River; new or modified interchanges at Marine Drive, Hayden Island and Victory Boulevard; a new integrated rail/vehicular/bicycle pedestrian bridge connecting Hayden Island with the Expo Center; and roadway realignments, widenings, modifications and new connections within the project area.

This 2011 LUFO also provides for expansion and improvement of the Ruby Junction Maintenance Facility along NW Eleven Mile Avenue in Gresham to accommodate and maintain additional LRT vehicles associated with the Columbia River Crossing Project.

This 2011 LUFO is also the latest in a long string of land use final orders dating back to 1991 to the approval of the first LUFO for the Westside Corridor Project. That LUFO, and several amendments to that LUFO which followed, expanded the Portland metropolitan region's commitment to a multi-modal transportation network including light rail transit serving populations to the north, south, east and west of the Central City, an improved state highway and local street network, and facilities to encourage walking and bicycle travel. These steps coincided with the Land Conservation and Development Commission's adoption in 1991 of the Transportation Planning Rule, which encourages and supports the availability of a variety of transportation choices for moving people that balance vehicular use with other modes to avoid principal reliance on any one mode. The Westside LUFOs, among other things, approved the extension of light rail initially through Portland, unincorporated Washington County and Beaverton and then later into downtown Hillsboro. They also approved highway and bicycle improvements associated with the light rail projects, including the widening of US 26 and Oregon 217, new or modified freeway ramps, a new bridge crossing US 26 at Sylvan, a new collector-distributor road system west of the Sylvan Interchange, a new US 26 bridge crossing at Sylvan, the closing of some local accesses to and from US 26, local street realignments, modifications and improvements, and bicycle facility improvements extending from approximately the Oregon Zoo to Oregon 217. The South/North Project continued this commitment to a multi-modal transportation system with a series of light rail and highway improvements extending along the South/North corridor between Clackamas County and the Oregon/Washington state line.[3] The Council anticipates that this 2011 LUFO amendment will not be the final step in that process, as House Bill 3478 envisions that at some future point, light rail transit will extend farther south into Oregon City.

1.2 Relationship of Council's Order to Requirements of the National Environmental Policy Act of 1969

Like the 1998, 1999, 2004 and 2008 LUFOs before it, this 2011 LUFO is adopted solely to implement the provisions in HB 3478 authorizing the Council to make land use decisions on the light rail route, stations, lots and maintenance facilities and the highway improvements for the South/North Project, including their locations. This land use decision is not required by the National Environmental Policy Act of 1969 (NEPA) or other federal law.

1.3 Requirements of House Bill 3478

Section 6(1) of House Bill 3478 requires the Council to "establish the light rail route, stations, lots and maintenance facilities, and the highway improvements for the project or project extension, including their locations." Section 6(1)(a) further provides that the locations for each of these facilities and improvements:

> "*shall be in the form of boundaries within which the light rail route, stations, lots and maintenance facilities, and the highway improvements shall be located. These boundaries shall be sufficient to accommodate adjustments to the specific placements of the light rail route, stations, lots and maintenance facilities, and the highway improvements for which need commonly arises upon the development of more detailed environmental or engineering data following approval of a Full Funding Grant Agreement.*"

Section 6(2) of the Act addresses amendments to the 1998 LUFO. It provides:

> "*Any siting of the light rail route, a station, lot or maintenance facility, or a highway improvement outside the locations established in a land use final order, and any new station, lot, maintenance facility or highway improvement, shall require a land use*

[3] The region's rail transit system now has 50 miles of light rail, with a new line south from the Central City to Milwaukie (7.3 miles) in final planning stages. The system includes a 14.7-mile commuter rail serving the southwest part of the region, opened in 2008, and four miles of streetcar with another eight miles under construction. Future light rail projects under consideration include a light rail line along the Barbur Boulevard corridor.

final order amendment or a new land use final order which shall be adopted in accordance with the process provided for in subsection (1) of this section."

Section 7 of HB 3478 requires the Council to apply land use criteria established by the Land Conservation and Development Commission (LCDC) in making decisions in a land use final order on the light rail route, stations, lots and maintenance facilities, and the highway improvements, including their locations, and to prepare and adopt findings of fact and conclusions of law demonstrating compliance with those criteria. *These findings serve to demonstrate compliance with LCDC's criteria for the modifications selected in this LUFO amendment.*

2. Amendments to the Light Rail Route, Stations, Lots and Maintenance Facilities, and Highway Improvements for the Project, Including Their Locations

2.1 Introduction

The Metro Council initially approved a light rail route, stations, park-and-ride lots, maintenance facilities and highway improvements for the Project, including their locations, in the 1998 LUFO. That decision established an alignment from the Clackamas Town Center through downtown Milwaukie to downtown Portland and northward to the Oregon/Washington state line on the Columbia River.

The 1999 LUFO modified the 1998 LUFO by relocating the light rail alignment farther to the west, establishing new light rail station locations, and providing an interim terminus at the Expo Center. The remainder of the Project outside that portion between the Steel Bridge and the Expo Center remained unchanged.

This 2011 LUFO modifies the 1998 LUFO by:

1) Relocating the light rail alignment and Hayden Island station farther to the west;

2) Relocating the light rail alignment leading into Vancouver, Washington onto the lower tier of a new southbound Interstate 5 bridge;

3) Providing significant highway improvements between approximately N. Victory Boulevard and the Oregon/Washington state line on the Columbia River, including but not limited to new northbound and southbound Interstate 5 bridges to accommodate highway, rail, pedestrian and bicycle travel; widening of northbound and southbound Interstate 5 to accommodate three travel lanes and two auxiliary lanes; and interchange and roadway modifications and improvements and new roadway connections within the Project area.

These 2011 findings replace and supersede findings supporting the 1998 LUFO as follows:

- That part in Section 6.4.8 of the 1998 LUFO findings addressing the portion of the North Portland segment between the Expo Center and N Marine Drive;
- In their entirety, Section 6.4.9 of the 1998 LUFO findings addressing the Hayden Island segment.

Further, to the extent these 2011 LUFO findings create inconsistencies with other sections of the 1998 or 1999 LUFO findings [*see, e.g.*, Sections 2.1, 6.1 and 6.3], these 2011 findings control and supersede the earlier findings.

This 2011 LUFO also authorizes use of the Ruby Junction Maintenance Facility in Gresham to serve light rail vehicles associated with the Columbia River Crossing Project.

2.2 Selected Expo Center/Hayden Island Segment Amendments

The Metro Council amends the 1998 LUFO and the 1999 LUFO to select and establish the locations of the light rail route, stations, lots, maintenance facilities and highway improvements identified below. The Council finds that its selected light rail route, stations, lots, maintenance facilities and highway improvements, including their locations, are identical to those for which TriMet requested Council approval in its "Application for South/North Land Use Final Order Amendment (Expo Center/Hayden Island Segments)", which TriMet filed on July 13, 2011 and which the Council incorporates herein by this reference.[4] The light rail route, station, and highway improvements selected by this amendment are described textually and illustrated on the maps contained in the Council's adopted 2011 LUFO.

In the 1998 LUFO there were two segments that, together, provided LRT service between the Expo Center and the Oregon/Washington state line on the Columbia River. These segments were the North Portland segment and the Hayden Island segment. In the 1999 LUFO, the Metro Council renamed the portion of the North Portland segment extending from south of the Columbia Slough near N Columbia Boulevard to the Expo Center the "Expo Center Segment." This 2011 LUFO amendment retains the name "Expo Center Segment" and extends it to N Marine Drive, where the Hayden Island Segment begins. This 2011 LUFO amendment also extends the Expo Center and Hayden Island segments east of Interstate 5 approximately 2,500 feet to include all areas identified for highway improvements. For convenience purposes, these two segments are consolidated and addressed as a single segment (Expo Center/Hayden Island) in these findings.

The Metro Council now deems it appropriate to approve the 2011 LUFO changes for the Expo Center/Hayden Island Segment as follows:

Light Rail Alignment

From the Expo Center station, the light rail alignment proceeds northward under N Marine Drive and onto a new, integrated light rail/vehicular/bicycle/pedestrian bridge crossing over the North Portland Harbor onto Hayden Island west of I-5. The alignment then continues northward, crossing over N Hayden Island Drive onto the lower deck of the new southbound Interstate 5 bridge.

From the state line on the Columbia River, the alignment continues northward into Vancouver, Washington. Because the portion of the Project in the State of Washington is outside the jurisdiction of the State of Oregon, it is not subject to compliance with House Bill 3478 and is not addressed in the LUFO or these LUFO findings.

Light Rail Stations

A single light rail station is located in the Expo Center/Hayden Island Segment.

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[4] TriMet's application is attached as Exhibit B to Resolution No. 11-4289.

The **Hayden Island Station** will be elevated and positioned adjacent to I-5, over or near Tomahawk Island Drive. Tomahawk Island Drive will be extended under I-5 to provide a third east/west street connection for Hayden Island. The Hayden Island Plan calls for retail development, a mixed-use station community, and a well-connected street system to be developed adjacent to the station.

Park-and-Ride Lots

There are no new park-and-ride lots in the Expo Center/Hayden Island Segment.

Operations & Maintenance Facilities

There are no operations & maintenance facilities in the Expo Center/Hayden Island Segment. Maintenance will be provided at the existing Ruby Junction Maintenance Facility in Gresham, discussed in Section 2.3 below.

Highway Improvements

The highway improvements in the Expo Center/Hayden Island Segment include the following:

1. New northbound and southbound I-5 Columbia River bridges. The southbound bridge is a two-tier bridge with highway on the upper deck and light rail on the lower deck. The northbound bridge is a two-tier bridge with highway on the upper deck and bicycle and pedestrian facilities on the lower deck. Each bridge will include three travel lanes and two auxiliary lanes.

2. Widening of I-5 in both the northbound and southbound directions from N Victory Boulevard to the Oregon/Washington state line. Northbound, I-5 will widen from three travel lanes at N Victory Boulevard to three travel lanes and two auxiliary lanes on the new northbound I-5 Columbia River bridge. Southbound, I-5 will narrow from three travel lanes and two auxiliary lanes on the new southbound I-5 Columbia River bridge to three lanes south of N Victory Boulevard.

3. A newly designed I-5/Marine Drive interchange, including ramps connecting I-5 with N Marine Drive and NE Martin Luther King Jr. Boulevard.

4. A newly designed I-5/Hayden Island interchange including relocated northbound and southbound exit and entrance ramps. The redesign is intended to further the Hayden Island Plan and implement features that are supportive of transit.

5. A new integrated light rail/vehicular/bicycle/pedestrian bridge west of I-5 connecting Hayden Island with the Expo Center and N Expo Road.

6. Realignment and widening of NE Martin Luther King Jr. Boulevard between the new I-5/Marine Drive interchange and approximately N Hayden Meadows Drive.

7. Realignment and widening of N Marine Drive between N Gantenbein Avenue and N Vancouver Way.

8. Modification, widening and extension of N Vancouver Way between east of N Haney Drive and approximately the light rail alignment west of I-5.

9. Realignment and widening of NE Union Court between N Hayden Meadows Drive and N Vancouver Way.

10. A new northbound connection between NE Martin Luther King Jr. Boulevard and N Vancouver Way and a new southbound connection between NE Martin Luther King Jr. Boulevard and NE Union Court.

11. Realignments, widening and roadway modifications to N Jantzen Avenue, N Jantzen Drive and N Hayden Island Drive.

12. Modification, widening and extension of N Tomahawk Island Drive from east of N Jantzen Drive to the west of I-5.

13. Construction of a new roadway west of I-5 and the light rail alignment between N Jantzen Avenue and N Hayden Island Drive.

14. A new public road extending N Expo Road westward to N Force Avenue.

15. Removal of the existing I-5 Columbia River bridges.

See **Figures 1.1 to 1.3** of the LUFO for the boundaries within which the above described light rail facilities and highway improvements would be located.

2.3 Ruby Junction Maintenance Facility Improvements

The Ruby Junction Maintenance Facility along NW Eleven Mile Avenue in Gresham was first authorized in 1980 as part of the Portland to Gresham light rail project. The facility includes light rail tracks, vehicle storage spaces and maintenance bays, an operation center, and related facilities necessary to maintain light rail vehicles.

As part of the 2008 LUFO amendments for the Portland to Milwaukie Project, the Council approved the modification and expansion of the Ruby Junction Maintenance Facility and adopted location boundaries for it. See **Figure 2.1** of this 2011 LUFO. This LUFO authorizes the use of the facility to serve light rail vehicles associated with the Columbia River Crossing Project. Such use was expressly anticipated in the 2008 LUFO findings. Because use and improvement of the facility in connection with the Columbia River Crossing Project will occur within the location boundaries approved in 2008, the Council finds it is not necessary to amend those boundaries.

3. South/North Project Land Use Final Order Criteria

On May 30, 1996, pursuant to Section 4 of HB 3478, LCDC established the criteria to be used by the Council in making land use decisions establishing or amending the light rail route, stations, lots and maintenance facilities, and the highway improvements for the Project or Project Extension, including their locations. The approved criteria include two procedural, six substantive, and two alignment-specific standards, set out as follows:

3.1 Procedural Criteria

1. Coordinate with and provide an opportunity for Clackamas and Multnomah Counties, the cities of Gladstone, Milwaukie, Oregon City and Portland, the Tri-County Metropolitan Transportation District of Oregon and the Oregon Department of Transportation to submit testimony on the light rail route, light rail stations, park-and-ride lots and vehicle maintenance facilities, and the highway improvements, including their locations.

2. Hold a public hearing to provide an opportunity for the public to submit testimony on the light rail route, light rail stations, park-and-ride lots and vehicle maintenance facilities, and the highway improvements, including their locations.

3.2 Substantive Criteria

3. Identify adverse economic, social and traffic impacts on affected residential, commercial and industrial neighborhoods and mixed use centers. Identify measures to reduce those impacts which could be imposed as conditions of approval during the National Environmental Policy Act (NEPA) process or, if reasonable and necessary, by affected local governments during the local permitting process.

   A. Provide for a light rail route and light rail stations, park-and-ride lots and vehicle maintenance facilities, including their locations, balancing (1) the need for light rail proximity and service to present or planned residential, employment and recreational areas that are capable of enhancing transit ridership; (2) the likely contribution of light rail proximity and service to the development of an efficient and compact urban form; and (3) the need to protect affected neighborhoods from the identified adverse impacts.

   B. Provide for associated highway improvements, including their locations, balancing (1) the need to improve the highway system with (2) the need to protect affected neighborhoods from the identified adverse impacts.

4. Identify adverse noise impacts and identify measures to reduce noise impacts which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by affected local governments during the permitting process.

5. Identify affected landslide areas, areas of severe erosion potential, areas subject to earthquake damage and lands within the 100-year floodplain. Demonstrate that adverse impacts to persons or property can be reduced or mitigated through design or construction techniques which could be imposed during the NEPA process or, if reasonable and necessary, by local governments during the permitting process.

6. Identify adverse impacts on significant fish and wildlife, scenic and open space, riparian, wetland and park and recreational areas, including the Willamette River Greenway, that are protected in acknowledged local comprehensive plans. Where adverse impacts cannot practicably be avoided, encourage the conservation of natural resources by demonstrating that there are measures to reduce or mitigate impacts which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the permitting process.

7. Identify adverse impacts associated with stormwater runoff. Demonstrate that there are measures to provide adequate stormwater drainage retention or removal and protect water quality which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the permitting process.

8. Identify adverse impacts on significant historic and cultural resources protected in acknowledged comprehensive plans. Where adverse impacts cannot practicably be avoided, identify local, state or federal review processes that are available to address and to reduce adverse impacts to the affected resources.

3.3 Alignment-Specific Criteria

9. Consider a light rail route connecting the Clackamas Town Center area with the City of Milwaukie's Downtown. Consider an extension of the light rail route connecting the City of Oregon City and the City of Gladstone with the City of Milwaukie via the Interstate 205 corridor and/or the McLoughlin Boulevard corridor.

10. Consider a light rail route connecting Portland's Central City with the City of Milwaukie's Downtown via inner southeast Portland neighborhoods and, in the City of Milwaukie, the McLoughlin Boulevard corridor, and further connecting the Central City with north and inner northeast Portland neighborhoods via the Interstate 5/Interstate Avenue corridor.

Compliance with Procedural Criteria 1 and 2 is demonstrated in Section 5 of these findings. Compliance with Substantive Criteria 3 through 8 is demonstrated in Section 6 (long-term impacts) and Section 7 (short term construction impacts) of these findings. The Council finds that Criterion 9 is not relevant to this 2011 LUFO because the South/North Project already connects Clackamas Town Center with downtown Milwaukie and this amendment does not concern light rail extensions from Milwaukie to Gladstone or Oregon City. It finds that compliance with Criterion 9 has been addressed in prior South/North LUFOs, including the 2004 LUFO. Regarding Criterion 10, the Council finds that this 2011 LUFO amendment further connects the Central City with the Kenton and Hayden Island neighborhoods in north Portland via the existing alignment along the Interstate Avenue corridor.

For all of the reasons set out in these findings, the Council finds and concludes that these 2011 LUFO amendments comply with the applicable LCDC criteria.

4. Implementation of a Land Use Final Order

4.1 Overview of Process for Selecting Mitigation Measures

LCDC Criteria 3 through 8 require the Council to identify (1) specified adverse impacts (*e.g.*, impacts to neighborhoods and natural resources) that would result as a consequence of its decisions, and (2) "measures" to reduce those impacts which potentially could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the local jurisdiction permitting processes. Consideration of appropriate measures is consistent with local comprehensive plan policies and land use regulations which recognize that development can have adverse impacts on persons and property and which seek to reduce those impacts to the extent reasonable and permitted by law.[5]

The Council's decisions selecting the light rail route, stations, lots and maintenance facilities, and the highway improvements for the Project, including their locations, are not the final steps in the process culminating with completion of construction of the South/North Project. Subsequent to or concurrent with Council actions, Final Environmental Impact Statements (FEIS) are submitted to the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA). As part of that process, mitigation plans are developed addressing mitigation of adverse impacts associated with the selected rail and highway improvements for the Project. In each case, following federal approval of the FEIS, issuance of a Record of Decision and the signing of a Full Funding Grant Agreement with FTA and FHWA, the Final Design phase will begin. During Final Design, all necessary federal and state permits for project construction are obtained.

Also during Final Design, the siting of light rail and highway improvements is subject to local permitting processes. Section 8(1)(b) of House Bill 3478 directs all affected local governments and agencies to "issue the appropriate development approvals, permits, licenses and certificates necessary for the construction of the Project or project extension consistent with a land use final order." Section 8(1)(b) further allows these affected local governments to attach approval conditions to their development approvals permits, licenses and certificates. However, any such conditions must be "reasonable and necessary" and "may not, by themselves or cumulatively, prevent implementation of a land use final order." Under Section 8(3) of HB 3478, unreasonable or unnecessary conditions would include 1) measures for which there are insufficient funds within the Project budget to pay for those measures; 2) measures that would significantly delay the completion or otherwise prevent the timely implementation of the Project; and 3) measures that would significantly negatively impact Project operations. See also *TriMet v. City of Beaverton*, 132 Or App 253 (1995). A condition prevents implementation of a LUFO if its imposition would require TriMet to finance construction of the condition at the expense of improvements funded under the Full Funding Grant Agreement or to go beyond the available federal funds and local matching funds for the Project. The Council finds that these funds constitute the envelope of available funds for the Project.

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[5]Section 1(17) of HB 3478 defines "measures" to include "any mitigation measures, design features, or other amenities or improvements associated with the project or project extension."

In summary, Criteria 3 through 8 require the Council to identify measures which potentially "could be imposed" later in the process as part of an approved mitigation plan under NEPA or through local permitting (if reasonable and necessary). However, the actual determination and imposition of appropriate measures occurs only through these later federal or local processes, not through this Council action. The Council finds this approach to be reasonable and appropriate, particularly given that the LUFO is not based on final design plans. Through final design, many identified adverse impacts may be avoided, and appropriate mitigation can be better determined.

4.2 Effect of Land Use Final Order on Local Comprehensive Plans and Land Use Regulations

Section 8(1)(a) of HB 3478 requires the affected cities and counties and Metro to amend their comprehensive or functional plans, including their public facility and transportation system plans and land use regulations, to the extent necessary to make them consistent with a land use final order. Section 8(2) further provides that a LUFO "shall be fully effective upon adoption."

The legal effects of these provisions are (1) to immediately authorize, as permitted uses, the light rail route, stations, lots and maintenance facilities and the highway improvements, including their locations, as identified and approved in a land use final order, and (2) to require appropriate plan and land use regulation amendments so that local land use requirements are consistent with a land use final order.[6] However, as noted above, the uses approved in a land use final order remain subject to local imposition of reasonable and necessary approval conditions under Section 8(1)(b).

While approval of a LUFO identifies where rail and highway improvements may go and authorizes their development at these locations subject to reasonable and necessary conditions, it does not concurrently prevent other uses allowed by existing zoning. Stated another way, a LUFO is not a right-of-way preservation tool. It does not prevent development of economically feasible uses currently permitted under acknowledged plans and land use regulations. It merely adds to the list of uses permitted on the properties affected by the LUFO without eliminating other uses from that list.

Similarly, a LUFO does not require local zoning amendments to allow more intense scales of development. Instead, it requires amendments only as necessary to authorize the approved Project elements and ancillary facilities or improvements that may be required to ensure the safe and proper functioning and operation of the light rail system or other Project elements, provide Project access, improve traffic flow, circulation or safety in the Project vicinity, or mitigate adverse impacts resulting from the Project.

[6] This may require amendments to authorize the ancillary facilities and improvements for the South/North Project.

In summary, Metro Council adoption of a LUFO has the immediate effect of authorizing, on the affected properties, the light rail and highway facilities and improvements approved in the LUFO. It also identifies the affected locations for future public acquisition for rail or highway purposes. However, LUFO adoption in no way prevents or limits currently allowed uses on these properties during the interim period pending ultimate public acquisition, nor does it mandate the rezoning of areas nearby light rail stations to achieve regional growth management objectives.

5. Compliance with Procedural Criteria (1-2)

5.1 Criterion 1: Agency Coordination

> **"Coordinate with and provide an opportunity for Clackamas and Multnomah Counties, the cities of Gladstone, Milwaukie, Oregon City and Portland, the Tri-County Metropolitan Transportation District of Oregon and the Oregon Department of Transportation to submit testimony on the light rail route, light rail stations, park-and-ride lots and vehicle maintenance facilities, and the highway improvements, including their locations."**

Criterion 1 ensures Metro coordination with the Tri-County Metropolitan Transportation District of Oregon (TriMet), the Oregon Department of Transportation (ODOT), and six cities and counties that are directly affected by the Project or Project Extension. Criterion 1 further requires Metro to provide these jurisdictions and agencies an opportunity to submit testimony on the light rail and highway facilities and improvements for the Project or Project Extension, including their locations.

The light rail route, station, maintenance facility and highway improvement decisions that are the subject of this LUFO amendment fall within the jurisdictional boundaries of the cities of Portland and Gresham. The Metro Council finds that the City of Portland's planning, engineering, and other technical staff, as well as staff from TriMet and ODOT, have been actively involved in the process resulting in these proposed amendments, and that TriMet staff has met with City of Gresham staff with regard to expanding the Ruby Junction Maintenance Facility.

The Council finds that Metro coordination with TriMet, ODOT, Clackamas and Multnomah Counties and the cities of Portland, Milwaukie, Gresham, Oregon City and Gladstone has occurred both through their participation on the LUFO Steering Committee to make recommendations to TriMet on a 2011 LUFO amendment (except for Gladstone) and through invitations to these local governments and agencies to submit testimony to the Metro Council on this amendment. The Council finds that on or about June 13, 2011, TriMet staff mailed Project materials (*Proposed LUFO Steering Committee Recommendation Concerning the 2011 South/North Land Use Final Order*, dated June 23, 2011) describing all aspects of the proposed Project to ODOT and to elected officials of the cities of Portland, Milwaukie, Gresham, and Oregon City, the counties of Multnomah and Clackamas, and Metro, providing them with information regarding the proposed 2011 LUFO amendments for the Columbia River Crossing Project. The Council further finds that the LUFO Steering Committee, which includes representatives from Metro, TriMet, ODOT, Clackamas and Multnomah Counties, and the cities of Portland, Milwaukie, Gresham and Oregon City, reviewed the proposed LUFO amendments and on June 23, 2011, made recommendations to TriMet on those amendments as documented in the 2011 LUFO and as provided for in Section 6(1)(a) of House Bill 3478. Also, the Council finds that ODOT separately submitted its own recommendations to TriMet as required by Section 6(1)(a).

In addition, the Metro Council finds that notice of its August 11, 2011, public hearing to consider this LUFO amendment was mailed directly to each of the above-identified local governments and agencies identified in Criterion 1, including the City of Gladstone, thus providing those local governments and agencies with the opportunity to submit testimony to the Council on the proposed LUFO amendments at that hearing.

In adopting these 2011 LUFO amendments, the Metro Council carefully considered the recommendations of the LUFO Steering Committee and ODOT and the comments of the affected jurisdictions. The Council's decision in this 2011 LUFO amendment proceeding is fully consistent with TriMet's application, which in turn is consistent with the recommendations of the LUFO Steering Committee and ODOT.

For all of these reasons, the Metro Council finds that Criterion 1 is satisfied.

5.2 Criterion 2: Citizen Participation

> **"Hold a public hearing to provide an opportunity for the public to submit testimony on the light rail route, light rail stations, park-and-ride lots and vehicle maintenance facilities, and the highway improvements, including their locations."**

Criterion 2 ensures that the public has an opportunity to submit testimony and be heard in the process leading to the Metro Council's selection of the light rail route, stations, lots and maintenance facilities, and the highway improvements for the Project, including their locations.

On August 11, 2011, consistent with Criterion 2, the Metro Council held a public hearing and accepted public testimony on the proposed amendments to the 1998 LUFO and the 1999 LUFO. This followed public notice, which Metro published in *The Oregonian* on July 14, 2011, which is more than 14 days prior to its hearing. The Metro Council finds that *The Oregonian* is a newspaper of general circulation and that this publication of notice in *The Oregonian* meets and exceeds the requirements for notice set out in HB 3478.

In addition to the published notice, a postcard mailing announcing the hearing was mailed to people on Metro's South/North mailing list for the Columbia River Crossing Project. This list includes owners of property within 250 feet of the light rail and highway alignments and within 250 feet of the Ruby Junction Maintenance Facility boundary.

Also, announcements of the 2011 LUFO public hearing were included on Metro's website.

Further, the Metro Council finds that there has been substantial community participation in the process leading to the selection of the proposed amendments. The Metro Council takes notice of, and incorporates by reference herein, the description of the community participation process leading up to adoption of these 2011 LUFO amendments as set out in Appendix B of the Columbia River Crossing Draft Environmental Impact Statement (May 2008).

In summary, the Metro Council finds that the holding of the public hearing on August 11, 2011, satisfies the requirement of Criterion 2. It further determines and concludes that the notices provided through publication, mailings, recorded announcements and by other means were reasonably calculated to give notice to people who may be substantially affected by the Metro Council's decision on TriMet's application.

6. Compliance with Substantive Criteria (3-8) Long Term Impacts

6.1 Introduction

The Columbia River Crossing portion of the South/North Project will extend South/North LRT from the Expo Center to the Oregon/Washington state line on the Columbia River and then farther northward into Vancouver, Washington. The total length of the LRT extension is 2.9 miles, of which 1.0 mile is within the State of Oregon. Additionally, the Columbia River Crossing portion of the Project will provide two new bridge spans over the Columbia River, enhance pedestrian and bicycle travel in the area, widen and improve I-5, and substantially improve mobility on and the connectivity of the surrounding roadway network between N Victory Boulevard and the Columbia River.

This LUFO amendment affects the Hayden Island segment and a portion of the Expo Center segment of the South/North Project, as identified by the Council in the 1998 and 1999 LUFOs. For ease of analysis, those two segments are addressed as a single, consolidated segment (Expo Center/Hayden Island) in these findings.

6.2 Supporting Documentation

In addition to the findings of fact addressing the selected light rail route, stations, maintenance facilities and highway improvements for the Columbia River Crossing Section of the South/North Project, the Metro Council believes, adopts and incorporates by reference herein the facts set forth in the following documents:

*Columbia River Crossing Draft Environmental Impact Statement (2008)
*Preliminary Columbia River Crossing Technical Reports (including appendices) (2011):
*Acquisitions Technical Report
*Air Quality Technical Report
*Archaeology Technical Report
*Aviation Technical Report
*Cumulative Effects Technical Report
*Economics Technical Report
*Ecosystems Technical Report
*Electromagnetic Fields Technical Report
*Energy Technical Report
*Environmental Justice Technical Report
*Geology and Groundwater Technical Report
*Hazardous Materials Technical Report
*Historic Built Environmental Technical Report
*Indirect Effects Technical Report
*Land Use Technical Report
*Navigation Technical Report
*Neighborhoods and Population Technical Report
*Noise and Vibration Technical Report

*Parks and Recreation Technical Report
*Public Services Technical Report
*TDM and TSM Technical Report
*Traffic Technical Report
*Transit Technical Report
*Utilities Technical Report
*Visual and Aesthetics Technical Report
*Water Quality and Hydrology Technical Report
*Wetlands and Jurisdictional Waters Technical Report
*Stacked Transit/Highway Bridge Memorandum
*Highway, local road and transit roll map
*Biological Assessment for Threatened, Endangered, and Candidate Fish
*Draft Stormwater Management Design

Additionally, the Metro Council takes official notice of the following documents:
*Metro Regional Framework Plan and its components, including the 2040 Growth Concept Map
*Urban Growth Management Functional Plan (codified in Metro code)
*2035 Regional Transportation Plan (RTP) and its components, including the Regional High Capacity Transit System Plan
*Metro Ordinance No. 10-1241B, adopting the 2035 RTP
*City of Portland Comprehensive Plan
*City of Portland Transportation System Plan
*1998 South/North Land Use Final Order Findings
*1999 South/North Land Use Final Order Findings of Fact and Conclusions of Law
*Metro Resolution No. 11-4264, including attached exhibits

6.3 Expo Center/Hayden Island Segment: Findings and Mitigation Measures[7]

As noted in Section 2.2 of these findings, the Expo Center/Hayden Island Segment of the South/North Project includes the following facilities in Oregon:

- For light rail, the Project extends the existing MAX light rail facilities from the Expo Center Station in north Portland northward across Hayden Island to the Oregon/Washington state line on the Columbia River. The light rail transit alignment is located to the west of the alignment approved in the 1998 South/North LUFO and includes one LRT station on Hayden Island.

[7] The 1998 South/North LUFO was supported by "general findings" addressing impacts and measures applicable to all segments of the South/North Project (Section 6.3), and by "segment-specific findings" addressing additional impacts specific to a particular segment of the Project (Section 6.4). The 1999, 2004 and 2008 LUFO amendments incorporated the "general findings" by reference while making new segment-specific findings. Because this 2011 LUFO amendment consolidates the Expo Center and Hayden Island segments into a single segment for purposes of impact analysis, the "general findings" are not incorporated by reference but rather restated herein on a criterion-by-criterion basis. In restating these general findings, the Council relies on the factual base that was established as part of the 1998 LUFO decision.

- For the highway improvements, the Project begins just south of N Victory Boulevard and extends northward to the Oregon/Washington state line on the Columbia River. The multi-modal Project includes a new bridge crossing over the Columbia River (including the LRT extension noted above), and related highway, interchange and bicycle and pedestrian improvements.

See **Figures 1.1 to 1.3** of the LUFO for the boundaries within which these light rail facilities and highway improvements will be located.

6.3.1 Criterion 3: Neighborhood Impacts

> **"Identify adverse economic, social and traffic impacts on affected residential, commercial and industrial neighborhoods and mixed use centers. Identify measures to reduce those impacts which could be imposed as conditions of approval during the National Environmental Policy Act (NEPA) process or, if reasonable and necessary, by affected local governments during the local permitting process."**
>
> **"A. Provide for a light rail route and light rail stations, park-and-ride lots and vehicle maintenance facilities, including their locations, balancing (1) the need for light rail proximity and service to present or planned residential, employment and recreational areas that are capable of enhancing transit ridership; (2) the likely contribution of light rail proximity and service to the development of an efficient and compact urban form; and (3) the need to protect affected neighborhoods from the identified adverse impacts."**
>
> **"B. Provide for associated highway improvements, including their locations, balancing (1) the need to improve the highway system with (2) the need to protect affected neighborhoods from the identified adverse impacts."**

Criterion 3 requires the Council to provide for a light rail route, stations, lots, maintenance facilities and associated highway improvements, "balancing" the need to protect affected neighborhoods from identified adverse impacts with the positive benefits provided by light rail proximity and service (including the development of an efficient and compact urban form) and by an improved highway system.

The Council finds that the Columbia River Crossing Project amending the 1998 LUFO includes both light rail facilities and associated highway improvements. These improvements were identified and analyzed as Alternative 3 in the DEIS issued in 2008. After a public hearing on the DEIS on May 29, 2008 and extensive public review, a Locally Preferred Alternative (LPA) was selected. The LPA was endorsed by TriMet and ODOT and is being advanced into the Final Environmental Impact Statement as the Preferred Alternative. The Preferred Alternative includes the light rail improvements necessary and appropriate to extend the South/North Light Rail Project into the State of Washington and the associated highway improvements, as presented in this application.

The Council finds that the Project, as set out in the LPA and the LUFO application, will be a significant transportation improvement project in which light rail, highway, bicycle and pedestrian improvements are all associated as part of an integrated, multi-modal project. The Council finds that the affected local governments and agencies involved in this Project have expressed strong interest that the Project be a joint light rail and highway project. It finds that the associated highway improvements directly and indirectly serve the light rail improvements by accommodating the alignment (e.g., new I-5 bridges, new arterial bridge over the North Portland Harbor) or providing regional and local access to the Expo Center and Hayden Island light rail stations (e.g., I-5 interchange improvements, access and circulation improvements and roadway modifications on Hayden Island and in the vicinity of the Marine Drive interchange). The Council further finds that some of the highway improvements are needed for engineering purposes to accommodate the new bridge containing the light rail alignment and the modifications to the I-5 interchanges and their approaches. And the Council finds that the light rail and highway improvements are linked together as well in federal and state proposals for funding the Project. See Metro Resolution No. 11-4264 and Exhibit A attached thereto, incorporated herein by this reference.

Description of Affected Neighborhoods in the Expo Center/Hayden Island Segment

The consolidated Expo Center/ Hayden Island segment extends north from N Marine Drive across the North Portland Harbor and Hayden Island to the Oregon/Washington state line in the Columbia River. The segment includes portions of the East Columbia, Kenton, Bridgeton and Hayden Island neighborhoods. These neighborhoods are identified and described in the Neighborhoods and Population Technical Report, incorporated herein by reference. Major public land uses in this segment include the Portland International Raceway, the Expo Center, and Delta Park.

The *East Columbia Neighborhood* is located directly east of I-5 and extends from the Columbia Slough north to Marine Drive. East Columbia contains a variety of land uses including large recreational and entertainment uses on the western and eastern boundaries of the neighborhood. One such use is East Delta Park, which is 86 acres in size. It features the Delta Sports Complex with five lighted softball fields and a synthetic soccer field. The complex also hosts additional softball fields, seven grass soccer fields, six sand volleyball courts, a playground, picnic tables, an off-leash dog area, and nature trails. The neighborhood also includes wetlands, trucking companies, and small industrial businesses. Other amenities within the East Columbia Neighborhood are Portland Meadows Race Track and Columbia Edgewater Golf Course. Between these large tracts of land are several manufactured home parks and large tracts of industrial land.

The East Columbia Neighborhood contained an estimated 2000 US Census population of 344. The percentage of African American residents is approximately twice that of the county or city, while the percentage of Hispanic or Latino residences is substantially smaller than that of the county or city. The percentage of population 65 years of age or older is one-third of the city percentage and slightly more than one-third of the county percentage.

The *Kenton Neighborhood* is located west of I-5 and extends from Lombard Avenue to North Portland Harbor. Kenton contains a wide range of uses, including residential, commercial, industrial, and recreational. Single-family residential development is concentrated south of Columbia Boulevard, with commercial and industrial uses located to its north. Multi-family residential dwellings are scattered throughout the neighborhood, but a majority are found among densely packed commercial structures along Interstate and Lombard Avenues.
The northern portion of Kenton contains multiple community resources including Portland International Raceway, Heron Lakes Golf Course, Multnomah County Fairgrounds, and the Expo Center. The large Paul Bunyan statue at the intersection of N Interstate and N Argyle Avenues, the Kenton Neighborhood Rose Garden, and the Historic Kenton Firehouse are also important cultural resources that provide identity to the community. West Delta Park and Vanport Wetlands serve as natural resources, as does Kenton Park on Brandon Avenue. There are many historic resources including the Kenton commercial historic shopping district on Denver Avenue, the historic David Cole House on N McClellan, and the historic Kenton Firehouse on Brandon Avenue.

The Kenton Neighborhood contained an estimated 2000 US Census population of 7,086. The percentage of African American residents in Kenton is more than twice that of the county or city, while the percentage of Hispanic or Latino residents is slightly higher than that of the county or city. The percentage of population 65 years of age or older is within one percent of the city percentage and county percentage.

The *Bridgeton Neighborhood* is located east of I-5 on North Portland Harbor. It is an early Portland neighborhood with cottages built between 1915 and 1930 along the Columbia River. Residential uses are concentrated at the eastern end of the neighborhood, both on land in rowhouses and detached single-family dwellings, and on the river in floating homes. Industrial uses can be found directly adjacent to I-5 around the Marine Drive interchange. There is a small commercial node at Marine Drive and I-5. Columbia High School and its adjacent playfield act as important community resources, as do the neighboring sloughs and the Columbia River, which provide recreational uses.

The Bridgeton Neighborhood contained an estimated 2000 US Census population of only 39 within the area of potential impact from the COLUMBIA RIVER CROSSING Project. The percentage of Hispanic or Latino population is lower than the county and city, while the percentage of African Americans is double that found in Multnomah County and almost double the percentage found in Portland. The percentage of population 65 years of age or older is one-third of the city percentage and slightly more than one-third of the county percentage.

While a range of uses is located in the *Hayden Island Neighborhood*, the primary use is commercial. Jantzen Beach Center, a large commercial mall, and other retail uses are located to the west of I-5. Hotels and restaurants are also located on the island. Residential uses are located in the northwestern and eastern portions of the island. The residences in the northwestern area are manufactured homes. In the eastern portion of the island the residences are both on the land and in the river; floating homes are located on the south side of the island and along North Portland Harbor. Small marinas are located around the island.

The Hayden Island Neighborhood contained an estimated 2000 US Census population of 2,086. The percentage of minority population and proportion of households below the poverty level is lower in the neighborhood than for the county and the region. The percentage of population over 65 years of age is considerably higher than averages for the county and the region

The LRT alignment will generally parallel the west side of I-5 through this segment, with a station located at the east end of the Jantzen Beach Center.

Identify adverse economic, social and traffic impacts on affected neighborhoods. Identify measures to reduce those impacts.

Economic, social and traffic impacts specific to the Expo Center/Hayden Island Segment are addressed in the following section. Economic, social and traffic impacts are also described, along with corresponding mitigation measures, in the Acquisitions Technical Report, Aviation Technical Report, Economics Technical Report, Environmental Justice Technical Report, Land Use Technical Report, Navigation Technical Report, Neighborhoods and Population Technical Report, Traffic Technical Report, Transit Technical Report, and Visual and Aesthetics Technical Report.

For the purpose of these findings, long-term adverse impacts generally are grouped under one of three headings: economic, social or traffic impacts. The Council recognizes, however, that impacts often can fall under more than one heading. For example, impacts on freight movement may be relevant as both economic and traffic impacts. Displacements have both economic and social implications. Parking can be categorized as an economic, social and traffic concern. The Council intends these findings to be interpreted broadly to allow overlap among these different categories.

Although the following list is not exclusive, the Council finds that the economic, social and traffic impacts associated with the Columbia River Crossing Project fall primarily within the following categories:

Economic Impacts

- Business displacements
- Loss of parking/access
- Tax base
- Freight movement (train, truck, water and air)

Social Impacts

- Residential displacements
- Access to community facilities
- Barriers to neighborhood interaction
- Safety and security

- Visual/aesthetic

Traffic Impacts
- Transit
- Systemwide and local traffic impacts

As noted, Criterion 3 directs the Council to balance these impacts with the need for light rail and highway improvements. Before identifying the adverse economic, social and traffic impacts on the affected neighborhoods, the Council finds it useful to briefly summarize the need for the light rail and highway improvements that comprise the Columbia River Crossing Project.

Overview of Need for Light Rail and Highway Improvements in the Expo Center/Hayden Island Segment

The Council finds that the Columbia River Crossing Project seeks to address problems relating to growing travel demand and congestion; impaired freight movement; limited public transportation operation, connectivity and reliability; safety and vulnerability to incidents; substandard bicycle and pedestrian facilities; and seismic vulnerability.

1. **Growing travel demand and congestion**: Heavy congestion on I-5 in the project area is the result of growth in regional population, employment, and interstate commerce. The existing I-5 crossing provides three lanes each for northbound and southbound travel, which can accommodate approximately 5,500 vehicles per hour in each direction. However, there are more people who want to use the crossing during peak periods than the bridges can accommodate, which results in stop-and-go traffic in the mornings and afternoons. Cars entering I-5 have little room to accelerate and merge with highway traffic (short merging lanes), and cars on I-5 have no room to pull off the highway (narrow or no shoulders) when an accident occurs or when vehicles break down. These conditions make congestion worse and decrease safety. Traffic can also become congested when the bridges' lift spans are raised to allow large river vessels to navigate underneath the bridges.

2. **Impaired freight movement**: Congestion on I-5 reduces freight mobility between regional markets in Portland and Vancouver, as well as national and international (Mexico or Canada) destinations along the I-5 corridor. Freight trucks most often travel in the middle of the day to avoid congestion, but can be delayed by bridge lifts. As hours of congestion continue to increase over time, travel times for freight trucks will continue to increase—even when traveling during the off-peak hours. This increases delivery times and raises shipping costs. It also negatively affects this region's economy. Truck-hauled freight in the Portland-Vancouver metropolitan region is expected to grow more rapidly than other forms of freight movement (such as marine-hauled freight).

3. **Limited public transportation operation, connectivity, and reliability**: Congestion on I-5 reduces bus travel speeds and reliability. Local bus services currently travel between downtown Vancouver and downtown Portland. Express bus routes serve commuters by providing service directly from Clark County park-and-rides to downtown Portland. Both

of these services travel over the I-5 bridges. Bus travel times from downtown Vancouver to Hayden Island increased 50 percent between 1998 and 2005. On average, local bus travel times are from 10 to 60 percent longer during peak periods than during off-peak periods.

4. **Safety and vulnerability to incidents**: Over 300 vehicle crashes are reported annually on I-5 in the project area, making this one of the most accident-intensive sections of I-5. This high accident rate is a result of multiple highway design features that do not meet current standards, including:

   - Close interchange spacing – Within the Columbia River Crossing Project area, I-5 has six interchanges spaced approximately one-half mile apart. The recommended minimum distance between interchanges is one mile so that cars entering and exiting the highway have enough distance to fully merge with traffic or diverge to the off-ramp before the next interchange.

   - Short on- and off-ramps – Several on-ramps are not long enough for vehicles to reach highway speed before merging with highway traffic. Off-ramps are too short for safely slowing down, and during heavy traffic, these short ramps may cause exiting vehicles to back up onto I-5. This generates traffic congestion and can cause accidents because maneuvering is difficult, especially for large trucks.

   - Vertical grade changes – A "hump" in the I-5 bridges that accommodates the Columbia River shipping channel blocks the view of roadway conditions ahead. This blocked view reduces speeds and creates potential hazards to motorists.

   - Narrow lanes and shoulders – Several portions of I-5 in the project area have narrow inside and outside shoulders, while the I-5 bridges essentially have no shoulders, with less than one foot between the outside lanes and the bridges' side barriers. The northbound I-5 bridge also has lanes one foot narrower than the minimum standard for a highway, and no shoulders. These conditions place vehicles very close to physical barriers and other vehicles, causing motorists to slow down, and do not provide space for disabled or emergency vehicles.

   - Hazardous river navigation – The U.S. Coast Guard (USCG) allows ODOT to not raise the I-5 bridges' lift spans during peak traffic periods because of the substantial impacts this would have on bridge traffic. This requires boats heading downstream (west) to navigate using the fixed "barge channel" near the middle of the river, and then quickly turn to line up with the narrow opening on the north end of the Burlington Northern Santa Fe (BNSF) railroad bridge, located about one mile downstream. This movement is especially difficult during high river levels.

5. **Substandard bicycle and pedestrian facilities**: The bicycle and pedestrian paths on the I-5 bridges are very narrow (four feet wide in most places, decreasing to less than four feet at some locations) and extremely close to traffic and to the steel trusses. Also, the connections to these paths at both ends of the bridges are difficult to follow, especially around the Marine Drive and Hayden Island interchanges, which at times require riders to cross active roadways. Many existing non-motorized facilities cannot be used by persons

with disabilities, and thus do not comply with the Americans with Disabilities Act (ADA) accessibility standards.

6. **Seismic vulnerability**: The I-5 crossing of the Columbia River main stem consists of two bridges, one built in 1917 (the northbound structure) and the other built in 1958 (the southbound structure). The foundations of both bridges rest in soils that could liquefy during a major earthquake. Neither bridge was built to current earthquake safety standards and could be damaged or collapse during a major earthquake.

Economic Impacts

The overall quality of the transportation system is an important factor in the viability of the local and regional economy. For decades, transit has played an important role in maintaining the level of service and operation of the overall regional transportation system, particularly because the region has made a policy commitment to invest in transit improvements rather than expanded highway capacity. But for the overall transportation network to function efficiently, including transit service, significant highway improvements are necessary at times. This is the case with I-5, which is the principal major arterial in Oregon serving statewide transportation needs, including the movement of freight.[8]

Overall, the Columbia River Crossing portion of the South/North Project will result in positive impacts in the Expo Center/Hayden Island Segment because improved transit capacity will be available to support more intensive development in the Jantzen Beach area and the highway improvements, including the new I-5 bridges, improvements to I-5 and its interchanges, and improvements to local roadways in the area, will provide greater accessibility and mobility not just for automobile and truck traffic but also for transit riders, bicyclists and pedestrians. LRT will also offer an alternative to traveling on I-5. However, the long-term benefit must be balanced by the short-term adverse economic impacts associated with the displacement of existing businesses on Hayden Island and in and near North Portland Harbor.

Business Displacements. In every instance where the South/North Project displaces an existing commercial or industrial use, that represents an adverse economic impact. Displacements affect employment, incomes, services and taxes. Even though the adverse impacts associated with displacements in the Expo Center/Hayden Island Segment may not be significant on a region-wide or citywide level, the Metro Council recognizes and is sympathetic to the significance of each displacement at the individual business and community level. The Council understands and acknowledges that relocations can cause significant anxiety and trauma not only to the company being displaced, but also to employees who work for the company.

Given that the South/North Project as a whole, including the Columbia River Project portion of the South/North Project, serves a largely developed urban area, it is impossible to avoid displacement impacts while still providing transit accessibility and highway improvements.

[8] I-5 serves this role for Washington and California as well, as (heading north to south) the freeway extends from the Washington/British Columbia border through major northwest metropolitan centers in Seattle, Tacoma, Olympia, Portland, Salem, Eugene and Medford into northern and southern California and their major urban centers.

To the extent feasible and practicable, the LRT route has been designed to follow existing public road and railroad rights-of-way to minimize displacement impacts. Locations for related facilities such as LRT stations, park-and-ride lots and operations & maintenance facilities also have been selected with the objective of balancing displacement and other adverse impacts with the positive benefits of LRT proximity and service. Highway improvements generally have been located within or next to existing highway right-of-way to minimize displacement impacts.

Oregon Mainland. On the Oregon mainland south of Hayden Island, the Columbia River Crossing Project would displace five businesses in the Marine Drive area: a boat sales business, a boat repair business with an auxiliary boat dock, a billboard operated as a business, and two marine businesses with a total of 25 staff and approximately $10.6 in annual sales revenues. The boat sales business and the two marine-related businesses are dependent upon a location close to the river. Finding suitable locations for boat sales, a boat dock, and the repair and marine-related businesses may be difficult because much of the Columbia River area in the vicinity of freeway access is built up for either residential or industrial/commercial use. ODOT would provide relocation assistance to displaced businesses.

Hayden Island. On Hayden Island, the Columbia River Crossing Project would displace an estimated 39 businesses on Hayden Island with a total of 643 employees and approximately $62.7 million in annual sales revenues. The displacements include a section of restaurant and bar establishments currently between the existing freeway and N Center Drive; a restaurant and an office supply store west of N Center Drive; eateries and a cellular services store north of N Hayden Island Drive; fast food and service establishments along N Jantzen Beach Drive; two cellular arrays run as businesses both east and west of I-5; and the Safeway store east of I-5 between the existing freeway and N Jantzen Drive.

Hayden Island is a regional draw because of the numerous big box retail establishments located west of the freeway and the Jantzen Beach SuperCenter. Although the extent of displacements caused by the project is great, these regional attractors would not be directly affected. The City of Portland has, however, documented a vision for this area in the Hayden Island Plan (City of Portland, adopted August 2009). This plan assumes redevelopment of the SuperCenter property into a Regional Retail Center (called a "Lifestyle Center") with mixed use and transit-oriented residential to the south. Redevelopment of the property is of interest to its current owners, who have entered into a design process, but planning has been put on hold because of current economic conditions. Even without redevelopment of the property, the retail uses west of the freeway could be assumed to draw regional traffic in the long run.

More important from an economic standpoint is the effect of the project on island residents as customers and/or employees of displaced businesses. The majority of businesses displaced by the project serve mainly local clientele. These include a series of delis and bars west of the freeway; local fast food and sit-down restaurants; retail; and services. The project displaces one of the two banking establishments and the only grocery store on the island. ODOT would work with affected business owners to provide relocation assistance.

The Safeway Grocery Store is the only grocery store on Hayden Island since another grocery store (Zupan's) closed several years ago. The Columbia River Crossing Project may suggest replacement sites for the relocation of Safeway, but it is up to the store owners to choose their replacement location, if any. While Safeway may not relocate on the island, it could be replaced by other grocery stores. Officials representing the Jantzen Beach SuperCenter initiated a site plan review with the City of Portland for a relocation and expansion of the Target store on the island. Plans submitted to the City of Portland's Bureau of Development Review indicate that the Target store would include a grocery and a pharmacy.

Safeway officials have indicated that it would be difficult for the store to relocate to another site on Hayden Island or in the Delta Park area because of the current lack of available sites. They may be able to locate a replacement store in either the North Portland area or South Vancouver. Alternately, Safeway may choose to remodel or expand existing stores in Vancouver or Portland. Relocation of Safeway to the north would mean a permanent loss in tax revenues for the City of Portland. Relocation to either the north or south would mean required travel on I-5 or the local traffic bridge between Hayden Island and North Portland for all customers and employees currently living on the island. Added to this is that movement to another location could reduce the viability of other Safeway stores nearby. Currently there are six other Safeway stores within five miles of the store on Hayden Island. Four of these are in Vancouver and two are in Portland.

The direct impacts on Hayden Island have the potential to significantly affect wage-earning opportunities for those seeking service industry employment. According to the Oregon Employment Department, the average salaries of most food preparation and service workers within Multnomah and Washington Counties fall within the range of $18,000 to $23,000 per year. Wages within this range would lift all individuals and most small families above the federal poverty guidelines and therefore would not constitute an environmental justice impact.

Measures to Mitigate Displacement Impacts. The methods used to determine displacement impacts are described in the Acquisitions Technical Report. A displacement occurs if a use, such as a building or parking lot, is demolished or moved as a result of the project, or if people or a business is no longer able to occupy the building as a result of the project. Individuals or businesses that are displaced from their real or private property would be eligible to receive relocation benefits.

Where property acquisition and residential or business displacements are unavoidable, the project would provide mitigation. These mitigation measures are addressed by federal and state regulations, which require that acquired property be purchased at fair market value and that individuals living in a residence displaced by the project be provided decent, safe, and sanitary replacement housing. Displaced households and businesses would be relocated per the Uniform Relocation and Real Property Acquisitions Policies Act of 1970, as amended (Uniform Act). Under these regulations, relocation experts would:

- explain all relocation programs to the affected businesses;
- assist in preparing and filing reimbursement claims; and

- □ssist in completing forms required by the lending institutions, the Small Business Administration, and others associated with the lease or purchase of new properties.

All properties required for the Columbia River Crossing Project will be acquired at fair market value for land and improvements. If only a portion of a property is required, the acquisition price will also reflect any measurable loss in value to the remaining property due to the partial acquisition. Generally, the relocation process occurs concurrently with the acquisition of affected properties. Relocation benefits vary between residential and business properties and may include payment for actual reasonable expenses of moving a business or personal property and/or other benefits, such as rent supplements, increased interest costs on replacement dwellings, reasonable search costs for new business sites, and business reestablishment costs. Relocation assistance for businesses could include moving costs, site search expenses, business reestablishment expenses, and assistance in locating a replacement business site. The specifics of relocation assistance are determined on an individual basis and are based, in part, upon ownership or tenant status.

Each acquiring agency (TriMet or ODOT) has an established advisory services program to ensure that displaced businesses or persons receive adequate assistance in relocating to a new business site or to decent, safe, and sanitary housing, respectively, with a minimum of hardship. For displaced businesses, such services could include the hiring of an outside specialist to assist in planning the move, making the move, and reinstalling machinery and other personal property. For displaced residents, these advisory services could include supplying information concerning federal and state programs that offer assistance to displaced persons and technical help in applying for such assistance or providing transportation to displaced persons to search for or view replacement housing. These programs work to ensure that the acquiring agency takes advantage of all financial and personal resources available during the relocation process.

The displacement of publicly owned facilities, such as the ODOT permit center, could be mitigated by functionally replacing the property acquired with another facility that would provide equivalent utility. Alternately, such facilities could be provided relocation assistance in a similar fashion as displaced businesses.

In some instances there may be opportunities for minor design modifications to avoid or reduce business displacement impacts. During the preliminary and final engineering processes, engineering staff will try to minimize displacement impacts to the extent practicable through design refinements.

Although there are multiple vacant buildings on the island, including several in and around the Jantzen Beach SuperCenter, the island is limited in its capacity to provide appropriate replacement sites for the 39 businesses that would be displaced by the Project. As a result, many of these businesses may have to relocate outside the main project area. According to the Hayden Island Plan, there are plans to redevelop a portion of the Jantzen Beach SuperCenter site into a high-density mixed-use transit-oriented development supported by the new light rail station. This redevelopment would include new commercial space that could house existing businesses and attract new ones to the island. It is not known when this redevelopment would occur, and therefore it is not known whether businesses displaced by the Project could be directly relocated to the newly constructed space.

Several measures are potentially available to mitigate for the loss of service industry jobs on Hayden Island. Many large public projects in the region set goals for hiring local contractors, utilizing apprenticeships, and otherwise cooperating with job training programs. The City of Portland has requirements for City projects that pertain to both of these measures as well as the hiring of minority, women-owned, emerging, and disadvantaged businesses. The project could adopt similar goals for construction contracting. The project could include innovative requirements in its construction contracting and contractor selection, with the intent of providing job training and a preference for local services.

Workforce practices can be used to provide experience and business for disadvantaged workers and companies. For instance, apprentices could be used for a percentage of labor during construction. Alternatively, the project could set a goal for the percentage of construction dollars contracted to DBE firms with a focus on those in within the project area.

Lastly, the project could work with TriMet to maintain the existing bus service that regularly connects Hayden Island with nearby grocery and other retail services. This may include additional routing on the island to provide greater transit access during construction. The project could also work with TriMet to maintain paratransit service for qualifying, mobility impaired Hayden Island residents.

The provision of a light rail station, the completion of Tomahawk Drive, the improved I-5 access and capacity of the Hayden Island interchange, and the addition of direct local access on a new local multimodal bridge would provide beneficial land use and economic impacts and would all contribute to the viability and success of the redevelopment plans for the island and mitigate for the business displacements on the island. Additional beneficial effects would result in improvements in the local street network consistent with the Hayden Island Plan.

Loss of Parking/Access. The loss of parking, and loss or change of access can have adverse economic impacts on businesses. If the project must remove an existing access, and if that access cannot be safely and adequately relocated or reconfigured, then the entire business is assumed to be displaced. Even if alternative access is available, it may not be as convenient as the existing access and could result in some loss of business.

Oregon Mainland. On the Oregon mainland there would not be impacts to on-street parking. However, the Expo Center parking lot would be reduced by 280 parking spaces, a reduction of 13 percent of the total parking. This area would be used for landscaping and the realignment of both Marine Drive and the new Expo Center Drive. The Expo Center seldom requires the use of all 2,100 parking stalls and any impacts that could be observed during peak events would likely be offset by the new light rail transit service provided connecting the Expo Center with Vancouver.

The realignment of Marine Drive and the new Expo Center Drive would eliminate parking spaces in a parking lot located on ODOT land, which is currently leased by Diversified Marine for equipment storage. Currently there are approximately 20 unstriped parking spaces in this parking lot. There is potential for identifying new space on the lessee's property or along property remainders for vehicle storage.

Two existing freight and truck storage businesses would experience impacts to their parcels from construction of the Delta Park to Vancouver Way connection over Martin Luther King Jr. Boulevard, and a connection between Martin Luther King Jr. Boulevard and N Haney Drive via Vancouver Way. These new connections could require relocation of existing access for both parcels. This portion of the Columbia River Crossing Project would reduce the parking capacity on the truck storage parcel south of Vancouver Way by approximately 55 to 60 vehicles, out of a total capacity of around 200 vehicles. Typical utilization is approximately 80 percent. This limits the number of vehicles able to park in the lot and could impact the viability of business at this location. The new roadway alignment bisects the existing storage lot, requiring a new access to be added for the northeastern segment cut off by the new road connecting to Marine Drive. The truck storage and distribution business north of Vancouver Way would lose approximately 50 truck parking spots, out of a total capacity of approximately 400 total spaces. The business could also lose some employee parking in one lot, though there is adequate room to relocate the displaced parking. Additionally, two fuel storage tanks and a refueling area located on the parcel would need to be relocated, potentially impacting existing parking configuration and reducing the number of available parking spaces.

The roadway realignments and extensions in the vicinity of the Marine Drive interchange associated with the Columbia River Crossing Project would improve access and circulation overall, with specific benefit for commercial vehicles accessing the freeway from Marine Drive. The realignment of Marine Drive would still provide circulation to I-5, Vancouver Way, and Martin Luther King Jr. Boulevard. Accessing the existing area of Marine Drive northeast of I-5 would require a minimum level of out-of-direction travel, but access would remain with the development of a new underpass that crosses through Werner Enterprise to Vancouver Way and on to Marine Drive.

A tire business would need to relocate its main entrance off of Vancouver Way to an existing access from N Haney Drive. A freight storage business south of Vancouver Way would need to relocate its entrance between N Haney Drive and the new connection to Marine Drive. Access would be kept open for the manufacturing facilities north of Marine Drive and west of I-5; however a local road would be constructed to preserve access to two businesses. The new Anchor Way extension under I-5 would allow traffic to circulate back onto the major roadways east of I-5 and would provide improved access to the west of I-5 for the businesses along this roadway.

The local traffic bridge connection between North Portland and Hayden Island would provide one lane in each direction over the North Portland Harbor, allowing residents and those accessing Hayden Island from the Oregon mainland an additional access option between the two areas, creating a local connection that currently does not exist. Local traffic near the arterial bridge and the Anchor Way extension could increase as drivers have the option to avoid the highway.

An aggregate gravel business's access and circulation would be modified. The access to the site would be via a driveway from the Anchor Way connection under I-5. Currently vehicles accessing I-5 from the site turn left directly onto Marine Drive. With the Columbia River Crossing Project, traffic accessing I-5 north from the site would go south on the new access road, travel along the east side of the Expo Center parking lot, would turn right on Expo Road and right again on N Force Avenue, and would finally turn right on Marine Drive, accessing I-5 via the SPUI (phased highway option) or the flyover in the Full Build option. This is illustrated in Exhibit 4-5 of the *Economics Technical Report.*

The option of constructing the Bridgeton Trail between Marine Drive and the Columbia River would require a partial acquisition of multiple industrial parcels though no displacements would occur, and no economic impacts are anticipated. Design of the trail would need to consider the potentially conflicting users of freight and recreational bicyclists and pedestrians. Internal circulation within the aggregate gravel business is currently difficult. Some backing of vehicles onto Marine Drive is needed to access certain areas of the site. Left turns are currently allowed onto Marine Drive directly from the business but can be difficult when traffic flows are heavy.

Hayden Island. There is currently no on-street parking on Hayden Island. However, parking lot impacts would be experienced for the following properties adjacent to I-5: Large hotel on N Hayden Island Drive (10 stalls removed of approximately 700); Hotel on N Jantzen Drive (8 stalls of 185); parking lot for floating homes (40 stalls of 200), Jantzen Beach SuperCenter (175 stalls of 1300+). The Jantzen Beach SuperCenter parking lot would have 175 spots permanently removed, but because of the high number of overall parking spaces in the area, the effect of this change would be small – a sufficient supply of parking would remain at the SuperCenter to serve to serve anticipated future need most of the year, and the addition of light rail transit adjacent to the SuperCenter would help offset the small reduction in on-site parking.

Overall, access to Hayden Island would be improved by the Project. The extension of the Yellow MAX Line would provide direct transit service for residents, employees, and customers between the island and both downtown Portland and Vancouver. The two-lane local traffic bridge between Hayden Island and North Portland would also provide an off-highway option for travelers between the island and mainland Oregon. The Project includes widening two east-west local streets, extending N Tomahawk Drive under I-5, and widening N Jantzen Drive. Subsequent plans for the Jantzen Beach Super Center include rearranging the buildings around an extension of N Tomahawk Drive and the development of a new road connecting N Jantzen Drive to N Hayden Island Drive.

The widened N Jantzen Drive between the underpass with I-5 and N Hayden Island Drive to the north would acquire all the existing properties except for a fast food restaurant on the west and the hotel on the east side of N Jantzen Drive. The Project would restrict access to both the hotel and the restaurant to right-in/right-out only movements. The hotel and restaurant along N Jantzen Beach Drive could experience circulation impacts, because the entrances and areas adjacent to the road are currently the primary access and circulation for the businesses. The expansion of the sidewalk along N Jantzen Drive to the east would require reconstruction of the guest canopy and load/unload area currently facing the street. This is the primary entrance for guests to the hotel, and alterations to the canopy could impact business operations. Access to the large hotel along N Hayden Island Drive would be reduced from three points to one new access opposite the widened N Jantzen Drive. This entrance would also serve banquet services and restaurants located on the property. All four businesses could experience slightly impaired circulation in the parking lot and increased congestion at the entrance. However, the design for N Jantzen Drive extends into the parking lot of the hotel, and could cause internal circulation issues, as the guest loading/unloading canopies and the principal entrance to the hotels would be difficult to maintain with the extension of the street.

The Columbia River Crossing Project team has coordinated with the City of Portland Office of Transportation, Bureau of Planning, the Portland Development Commission, and business owners on Hayden Island (through the development of the Hayden Island Plan and an Interchange Area Management Plan for the I-5/Hayden Island Interchange), to identify an adequate local circulation system, access spacing, and land use policies to manage demand on the interchange.

Although portions of parking lots near the Hayden Island Station could potentially be used as a de facto park-and-ride, the availability of 2900 park-and-ride spaces in Vancouver, Washington should minimize this likelihood. Because there will be a toll for vehicles to cross the bridge, the Council believes and finds that most Washington commuters travelling by light rail would park in Vancouver rather than at Jantzen Beach.

To mitigate for the adverse economic effects of the project, Interchange Area Management Plans (IAMPs) for the Hayden Island and Marine Drive interchanges are currently being developed in coordination with the City of Portland, ODOT, and other stakeholders. These efforts are building off the adopted Hayden Island Plan and the work of the Marine Drive Stakeholders Group. The IAMPs will provide a framework for access management and local circulation decisions in the context of these interchanges.

An Interstate Access Modification Request (IAMR) for the Hayden Island, Marine Drive, and Victory/Denver interchanges is also in preparation. The IAMR is a stand-alone document that includes the necessary supporting information needed for access modification requests to the Interstate System. An IAMR provides the rationale for access modifications to the Interstate System and documents the assumptions and design of the preferred alternative, the planning process, the evaluation of alternatives considered, and the coordination that supports and justifies the request for an access revision.

Tax Base. Local jurisdiction tax bases are affected in two ways by the development of large public infrastructure projects such as South/North light rail. First, and by far the greatest long-term impact, is the development and redevelopment that could occur in conjunction with the project. As this development occurs, the value of the investments are added to the tax base. The effect of this kind of impact is difficult to estimate because it is dependent upon many independent private decisions that would occur in the future. However, the Council finds that the overall impact should be positive.

The second type of impact is the direct impact to tax bases that occurs through property acquisition for construction of the project. Private property is typically acquired by the Project. Through acquisition, this property converts to public property and, as such, is removed from the tax rolls unless resold for private purchase. Often, the short term impacts are minimal, as the loss in value in the tax rolls are offset over time by the expected greater increase in value added to the tax base due to new development in the corridor, specifically in station areas.

As shown below, the Columbia River Crossing Project will have a negative economic impact on the tax base through the displacement of business uses from the tax rolls. However, the Council finds that tax base impacts associated with displacement may be shorter-term because the availability of light rail and highway improvements is expected to spur redevelopment of the commercial area around the Hayden Island Station and could enhance property values and the tax base on a long-term basis.

Oregon Mainland. The five businesses displaced have an estimated right-of-way value of $4.1 million, a property tax impact of $27,000, which is 0.01% of Multnomah County budgeted 2008 property tax revenue.

Hayden Island. The 39 businesses to be displaced have an estimated right-of-way value of $33.3 million, a property tax impact of $219,000, which is 0.10% of Multnomah County budgeted 2008 property tax revenue.

Freight Movement. The area encompassed by the South/North Corridor is of critical importance to the movement of commodities within and through the Portland metropolitan area. The freight movement system in the South/North Corridor is comprised of two primary transportation modes: freight railroads and trucking. Additionally, along the Columbia River, the movement of commodities also relies on water freight movement and air transportation.

There are no rail lines crossed by LRT or the highway improvements in the Oregon portion of the Expo Center/Hayden Island Segment, so there will be no impact on *rail freight movement.*

Truck traffic relies heavily on the major streets and highways in the South/North Corridor and the region, including I-5. The Project is expected to improve traffic conditions in the corridor compared to No-Build and therefore will improve conditions for truck traffic, as addressed in the *Traffic Technical Report.* Daily truck travel demand would be similar for the No-Build and the Project because the movement of freight is substantially related to economic conditions in the region, and freight moved by trucks is not likely to shift travel modes due to congestion. However, truck demands by time of day would likely change because there would be fewer congested hours with the Columbia River Crossing Project, resulting in more trucks during the commuter peak and midday hours.

The Project would result in higher volumes of trucks during midday operations compared to the No-Build Alternative. The reduction in congestion and truck travel occurring throughout the day would mean more flexibility in truck scheduling and improved reliability of truck shipments. Exhibit 7-10 of the Traffic Technical Report summarizes truck volumes by time of day.

Adverse impacts to truck movements in the South/North Corridor include both potential delays due to increased congestion or out-of-direction travel associated with light rail, and the possible loss of on-street loading zones. Localized delays to peak-period truck activity could occur due to increased congestion that would result from reductions in roadway/intersection capacity associated with light rail operations. However, the overall improvement to traffic conditions in the corridor mitigates the localized delays that would occur from light rail.

The roadway realignments and extensions in the vicinity of the Marine Drive interchange associated with the Project would improve access and circulation overall, with specific benefit for commercial vehicles accessing the freeway from Marine Drive. The realignment of Marine Drive would still provide circulation to I-5, Vancouver Way, and Martin Luther King Jr. Boulevard. Accessing the existing area of Marine Drive northeast of I-5 would require a minimum level of out of direction travel, but access would remain with the development of a new underpass that crosses under I-5 to Vancouver Way and on to Marine Drive

The Council finds that the project would improve truck traffic through better local intersection operations and fewer hours of congestion on I-5 compared to the No-Build alternative.

Segments of two navigable waterways are located within the South/North Corridor: the North Portland Harbor and the main Columbia River channel. The United States Coast Guard (USCG) has jurisdiction over navigation within these waterways, and construction of a bridge across these waterways will require the USCG's approval of a bridge permit under Section 9 of the Rivers and Harbors Act of 1899 and the General Bridges Act of 1946, as amended.
The CRC project would have a positive effect on marine commerce on the Columbia River. The existing I-5 bridge structures each have nine piers which result in navigation "channels" between the piers. Three such channels are used for navigation:

- A wide span with approximately 60 feet of mid-span vertical clearance;
- A high span with approximately 70 feet of mid-span vertical clearance; and
- A lift span with approximately 40 feet of mid-span vertical clearance when closed and 180 feet when open.

The wide span is the main channel used for navigation, but during high-water many barges need to use the high span, or require bridge lifts at the lift span. In 2004, there were 604 bridge openings. The proposed I-5 bridges would be high enough to allow the vast majority of vessels to pass without bridge openings. With the exception of a small number of specialized vessels that use the river infrequently, the majority of vessels require vertical clearances of less than 90 feet from the surface of the water to the bottom of the bridge deck. The project team, in consultation with the Coast Guard, established a 95-foot minimum vertical clearance for structures built without a lift span. Vertical clearances greater than 95 feet would raise the bridge structure into restricted airspace for flight navigation. The 95-foot clearance with the LPA will be fixed, not subject to lift restrictions, and accommodate all recreational and commercial vessels. Infrequent trips of marine contractor's cranes will not be accommodated.

Their cranes or cargo may be broken down, at a cost, to meet proposed clearances. Reduced clearances resulting from the project will be mitigated by significantly improved navigational safety.

Currently, bridge openings are restricted to non-peak roadway commute hours. Thus, the new spans would provide more flexibility in operating schedules for marine commerce. The new spans would also eliminate some of the "S-Curve" marine movements currently required for marine traffic to pass under the highway and railroad bridge structures at their highest elevation.

Six piers would support the bridge structures, which is three fewer than exist on the current bridges, thus widening the horizontal clearance of navigation channels. The bridge span length would be 465 feet, with 390 feet of clearance for marine travel between the pile caps, which would be an increase over the width of the "main channel" by 127 feet and a decrease of the "barge channel" width by 121 feet. The current main channel width is 263 feet, and the barge channel has a horizontal clearance of 511 feet. The longer span lengths in the main channel would provide more room for boat captains to maneuver between the piers and improve the inherent safety of marine navigation.

The North Portland Harbor does not include a designated shipping channel, and is largely travelled by recreational boaters and those accessing the water-oriented uses along the Harbor. All of the new structures would have at least as much vertical clearance over the river as the existing North Portland Harbor bridge.

The Council finds that the project will improve marine navigation due to the removal of the "S-Curve" maneuver that currently exists, the removal of bridge lifts and associated restrictions, and the reduction in the number of piers in the river.

Two airports are located near the Columbia River Crossing Project area. Portland International Airport (PDX) is located about three miles southeast of the project on the Oregon side of the Columbia River. It is the major regional airport and serves large commercial passenger and freight service, private aircraft, and the Air National Guard. Planned expansions include both potential runway extensions and the addition of a new runway.

Pearson Field is located directly east of the project on the Washington side of the Columbia River. It serves primarily small piston-engine aircraft weighing 10,000 pounds or less. Because developed urban uses and the Vancouver National Historic Reserve (VNHR) surround it, there are no plans to expand facilities or operations at this airfield.

The lift towers of the existing bridge currently intrude 98 vertical feet into protected airspace for Pearson Field and are an aviation hazard. To avoid the towers, aircraft must use special departure and arrival procedures. The new bridge designs will not include lift towers. The bridges would be located slightly farther from the airfield, and so would intrude less into Pearson Field airspace.

The Council finds that the project will improve aviation safety and efficiency due to the removal of lift spans in Pearson Field's airspace. At worst, the project will have no negative impact to air freight.

Other Economic Impacts. Other economic impacts include the disruption of business during construction, possible loss of property values, possible inability to sell a business or secure loans to pay off mortgages or other business debts due to proximity to the light rail alignment or related light rail facilities, and utility relocations. Construction impacts are addressed in the Short-Term Impacts portion of these findings. The Council finds that generally, there is no required mitigation for temporary economic loss or business interruption during construction of a public project. However, for this specific project, the Council finds that TriMet would be willing to provide staff assistance to impacted property owners in assisting the property owners with their loan refinancing and/or loan application processes. Programs to help businesses affected during construction would include some combination of the following: business planning assistance, marketing and retail consulting, and promotions to generate patronage in construction areas. These programs would be provided by TriMet; similar programs have been employed on recent light rail extension projects. The Council also finds that there may be reductions in property values, but it believes and finds that most of these properties will increase in value over the long term following construction. The Council finds that no mitigation is necessary for possible temporary reductions in property value.

The project will require relocation of certain utility facilities and lines. Utility relocations typically are addressed during preliminary engineering and final design. The Council finds that the costs of relocating utilities impacted by the project are addressed, and can be paid, as provided in existing law.

For some, bridge tolling may constitute an adverse economic impact. Tolling of interstate facilities must be consistent with Title 23 U.S.C. Section 129, the federal law that specifies the circumstances under which interstate facilities may be tolled. The CRC Project qualifies, though tolling on I-205 does not. The Council finds that at this point that tolling will be necessary both to manage congestion and as part of a funding package for the CRC Project along with federal and state funding. It also finds that tolling would likely be beneficial for freight-dependent businesses and businesses that rely on just-in-time deliveries, because the predictability of travel times would improve. However, the greater the toll, the higher the operating costs for truck movements. For other kinds of businesses, tolling will be an additional expense. However, timesavings associated with improved mobility on I-5 will help mitigate that impact.

Concerns have been raised that tolling the I-5 bridge could divert traffic onto the I-205 bridge, increasing congestion and causing added delays on that bridge and its approaches from I-84 and I-205. The Tolling Study Report, released in January 2010, indicates and the Council finds that at the Columbia River, there is an approximate 4.5% shift of auto trips on an all day basis from I-5 to I-205 as compared to a Build-No Toll scenario. More diversion to I-205 is predicted in the off-peak hours when capacity is available than during peak hours. On I-205 south of I-84, the models estimate that diversion will be approximately 1% on an all day basis as compared to the no-build.

While the Tolling Study found, under most of the I-5 only toll scenarios, that the majority of drivers would not change their travel patterns and that most diversion would occur in off-peak hours, the Council finds that the full extent of diversion onto I-205 and associated impacts from tolling on I-5 are not fully known at this time. This will require additional study and analysis as the Project advances. In particular, more refined analysis of traffic demand and patterns will be developed prior to setting the toll rates, and tracking of travel demand and patterns after completion of the Project will allow for adjustment over time. In addition to adjusting the toll rates over time, there will also be adjustments as appropriate to transit service and fares and demand management programs such as incentives for carpooling and vanpooling. These adjustments will mitigate the effects of tolling on travel patterns.

The Council heard testimony questioning the adequacy of the models used to forecast toll traffic and revenues. While the Council recognizes the importance of funding for this Project, it finds that the LUFO process under HB 3478 is a land use decision-making process established to address land use impacts and provide land use authorization for the Project. See HB 3478, Sections 3, 4, 6(1), 7. It finds that the criteria established by LCDC are criteria established for making land use decisions. It further finds that the LUFO process and the LCDC criteria do not address how a project gets paid for and that project funding is not a land use issue.[9] The Council understands that in order to be eligible to obtain federal funding, it must demonstrate that the Project is consistent with land use requirements. These findings demonstrate such compliance.

As explained in the social impact findings below, the Project may affect localized access to properties by police, fire and ambulance vehicles. However, the project should not otherwise increase these governmental services. The Council has seen no evidence to this effect, and it finds that any significant increase in police, fire or emergency medical services as a result of the project is speculative. The Council concludes that no mitigation is necessary in this regard.

Conclusions on Economic Impacts

While the Council is sensitive to the displacement of businesses and loss of existing jobs associated with the Columbia River Crossing Project, the Council finds that, on balance, the Columbia River Crossing Project will result in positive economic impacts in the East Columbia, Kenton, Bridgeton and Hayden Island neighborhoods, particularly because the extension of light rail transit to Hayden Island and northward into Vancouver, Washington will further support commercial development at the Jantzen Beach Center and because highway improvements, including new I-5 bridges with greater capacity, improved I-5 interchanges at Hayden Island, Marine Drive and Victory Boulevard, and better roadway connections to I-5 and between Hayden Island and N Marine Drive will improve access and circulation for companies and businesses in the area. Furthermore, the improvements to I-5

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[9] Although the provisions in OAR Chapter 660 do not apply, the Council understands that provisions addressing the timing and financing of transportation improvements are not considered to be land use decisions. See, e.g., OAR 660-012-0040(5).

will substantially reduce delay and improve the movement of freight between Oregon and Washington, improve navigation along the Columbia River, and remove hazards to air navigation associated with the existing I-5 Interstate Bridge lift towers.

The Council also finds that the Project would result in short-term economic benefits with the increase in employment resulting from the construction of the LRT facilities and highway improvements in the Expo Center/Hayden Island segment. The Council finds that there will be a short-term decrease in the tax base due to business displacements. However, the availability of light rail is expected to spur redevelopment of the commercial area around the Hayden Island Station and could enhance property values and the tax base on a long-term basis.

Based on information in the Columbia River Crossing technical reports, the Council finds that adverse economic impacts associated with light rail transit and highway improvements can be mitigated through a variety of means, including relocation assistance programs for displaced businesses and coordination with local jurisdictions and stakeholders. The Council finds that the bridge has been designed to avoid any need for bridge raising or lowering to accommodate river traffic on the Columbia River, and also designed to avoid interference with air navigation using Portland International Airport or Pearson Field Airport in Vancouver.

Tolling issues have yet to be fully resolved and could impact larger portions of the region than just the I-5 corridor. Coordination between the states and regionally among the affected South/North Project local governments could help lead to a more generally accepted resolution of this concern.

Social Impacts

The Council finds that the social impacts of the South/North Project are generally positive in the Expo Center/Hayden Island Segment. Light rail will provide quicker, more reliable and more comfortable transit access to the substantial commercial and employment base at the Jantzen Beach commercial center and to residents of Hayden Island. The highway improvements will improve access and circulation on I-5 and local roads in the area, improving safety, reducing congestion, and increasing mobility of motorists, freight traffic, bicyclists, and pedestrians along the I-5 corridor.

Residential Displacements. As with business displacements, the Council recognizes that in every instance where the South/North Project displaces an existing household, that represents an adverse social impact, and the Council is sympathetic to the significance of each residential displacement. The Council understands and acknowledges that relocations can cause significant anxiety and trauma to families, uprooting them from neighborhoods, schools and friends and imposing change on them.

Given that the South/North Project serves a largely developed urban area, it has been impossible to avoid residential displacement impacts while still providing transit accessibility. To the extent feasible and practicable, the LRT route follows existing public road and railroad rights-of-way to minimize displacement impacts. Locations for related facilities such as LRT stations and park-and-ride lots have also been selected with the objective of balancing displacement and other adverse impacts with the positive benefits of LRT proximity and service.

The methods used to determine displacement impacts are described in the Acquisition Technical Report and in the discussion of economic impacts above. The same methods applicable to business displacements are relevant to determination of residential displacement impacts and are incorporated by reference. Additionally for residential displacements, federal and state guidelines determine the standards and procedures for providing replacement housing, based on the characteristics of individual households. Eligibility for relocation benefits would be determined after the issuance of the NEPA Record of Decision (ROD) and once the project is granted approval to begin right-of-way acquisition. Relocation assistance could include replacement housing for displaced persons, moving costs, and assistance in locating replacement housing.

Oregon Mainland. Impacts summarized in this section include those between the southern terminus of the project at Victory Boulevard and the south shore of North Portland Harbor. Most of the permanent property impacts in this portion of the project area are due to the highway portion of project, specifically, the realignment of Marine Drive and the addition of local street connections near the Marine Drive interchange.

The transit alignment over North Portland Harbor would result in the displacement of one floating home associated with the parcel adjacent to and west of I-5. The remaining portion of this parcel, not impacted by transit, would be permanently acquired for the highway alignment, which would displace a single-family home with two households on land and two additional floating homes in the harbor. A total of five households would be displaced in this portion of the project area.

Hayden Island. Impacts summarized in this section include those on Hayden Island and associated portions of North Portland Harbor. The permanent acquisition of property would be required in this area to accommodate the reconstruction of the Hayden Island interchange and the extension of light rail over Hayden Island.

The project would have 32 residential displacements on Hayden Island. Twelve of the 32 residential displacements on Hayden Island would be from Row 9 of the Columbia Crossings Jantzen Bay moorage in North Portland Harbor east of I-5. Two of the homes were identified by survey as also containing businesses that would be displaced, as would an additional floating home in this moorage that is used solely for a business. These business displacements are included in the business displacement section of this document. The remaining 20 residential displacements on Hayden Island would occur at rows A, B, and the east side of row C in the Jantzen Beach Moorage, Inc. located in North Portland Harbor west of I-5.

Mitigation of residential displacements could include minor redesign of the project during preliminary and final engineering to avoid or reduce displacements. Some displacements could be mitigated by taking only a portion of the property and/or structure and by modifying the remaining property and/or structure to allow continued occupancy. Where displacements are unavoidable, the project will provide compensation to property owners based on fair market value and a comprehensive relocation program. The compensation/relocation program for residential properties operates in the same manner as described above for business relocations.

It has been FHWA's and FTA's long-standing policy to actively ensure nondiscrimination under Title VI of the Civil Rights Act. Title VI-related impacts include those impacts which are specific to a protected population under the 1964 Civil Rights Act. Under Title VI and related statutes, each federal agency is required to ensure that no person is excluded from participation in, denied the benefit of, or subjected to discrimination under any program or activity receiving federal financial assistance on the basis of race, color, national origin, age, sex, disability, or religion. Some of these populations (such as the elderly) are not covered by EO 12898, which specifically addresses disproportionately high and adverse effects to minorities and low-income populations.

The Council finds that for the Expo Center/Hayden Island Segments, the data on residential displacements does not suggest disproportionate or discriminatory impacts to environmental justice populations.

Access to Community Facilities. The Columbia River Crossing portion of the South/North Project will improve mobility for Hayden Island residents to travel to and from community facilities and employment centers outside their neighborhood. This is a particular benefit given the absence of other convenient travel options besides the automobile. The Hayden Island Station will improve transit access to the substantial concentration of jobs and commercial services at the Jantzen Beach Center. It will also provide improved transit accessibility and links for Hayden Island residents to local and regional employment centers, community facilities and recreational destinations along the South/North and East/West MAX lines, including employment centers and community facilities in the downtown areas of Portland, Milwaukie, Gresham, Beaverton and Hillsboro. The highway improvements will improve local access and circulation in the area and improve mobility along I-5.

Construction of the Project would displace the Safeway grocery store and pharmacy, which are the only grocery store and pharmacy on the island and are important community resources. While ODOT can suggest replacement sites for the relocation of Safeway, it is up to the store owners to choose their replacement location, if any. While Safeway may not relocate on the island, it could be replaced by other grocery stores. Officials representing the Jantzen Beach SuperCenter initiated a site plan review with the City of Portland for a relocation and expansion of the Target store on the island. Plans submitted to the City of Portland's Bureau of Development Review indicate that the Target store would include a grocery and a pharmacy. During construction, the project would work with TriMet to maintain the existing bus service that regularly connects Hayden Island with nearby grocery and other retail services. This would include additional routing on the island to provide greater transit access during construction. DOTs would also work with TriMet to maintain paratransit service for qualifying, mobility-impaired Hayden Island residents.

Displacement of the Safeway grocery store and pharmacy may disproportionately impact low-income residents who use these services and do not own cars. This impact would be mitigated by the addition of light rail to Oregon and Vancouver.

The displacement of the Safeway store would also displace an extremely active bottle return center. The store managers report over $10,000 each week paid out through the returns. Although it limits each patron to only $7.20 in returns per day, this bottle return center provides an opportunity for individuals to generate income. There are other locations where bottles can be returned on the island and in north Portland. Many of these smaller establishments (such as convenience marts) also enforce limits on the number of bottle returns per visit. However, as long as these businesses continue to operate and proper access to them is maintained, displacement of the return center at Safeway would not result in a high degree of impact.

To mitigate for the displacement of the Safeway bottle return center, the project could provide some written and posted guidance before the closure of the Safeway return center. The guidance would provide community members with alternate bottle-return locations, and directions for getting to these locations. In the event that there would be no other return center on the island, the project could work with an appropriate business site to provide this service.

Barriers to Neighborhood Interaction. The Council finds that the LRT alignment will not result in barriers to neighborhood interaction, primarily because the alignment in large measure parallels the I-5 freeway that already functions as an edge and boundary to the local neighborhoods. Similarly, the Council finds that the highway improvements generally improve existing roadways that either already create barriers to neighborhood interaction (e.g., I-5) or provide convenient access and circulation within and between the affected neighborhoods. The bicycle and pedestrian lanes on the new northbound I-5 bridge will improve interaction between north Portland and Vancouver, Washington neighborhoods.

Safety and Security. The Council is sensitive to the importance of safety and security in neighborhoods affected in particular by the light rail components of the South/North Project. For the South/North Project as a whole to succeed, passengers must feel safe using the stations and trains. The Council finds that with appropriate location and design, and with implementation of system-wide transit security measures as described below, safety and security would not be adversely affected by any of the LRT stations or park-and-ride facilities.

The extension of light rail north from its existing terminus at the Expo Center would cross several intersections at grade. Train frequency in the peak periods is estimated to have 7.5-minute headways with greater headways during off-peak periods. Positive traffic control such as signalization, signage and pedestrian treatments would be used to enhance the safety of other vehicles, pedestrians and bicyclists traveling near light rail vehicles. Transit security on vehicles and at stations and park and ride lots would also be addressed during the design, construction, and operational phases of the project. Examples of safety and security measures which may be designed into the project include:

- Physical barriers such as medians, fencing, landscaping, or chain and bollard (short, vertical posts) to help channel automobiles, pedestrians and bicyclists
- Signage, tactile pavers, audio warnings, and pavement markings at track crossings to alert individuals they are approaching tracks

- Active treatments such as flashing lights, bells, and illuminated and audible warning devices in traffic signals
- The creation of inviting, well-lighted platforms and station areas
- Maintaining clear sight lines for oncoming trains
- Implementing a public safety education campaign before the start of rail service

TriMet has adopted a system-wide Transit Security Plan that applies community policing techniques to transit security. Elements of the Transit Security Plan that will be incorporated into the design and operation of the light rail line serving the Expo Center/Hayden Island Segments include: increased in-house training of transit district employees in crime prevention; a high level of coordination with local law enforcement agencies and personnel; improved facility design and operation standards to increase visibility and security enforcement levels, and investment in new tracking and surveillance technology.

The Council further finds that security lighting will be provided at station platforms and that landscape design will ensure consideration of safety and security Additional potential mitigation measures include emergency call boxes and monitoring/surveillance cameras. Strategies such as crime prevention through environmental design (CPTED) and the use of police, private security patrols, and security cameras could be employed as appropriate to make the light rail facilities as safe and secure as possible. The existing policies and procedures developed by TriMet and FTA for operations during a potential catastrophic event and to prevent terrorist activities would be expanded to include the Columbia River Crossing Project. Finally, design criteria such as platform location and length, pedestrian crossings, and alignment design would be used to ensure that the project operates safely.

Localized access to properties by fire, police and ambulance vehicles could be affected by changes in local street configurations throughout the corridor. The current level of design reflects consideration of access by emergency vehicles (e.g., street and bike path dimensions, proximity to emergency facilities, primary access routes for emergency vehicles, etc.)

The Council finds that, with appropriate design and implementation of systemwide transit security measures identified above, safety and security will not be adversely affected by the LRT station in the Expo Center/Hayden Island Segment. The Hayden Island Station will be elevated to the level of I-5. The final design of the LRT station will include careful consideration of security concerns. Security lighting and landscape design will ensure consideration of safety and security.

Visual/Aesthetic. The Columbia River Crossing Project will result in impacts to visual and aesthetic resources in the Expo Center/Hayden Island Segment as a consequence of introducing:

- Cut/fill slopes, bridges, overhead structures, sound/retaining walls, catenary poles and overhead wires;
- A light rail station at Hayden Island;
- New I-5 bridges and interchanges;

- New North Portland Harbor bridges;
- Improvements and modifications to existing structures, roads, vegetation, topography;
- Disruptions of existing visual resources, viewpoints, view corridors and vistas; and
- New views.

Impacts to the Columbia River main channel would be mostly positive. Potential impacts would include:

- Removal of the visually complicated truss structures and lift towers of the existing I-5 bridges, which obstruct views from the river, from the Interstate bridges themselves, and from the shoreline. This action would remove an important contributor to the area's historic context (the I-5 bridges) and a character-defining aspect of interstate travel.
- From I-5, views of the Portland and Vancouver skylines, distant shorelines, rolling hills, and mountain profiles would generally improve. Toward I-5, views of open water and shorelines from shoreline-level and elevated viewpoints would also generally improve.
- Removal of the lift towers would be interpreted to have a generally positive visual impact on views from downtown Vancouver.
- Modifications to interchanges would increase heights at the Marine Drive and Hayden Island interchanges, where new ramps and elevated roadways would be higher than any existing facilities in these immediate areas. Even at these interchanges, the degree of change is expected to be moderate, since these areas are already and would continue to be large urban interchanges.
- Removal of the existing bridge structures that currently obstruct views of much of the area immediately beneath the bridges, along the river, This would provide for more light and vegetation under the bridges. These elements would all provide positive visual changes to the immediate area and adjacent areas.

North Portland Harbor would experience moderately negative visual impacts from the addition of piers for the light rail transit bridge and collector/distributor ramps; these would clutter views along the slough and reduce views of open water.

Given the types of visual impacts summarized in the *Visual and Aesthetics Technical Report,* the Council finds that the following strategies can be used to reduce adverse visual impacts to affected neighborhoods:

- Planting vegetation, street trees, and landscaping for screening or visual quality. The project will adhere to a green-over-grey approach for treatment of many new structures, using climbing vines and non-invasive ivies, where practicable.
- Designing landscape plans and other visual treatments consistent with adopted guidance and plans.
- Shielding station and facility lighting from nearby residences and the night sky.
- Minimizing structural bulk, such as for ramps and columns.
- Designing architectural features to blend with the surrounding community context.

- Placement of public art (to be relocated when necessary and added as part of transit stations and gateways).
- Where practicable, integrating lighting with facilities in a manner that produces a positive visual and aesthetic impact, reduces night sky light pollution, reduces possible light trespass into residential units, and contributes to crime prevention through environmental design (CPTED).
- Utilizing the UDAG Design Guidelines, as well as design guidelines of the City of Portland and Tri-Met.
- Selecting new and replacement pole and utility cabinet locations, colors, and styles in relation to their context and in accordance with municipal lighting standards.

In each affected neighborhood, the Council recognizes that potential mitigation measures will vary to fit neighborhood scale, character and concerns. In some neighborhoods, potential measures could improve the visual character of impacted areas. In other areas, the Columbia River Crossing portion of the South/North Project will be a prominent visual feature even with mitigation.

The area from Victory Boulevard, the Expo Center and Marine Drive north to Hayden Island and the Columbia River consists primarily of a major interstate freeway with connecting arterials, a busy, auto-dominated commercial strip, and large, dramatic expanse of open water. The area from Victory Boulevard to Marine Drive has industrial, recreational, and transit developments scattered throughout the area amid large tracts of open space. Commercial development patterns on Hayden Island have obscured natural features to the point where any connection to water or natural landforms is not visually apparent unless one is on the shoreline. Throughout this segment, many signs and utility poles; constant, fast traffic and noise; scattered moderate and large-scale commercial structures; and the artificial landforms associated with I-5 create a coarsely textured, complex environment with a confusing visual character. The breadth and openness of the Columbia River provides visual contrast to an otherwise cluttered visual environment.

Dominant visual features in this segment include I-5, Delta Park, the Vanport wetlands, the North Portland Harbor, Jantzen Beach Center, the historic I-5 truss bridge between Hayden Island and Vancouver, Washington and the wide, flat and open stretch of the Columbia River. The river is a significant regional resource and the dominant visual element within this segment because of its large scale and openness. It also serves as a dramatic gateway between Oregon and Washington.

LRT improvements in the Expo Center/Hayden Island Segment include a good deal of bridging. The bridges over the North Portland Harbor would remove structures, including floating homes and vegetation, along both banks of the harbor, and interrupt views south from Hayden Island to the west hills. The light rail alignment then parallels the west side of I-5, removing commercial structures along that side of the freeway

In general, the Council finds that the impacts to views would vary within the Columbia River Crossing portion of the project area. Impacts to the Columbia River main channel would be mostly positive, as described above. Impacts to North Portland Harbor would be moderately negative, with the addition of more bridges across the harbor. Impacts to the area from Victory Boulevard to Marine Drive would be low.

The Council finds that possible measures that could mitigate the adverse impacts of the new bridges on views include those described above. Appropriate conditions can be imposed through the local review process consistent with Section 8(1)(b) of HB 3478 to avoid or mitigate adverse impacts on designated scenic resources and viewpoints.

Other Social Impacts. Other social impacts include loss of property values, property acquisitions not requiring displacements, loss of trees along roadsides and in neighborhoods, increase in electric and magnetic fields (EMF) and perceived reductions in "quality of life" associated with light rail transit and highway improvements, both during construction and in the long term. Construction impacts are addressed in the Short-Term Impacts portion of these findings. The Council finds that there may be reductions in property values, especially during the construction phase, but it believes that most of these properties will increase in value following completion of construction. The Council also finds that residing immediately next to the alignment or a station may result in some property owners experiencing perceived reductions in quality of life. Others may see a reduction in quality of life associated with increased density that might result from the proximity of rail to an area. These are very subjective matters that can vary from individual to individual. Landscaping and noise barriers might help mitigate adverse impacts. Where trees are removed, potential mitigation includes equivalent tree replacement. Extension of the light rail system would generate EMF and could increase exposure, however, in those locations where people could be exposed (within and near the light rail right-of-way, near substations, or in the light rail vehicles), EMF emissions would be below exposure guidelines. Because light rail electric power substations tend to generate the highest EMF intensities in the field measurements, the substations have been designed and sited to minimize exposure to users of the system, the general public, and sensitive users.

Social benefits include cleaner air by providing improved transit access in the region, resulting in less automobile driving than would otherwise occur and less congestion and air pollution. Cleaner air also is provided by decreasing congestion through improvements to the highway system. Social benefits also include improved quality of life from lower and more reliable transit travel times, resulting in more time for people to spend doing things other than commuting.

A greenhouse gas emissions analysis was prepared for the Columbia River Crossing Project and is detailed in the Energy Technical Report. The report includes a macroscale analysis to provide a picture of the regional emissions, as well as a microscale analysis that focuses more on the project area. The Project is expected to reduce regional emissions by approximately 130 metric tons of CO_2e /day, which equates to a reduction of approximately 0.5 percent. For the 12.2-mile length of I-5 surrounding the CRC project area, the Project is expected to reduce emissions by roughly 21 metric tons of carbon dioxide equivalent during the AM and PM peak periods, or 5.4 percent.

The differences in long-term effects on water quality between the Project and the No-Build Alternative are substantial. Although the total amount of pollution generating impervious surface would slightly increase for the Project, the amount of untreated impervious surface would drop dramatically compared to existing conditions and the No-Build Alternative. This is because under the Project, stormwater runoff from all new or reconstructed impervious surface area would be treated, while stormwater runoff from most of the existing PGIS does not currently undergo stormwater treatment.

Payment of the new highway toll would require a higher proportion of income for lower income drivers than for higher income drivers. The Council finds, however, that when considered in combination with the other elements of the project, the impact would not be high and adverse. In exchange for the toll, travelers would receive the benefits of shorter highway travel times, lower congestion, extended light rail transit service, more reliable commute trips, reduced crashes, no bridge lift interruptions, increased access to employment, housing, education and services, and improved biking and walking facilities. There would also be toll-free options for crossing the river, including transit, carpooling, biking or walking, and crossing on I-205. The toll rate is also reduced during the off-peak travel times.

The project team reviewed the available research to inform the environmental justice impact evaluation. Several academic studies have been conducted on equity and tolling. The Washington State Department of Transportation (WSDOT) also conducted research on tolling equity for various projects.

The University of Washington and the Washington State Transportation Center published in 2009 a research paper entitled "The Impacts Of Tolling On Low-Income Persons In The Puget Sound Region." The paper starts with the assertion that "Tolls may be progressive, regressive, or neutral, depending on the social and geographic characteristics of the town or region and the structure of the tolling regime. The distributional effects must be evaluated on a site and project specific basis."

In "International Experiences with Congestion Pricing" (May 1993), Anthony May considered the equity component of congestion pricing. He cited older studies that argue that congestion pricing is a regressive measure that has greater impacts on lower-income drivers, but indicated this population is more likely to travel by bus or foot. May concluded that the most inequitable effects are dependent on the pricing scheme implemented and would likely impact a small percentage of lower-income drivers. He suggests that the only way to address the issue of equity is to invest some of the toll revenue in public transport rather than solely to improve the road infrastructure. The Project includes substantial improvements to transit as well as bicycle and pedestrian facilities.

Existing electronic toll collection systems with transponders present various hurdles for low-income users. One must normally either pay a deposit or link the account to a credit card or bank account. Some low-income populations may not be able to purchase a transponder. Not being able to purchase a transponder due to large set-up fees or lack of a credit card and/or bank account would be an adverse impact on those low-income populations affected. A similar barrier may exist when new tolls are instituted in areas where some groups and individuals lack the English language skills to understand the complex tolling system. These impacts would be mitigated through outreach and special programs.

Several strategies would mitigate the potential impacts of tolling on low-income populations. Since toll transponders are unfamiliar to most Oregon and southwest Washington residents, educational materials can be made available that explain how tolling and transponders work. All such communications would be made available in selected non-English languages, as appropriate. C-TRAN offers programs that assist low-income populations and people with disabilities to obtain a reduced transit fare. TriMet offers similar programs that assist senior and disabled populations using transit.

Conclusions on Social Impacts. The Council finds the social impacts of the Columbia River Crossing project are generally positive in the affected East Columbia, Kenton, Bridgeton and Hayden Island neighborhoods. There are 46 potential residential displacements in these segments.

Relative to access to community facilities, the project would displace the only grocery store and pharmacy (Safeway) on Hayden Island. The displacement could also affect low-income populations that use the bottle return center. However, the Council finds that the improved transit access, improvement of the local street network, and a bridge providing local multimodal access to and from the island, as well as the other mitigation measures mentioned above, would mitigate the displacement of the Safeway.

Relative to barriers to neighborhood interaction, the Council finds that the LRT alignment will not result in barriers to neighborhood interaction, primarily because the alignment in large measure parallels the I-5 freeway which already functions as an edge and boundary to the Hayden Island Neighborhood. Similarly, the highway improvements generally expand or improve existing roadways.

Relative to safety and security impacts, the Council acknowledges and supports TriMet's continuing efforts to improve passenger and community safety throughout its service area. The Council finds that TriMet is committed to making continued improvements to help maintain a safe and effective transit system, and it finds that the measures identified above improve public safety.

Relative to the visual impacts, the Council finds that the project would result in positive and negative impacts. The negative impacts could be mitigated by the measures addressed above, including following existing design guidelines from the City of Portland and TriMet when designing the light rail and highway improvements.

Traffic Impacts

The *Transit Technical Report, Traffic Technical Report* and Section 3.1 Transportation of the Draft Environmental Impact Statement (DEIS) evaluate the Project's impacts to the highway and street network. Traffic impacts from transit and highway improvements and potential mitigation are summarized below.

Transit. The Council finds that the light rail route and station on Hayden Island will provide light rail proximity and service to the substantial employment and commercial base located at the Jantzen Beach Center. Additionally, through improved high capacity transit service, island residents will have improved accessibility to local and regional employment centers, community facilities and recreational destinations throughout the Portland metropolitan region.

Currently, travel options to and from Hayden Island are limited and often congested, and under the DEIS No-Build alternative, these options would get much worse over time. Light rail will provide a convenient, reliable alternative mode of travel.

The Columbia River Crossing Project would more than double the number of transit passenger trips over the I-5 crossing, compared to the 2030 No-Build Alternative. For weekdays, there would be 20,600 bridge crossings on transit, compared to 10,200 trips under the 2030 No-Build Alternative. Of the transit passengers crossing the Columbia River, 18,700 would be on light rail transit (91 percent) and 1,900 would be on buses (9 percent).

One of the major contributing factors to reliable transit service is reserved or separated right-of-way for transit vehicles. Transit vehicles operating in mixed traffic are subject to delays caused by accidents, breakdowns, congestion, and in the case of existing I-5 Columbia River bridges, bridge openings. With a separated right-of-way and separated bridge crossing on the lower deck of the new southbound I-5 bridge, transit service between Portland and Vancouver, Washington will become faster and more reliable. For example, a transit trip between Hayden Island and Vancouver would save an estimated five minutes in comparison with the No-Build Alternative, while a trip between Pioneer Square and Clark College would save 28 minutes (dropping from 72 minutes with the No-Build to 44 minutes with LRT).

Additionally, most of the intersections within the South/North Corridor through which light rail vehicles will operate have traffic signals preempted for LRT, have gated crossings for LRT, or have LRT separated from other traffic. In summary, the Columbia River Crossing portion of the South/North Project will provide significantly more reliable transit service than the No-Build Alternative, and a significant portion of the corridor's transit riders will experience the improvement in reliability with light rail.

Transit improvements in the Expo Center/Hayden Island segments of the South/North Project could affect traffic congestion in two basic ways. First, these improvements could divert trips from automobiles to transit, resulting in reduced systemwide vehicular travel. Second, transit facilities could also affect localized traffic operations on highways and streets in the study area.

The LRT alignment will have an at-grade crossing with the extension of N Vancouver Way, at the south end of the local multimodal bridge. Traffic analysis performed for the *Traffic Technical Report* models that this intersection will operate acceptably (meeting City of Portland Bureau of Transportation standards) in design year 2030. Light rail will be grade-separated on Hayden Island, with no traffic impacts on the island. The LRT alignment will bridge over N Jantzen Avenue and N Jantzen Drive, and Hayden Island Drive and N Tomahawk Island Drive (to be constructed as part of the project). Given the design, the Council concludes that the Columbia River Crossing transit portion of the South/North Project will not result in adverse traffic impacts in the Expo Center/Hayden Island Segment.

The traffic analysis model shows only one intersection in Oregon as not meeting the appropriate jurisdictional standards. The intersection, Going Street and Interstate Avenue, will not meet Portland Bureau of Transportation standards in 2030. Potential mitigation could be to optimize the light rail transit pre-emption at the intersection, install advanced signal controllers to manage light rail transit pre-emption, and change the westbound right lane into a through/right choice lane to allow traffic to continue westbound.

Regarding traffic safety, light rail transit is designed to be safe through methods and devices such as speed control, signalization, gated crossings, and pedestrian movement controls. In general, light rail vehicle speeds match road vehicle speeds where the vehicles run in adjacent lanes. Light rail vehicles operate in accordance with normal traffic control devices (traffic signals) as supplemented by specific light rail signals where needed. Specific train warning signals may be provided as needed. Pedestrian movements are governed by pedestrian signals at signalized intersections. At gated intersections, pedestrian movements are controlled by the gates and warning signals. At non-signalized, non-gated pedestrian crossings, barriers ("z-crossings") may be used to focus pedestrian attention on the direction of approaching light rail vehicles. The project could provide pedestrian access to stations by establishing "through-walking areas"—clear pathways free of street furniture or other impediments—adjacent to the planned station locations. The project would strive to maintain the width of these areas at approximately 7 to 8 feet in busy pedestrian locations and 6 feet in areas with lower levels of pedestrian traffic. For bicycles, station areas could include bicycle facilities, which could include secure storage areas. The Council concludes that these methods and devices provide for a safe multi-modal environment.

Highway Improvements. Since the stated purpose from the DEIS of the Columbia River Crossing project is "to improve I-5 corridor mobility by addressing present and future travel demand and mobility needs in the CRC Bridge Influence Area," most project impacts to traffic are positive. The associated highway improvements in the segment are provided as part of the Columbia River Crossing Project in order to improve transportation performance compared to the No-Build alternative.[10]

In 2030 the traffic models predict 15 hours of congestion per day (northbound and southbound) on I-5. With the Columbia River Crossing Project, there would be just 3.5 to 5.5 hours of congestion in 2030. During the peak period, the Project would increase the number of people over the I-5 crossing northbound in 2030 from 26,500 with No-Build to 35,300 (in vehicles), and from 2,200 to 6,100 (on transit).

Local street traffic performance is monitored and measured by the City of Portland and ODOT based on established performance standards for the facilities under their respective

[10] House Bill 3478, Section 8(1)(a), directs all affected local governments and special districts to amend their comprehensive or functional plans, including transportation system plans, "to the extent necessary to make them consistent with a land use final order." As noted below and in Section 1.3 of these findings, most of the highway improvements included in the Project are already identified and authorized in the City of Portland's acknowledged Transportation System Plan. As such, they already have land use approval. They are addressed in these findings because they are included as part of the Columbia River Crossing Project which, as an element of the South/North Project, requires findings of compliance with the applicable criteria for any "highway improvements". For these improvements, no further local planning action is necessary to make them consistent with this 2011 LUFO. For those highway improvements that are not already part of Portland's Transportation System Plan, the city will need to amend its plan to comply with Section 8(1)(a).

jurisdictions. Local street congestion is most intense near the I-5 ramps and is influenced by the travel direction and length of time that I-5 is congested during each weekday. This section summarizes existing local street performance at selected study intersections. Results are reported for the AM and PM peak hours of travel.

The Project would address most of the non-standard geometric and safety design features currently existing on the I-5 mainline and ramps within the main project area. Improvements would be made to the existing short on-ramp merges/acceleration lanes and off-ramp diverges/deceleration distances, short weaving areas, substandard lane widths, vertical and horizontal curves that limit sight distance, and narrow or non-existent shoulders. The Project would remove both Interstate Bridge lift spans. In addition, the Project would substantially reduce traffic congestion compared to No-Build conditions.

As the number of vehicular collisions in the main project area is related to the presence of non-standard geometric design and safety features, which is exacerbated when traffic levels are at or near congested conditions, the Project would substantially improve traffic safety in the area. It is estimated that the Project would reduce average annual yearly collisions in the main project area from 750 under the No-Build Alternative to between 210 and 240.

This estimate was calculated by making the assumption that the highway geometric and safety improvements would result in a highway corridor that performed at least as good as an average, similar type of urban interstate facility in Oregon. The collision rate for similar urban, interstate facilities is approximately 0.55 collisions per million vehicle miles travelled (MVMT). Applying this rate (with an allowance for a higher collision rate during congested periods and during late evening and early morning hours) to the forecasted traffic volumes over a year period generated an estimated annual collision total of between 210 and 240.

The Portland local street system is divided by I-5, with community connections across I-5 limited to the following interchange and non-interchange crossing locations: Skidmore Street, Alberta Street, Killingsworth Street, Ainsworth Street, Rosa Parks Way, Lombard Street, Columbia Boulevard, Schmeer Road, Victory Boulevard, Martin Luther King Jr. Boulevard, Pier 99 Street, Jantzen Street, and Hayden Island Drive (overcrossings for non-motorized travel also exist at Failing Street and Bryant/Saratoga Streets). In addition to the interchanges, several local streets and nearby intersections are affected by traffic operations in the I-5 corridor.

Under 2030 No-Build conditions, 25 intersections were analyzed, one of which would not meet applicable performance standards during the morning peak hour - the intersection of Fremont Street with Martin Luther King Jr. Boulevard. During the afternoon/evening peak hour, five intersections would not meet applicable performance standards: Martin Luther King Jr. Boulevard with Fremont and Alberta Streets, Interstate Avenue with Argyle and Going Streets, and Marine Way with Vancouver Avenue.

With the Project, Portland's local street operations would improve along the I-5 corridor relative to No-Build conditions. For example, at the I-5 interchange with Marine Drive, 2030 afternoon peak intersection performance would improve from V/C 0.82 (LOS F) with the No-

Build Alternative to V/C 0.42 (LOS B) with the Project. This indicates that the Project would improve mobility and accessibility to this freight and employment corridor during the afternoon peak. Similar findings were observed during the morning peak. The Project with highway phasing would improve the 2030 p.m. peak V/C to 0.64 (LOS B) from 0.82 (LOS F).

With the Project improvements, the total number of local intersections and ramps would increase to 38, primarily as a result of additional intersections associated with the local roads in the Hayden Island and Marine Drive interchange areas. During the 2030 morning peak hour, 37 of these 38 intersections and ramps are expected to operate within acceptable standards, while one would fail to meet standards. The intersection of Interstate Avenue with Going Street is expected to fail to meet applicable performance standards and to require mitigation. During the 2030 afternoon/evening peak hour, with Project improvements, all intersections would operate within acceptable standards. Potential mitigation for the Interstate Avenue and Going Street intersection (also described above in the Transit section) could be to optimize the light rail transit pre-emption at the intersection, install advanced signal controllers to manage light rail transit pre-emption, and change the westbound right lane into a through/right choice lane to allow traffic to continue westbound.

The existing pedestrian and bicycle facilities throughout the Columbia River Crossing main project area are outdated, potentially unsafe, and confusing to navigate. The width of the shared-use pedestrian and bicycle facility on the I-5 bridge is non-standard (generally no wider than 4 feet) and separated from traffic by the bridge girders and non-standard low barriers. The mixing of pedestrians and bicycles in this narrow facility can cause safety problems. The Project would improve bicycle and pedestrian facilities in the area, as described in the *Traffic Technical Report*, resulting in greater use of the facilities and safety improvements.

Several pedestrian and bicycle forecasting scenarios predict that pedestrian and bicycle travel demands would increase substantially if a new I-5 bridge is constructed with sufficient multimodal facilities. Pedestrian travel across the bridge would be expected to increase from 80 daily pedestrians today to between 600 and 1,000 daily walkers in 2030, an increase of 650 to 1,150 percent. The number of bicyclists predicted to use the crossing would increase from 370 today to between 900 and 6,400 riders in 2030, an increase of between 150 and over 1,600 percent.

The majority of the Project transit and highway improvements are identified in Metro's Regional Transportation Plan and in the City of Portland Transportation System Plan (TSP) and are therefore consistent with those transportation system plans. Below is a list and description of the RTP and TSP projects for which the Project would build the improvements:

Regional Transportation Plan (Metro)

- **RTP Project 10893: Improve I-5/Columbia River Bridge (Victory Boulevard to Washington State Line);** *Replace I-5/Columbia River bridges and improve interchanges on I-5.* New bridges will replace the existing I-5 bridges and the following I-5 interchanges in Oregon will be improved: Victory Boulevard, Marine Drive, Hayden Island/Jantzen Beach

- **RTP Project 10902: MAX Light Rail: Yellow Line: CRC/I-5 North Extension** *CRC: Expo to Vancouver, north on Main to Lincoln.* Light rail will be extended from the Expo Center MAX station in Portland to a station and park-and-ride lot at Clark College in Vancouver.
- **RPT Project 11032: Ruby Junction light rail operating base expansion**: *LRV maintenance and storage facility, including expansion on the west side of Eleven Mile Avenue. Capital cost is included in Milwaukie and CRC projects.* Ruby Junction maintenance facility in Gresham will be expanded to accommodate a new operations facility, new storage tracks and additional light rail vehicles.

Transportation System Plan (Portland)

- **TSP Project 30018: Hayden Island: Street Network Improvements.** *Provide a street network plan for improvements that implement the Region 2040 connectivity standards and improve multi-modal access for Hayden Island.* The Hayden Island Street Plan is described in more detail in the Hayden Island Plan which was adopted into the City Comprehensive Plan in August 2009. The Hayden Island Plan recommends amending the TSP to implement the street network as shown in the document. The Columbia River Crossing Project would build these improvements consistent with the Hayden Island Street Plan.
- **TSP Project 30020: I-5 (Columbia River-Columbia Blvd): Bridge Widening** *Improve I-5/Columbia River bridge (local share of joint project) based on recommendations in I-5 Trade Corridor Study. Project addresses a high congestion location.* The Columbia River Crossing Project would build these improvement
- **TSP Project 30033: Light Rail Extension - Phase 2.** *Extend light rail service from Expo Center to Vancouver WA.* The Columbia River Crossing Project would build these improvements.
- **TSP Project 40080: Marine Dr. (6th - 33rd & Gantenbein - Vancouver Way) Bikeway** *Retrofit bike lanes to existing street and complete off-street paths in missing locations.* The Columbia River Crossing Project would build these improvements.

The CRC project also includes improvements to the local street system east and west of the Marine Drive interchange and a new bridge over North Portland Harbor to the west of I-5 that would carry light rail vehicles as well as local motor vehicle and bicycle/pedestrian traffic between Marine Drive and Hayden Island. The local street improvements east and west of the Marine Drive Interchange will improve local access to and from the Expo Center and Hayden Island light rail stations and are necessary as well to accommodate the design of the new I-5 bridges and the modified interchanges.

The physical and operational elements of the Columbia River Crossing Project provide the greatest Transportation Demand Management (TDM) opportunities by promoting other modes to fulfill more of the travel needs in the project corridor. These include:

- Major new light rail line in exclusive right-of-way, as well as express bus and feeder routes.
- Modern bicycle and pedestrian facilities that accommodate more bicyclists and pedestrians, and improve connectivity, safety, and travel time.
- Park and ride lots and garages.
- A variable toll on the highway crossing.

In addition to these fundamental elements of the project, facilities and equipment would be implemented that could help existing or expanded Transportation System Management (TSM) programs maximize capacity and efficiency of the system. These include:

- Replacement or expanded variable message signs or other traveler information systems in the Project area.
- Expanded incident response capabilities.
- Queue jumps or bypass lanes for transit vehicles where multi-lane approaches are provided at ramp signals for entrance ramps.
- Expanded traveler information systems with additional traffic monitoring equipment and cameras.
- Active traffic management

Conclusions on Traffic Impacts. The Council finds that the transit and highway improvements summarized above will substantially improve traffic operations in 2030 compared to the No-Build Alternative and that adverse traffic impacts associated with extending light rail transit through this Segment can be mitigated. The Council finds that the potential mitigation for the Interstate Avenue and Going Street intersection would mitigate for the reduction in intersection performance as a result of the project. Potential mitigation could be to optimize the light rail transit pre-emption at the intersection, install advanced signal controllers to manage light rail transit pre-emption, and change the westbound right lane into a through/right choice lane to allow traffic to continue westbound.

The Council finds that transit improvements will increase transit ridership, decrease transit travel times, and improve accessibility to local and regional employment centers, community facilities and recreational destinations throughout the Portland metropolitan region.

Relative to general transit safety and transit impacts on bicycle and pedestrians, the Council finds that the impacts could be mitigated through the measures described above. Relative to impacts from highway improvements, the Council finds that most impacts from the Columbia River Crossing portion of the North/South project would be positive and would improve transportation performance in the Hayden Island/Expo Center segment.

Provide for a light rail route and associated facilities, balancing the need for light rail proximity and service to areas that are capable of enhancing transit ridership; the likely contribution of light rail proximity and service to the development of an efficient and compact urban form; and the need to protect affected neighborhoods from the identified adverse impacts.

The South/North Steering Committee initially assembled in the 1990s to recommend the federal Locally Preferred Strategy adopted the following goal for the project[11]: *To implement a major transit expansion program in the South/North Corridor that supports bi-state land use goals, optimizes the transportation system, is environmentally sensitive, reflects community values and is fiscally responsive.* That "LPS Steering Committee" also adopted the following objectives for the project:

1. Provide high quality transit service;
2. Ensure effective transit system operations;
3. Maximize the ability of the transit system to accommodate future growth in travel;
4. Minimize traffic congestion and traffic infiltration through neighborhoods;
5. Promote desired land use patterns and development;
6. Provide a fiscally stable and financially efficient transit system; and
7. Maximize the efficiency and environmental sensitivity of the engineering design of the proposed project.

The project goal and objectives closely parallel the emphasis of Criterion 3(A) for this Land Use Final Order. The effectiveness evaluation of the South/North Project relative to meeting the objectives is summarized below.

Ability to Provide High Quality Transit Service. The Council finds that the portions of South/North Project already constructed or currently under construction provide a significant amount of light rail coverage between the Portland downtown and Milwaukie and Clackamas Town Center to the south and between the Portland downtown and the Expo Center to the north. The Columbia River Crossing Project provides the missing piece to the original transit concept by extending LRT coverage into Vancouver, Washington. It finds that the South/North Project, including the Columbia River Crossing Project, provides improved reliability over the No-Build Alternative. Factors that affect reliability include the amount of reserved right-of-way, percent of protected trunk-line intersections and percent of passengers on exclusive transit right-of-way.

The Council finds that the Columbia River Crossing Project will result in improved peak-hour in-vehicle and total weighted travel times between Portland and Vancouver, Washington compared to the No-Build Alternative. It will increase transit trips within the South/North Corridor and increase the transit mode split for peak-hour radial trips.

Moreover, compared to an expanded all-bus system, the Council finds that the Columbia River Crossing Project will

- Increase transit trip production in the Project Transit Corridor by 150 percent compared to existing conditions by the year 2030;
- Increase weekday transit ridership into on the Interstate Max Yellow Line by 21,400 trips (150 percent) compared to the No-Build Alternative;

[11]This Steering Committee was assembled under requirements of federal law. It differs from the LUFO Steering Committee assembled to comply with House Bill 3478.

- Double the number of transit passenger trips over the I-5 Columbia River crossing, compared to the 2030 No Build alternative
- Decrease rush-hour transit travel times between Pioneer Courthouse Square and Clark College in Vancouver by 28 minutes compared to the No Build alternative; and
- Increase the percent of transit trips between the project corridor and downtown Portland from 21% in 2005 to 39% in 2030.

Ensure Effective Transit System Operations. By locating the South/North light rail alignment on the downtown Portland transit mall, all alignment alternatives have allowed for easy transfers to other transit routes serving most of the metropolitan region. The Council believes that this improved transit access has enhanced transit ridership, and it so finds.

Maximize the Ability of Transit to Accommodate Growth in Travel Demand. In 1998 the Council determined that the South/North Project had the greatest ability to accommodate growth of the various DEIS alternatives studied. The Columbia River Crossing portion of the South/North Project would increase LRT place miles ("place miles" are transit vehicle capacity for each vehicle type multiplied by vehicle mile travelled) by 58% and would increase total bus and LRT place miles by over 2% compared to No-Build.

Minimize Traffic Congestion and Traffic Infiltration Through Neighbo In 1998 the Council determined that the South/North Project would help slow the rate of traffic congestion and related problems, compared to the No-Build Alternative. It would:

- Remove almost 133,000 vehicle miles of travel per average weekday from the corridor road system;
- Eliminate 16 lane-miles of congested roadways; and
- Avoid 4,500 hours of traffic delays each weekday (compared to the No-Build Alternative in the year 2015).

By slowing the rate of traffic congestion growth, avoiding delay, and reducing the number of vehicle miles of travel per average weekday as compared to the No-Build Alternative, the South/North Project will minimize traffic congestion. The Council found that the slowing of congestion and reductions in vehicle miles of travel also would reduce the amount of traffic infiltrating Portland and Clackamas County neighborhoods by causing fewer vehicles to be on the roads than would otherwise occur in the absence of light rail transit.

The Council now finds that with the Columbia River Crossing Project, in comparison with a No-Build Alternative and with the highway improvements that are included in the Project, will result in a 57 percent decrease northbound and a five percent decrease southbound in rush-hour automobile travel times between Columbia Boulevard in Portland and SR 500 in Vancouver. It also finds that the Project will reduce the duration of congestion from 15 hours per day in the No-Build to between 3.5 and 5.5 hours per day with the improvements being made for automobile, transit and truck travel.

Facilitate Efficient Land Use Patterns. The Council finds that light rail has influenced the quality of access to vacant developable and redevelopable parcels of land in the South/North Corridor. It finds that light rail transit throughout the South/North corridor has supported the region's growth management strategy and the urban growth boundary (UGB) by:

- Providing access to vacant and redevelopable infill properties;
- Providing transportation capacity to the Portland Central City that will enable the region's core to accommodate the expected high growth levels;
- Providing the high quality transit needed to make the Clackamas Regional Center and Milwaukie Regional Center function in accordance with the growth strategy;
- Establishing new station communities which can be developed as mixed-use areas; and
- Instituting a pattern of growth that conforms to the goals, objectives and policies of local land use and infrastructure plans.

The Council finds that the Columbia River Crossing Project will further facilitate efficient land use patterns by promoting denser, transit-oriented development on Hayden Island. This shift in land use patterns from the existing auto-oriented development is consistent with the Hayden Island Plan.

Balance the Efficiency and Environmental Sensitivity of the Engineering Design. Indicators of environmental sensitivity include displacements, noise and vibration impacts, parkland impacts, floodplain impacts, wetland impacts and historic and archaeological resources impacts. These impacts are addressed in other findings, set out below, addressing the relevant LCDC criteria applicable to this proposal. For the reasons stated in the findings addressing those other criteria, the Council concludes that the positive impacts of the Project outweigh the negative environmental impacts.

Social Equity Considerations. In addition to the LPS Steering Committee objectives listed above, the Council believes and finds that social equity considerations should be taken into account. When it adopted the initial South/North LUFO back in 1998, the Council found the percentage of minority populations in nearly one half of the neighborhoods in the South/North Corridor to be higher than the regional average of 8.6 percent. Nearly two-thirds of corridor neighborhoods have a percentage of low-income households that is higher than the regional average (1990 US Census). The Council also found that the South/North Project would serve both low-income and minority neighborhoods. The Council concluded that the South/North Project will not adversely affect low income or minority neighborhoods disproportionate to the benefits they will receive with improved transit access. Indeed, it found that the project will substantially benefit a much larger segment of the populations of these affected areas, including low-income, transportation-disadvantaged, minority and elderly populations, than are otherwise directly adversely affected by the project. The Council continues to abide by these findings.

Overall Conclusions Regarding Neighborhood Impacts (Transit)

In summary, the Council finds and concludes that the selection of the light rail route and the Hayden Island station, including their locations, within the area constituting the Columbia River Crossing project has included a balancing of:

- the need for light rail proximity and service to present or planned residential, employment and recreational areas that are capable of enhancing transit ridership;
- the likely contribution of light rail proximity and service to the development of an efficient and compact urban form; and
- the need to protect affected neighborhoods from identified adverse impacts.

The Council finds and concludes that the Columbia River Crossing portion of the South/North Project will enhance transit service to areas all along the South/North Corridor, with particular benefits to Hayden Island and Vancouver Washington. The Council finds and concludes that this Project will improve connections and mobility throughout the Portland metropolitan region, including to areas along the existing eastside and westside MAX light rail lines; that the presence of light rail transit north of the Expo Center into Vancouver, Washington will encourage and support new and efficient development, consistent with Region 2040 Growth Concepts, that will benefit the affected local communities and the region; and that the improved accessibility provided by extending the South/North Project, and its many benefits, north to Hayden Island and Vancouver, Washington, especially when compared with the No-Build Alternative, combined with available measures to mitigate adverse impacts created by the Project, result in a substantial net benefit to the affected local communities, the region, and the states of Oregon and Washington.

For the reasons stated herein, the Council finds that it has considered the adverse economic, social and traffic impacts of the Columbia River Crossing Project and balanced these impacts against the Project's benefits. It finds and concludes that the northern extension of the South/North light rail line to Hayden Island and Vancouver, Washington will make a significant positive contribution to the quality of life in the Portland region, through improved mobility, decreased congestion, improved air quality, reduced energy consumption, and decreased reliance on the automobile, which will benefit Oregonians now and well into the future. It further finds that light rail transit can, has, and will continue to stimulate and enhance development of an efficient and compact urban form in appropriate locations identified for such development. It also finds that with mitigation imposed as part of the NEPA process or during local permitting processes, most of the adverse consequences identified in these findings can be reduced or avoided. Potential mitigation measures are identified in findings.

Provide for associated highway improvements, balancing the need to improve the highway system with the need to protect affected neighborhoods from the identified adverse impacts.

The Columbia River Crossing Project includes a broad spectrum of highway improvements including new I-5 bridges across the Columbia River, widening of and interchange improvements along I-5, and improvements to highways accessing I-5, the Expo Center and Hayden Island. The Council finds that these highway improvements are in addition to other highway improvements that the Council previously approved for the South/North Project, including highway improvements in SW Portland, SE Portland and Milwaukie. All other street and highway changes, such as intersection modifications, installation of traffic signals, access changes, etc. are ancillary to light rail improvements or proposed as mitigation to address specific adverse impacts of the South/North Project, and are not classified as highway improvements.

The Council finds that the need to construct new I-5 bridges is the principal catalyst behind the Columbia River Crossing Project and that light rail transit is a fundamental component of the bridge project. It finds that the Columbia River Crossing Project is a combined transit/highway project that represents a consensus among affected local government officials. It finds that without the identified highway improvements, the light rail improvements would not and could not go forward independently and that without the rail component, the highway improvements would not independently be going forward. For this project to work, both components are required. Additionally, the Project will facilitate bicycle and pedestrian travel across the Columbia River, thereby being a truly multi-modal project. The Council further finds that the combining of rail and highway improvements is not unique to the region. Indeed, it finds that the Westside Corridor Project, which extended light rail transit from downtown Portland to downtown Hillsboro, was a combination rail and highway project that was approved through a series of LUFOs adopted in the early and mid-1990s.

The Council finds that construction of new I-5 bridges, including a southbound bridge carrying light rail transit and a northbound bridge accommodating bicycle and pedestrian traffic, is necessary to maintain and improve an adequate interstate highway system. It finds that I-5 is the principal arterial serving the west coast states of Oregon, Washington and California, and the principal facility serving the interstate movement of freight by truck travel in these states. It finds that the existing I-5 bridges are severely congested during peak travel hours and severely hindered by their need to close traffic for periods at a time to allow ships and boats to pass underneath. All of this impedes mobility and delays the timely and efficient movement of freight between Oregon and Washington.

The Council also finds that the other identified highway improvements are necessary to complement the I-5 improvements and allow for an efficient local transportation system and access to/from I-5, the Hayden Island LRT station, and residential, commercial and industrial areas in the project area.

The improvements at Victory Boulevard interchange would improve safety and lengthen short, substandard on- and off-ramps. All movements within the Marine Drive Interchange would be reconfigured to reduce congestion and improve safety for trucks and other motorists entering and exiting I-5. Trucks currently account for 8 to 10 percent of the daily vehicles that cross the I-5 bridges. At the Marine Drive Interchange, trucks account for greater than 20 percent of the daily vehicle composition. During the hour when the highest numbers of trucks are using the Marine Drive Interchange (9-10 a.m.), trucks account for approximately 30 percent of vehicles in the interchange. So by virtue of the improvements, the proposed design for the Marine Drive Interchange improves truck mobility. The improvements would allow the movements with the highest volumes in the interchange to move freely without being impeded by stop signs or traffic signals.

All movements for the Hayden Island Interchange would be reconfigured. The new configuration would be a split tight diamond interchange. Ramps parallel to the highway would be built, lengthening the ramps and improving merging speeds. Improvements to Jantzen Drive and Hayden Island Drive would include additional through, left-turn, and right-turn lanes. A new local road, Tomahawk Island Drive, would travel east-west through the middle of Hayden Island and under the I-5 interchange, improving connectivity across I-5 on the island and improving access to and from the Hayden Island LRT station.

The Columbia River Crossing Project would also include local street improvements on the Oregon mainland, which would improve access between I-5 and local roads in the area. The project would build a local multimodal bridge that would provide access to and from Hayden Island and the Hayden Island station for vehicle traffic, bicycles and pedestrians separate from the I-5 mainline.

Many bicycle and pedestrian improvements are included in the Columbia River Crossing Project. These include new facilities such as the multi-use pathway across the Columbia River, street improvements around the rebuilt interchanges, and new facilities for bicyclists and pedestrians around the new light rail stations and park and rides.

The proposed Marine Drive Interchange area would be entirely grade-separated, with the local road network and multi-use paths running below the interchange. Pedestrian and bicycle improvements at the Marine Drive Interchange would include a multi-use path constructed from the Marine Drive Interchange, over Hayden Island and the Columbia River. The path would be a minimum of 16 feet wide between its barriers and would direct users with pavement markings and signage. Larger curves would provide improved sight distance and flow, and path components would meet ADA accessibility standards.

Sidewalks would be constructed on most reconstructed streets throughout the project area. To improve east-west connections on Hayden Island, a 6- to 8-foot-wide sidewalk would be provided along Jantzen Drive and Hayden Island Drive. A 6-foot minimum width sidewalk would be provided along Tomahawk Island Drive. Crosswalks would be provided at all intersections and would meet ADA accessibility standards. The island streets would also include 6-foot bicycle lanes wherever improvements are made. All of the improvements would facilitate access to the light rail system.

The new northbound bridge over the Columbia River would also accommodate a multi-use pathway under the highway deck. This path would be 16 to 20 feet wide, located within the superstructure above the bridge columns and below the bridge deck. The multi-use path would separate pedestrians and bicyclists from vehicle noise and avoid proximity to moving vehicles.

The Council finds that the local improvements summarized above would improve the flow of traffic in the I-5 corridor, would improve intersection performance on local intersections compared to No-Build and would improve bicycle and pedestrian mobility and safety.

The Council finds that the local multimodal bridge that provides local access to/from Hayden Island would benefit residents of the island, providing an alternate access to the island.

The Council finds that although there are adverse impacts associated with the highway improvements of the Project, many of the impacts can be sufficiently mitigated, as addressed in the NEPA documentation. The Council finds that the benefits of the Project including improved I-5 and local intersection performance, decreased congestion in the corridor, improved bicycle and pedestrian mobility and safety, and others as addressed in this document herein, outweigh the impacts and that the Columbia River Crossing Project would cause a net positive impact to residents.

Overall Conclusions Regarding Neighborhood Impacts (Highway)

Overall, the Council finds that these highway improvements, taken together, will have a positive impact on interstate and local travel and on interstate and local commerce. They will enhance nearby neighborhoods and improve opportunities for pedestrian, bicycle and vehicle circulation to and around the Expo Center, Jantzen Beach Center, Hayden Island and Vancouver, Washington. While the expansion of and modifications to the local highway network may result in some adverse impacts identified and discussed above, the Council believes and concludes that on balance, these highway improvements will be a substantial benefit to the City of Portland, the Metro region, the State of Oregon, and their residences and businesses, in terms of accessibility, mobility, improved movement of commerce, and improved bicycle and pedestrian transport. The Council concludes that the benefits of these improvements strongly outweigh the adverse impacts that are associated with them.

6.3.2 Criterion 4: Noise Impacts

> **"Identify adverse noise impacts and identify measures to reduce noise impacts which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by affected local governments during the permitting process."**

Noise is a form of vibration that causes pressure variations in elastic media such as air and water. The ear is sensitive to this pressure variation and perceives it as sound. The intensity of these pressure variations causes the ear to discern different levels of loudness, and these differences are measured in decibels, or dBs. Vibrations can also be carried through the ground, in which case they are described in terms of vibration velocity levels in dB referenced to one micro-inch per second. As with air or water borne vibrations, ground vibrations have a threshold of human perception. Because air and ground borne vibrations have similar properties and are measured in similar ways, the Council finds that vibration impacts are appropriately considered with noise impacts in these findings.

Noise and vibration impacts specific to the Expo Center/Hayden Island Segment are addressed in the following section. Noise and vibration impacts also are identified, along with corresponding mitigation measures, in the Noise and Vibration Technical Report (Noise Report).

Identification of Noise and Vibration Impacts in the Expo Center/Hayden Island Segment.

The guidelines and standards for analyzing and mitigating transit noise and vibrations are different from those used for analyzing and mitigation highway noise. For transit noise, the guidelines and standards are established by the FTA while for highway noise, the guidelines and standards are established by the FHWA and ODOT. Because of the different guidelines and standards, the noise and vibration impacts of the transit and highway improvements in the Expo Center/Hayden Island Segment are addressed separately.

Transit Noise and Vibration Impacts and Mitigation Options

The noise criteria in the FTA Guidance Manual are founded on well-documented research on community reaction to noise and are based on change in noise exposure using a sliding scale. The amount that a transit project is allowed to change the overall noise environment is reduced with increasing levels of existing noise.

The FTA Noise Impact Criteria groups noise sensitive land uses into the following three categories:

> *Category 1*: Buildings or parks where quiet is an essential element of their purpose.
>
> *Category 2:* Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
>
> *Category 3:* Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, churches, office buildings, and other commercial and industrial land uses.

There are two levels of impact included in the FTA transit noise criteria.

> *Severe Impact:* Severe noise impacts are considered "significant" as this term is used in NEPA and implementing regulations. Noise mitigation will normally be specified for severe impacts unless there is no practical method of mitigating the noise.
>
> *Impact:* In this range, often called a "moderate" impact, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors can include the predicted increase over existing noise levels, the types and number of noise-sensitive land uses affected, existing outdoor-indoor sound insulation, and the cost-effectiveness of mitigating noise to more acceptable levels.

Transit noise can take several forms. These include LRT-induced noise impacts resulting from changes to roads and to motor vehicle traffic volumes; wayside LRT noise impacts; LRT wheel squeal impacts; noise from ancillary LRT facilities; and LRT vibration impacts and mitigation.

LRT-induced road traffic noise is generally associated with park-and-ride lots. There are no new planned park-and-ride lots in the Expo Center/Hayden Island Segment. There are, however, numerous highway improvements proposed for this segment. Their noise impacts are addressed below.

Wayside LRT noise is modeled based on measurements of existing LRT systems, the length and speed of trains, rates of acceleration and deceleration, location of special trackwork, auxiliary equipment and other factors. Options generally available to mitigate wayside LRT noise impacts include sound walls, crossover relocation and reduced LRT speeds. Within the Expo Center/Hayden Island Segment, wayside LRT noise impacts floating homes within the North Portland Harbor. These noise impacts are addressed below

Wheel squeal noise is generated by train wheels as they traverse a curve. Whether wheel squeal occurs and how loud it is depends on many factors, including the material used to make the rail, the level of wheel/rail contact point lubrication, the sharpness of the curve, train speed and wheel profile. There are several locations in the South/North Corridor where track curvature is acute enough to create wheel squeal impacts. However, none of these are located within the Expo Center/Hayden Island segment.

Where wheel squeal noise is generated, the noise impacts can be reduced or eliminated using the following general techniques:

- Dampening the wheel or using resilient wheels;
- Lubricating the wheel surface that slides against the rail;
- Using track designed to dampen squeal on sharply curved sections of the alignment.

If any wheel squeal impacts remain following the use of these mitigation measures, the use of barriers near affected receivers could be considered.

Noise from ancillary facilities includes noise from crossing bells and electrical substations located adjacent to the LRT trackway and LRT switching gear and transformers. Substation noise can be mitigated by designing and building substations to meet federal noise criteria for transit system ancillary facilities. Noise levels less than 60 dBA, which is a level typical of many residential areas, is expected at one foot from the exterior substation wall. This noise level can be reduced by as much as 10 dBA through the use of enhanced substation housing where substations are located near sensitive receivers. No noise impacts from crossing bells or substations are expected in the Expo Center/Hayden Island segment.

LRT vibration impacts resonate from the wheel/rail interface and are influenced by wheel/rail roughness, transit vehicle suspension, train speed, track construction and the geologic strata underlying the track. Vibration from a passing light rail train moves through the geologic strata into building foundations, potentially causing the buildings to vibrate. Ground-borne vibration is of such a low level that there is almost no possibility of structural damage to buildings near the alignment. The main concern of ground-borne vibration is that it can be annoying to building occupants. The primary options available to mitigate vibration impacts include: incorporating state-of-the-art vehicle specifications; keeping special trackwork (such as crossovers) as far as possible from sensitive receptors; using either spring-loaded frogs in tie-and-ballast track sections or flange-bearing rail in paved track sections where special trackwork cannot be moved; and installing ballast masts (in tie-and-ballast sections) or vibration isolation technology, such as "whisper rail," "booted" track-type support systems or resilient supported rail (for paved track sections). Small speed reductions may be able to reduce impacts to acceptable levels in a few locations, provided the speed reductions do not affect service schedules. There are several locations in the South/North Corridor where LRT vibration impacts occur. However, none of these are located within the Expo Center/Hayden Island segment.

The FTA has developed impact criteria for acceptable levels of ground-borne vibration that would apply to the light rail component of the Project. Exhibit 2-3 of the Noise Report summarizes the FTA impact criteria for ground-borne vibration as it affects most buildings. Exhibit 2-8 shows the ground-borne vibration and noise impact criteria for special buildings such as concert halls, TV and recording studios, auditoriums and theaters.

Overall, noise levels in the Expo Center/Hayden Island Segment of the project area are currently dominated by motor vehicle traffic on I-5 and Portland International Airport aircraft. Existing noise levels in this area exceed traffic noise criteria for 96 noise-sensitive receptors. As discussed in the Noise Report, the first three banks of floating homes in the vicinity of the new light rail alignment would be relocated due to project construction, and therefore those homes were not analyzed for project-related noise impacts. Of the floating homes that will remain, analysis identified 8 floating homes where noise levels are predicted to meet or exceed the moderate FTA noise impact criteria. The impacts occur at the row of homes nearest the future tracks, where light rail operations are predicted to produce a noise level of 61 dBA Ldn, which just meets the 61 dBA Ldn impact criteria. Noise from future light rail operations is well below the traffic noise levels at all other noise sensitive properties in the Expo Center/Hayden Island Segment, including the manufactured home residential area along the Columbia River.

Potential mitigation measures evaluated for reducing noise impacts from light rail for the project include 1) sound barriers, 2) track lubrication at curves, 3) special trackwork at crossovers and turnouts, 4) reduced train speed, and 5) building sound insulation. No light rail vibration impacts requiring mitigation were identified in the Expo Center/Hayden Island Segment. The eight light rail noise impacts at the floating homes would be best mitigated with the installation of sound barriers along the elevated light rail structure. A 3- to 4-foot acoustical absorbent sound wall or 6-foot reflective sound wall would be effective at reducing noise levels at these homes by 7 to 10 dBA.

Traffic Noise Impacts and Mitigation Options

Traffic and construction noise analyses are required by law for federal projects that 1) involve construction of a new highway, 2) substantially change the horizontal or vertical alignment, or 3) increase the number of through traffic lanes on an existing highway. Oregon policies also require the review and consideration of noise abatement on projects that substantially alter the ground contours surrounding a state highway.

FHWA and ODOT impact criteria for noise studies depend on existing land use or planned and permitted future land use. Existing land uses in the Expo Center/Hayden Island Segment include commercial, industrial, park/open space and residential. Most of the land uses near the LRT and highway improvements are commercial/industrial and park/open space. There is a large group of floating homes located along the southern edge of Hayden Island on both sides of I-5. Other residential land uses include the Red Lion Jantzen Beach Hotel, the Oxford

Suites, and the Courtyard by Marriott. There is also a large group of single and multi-family residential units east of I-5 along N Hayden Drive and N Tomahawk Drive.

As described in the discussion of transit noise impacts above, existing noise levels in the project corridor were modeled and noise levels currently exceed FHWA and ODOT traffic noise criteria for 96 noise-sensitive receptors located in the Expo Center/Hayden Island Segment. These receptors include floating homes, the south portion of Delta Park and at the Red Lion Columbia Center Hotel, which include all rooms facing toward I-5

The project includes removal of the floating homes closest to the I-5 crossing of the North Portland Harbor and the addition of 3.5 foot safety barriers along all sides of all elevated roadway structures. The combined effect of displacing noise sensitive properties nearest the project roadways, and the addition of the safety barriers, would result in no newly impacted noise-sensitive receptors in Expo Center/Hayden Island Segment. In addition, those receptors currently impacted will not experience substantial increases in the severity of those impacts.

Overall Conclusions Regarding Noise Impacts and Mitigation Options

Based on the information in the Noise Report, the Council finds and concludes that sound wall options are available and have been recommended to mitigate the identified light rail noise impacts in the Expo Center/Hayden Island Segment. Based also on information in the Noise Report, with the removal of some existing noise-sensitive receptors and the addition of safety walls, no new highway noise impacts are expected in the Expo Center/Hayden Island Segment. The final decision and recommendation to include the approved mitigation will be made during the final design process.

6.3.3 Criterion 5: Natural Hazards

> **"Identify affected landslide areas, areas of severe erosion potential, areas subject to earthquake damage and lands within the 100-year floodplain. Demonstrate that adverse impacts to persons or property can be reduced or mitigated through design or construction techniques which could be imposed during the NEPA process or, if reasonable and necessary, by local governments during the permitting process."**

Natural hazard impacts specific to the Expo Center/Hayden Island Segment are addressed in the following section. Natural hazard impacts, and associated mitigation measures, also are described in the Geology and Groundwater Technical Report (Geology Report) and the Water Quality and Hydrology Technical Report (Hydrology Report).

Overview of Natural Hazards Impacts in South/North Corridor and Mitigation Measures

The South/North Project, including the Columbia River Crossing portion, lies within the Portland Basin, a basin characterized by relatively low topographic relief with areas of buttes and valleys containing steep slopes. Much of the overall South/North Project alignment crosses developed land. Long-term impacts to the geologic environment consist of relatively minor changes in topography and drainage patterns, minor settlement of near-surface materials, and potential changes in slope stability and erosion. These impacts could occur as a result of excavation, placement of structures and fills and clearing and grading.

The geology and soils in the area of the South/North Project are typical of the Portland Basin. Soils within the South/North Corridor developed on flood and alluvial deposits. Where undisturbed, they are generally sandy to clayey loam and are well to poorly drained. However, much of the area is classified as urban land, where the original soils have been extensively modified or covered. Associated with the channel deposits, areas of highly organic silt and clay and deposits of peat may be encountered and require special construction techniques. Expansive (high shrink-swell) soils are present in the corridor.

The potential for major landslides within the South/North Corridor is very limited because the topography within the corridor is relatively gentle, and the geologic conditions are generally favorable.

The Pacific Northwest is a seismically active area and subject to earthquakes. Oregon has the potential for three types of earthquakes: crustal, intraplate and subduction zone. Although earthquake prediction is an inexact science, it is reasonable to assume that earthquakes will occur in Oregon.

Studies of relative earthquake hazards have been completed for much of the Portland area. These studies show that much of the South/North corridor lies in areas with relatively high potential for earthquake damage. Project design and estimated construction costs reflect the need to conform to the relevant seismic standards for capital construction.

To mitigate earthquake hazards, TriMet and ODOT will adhere to applicable Federal, State and local building codes or standards for bridges and structures in the South/North Project.

Groundwater may be encountered at shallow depths along sections of the corridor that cross the flood plains of rivers and creeks. Other areas of shallow groundwater levels may exist locally, controlled by local variations in soil type and drainage.

Additionally, the study area intersects major rivers, minor water courses and floodplains within the lower Columbia and Willamette River basins. Floodplains are valuable natural resource areas providing fish and wildlife habitat, flood control, stormwater storage, water quality enhancement, sediment and erosion control, and educational, recreational, research, and aesthetic uses. Executive Order 11988 directs federal agencies to conduct their activities in ways designed to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains.

Natural Hazard Impacts within the Expo Center/Hayden Island Segment

As shown in Exhibit 3-12 of the Geology Report, no specific *landslide areas* or steep slopes (greater than 25 percent) are identified in the Expo Center/Hayden Island Segment. As noted above, the potential for major landslides within the South/North Corridor is very limited because the topography within the corridor is relatively gentle. Although the LRT and highway improvements will cross the North Portland Harbor and the Columbia River on new bridge structures, the banks associated with the crossings are not particularly steep. As shown in Exhibit 3-4 of the Geology Report, the mapped surface unit for the bridge footprints is Quaternary alluvium and fill. In addition, historic aerial photographs for the area indicate that construction of North Portland Harbor and Columbia River bridge foundations and abutments would likely encounter fill embankments at Hayden Island. However, because steep slopes and landslides have not been identified near the proposed bridge footprints, no long-term adverse effects due to steep slopes or landslides are anticipated.

Exhibit 3-5 of the Geology Report identifies soil types within the greater Expo Center/Hayden Island Segment area, and Exhibit 3-6 describes the erosion hazard ratings for these soil types. As shown in Exhibit 3-5, the project footprint extends to areas with three soil types – Pilchuck-Urban land complex (0 to 3 percent slope); Sauvie-Rafton-Urban land complex (0 to 3 percent); and Rafton silt loam, protected. These soil types are not considered to have *severe erosion potential*.

As stated above, the Pacific Northwest is a seismically active area and is subject to *earthquake damage*. Bridges are vital links in the transportation system and are often especially vulnerable during seismic events. The Geology Report does not identify any seismically active earthquake faults in the Expo Center/Hayden Island Segment. However, several types of earthquakes could occur in the project area. In particular, there is a large, offshore fault located in the Pacific Ocean west of the I-5 crossing. Exhibit 3-16 of the Geology Report shows a map of the relative earthquake hazard ratings in the project area. These ratings take into account a variety of potential earthquake effects, with Zone A being the most hazardous areas and Zone D being the least hazardous. Earthquake effects include ground motion amplification, slope instability, and soil liquefaction, all of which have a high potential to impact public safety and cause structural damage and economic disruption. The Expo Center/Hayden Island Segment is identified in relative earthquake hazard Zones A and B.

The Hydrology Report includes background information on hydrology and floodplains in the CRC project corridor. The I-5 bridges are located at river mile 106 of the Columbia River. The Columbia River is highly constrained within the project area by existing levees and landform. In addition, 10 bridge footings are currently located below the river's ordinary high water level (OHW), and also constrict the river. The North Portland Harbor is a large channel of the Columbia River located between North Portland and the southern bank of Hayden Island. A flood control levee runs along the south bank of the North Portland Harbor and forms a boundary between the adjacent neighborhoods and the harbor.

The installation of piers within the Columbia River and North Portland Harbor would encroach upon the Columbia River's *100-year floodplain*. However, this would result in little, if any, increase in flooding risks, given the relatively small size of the bridge piers compared to the size of the Columbia River. The LRT and highway improvements in the Expo Center/Hayden Island Segment would either avoid or be elevated above the floodplain, with no significant encroachment or fill that would cause adverse flooding conditions or changes in flood velocity. The volume of displacement presented by the piers is expected to be insignificant.

Mitigation Options for Natural Hazard Impacts in the Expo Center/Hayden Island Segments

Based on the information contained in the Geology Report, the Council finds that no *landslide areas* or *areas of severe erosion potential* have been identified in the Expo Center/Hayden Island Segment. While historical evidence of seismic activity in Oregon is minimal, recent studies indicate that western Oregon may be subject to a greater risk from *earthquake hazards* than previously thought. Site geology has a significant impact on earthquake damage. Young unconsolidated silt, sand, and clay deposits are associated with enhanced earthquake damage through amplification of shaking, settlement, liquefaction, and landsliding.

Potential mitigation measures to address geologic/soils conditions are provided in the Geology Report. During final engineering stage of the project, site-specific assessments would include additional geotechnical testing and monitoring. Soft foundation conditions, delineated by the exploration program, can be mitigated with proper designs. The site-specific assessments will also assess the use of soil stabilization techniques to minimize liquefaction of soils. Stabilization techniques include the use of compaction grouting, stone columns, and other techniques.

Mitigation measures would also apply to project structures. The project will provide seismic upgrades to existing structures, as-needed, and new and upgraded structures will adhere to the following applicable building codes and standards:

- AASHTO LRFD Bridge Design Specifications
- AASHTO Guide Specifications for LRFD Seismic Bridge Design
- WSDOT Bridge Design Manual, LRFD M 23-50 (BDM)
- ODOT Bridge Design and Drafting Manual (BDDM)
- City of Vancouver Municipal Code (VMC) Chapter 20.740.130 Critical Areas Protection- Geologic Hazards Areas

The project will use elements such as drilled shafts, driven piles, abutments and retaining walls. Structural designs will take into consideration stormwater infiltration or other future changed conditions near shallow footings, retaining walls and/or other structures that could increase the potential for soil liquefaction during a future seismic event.
Based on the facts in the Geology Report, the Council finds that long-term impacts to geology and soils in the Expo Center/Hayden Island Segment are minor and can be mitigated. Mitigation could consist of using standard engineering practices to construct stable slopes; design of bridges to meet Uniform Building Code seismic standards; and techniques such as excavation and backfilling, special footing and foundation designs, and special construction techniques such as surcharging and dewatering to address the stability of artificial fill and the high water table on Hayden Island. Additionally, the Columbia River Crossing Project would replace existing bridges with new and retrofitted structures built to modern seismic safety standards, and would stabilize weak soils along the Columbia River on Hayden Island and

around Marine Drive. The Council concludes that the proposed LRT and highway improvements would significantly improve public safety and structure stability during earthquake seismic events when compared with existing conditions.

The North Portland Harbor and the Columbia River will span the 100-year *floodplain*, but with no significant fill or encroachment into the floodplain resulting from pier placement. A minor amount of fill will be associated with the placement of piers for the new bridges. However, the Council finds that floodplain impacts, if any, would be very small given the relatively small size of the bridge piers in comparison to the Columbia River. A flood-rise analysis will be conducted during the final design to calculate the impact that piers in the water will have on flood elevation, in accordance with local regulations and Executive Order 11988 – Floodplain Management. If flood-rise exceeds the allowable limit, the rise would be mitigated through floodplain excavation (cut/fill balance) activities, and the Council finds that such mitigation is feasible

6.3.4 Criterion 6: Natural Resource Impacts

> **"Identify adverse impacts on significant fish and wildlife, scenic and open space, riparian, wetland and park and recreational areas, including the Willamette River Greenway, that are protected in acknowledged local comprehensive plans. Where adverse impacts cannot practicably be avoided, encourage the conservation of natural resources by demonstrating that there are measures to reduce or mitigate impacts which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the permitting process."**

Natural resource impacts specific to the Expo Center/Hayden Island Segment are addressed in the following section. Natural resource impacts, along with associated mitigation measures, also are described in the Ecosystems Technical Report (Ecosystems Report), the Wetlands Technical Report (Wetlands Report), the Parks and Recreation Technical Report (Parks Report) and the Visual and Aesthetics Technical Report (Visual Report).

Identification of Impacts to Significant, Protected Natural Resources in the Expo Center/Hayden Island Segment

Criterion 6 of this Land Use Final Order requires identification of adverse impacts on *significant* resources (fish and wildlife, scenic and open space, riparian, wetland and park and recreational areas, including the Willamette River Greenway) that are *protected* in acknowledged local comprehensive plans. Oregon planning under Statewide Planning Goal 5 calls for inventories and protection of significant natural resources including fish and wildlife habitat, wetlands, riparian and scenic and open space areas. Because not all natural resource sites within the project area are identified as significant by local governments in their comprehensive plans, the scope of analysis of natural resource impacts under Criterion 6 is generally narrower than the scope of analysis contained in the federal environmental impact statements.

For the Columbia River Crossing portion of the South/North Project, the relevant acknowledged comprehensive plan is the City of Portland Comprehensive Plan. That plan includes policies and objectives to address conservation of a range of natural resources identified in Statewide Goal 5, including wetlands, riparian areas and water bodies, fish and wildlife habitat, scenic routes and viewpoints, and significant upland areas. The City has completed an inventory and analysis of natural resource sites, identified the significance of each resource site and provided varying levels of protection to specific sites through the application of Environmental Overlay zones (E-zones). The city applies two environmental overlay zones: environmental protection (ep) and environmental conservation (ec). The *environmental protection zone* provides the highest level of protection for resource areas deemed highly valuable through a detailed inventory and economic, social, environmental, and energy (ESEE) analysis. Development is largely prevented in these areas. The *environmental conservation zone* areas are also considered valuable, but can be protected while allowing "environmentally sensitive urban development."

Within the Expo Center/Hayden Island Segment, the Council finds that the environmental conservation zone applies to the Columbia River, North Portland Harbor, Columbia Slough, and the Vanport Wetlands to identify and protect these areas for multiple resource values, including *fish and wildlife habitat, riparian corridors, open space and scenic and wetland areas.* However, the E-zone regulations are superseded by the regulations of Peninsula Drainage District #1 at the Vanport Wetlands. As identified in the Ecosystems Report, about 41 acres within the project's footprint in the Expo Center/Hayden Island Segment are within Portland's E-zones, and impacts to these resources are regulated.

The Council also finds that N Marine Drive is identified as a *scenic corridor* in the Portland Comprehensive Plan and the Columbia Slough has been defined as a *scenic waterway* by the City of Portland, and could be considered a recreational resource. Further, the Portland Comprehensive Plan designates the planned extension of the 40-Mile Loop *recreational trail* along N Marine Drive adjacent to the south side of the North Portland Harbor. Additionally, the Portland Comprehensive Plan designates lands within the Expo Center/Hayden Island Segment as *Open Space.* This designation provides for the enhancement and preservation of public and privately owned open, natural, and improved parks and recreational areas. Designated Open Space is found on the east side of I-5 between N Martin Luther King Jr. Boulevard and N Hayden Meadows Drive (Delta Park), and on the west side near the Expo Center exit. The Open Space designation also borders the N Columbia Boulevard interchange at the southern end of the area of primary impact. Based on these facts, the Council concludes that the natural resources highlighted above are significant and afforded some protection under the acknowledged Portland Comprehensive Plan.

Fish and Wildlife Habitat. The Columbia River and North Portland Harbor are major aquatic resources in the Expo Center/Hayden Island Segment and are recognized as significant natural resources for multiple values, including *fish and wildlife habitat.* Shorelines along both of these waterways have been substantially altered and now support limited natural vegetation. These aquatic resources could be directly affected by one or more of the following activities: 1) in-water construction work, 2) construction in or near riparian areas, 3) re-routing of stormwater drainage from roadways and bridges, and 4) permanent structures placed in or removed from waterways.

Historically, the project area was forested, with forested wetlands along the Oregon shoreline and on Hayden Island. The Oregon shoreline was part of a large floodplain wetland system and included many sloughs, back channels, and small or seasonal lakes. Urban development has substantially degraded historic habitat in all parts of the project area, particularly for land-based species. Exhibit 3-10 of the Ecosystems Report shows the amount of different habitat types within the project area. The largest area is comprised of open water, as this classification includes the portions of the Columbia River, North Portland Harbor and Columbia Slough within the project area, and stretches up and downstream from the existing I-5 bridges to account for hydroacoustic attenuation areas. Outside of open water, the project area is almost exclusively occupied by urban habitats. Less than2 percent of the project area is classified as either wetland or forest habitat, with most of this occurring as small patches isolated from other natural areas.

As described in the Ecosystems Report, the Columbia River and its tributaries are the dominant aquatic system in the Pacific Northwest. In the project area, river height and flow rate are influenced by tides and upstream dams. Because the project is within a heavily developed area, riparian habitat quality along the banks of the Columbia River is poor. Dikes and levees, particularly when reinforced with riprap or concrete, as is the case near the I-5 bridges, make poor quality riparian habitat. The river in this area offers pool and glide habitats for fish, though the water quality is limited for several pollutants. The I-5 bridges influence aquatic habitat conditions in the main channel and North Portland Harbor. Bridge piers in the river provide potential refuge from the current for both predatory fish and juvenile salmon.

The North Portland Harbor channel, on the south side of Hayden Island, supports several floating home communities and commercial and recreational moorages. Average depth in this channel is about 14 feet, with deeper water on the south side. The south shore supports active industrial uses. Piers and moorages line the shore, providing very low quality riparian habitat. Piers and floating homes provide shade and refuge for both predatory fish and juvenile salmon. With the exception of a few large cottonwoods along both shores of the harbor, ornamental plantings and weedy exotic species comprise most of the vegetative cover. Only the open water of the river, and to a lesser extent the harbor, provides much habitat value to wildlife. A variety of resident and migratory waterfowl are expected on both waterways, as are small mammals such as nutria and river otter.

The Ecosystems Report contains detailed information on the status of protected species in the project corridor. Bald eagles use the Columbia River and environs to forage for fish and waterfowl, but no nesting or breeding sites are known within one mile of the project. Bald eagles were removed from the federal ESA list in August 2007, but are still listed as threatened under Oregon and Washington ESAs.

Peregrine falcons are known to be present in the project area, and utilize the existing I-5 bridge structures year-round. This species was removed from the federal ESA list in 1999 and from the Oregon ESA list in March 2007.

The project area is located in the Pacific flyway, the major north-south route for migratory birds that extends from Patagonia to Alaska. Many migratory birds use the area for resting, feeding, and breeding.

The Columbia River is an important passageway for anadromous fish species moving between the ocean and upstream spawning areas, and also provides significant habitat for resident fish species. The Columbia River and North Portland Harbor are known to support listed anadromous salmonids, including Chinook salmon, chum salmon, sockeye salmon, steelhead trout, and coho salmon, which use this habitat primarily for migration, holding, and rearing. Exhibit 3.9 of the Ecosystems Report summarizes the protected aquatic species known to use or potentially be using waterways in the project area.

The Council finds that the existing I-5 highway, bridges, and interchanges are located in a highly urbanized area. The combined effect of existing transportation facilities and development patterns results in adverse impacts to aquatic, riparian, and terrestrial habitats and the species that rely on them for survival. Existing fish and wildlife habitat impacts include the following: 1) Untreated stormwater runoff has degraded water quality, 2) Columbia River bridge piers provide a refuge for fish species that prey on juvenile salmon, and 3) the bridge and roadway alignment travels through locally and regionally designated habitats.

In general, the Council finds that the long-term effects to aquatic habitat would be consistent with current conditions with the continued presence of bridge piers in the Columbia River and a major transportation structure over the river. Compared with the No-Build Alternative, the Project has fewer bridge piers; however, the piers will be bigger than those currently in place, casting larger shadows and displacing some shallow water habitat.

The Council finds that effects to riparian habitat will be negligible in the Columbia River and North Portland Harbor, as there is very little functioning riparian vegetation in the main project area. About 35 acres within Portland's E-zones would be directly impacted by light rail and highway improvements in the Expo Center/Hayden Island Segment. However, the additional acreage impacted should not adversely affect the overall function of terrestrial and riparian habitat or the long-term sustainability of plant and animal species in the project area. The project improvements will mostly be constructed within existing rights-of-way or land already developed to urban densities, areas that generally provide poor quality fish and wildlife habitat. The project will revegetate disturbed shoreline areas, minimizing long-term effects to Columbia River riparian habitat. There will be no excavation or removal of trees from the Columbia Slough riparian area. Therefore, the project will have no effect on Columbia Slough riparian habitat.

Scenic and Open Space Areas. *Scenic and open space* resources recognized in the City of Portland's *Scenic Views, Sites and Drives Inventory, Scenic Resource Protection Plan* include the Marine Drive scenic corridor, the North Portland Harbor scenic corridor, the historic northbound I-5 truss and lift bridge, and the Columbia River scenic corridor. Additionally, the Columbia Slough has been defined as a scenic waterway by the City of Portland and could be considered a recreational resource.

The Council recognizes that highways and major transit facilities are highly visible public facilities that can noticeably affect the visual character of surrounding landscapes and the perception of visual resources. Such changes can be of keen interest to local residents and jurisdictions as well as to travelers using the facilities.

The Visual Report describes existing conditions and long-term effects to the viewsheds in the project corridor. A viewshed, or "landscape unit", is the portion of the landscape that can be seen from within the project area and that has views of the project area. The boundaries of a viewshed are determined by the surrounding topography, vegetation, and built environment. Two viewsheds are described for the Expo Center/Hayden Island Segment: 1) the Columbia Slough landscape unit, and 2) the Columbia River landscape unit.

Mixed industrial-commercial development, sports fields, and marinas define the visual character of the Columbia Slough landscape unit. Visual resources include the Columbia Slough Scenic Corridor, stands of mature trees, Vanport Wetlands (west of I-5), and views of the Tualatin Hills, Mount St. Helens, and the Washington Cascades. Viewer sensitivity in the Columbia Slough landscape unit is low for drivers and high for recreational users.

The river defines the visual character of the Columbia River landscape unit. Visual resources include the Columbia River and its shoreline and views of Mt. Hood and the Tualatin Hills. Viewer sensitivity and vividness in the Columbia River landscape unit is high.

The primary elements of the Columbia River Crossing Project that would affect visual quality and character are the new bridge structures across the North Portland Harbor and the Columbia River. The Council finds that the visual effects in the Columbia Slough scenic corridor would be minor.

Visual impacts to the N Marine Drive and Columbia River scenic corridors would occur from:

- The greater heights and widths of the new structures across the Columbia River;
- The widening of the I-5 corridor due to the addition of auxiliary lanes along I-5;
- The new light rail/vehicular/bicycle/pedestrian bridge between Hayden Island and Expo Center Drive; and
- The wider or higher ramps for reconfigured interchanges at Marine Drive and Hayden Island.

This section of the N Marine Drive Scenic Corridor borders the North Portland Harbor, a narrow waterway dominated on the east by the large horizontal forms of I-5 and heavy industrial activities and busy roads along its south banks. Older, wooden and metal storage and other buildings rim the bank. Views from the south and north bank of the Harbor are blocked to the east by the I-5 bridge but focus on a cluster of small docks and houseboats nestled against the south shore of Hayden Island adjacent to the bridge. Views west down the harbor focus on the channel and on river-related commercial and industrial activities along both banks.

The new light rail/vehicular/bicycle/pedestrian bridge will cross under N Marine Drive and over the North Portland Harbor on an approximately 1000 foot structure constructed west of the existing I-5 bridge over the harbor. The LRT bridge would remove some houseboats and vegetation along both banks of the harbor. The bridge would also introduce a new overhead structure over the Marine Drive and North Portland Harbor scenic corridors. However, because the multi-modal bridge will closely parallel the existing I-5 bridge and is located in an intensively urban, industrial section of the scenic corridor, the Council finds that the project will not result in a significant adverse impact on either scenic corridor.

The reach of the Columbia River crossed by the I-5 bridges is flat, open water bordered by industrial, commercial, residential and undeveloped areas along its shoreline. The river is a significant regional resource and the dominant visual element within this segment because of its large scale and openness. The river also serves as a dramatic gateway between Oregon and Washington. The Visual Report concludes that the new bridge forms over the Columbia River and the resulting changes to views of (and from) the Columbia River would be mostly positive. Potential impacts would include:

- Removal of the visually complicated truss structures and lift towers of the existing I-5 bridges. This action would remove an obstruction of views from the higher deck and from the river. However, this action would remove an important contributor to the area's historic context (the I-5 bridges) and a character-defining aspect of interstate travel.
- From I-5, views of the Portland and Vancouver skylines, distant shorelines, rolling hills, and mountain profiles would generally improve. Toward I-5, views of open water and shorelines from shoreline-level and elevated viewpoints would also generally improve.

The Council finds that high-quality design and construction of the proposed transit and highway facilities will be important mitigation tools for visual quality and aesthetics associated with designated scenic and open space resources. The City of Portland and other stakeholders will continue to discuss the aesthetic attributes of the new bridge structures to best mitigate potential visual impacts and to create a noteworthy visual feature. The Council understands that design guidelines have been developed and will be used during the final design phases of the project to guide decisions that impact visual character and quality. It considers the design of the I-5 bridges to be a substantial visual mitigation opportunity for the project. Appropriate conditions that are reasonable and necessary and do not prevent implementation of the LUFO can be imposed through the local review process to avoid or mitigate adverse impacts on designated scenic resources and viewpoints.

Riparian Areas. As described in the discussion of fish & wildlife habitat, the *riparian area* along the North Portland Harbor and the Columbia River has been significantly altered with development. Shorelines along both of these waterways now support limited natural vegetation. The project improvements will mostly be constructed within existing rights-of-way or on land already developed to urban densities, areas that generally provide poor quality fish and wildlife habitat. The project will revegetate disturbed shoreline areas, minimizing long-term effects to Columbia River riparian habitat. There will be no excavation or removal of trees from the Columbia Slough riparian area. Therefore, the project will have no adverse effect on Columbia Slough riparian habitat.

Wetland Areas. The Wetlands Report notes that there are large wetland systems east and west of the immediate project area in the Expo Center/Hayden Island Segment, including the Vanport Wetland, Force Lake, Smith and Bybee Lakes, and West Hayden Island wetlands. Additionally, the Columbia Slough watershed has substantial wetlands and other water present within the urban matrix. Exhibit 3.6 identifies the following field-identified wetlands in the Expo Center/Hayden Island Segment: 1) Victory interchange wetlands, 2) Schmeer Slough, 3) Walker Slough, 4) Expo Road wetland, and 5) Vanport Wetlands. The wetland delineation report was submitted for concurrence to the Oregon Department of State Lands (DSL) in 2008 and DSL has concurred with the delineation (#WD 2008-0205). In addition to field-identified wetlands, a potentially jurisdictional water area is also identified in Exhibit 3-6 of the Wetlands Report (PJWA O). The CRC project has the possibility of encroaching upon the eastern edge of PJWA O, however, lacking permission from the property owner to enter the Vancouver Way property, neither the project team nor regulatory agencies can confirm the presence or absence of jurisdictional wetlands at this location.

Based on information in the Wetlands Report, the Council finds that the project footprint would not encroach upon any identified wetlands in the Expo Center/Hayden Island Segment. The new impervious surface will not discharge untreated stormwater runoff into the wetlands and the wildlife activities that may be impacted are already negatively affected by the urbanized environment.

Park and Recreational Areas and Willamette River Greenway. Designated *park and recreational areas* close to the proposed LRT and highway improvements in the Expo Center/Hayden Island Segment include East Delta Park, the Marine Drive Multi-Use Trail and the proposed Bridgeton Multi-Use Trail. The project improvements are located outside of the boundaries of the *Willamette River Greenway.*

East Delta Park is a regional park located east of I-5 between N Denver and Martin Luther King Jr. Boulevard. East Delta Park encompasses about 85 acres and facilities include softball and soccer fields, control line flying field, sand volleyball courts, playground, and off-leash dog area on ODOT property. Approximately 0.4 acre of off-leash area associated with East Delta Park, but located in ODOT right-of-way, would be permanently acquired for the project improvements.

The Marine Drive Multi-use trail is a designated *recreational trail* along N Marine Drive. The five-mile segment extending from I-5 west to Kelley Point Park connects to the Marine Drive interchange and North Portland Harbor bridges. The 40-Mile Loop is designated a significant recreational resource and is protected in the acknowledged City of Portland Comprehensive Plan. Project improvements in the Expo Center/Hayden Island Segment would not require any use of the trail. Based on information included in the Parks and Recreation Report, the Council finds that improvements to the bicycle and pedestrian facilities would represent a large improvement over the circuitous paths that exist today within the loops and ramps of the Marine Drive interchange. New, wide multi-use paths beneath the Marine Drive interchange would connect both sides of I-5 to the Expo Center light rail station, East Delta Park, the Marine Drive Multi-use Trail, and the crossing over North Portland Harbor to Hayden Island. Additionally, the Council finds that the new improvements to bicycle and pedestrian facilities within the Marine Drive interchange area could be connected to the proposed Bridgeton Trail sometime in the future.

Mitigation Options for Natural Resource Impacts in the Expo Center/Hayden Island Segments

The Council finds that the South/North Project will have no adverse impacts on park areas and designated recreational trails, riparian areas and identified wetland areas. Pedestrian and bicycle improvements in the vicinity of the Marine Drive interchange will substantially improve connections to the Marine Drive multi-use recreational trail.

The Council finds that the bridges across the North Portland Harbor will have an impact on the scenic and visual character of this segment. However, by locating the LRT bridges in close proximity to the existing and more dominant I-5 bridges, the Council concludes that visual impacts will be reduced. Additionally, by locating the LRT alignment to the west of I-5, views up the Columbia River from the I-5 bridges toward Mt. Hood are not affected.

Construction of the new LRT and highway bridges over the North Portland Harbor and the Columbia River could result in adverse impacts to wildlife habitat. Impacts to riparian habitat along North Portland Harbor would be limited to the loss of several relatively large cottonwood trees along the harbor shorelines. Since these trees occur in small, isolated stands surrounded by development, their loss would not adversely affect wildlife populations. Small, isolated stands of trees in an urbanized area afford relatively poor quality habitat due primarily to the lack of habitat diversity, lack of buffering from human activity and lack of movement corridors to other habitat areas.

Long-term impacts to fisheries include the removal of a small amount of channel bottom habitat due to construction of the bridge pier foundations. None of the bridge piers is expected to adversely modify critical habitat; however, elements such as cover, shelter, refuge, holding, or rearing might be adversely affected to a relatively small extent. No suitable spawning habitat, and limited rearing and holding habitat for juvenile salmonids, is present in the area of the bridge crossings. As a result of the analysis and findings presented in the *Biological Assessment for Threatened, Endangered, and Candidate Fish* and the approved Biological Opinion, the Council concludes that, with implementation of a number of conservation measures, the South/North Project would not likely jeopardize populations of threatened or endangered fish species or adversely modify their critical habitat in the project area. However, due to the extent of in-water work and the presence of many ESA-listed fish, it is acknowledged that adverse effects to individual fish and their critical habitat are likely to occur, but effects are avoided or minimized to the extent practicable. The Council notes that NMFS produced this finding in their Biological Opinion.

The Council finds that the following mitigation measures outlined for Threatened, Endangered, and Candidate Fish in the Expo Center/Hayden Island Segment are available to mitigate adverse impacts to the North Portland Harbor and the Columbia River and could be imposed as conditions of approval during the FEIS process and/or the local permitting process if reasonable and necessary:

- Implement erosion and sediment control measures to prevent sediment from entering surface waters.
- Time in-water construction activities based on discussions with NMFS and the Oregon Department of Fish and Wildlife, and take into consideration factors such as timing of fish migration and construction schedule and cost.
- Use of hydroacoustic attenuation measures to reduce impacts on the behavior of fish and sea lions.
- Conduct sediment sampling prior to construction of in-water bridge piers in order to determine the presence of and characterize potential contaminants.
- Limit the operation of equipment in the active river channel to the minimum necessary.
- Clean all equipment that is used for in-water work prior to entering the water.
- Do not store or transfer petroleum products within 150 feet of the active river channel, unless isolated within a hard zone with suitable containment measures in place.
- Assure the development and implementation of plans for the safe storage and containment of all hazardous materials used in project construction.
- Include measures in the plan for containment berms and/or detention basins, where appropriate.
- Develop a site-specific sediment control and erosion control plan prior to project implementation.

The Council finds that these types of measures could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the local permitting process.

6.3.5 Criterion 7: Stormwater Runoff

> **"Identify adverse impacts associated with stormwater runoff. Demonstrate that there are measures to provide adequate stormwater drainage retention or removal and protect water quality which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the permitting process."**

Stormwater runoff impacts specific to the Expo Center/Hayden Island Segment are addressed in the following section. Stormwater impacts and mitigation measures are also described in the Water Quality and Hydrology Technical Report.

General Overview of Stormwater Runoff Impacts and Mitigation

The South/North Project intersects major rivers, minor water courses and floodplains within the lower Columbia and Willamette River basins, including the Willamette and Columbia Rivers. Existing waterways in the South/North Project area receive large volumes of stormwater and surface runoff containing a variety of pollutants, including chemicals and nutrients from fertilizers and pesticides, roadway sediments, motor vehicles and other man-made or natural sources. Water quality in the corridor is typical of drainage basins with urban development.

Areas developed or under development increase the rate and volume of peak stormwater discharges. The peak runoff rate and volume of stormwater discharges usually increase when construction removes vegetation, compacts soils, and/or covers significant portions of a site with buildings or pavement. Typical problems associated with increases in peak discharge rates include higher flow velocities in streams, more erosion, and more frequent flooding. These problems degrade habitat areas, damage property, and require increased maintenance of culverts and stormwater facilities.

A range of federal laws, state statutes, and local and regional ordinances address hydrologic impacts from development. State and local regulations typically establish standards for controlling the peak rate of stormwater runoff. Regional standards, contained in Title 3 of Metro's *Urban Growth Management Functional Plan*, more broadly address flood mitigation, erosion and sediment control, and the protection of long term regional continuity and integrity of water quality and flood management areas. Federal National Flood Insurance Program criteria and Executive Order 11988 regulate development in flood prone and floodplain areas.

Potential sources of water quality degradation include pollutants from chemicals and nutrients from natural or man-made sources. Eroded sediments and other pollutants can be carried by stormwater to downstream receiving waters. Resulting water quality issues can impair the beneficial use of local waterways for recreation, wildlife habitat, and watering of livestock or other farm animals.

Water quality impacts are generally regulated by federal and state guidelines, usually through required water quality standards for receiving waters quality and limitations on the generation and release of urban pollutants.

Stormwater detention treatment facilities can be used to mitigate the effects of long-term and short-term hydrologic and water quality impacts changes. State and local regulations establish standards for detention stormwater treatment and other methods of stormwater control which can be applied as conditions of approval during local permitting proceedings. Mitigation for hydrologic and impacts are is usually accomplished by reducing or attenuating peak runoff rates, by either detaining (store and release), retaining (store but do not release) through stormwater detention , or infiltrating runoff from a developed site. Stormwater detention provides water quality benefits because storage promotes settlement of suspended sediments and other pollutants. Stormwater detention and water quality facilities are typically combined to use land more efficiently. "Dry" ponds, bioretention ponds, "wet" ponds, constructed treatment wetlands, retention ponds, biofiltration swales, biofiltration swales filter strips, underground vaults, bioslopes, and constructed wetlands dry wells are typically used stormwater treatment facilities. The Council finds that a range of measures are available and site-specific mitigation for hydrologic and water quality impacts will be refined and selected during the Final Design and local permitting processes.

All of these facilities detain stormwater by releasing runoff through a regulating structure, such as an orifice or weir. Stormwater detention provides water quality benefits because storage promotes settlement of suspended sediments and other pollutants. Stormwater detention and water quality facilities are typically combined to use land more efficiently.

Source control Best Management Practices (BMPs) are intended to mitigate pollutants generated through normal operation and use of buildings, roadways, and other urban facilities. The Council finds that water quality degradation resulting from erosion and sedimentation and the release of pollutants can be minimized through the use of BMPs during construction. Construction BMPs include use of barrier berms, silt fencing, temporary sediment detention basins, plastic covering for exposed ground, vegetative buffers (hay bales), and restricting clearing activities to dry weather periods to contain sediment on-site. Further requirements could include diapering of all dump trucks to avoid spillage, and cleaning of heavy equipment tires and trucks before they are allowed to drive off-site. A variety of special BMPs can also be used at crossings or adjacent to streams or watercourses during construction.

In general, the Council finds that water quantity and water quality and hydrology impacts created by the construction and operation of the Columbia River Crossing Project can be substantially mitigated by complying with the following: DEQ water quality standards; Army Corps of Engineers Section 404 permit regulations; Department of State Lands regulations for instream activities; National Marine Fisheries Service (NMFS) conservation measures specified in the project Biological Opinion; Metro Title 3 regional standards; and City of Portland erosion control and stormwater regulations. These rules and regulations outline Best Management Practices to prevent or limit pollutants from entering surface waters through urban drainage systems. These types of measures could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the local permitting process.

Stormwater Runoff Impacts and Mitigation Options with the Expo Center/Hayden Island Segments

Within the Expo Center/Hayden Island Segments, specific water bodies include the Columbia Slough, the Columbia River and North Portland Harbor. As described in the Water Quality and Hydrology Report, the Columbia Slough is a slow-moving, low-gradient drainage channel running nearly 19 miles from Fairview Lake in the east to the Willamette River in the west. Water levels are managed with pumps, weirs, and levees. The levee system protects most of the floodplain in the vicinity of I-5 against flooding. Within the project area, the Columbia Slough is currently on Oregon's 303(d) list because it does not meet water quality standards for four parameters.

The I-5 crossing of the Columbia Slough is in a highly urbanized area. Riparian habitat along the slough has largely been replaced by buildings and paved surfaces compared to historic conditions. Riparian areas along the Slough are generally not adequate to provide shade, bank stabilization, sediment control, pollution control, or stream flow moderation. Within the project area, I-5 is elevated on embankments or structures and, in general, the highway drainage systems do not handle runoff from outside the right-of-way.

I-5 crosses the Columbia River near river mile 106.5. North Portland Harbor, the portion of the Columbia River running south of Hayden Island, lies within the project area. Runoff from I-5 on Hayden Island drains directly into the Columbia River and North Portland Harbor. The east portion of Hayden Island is highly developed, with large hotels, a shopping center, residential communities, and other commercial activities. The western portion of the island is undeveloped and is comprised of pasture, woods, and wetland areas. Within the project area, the Columbia River is currently on Oregon's 303(d) list because it does not meet water quality standards for six parameters. DEQ does not differentiate between the North Portland Harbor and the Columbia River when compiling the 303(d) list.

Project data show four outfalls that drain to the Columbia River/North Portland Harbor within the project area. On Hayden Island, runoff from I-5 discharges directly to the Columbia River through road-side grates located along the entire span. Runoff from the bridge is not treated prior to release to the river.

As summarized in the Water Quality and Hydrology Report, the differences in long-term effects on water quality between the Columbia River Crossing Project and the No-Build Alternative are substantial. Although the Project would increase the total amount of pollutant generating impervious surfaces in the Columbia Slough Watershed and the Columbia River Watershed, the amount of untreated impervious surface would drop dramatically compared to existing conditions and the No-Build Alternative. This is because, with the Project, stormwater runoff from the entire Contributing Impervious Area (CIA) would be treated, while stormwater runoff from most of the existing impervious surfaces does not currently undergo stormwater treatment.

Based on the information contained in the Water Quality and Hydrology Report, the Council concludes that no adverse hydrologic or water quality impacts are expected in the Expo Center/Hayden Island Segment. The Project would increase overall impervious surfaces by about 28 acres, which could result in increased stormwater runoff rates and volumes and increase the amount of pollutants in stormwater. Without mitigation, this would affect the hydrology of project waterways. However, the Columbia Slough and the Columbia River are large water bodies and the project-related increase in stormwater volume would not result in a measurable increase of flows in these surface waters. Additionally, stormwater treatment design for the project corridor includes a number of stormwater treatment and/or infiltration facilities to reduce pollutants (including sediments and metals). Therefore, although the impervious surface area will increase by about 28 acres, untreated pollution generating surface area would be reduced from 219 acres to 0 acres.

The Council finds that, as described in the Water Quality and Hydrology Report, the Project will provide treatment not only for the new impervious area, but also for runoff from existing impervious surface area that does not currently receive treatment. The Council concludes that the project will provide treatment of approximately nine times the area of additional impervious surface being added as part of the Locally Preferred Alternative and will result in overall positive effects to the water quality and hydrology of receiving waters. Stormwater runoff would be treated in compliance with current standards before being discharged to project area water features.

The Council recognizes that specific and detailed mitigation erosion control and water quality measures will be required for the construction of the LRT facilities and highway improvements in the Expo Center/Hayden Island Segment. The project team has prepared a draft stormwater management design in order to evaluate general feasibility and water quality effects associated with the project. For the portion of the Columbia River Crossing project in Oregon, the draft was prepared to meet the stormwater management requirements of ODOT and the City of Portland. The draft design includes gravity pipe drainage systems that would collect and convey runoff from the new bridges, transit guideway, and road improvements. Stormwater treatment facilities would reduce total suspended solids (TSS), particulates, and dissolved metals to the maximum feasible extent before runoff reaches surface waters.

The following stormwater treatment devices are included in the draft stormwater management design:

- Bioretention ponds – infiltration ponds that use an engineered (amended) soil mix to remove pollutants as runoff infiltrates through this material and into underlying soils.
- Constructed treatment wetlands – shallow, permanent, vegetated ponds that function like natural wetlands. They remove pollutants through such means as sedimentation, microbial activity, and uptake by plants.
- Soil-amended biofiltration swales – channels with mild slopes and shallow depths of flow. The channels are dry between storm events and they treat runoff by filtration as runoff flows through the vegetated surface and amended soils.
- Soil-amended filter strips – similar to grass swales, filter strips are intended to treat sheet runoff from an adjacent roadway surface.
- Bioslopes – like filter strips, are intended to treat sheet runoff from an adjacent roadway surface. The percolating runoff flows through a special mixture of materials, which promotes the absorption of pollutants.

Based on the draft stormwater management design, the Council finds that a range of measures are available to mitigate stormwater impacts and site-specific mitigation for stormwater quantity and quality impacts associated with the LRT and highway improvements, including the bridge construction across the North Portland Harbor and the Columbia River. These measures will be refined and selected during the FEIS and local permitting processes.

6.3.6 Criterion 8: Historic and Cultural Resources

> **"Identify adverse impacts on significant historic and cultural resources protected in acknowledged comprehensive plans. Where adverse impacts cannot practicably be avoided, identify local, state or federal review processes that are available to address and to reduce adverse impacts to the affected resources."**

Historic and cultural resource impacts specific to the Expo Center/Hayden Island Segment are addressed in the following section following a more general discussion of historic and cultural resource impacts and mitigation. Historic and cultural resource impacts and mitigation measures are also described in the Historic Built Environment Technical Report (Historic Report), and the Archaeology Technical Report (Archaeology Report).

General Overview of Historic and Cultural Resource Impacts

Section 106 of the National Historic Preservation Act of 1966, as amended, and Executive Order 11593 require that a federal agency consider the effect of a federally assisted project on any historic district, sites, buildings, structures, objects or any archaeological sites listed in or eligible for inclusion in the National Register of Historic Places.

Throughout earlier phases of the Columbia River Crossing Project, as with previously approved segments of the South/North Project, alternatives and options have been developed, evaluated, narrowed and refined. A significant objective in the narrowing and refinement of alternatives and options has been to avoid where practicable, or to minimize where avoidance is impracticable, potential impacts to historic and cultural resources

During preliminary and final engineering, further design work will be completed that would further attempt to avoid, minimize and/or mitigate adverse impacts to historic and cultural resources. Under federal procedures, the resulting impact analyses and commitment to feasible mitigation measures will be completed in coordination with the Oregon State Historic Preservation Officer (SHPO) and the Advisory Council for Historic Preservation (ACHP). A Memorandum of Agreement between FTA, FHWA, SHPO and ACHP and others will be executed to define how the project will mitigate adverse effects to historic and cultural resources.

Project staff, in consultation with Oregon's State Historic Preservation Officer, made a determination of the "area of potential effect" for that portion of the Columbia River Crossing Project within Oregon. The criteria of effect and criteria of adverse effect as set forth in the National Historic Preservation Act are highlighted below. The Council agrees with and adopts these criteria for purposes of measuring compliance with Criterion 8.

An undertaking has *an effect* on an historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the *National Register*. For the purpose of determining effect, alteration to features of the property's location, setting, or use may be relevant depending on a property's significant characteristics and should be considered.

An undertaking is considered to have an *adverse effect* when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association. Adverse effects on historic properties include, but are not limited to:

- Physical destruction, damage, or alteration of all or part of the property;
- Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the *National Register*;

- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
- Neglect of a property resulting in its deterioration or destruction; and
- Transfer, lease or sale of the property.

The Historic Report includes an analysis of historic resources and historic districts within the Expo Center/Hayden Island Segments to determine the National Register of Historic Places status. It also assesses short and long-term impacts of the Project on historic, cultural and archeological resources. The Council accepts the methodology for determining "adverse effect" established in the Historic Report, and it adopts and incorporates by reference herein the facts and conclusions set forth in that document.

The City of Portland has completed an inventory of cultural resources and designated significant resource sites in its comprehensive plan. Some resources, which are inventoried in the local comprehensive plans under LCDC Goal 5, are not necessarily defined as "significant" through the NEPA process. Conversely, the federal environmental documents include discussion of some resources which are not inventoried or protected in Portland's plan. Criterion 8 only requires identification of adverse impacts on significant historic and cultural resources *protected* in acknowledged comprehensive plans.

General Discussion of Historic and Cultural Resource Mitigation Measures

The Historic Report outlines general measures to avoid, minimize or mitigate for long-term impacts and short-term construction impacts. It also includes a more specific discussion of mitigation measures for resources that may be adversely affected by the Columbia River Crossing Project. The Council finds the following to be examples of avoidance, minimization and mitigation options:

1. Demolition of resources could be minimized in some instances through refinement in the design of the project in a specific area.
2. Demolition could also be avoided through relocating the resource.
3. If these options are not feasible, recordation and salvage of the resource could mitigate for its loss.
4. Loss of access or isolation of resources could be minimized through design treatments such as creation of alternative access points, more visible signage, or traffic control to facilitate accessibility.
5. Noise and vibration impacts to resources could be minimized through design treatments and vibration suppression.
6. Visual impacts could be mitigated through enhanced design treatments. Station and shelter design, construction materials, and street improvements could be chosen to complement existing building and street settings. Stations could be moved to avoid placement in front of historic resources. Where possible, overhead wiring could be attached to existing support structures.
7. Areas with a high probability of archaeological resources have been identified. A professional archaeologist would be on site to monitor construction activities in these specified areas.

The Council finds that the discussion of general mitigation measures included within the Historic Report provides a good base for more detailed mitigation commitments in the FEIS.

Federal, State and Local Review Processes to Reduce Resource Impacts

Federal and State Processes

Section 106 of the National Historic Preservation Act of 1966, described above, defines the federal review process designed to ensure that historic properties are considered during federal project planning and execution. The process is administered by the ACHP and coordinated at the state level by the SHPO. An agency must afford the ACHP a reasonable opportunity to comment on the agency's project. Section 106 requires that every federal agency take into account how each of its undertakings could affect historic properties.

For the purposes of Section 106, any property listed in or eligible for listing in the National Register of Historic Places is considered historic. The process has five steps as follows: 1) identify and evaluate historic properties; 2) assess effects of the project on historic properties; 3) if an adverse effect would occur, then consultation with the SHPO and other interested parties would occur, and if necessary, a Memorandum of Agreement would be developed which defines what will be done to reduce, avoid or mitigate the adverse effects; 4) ACHP comment; and 5) proceed with the project, incorporating the mitigation in the Memorandum of Understanding.

At the state level, the historic preservation process is defined in ORS Chapter 358 and in the Land Conservation and Development Commission's Goal 5. The state process is implemented by the local jurisdictions through the adoption of historic preservation identification and protection plans in their individual comprehensive plans. The state process limits local preservation options. Under current law, local protection of historic properties requires owner consent. However, properties listed on the National Register may be preserved by local governments. Within the City of Portland, demolition must be reviewed and may be denied.

State law in ORS Chapter 358 and LCDC's Goal 5 rule, OAR 660-023-0200, encourage the preservation, management, and enhancement of structures of historic significance. It authorizes local governments to adopt or amend lists of significant historic resource sites. However, owners of inventoried historic resources must be notified and may refuse local historic resource designation at any time prior to adoption of the designation. No property may be included on the local list of significant historic resources where the owner objects. Moreover, a property owner may remove from the property a local historic property designation that was imposed by the local government.

OAR 660-023-0200(7) encourages local governments to adopt historic preservation regulations regarding the demolition, removal or major exterior alteration of all designated historic resources. It encourages consistency of such regulations with the standards and guidelines recommended in the Standards and Guidelines for Archaeology and Historic Preservation published by the US Secretary of the Interior. Further, OAR 660-023-0200(9) prohibits local governments from issuing permits for demolition or modification of an inventoried significant historic resource for at least 120 days from the date a property owner requests removal of historic resource designation from the property. It requires that local governments protect properties that are listed on the National Register, including demolition review and design review.

Local Process

The City of Portland has a local process in place to address alteration or demolition of historic and cultural resources that are identified as significant and protected in local comprehensive plans. This process could be applied to address and to reduce adverse impacts to affected historic and cultural resources.

As described below, certain protected historic resources in the City of Portland would be adversely affected. City review processes to address and to reduce adverse impacts to such resources are provided in the City's Zoning Code at Chapter 33.445, Historic Resources Protection, and Chapter 33.846, Historic Reviews.

Under these chapters, two levels of historic resource designation are created: Historic Landmarks and Conservation Landmarks. The Historic Landmark designation offers the highest level of protection for resources of citywide significance. Resources in this designation have access to incentives for historic preservation, including transfer of development rights and the right to a more flexible range of uses (such as multi-family use in a single family zone; reuse of institutional and business buildings in residential zones for commercial or institutional purposes; and streamlined review procedures). However, owners doing projects that utilize incentives must consent to designation and agree not to demolish or modify the building without City approval.

Conservation Landmarks are available for resources whose significance is local rather than citywide. Although part of the city's inventory, these sites generally are not qualified to be Historic Landmarks.

The City has the option to deny demolition only for those resources designated as landmarks that have taken advantage of one or more of the preservation incentives offered by the code or are listed on the National Register. A condition for use of the incentives is the owners entering into a covenant with the city agreeing not to modify or demolish the resource without city approval. Also, demolition delays have been adjusted to meet the requirements of state law. The delay period is 90 days for Conservation Landmarks and 180 days for Historic Landmarks and resources in the Historic Resources Inventory. These delay periods start the day an application for demolition is received by the city.

Identified Significant and Protected Historic and Cultural Resources in the Expo Center/Hayden Island Segment

The Historic Report and the Portland Comprehensive Plan identify three significant and protected historic resources in the Expo Center/Hayden Island Segment.

- The northbound structure of the I-5 bridge (built in 1917); listed in the National Register of Historic Places (NRHP) in 1982.
- The carousel located at the Jantzen Beach Shopping Center; listed in the National Register of Historic Places.

- The Columbia Slough and Levee System as contributing elements of the Columbia Slough Drainage Districts Historic District. This resource was determined eligible by the State Historic Preservation Office in 2005.

Additionally, the 1960 Pier 99 commercial building has been determined to be NRHP-eligible for two reasons: (1) it is a good example of a Mid-Century Modern Commercial building designed and constructed in the "Googie" style; and (2) it was designed by Oregon architect John Storrs, whose innovative designs were an important contribution to the Northwest Regional style of architecture. However, the Pier 99 commercial building is not currently identified as a significant and protected resource in the Portland Comprehensive Plan.

The Archaeology Report states that no archaeological resources have previously been recorded within the Columbia River Crossing area of potential effect on the Oregon shore. The high degree of commercial development, along with a century of roadway construction and improvement within the area of potential effect, contributes to a low potential for historical archaeological features and deposits on the Oregon shore. Although the City of Portland Comprehensive Plan does not specifically identify and protect archeological resources, federal regulations, particularly Section 106 of the National Historic Preservation Act (NHPA), are applicable to such resources through the federal NEPA process.

Mitigation Options for Identified Historic and Cultural Resource Impacts in the Expo Center/Hayden Island Segment

Property acquisitions and physical changes are the primary source of long-term and direct effects to known and potential historic resources. Based on the findings in the Historic Report, the Council concludes that the Columbia River Crossing project will require the removal of the northbound bridge, which is included in the National Register of Historic Places and considered a significant resource in the Portland Comprehensive Plan. This northbound bridge structure has been a critical part of the transportation system and historic landscape for both Oregon and Washington since 1917.

The Council finds that a Memorandum of Agreement (MOA) to implement Section 106 of the National Historic Preservation Act will dictate the mitigation of effects to historic properties. Mitigation measures for the I-5 bridge are summarized below.

The Washington Department of Transportation (WSDOT) and ODOT would ensure that all efforts will be attempted to find an alternative use through a bridge marketing plan, including separating and relocating individual spans if relocation of the bridge in its entirety is not feasible. If it is not feasible to pursue moving and relocating the structure for adaptive reuse, documentation may be updated, including applicable photography and drawings. If appropriate, decorative or interpretive structural elements would be offered to local historical societies/museums or other interested parties. As the bridge is a critical component of the regional historic landscape, contributions would be made to interpretive programs and small projects which will result in documentation, waysides, exhibits, or other means of communicating the structure's history and meaning to the general public.

Based on the findings in the Historic Report, the Council concludes that the Columbia River Crossing project would have no adverse effects on the carousel located at the Jantzen Beach Shopping Center.

The project has an effect on the NRHP-eligible Columbia Slough Drainage Districts Historic District, but that effect is "not adverse." The Oregon Slough Levee is part of an extensive, historic system of engineered improvements to the area's drainage. A small portion of the levee, approximately 330 linear feet extending east of I-5, would need to be demolished and rebuilt in order to accommodate the ground improvements needed to stabilize soils below the I-5 ramps and bridges. There would also be modest modifications made to portions of two additional contributing properties: the North Denver Avenue Cross Levee and Union Avenue/Martin Luther King Fill/Cross Levee. Although localized alterations to contributing elements would occur, the integrity of each of the levees, as well as the overall system, would be maintained.

The Pier 99 Building would be displaced due to the construction of a ramp on I-5 between Marine Drive and Hayden Island. This would be an adverse effect. Although this building is not identified as significant or protected by the Portland Comprehensive Plan, it is identified as an NRHP-eligible structure. There is little likelihood that the structure can be relocated given the structural design and condition of the building. Documentation, including applicable photography and drawings, will be sought. If appropriate, decorative or interpretive building elements would be offered to local historical societies and museums.

Based on information in the Archaeology Report, the Council finds that long-term curation of any artifacts or samples recovered during archaeological investigations or during construction of the project will be determined in consultation with agencies, property owners, and appropriate tribes. Long-term curation of recovered materials is an essential element of archaeological investigations and is required as part of federal and state permitting processes.

6.4 Ruby Junction Maintenance Facility Findings and Mitigation Measures

As indicated in Section 2.3 of these findings, the Council authorized the modification and expansion of the previously approved Ruby Junction Maintenance Facility in 2008 to accommodate additional light rail vehicles associated with the Portland to Milwaukie Project. In its 2008 LUFO findings supporting that action, the Council noted: "The Ruby Junction expansion also is expected to serve additional light rail vehicles needed for future LRT expansion to Vancouver, Washington and potentially Oregon City."[12] Accordingly, the 2008 LUFO was approved with the expectation that the Ruby Junction Maintenance Facility would serve light rail vehicles associated with the Columbia River Crossing Project at some future time. With this 2011 LUFO, that expectation becomes a reality. As implied in the 2008 LUFO findings, the Council finds that such use can be fully accommodated within the location boundaries established in the 2008 LUFO.

Section 6.5 of the 2008 LUFO findings identified the impacts relevant to LCDC Criteria 3-8 that were expected to occur at the Ruby Junction Maintenance Facility as a consequence of expansion of that facility within the newly established location boundaries. Because all activity associated with the Columbia River Crossing Project will occur within the 2008 boundaries, the Council finds that additional impacts beyond those identified in the 2008 LUFO findings are not likely. The Council finds that increased light rail activity within the previously established boundaries will not result in any additional displacements or adverse economic, social or traffic impacts beyond those contemplated in 2008. For reasons stated in the 2008 findings, it also finds that use of the facility by light rail vehicles serving the Columbia River Crossing Segments will not increase noise in the vicinity of the facility or alter its findings with respect to natural hazards, natural resources, stormwater runoff or historic or cultural resources. The Council continues to adhere to those 2008 findings and it incorporates them herein by this reference.

[12] 2008 LUFO Findings of Fact and Conclusions of Law at page 91.

7.0 Compliance with Substantive Criteria (3-8) Short Term (Construction) Impacts

7.1 Introduction

This section summarizes the short-term impacts associated with construction of the light rail and highway improvements in the Expo Center/Hayden Island Segment. The primary objectives of including short-term, construction impacts in the LUFO findings are to:

- Identify the location, importance and duration of potential, major construction impacts; and
- Identify potential mitigation measures (in general terms) for major impacts.

Linear projects such as light rail transit are typically divided into various segments or line sections for construction of the trackway, structures, stations and related work. In sections where the track is located within a separate right-of-way, extensive clearing and grading may be required. During the grading phase, culverts and other permanent drainage structures will be installed. Underground utility services may be relocated during the grading phase to avoid interference with light rail construction.

Following the grading and preliminary site work, installation of light rail utility duct banks, catenary pole foundations, platform foundations, and major structures such as bridges will begin. Bridge work will be accompanied by foundation construction which may involve pile driving or other specialized operations. Other activity outside the trackway also may occur during this period, such as construction or relocation of roadways and construction of traction power substations and signal buildings.

The next construction phase involves the installation of track work, catenary poles, catenary wire, signals, communications cables and other system-wide elements. Once all elements of the LRT system are complete, integrated testing and start-up will begin.

For both the light rail transit and highway improvements, construction of the bridges over the Columbia River will be the most substantial element of the Project, and this element sets the sequencing for the other Project components. The main river crossing and immediately adjacent highway improvement elements would account for the majority of the construction activity necessary to complete the Project. Construction of the I-5 Columbia River bridges is expected to last approximately four years. The general sequencing of constructing the bridges would likely entail the following steps:

- Initial preparation – mobilize construction materials, heavy equipment and crews; prepare staging areas; install temporary piles to support work and anchor barge platforms
- Installation of drilled shafts – install drilled shafts to support the bridge pier columns
- Shaft caps – construct and anchor concrete foundations on top of the drilled shafts to support column piers

- Pier columns – construct or install pier columns on the shaft caps
- Bridge superstructure – build or install the horizontal structure of the bridge spans across the piers; the superstructure would be steel or reinforced concrete; concrete could be cast-in-place or precast off-site and assembled on-site.

Interchanges on each end of the bridge would first be partially constructed so that all I-5 traffic could be temporarily rerouted onto the new southbound (western) Columbia River bridge. Constructing the southbound approaches for the Hayden Island interchange (and SR 14 interchange in Washington) would require approximately 3 years. Certain portions of the Hayden Island interchange (and SR 14 interchange) must be completed before traffic can be moved onto the new southbound lanes and construction of the remaining northbound lanes and interchange ramps can proceed. Once I-5 traffic in both directions is rerouted to the new western I-5 bridge, the new northbound segments of the Hayden Island interchange (and SR 14 interchange) would be constructed.

The Marine Drive interchange construction would need to be coordinated with construction of the southbound lanes coming from Vancouver. While this interchange can be constructed independently from the work described above, the completion and utilization of the ramp system between Hayden Island and Marine Drive requires the work to occur in the same period.

Constructing the project would entail many different activities, some of which would disrupt traffic. Typical construction methods would require shifting I-5 traffic onto temporary alignments, narrowing lanes and shoulders to accommodate equipment and workers, shortening merge and exit distances, reducing posted speed limits, and closing or detouring some traffic movements. For I-5, it is anticipated that three southbound and three northbound lanes would be maintained during all weekdays, except when the final changeover occurs between the old bridges and the new bridges. Local streets and driveway accesses may be closed temporarily and traffic detoured. All parcels impacted by temporary access closures or detours will have alternate access routes.

The following summarizes the types of activities anticipated to construct the CRC project:

- Over-water bridge construction. This work would include the steps outlined above.
- Over-water bridge demolition of the existing I-5 bridges. The components of the existing I-5 bridges would be dismantled and removed. The main components include the bridge decks, the counterweights for the lift span, towers, decks trusses, piers and piles.
- Highway and over-land bridge construction. The reconstruction of mainline I-5 and associated interchanges and local roads would involve a sequence of activities that would be repeated several times, including on-land bridge and retaining wall construction, the excavation of embankments, and laying the pavement driving surface.

Construction would require staging areas to store construction material, to load and unload trucks, and for other construction support activities. The existing I-5 right-of-way would likely accommodate most of the common construction staging requirements. However, some construction staging would likely be needed outside the existing right-of-way, and temporary property easements from adjacent or nearby property owners may be required.

7.2 Short Term Construction Impacts and Mitigation Measures

7.2.1 Criterion 3: Neighborhood Impacts

> **"Identify adverse economic, social and traffic impacts on affected residential, commercial and industrial neighborhoods and mixed use centers. Identify measures to reduce those impacts which could be imposed as conditions of approval during the National Environmental Policy Act (NEPA) process or, if reasonable and necessary, by affected local governments during the local permitting process."**
>
> **"A. Provide for a light rail route and light rail stations, park-and-ride lots and vehicle maintenance facilities, including their locations, balancing (1) the need for light rail proximity and service to present or planned residential, employment and recreational areas that are capable of enhancing transit ridership; (2) the likely contribution of light rail proximity and service to the development of an efficient and compact urban form; and (3) the need to protect affected neighborhoods from the identified adverse impacts."**
>
> **"B. Provide for associated highway improvements, including their locations, balancing (1) the need to improve the highway system with (2) the need to protect affected neighborhoods from the identified adverse impacts."**

The Columbia River Crossing Project will result in adverse short-term economic, social and traffic impacts through disruptions to existing land uses. However, these impacts will be temporary in duration and should end when the construction activities are completed. Construction of light rail facilities and highway improvements will adversely impact local economic and social interests located adjacent to or nearby construction or staging areas by interfering with residences and businesses, disrupting traffic and pedestrian movement, displacing parking, altering accesses, and causing noise, vibrations, dust, congestion, increased truck traffic near residences and businesses, and visual impacts. Rerouting, detours and lane closures will create temporary additional traffic through neighborhoods, with associated noise, dust and congestion. Construction machinery, trucks, and general construction activities will be temporary negative visual features of the project. Businesses that would be likely to feel the greatest impact are those that would experience the longest construction periods, those that have many other convenient competitors and those that are most dependent upon convenient access.

Economic and Social Impacts

Throughout the Expo Center/Hayden Island Segment, construction will have short-term and temporary impacts to businesses and neighborhoods of the nature described above. During the FIES and preliminary engineering phase, specific mitigation plans will be developed to address short-term economic and social impacts to businesses and residences. These measures will include maintaining access to existing uses and providing screening to minimize dust and visual impacts. Wherever possible, the project will provide alternative access and ensure that access is maintained to all properties during construction. Businesses that require access at all times and generate many trips (e.g., delivery services, drive-ins) may be inconvenienced. Utility services also may be interrupted as a result of construction. In the event that access or utility service to a residence or businesses would be temporarily disrupted, advance notice would be provided and the length of the disruption would be minimized to the extent practical.

Temporary construction impacts on neighborhoods could result from increased traffic congestion, truck traffic, noise, vibration and dust. Temporary street closures, traffic reroutes and detours could increase traffic within neighborhoods and impede access to community facilities. These short-term impacts include partial closures of streets, temporary rerouting or relocation of driveways, noise impacts from pile driving and bridge pier construction, and impaired access for elderly and mobility-impaired residents.

For neighborhoods affected by construction, the Council finds that TriMet and ODOT can work with neighborhood representatives to identify issues of concern and potential mitigation measures. Potential mitigation measures for short-term impacts include:

- Developing construction management plans for incorporation into contracts following close coordination with neighborhood and business associations and with representatives of public facilities/utilities located adjacent to the alignment/corridor
- Providing on-going coordination during construction to keep affected neighborhood and business area representatives informed about the schedule and location of construction work and anticipated modifications to access
- Limiting construction hours for certain activities in sensitive areas
- Providing fencing around construction and staging areas

Construction activities also could reduce accessibility to police, fire departments and other public safety and emergency service providers. Construction activities will, at times, impede the movement of emergency vehicles by temporarily narrowing or reducing the number of travel lanes or by detouring traffic and road segment closures. To ensure the most effective, continuous access to construction site vicinity uses for public safety and emergency service providers, the Council finds that the following measures could be employed:

- Develop construction management plans, for incorporation into construction contracts, in close coordination with affected police and fire departments and other emergency service providers
- Involve emergency service providers in planning for traffic management during construction in order to identify alternate emergency routes in advance of construction

- Maintain regular coordination with emergency service providers during construction to give them advance notice of when, where and for how long traffic capacity constraints on streets will be employed, and to plan for how local emergency access will be maintained

In summary, the Council finds that numerous measures are potentially available to mitigate impacts to businesses and neighborhoods. Potential mitigation measures beyond those listed above include:

- Management of construction activities to reduce dust, noise and vibration
- Fencing and buffering to reduce construction impacts in sensitive areas
- Use of berms, hay bales, plastic sheeting and other similar measures to reduce surface erosion and runoff into water bodies and storm sewers
- Provision of temporary alternative parking and pedestrian access

Traffic Impacts

Construction of the LRT and highway improvements in the Expo Center/Hayden Island Segment would result in temporary impacts to local and regional traffic operations. These impacts would include increased congestion on several major traffic facilities in the corridor including I-5 and, potentially I-205, impacts resulting from traffic relocations or detours, full or partial street closures, and increased truck traffic associated with construction activity. Impacts could also result from the intrusion of non-local traffic into residential areas as a result of temporary street closures and traffic detours, disruptions to vehicular and pedestrian access to businesses and community services, and the temporary loss of on- or off-street parking.

A major element of the Project would be construction of new bridges over North Portland Harbor and the Columbia River to accommodate vehicular, light rail, and non-motorized traffic coupled with a partial or complete reconstruction of I-5 from south of the Victory Boulevard interchange to the new bridges. Complete reconstruction of freeway interchanges at N Marine Drive and Hayden Island would be included. Another major element of the Project would be construction of the light rail station on Hayden Island. High levels of tuck traffic are anticipated in connection with earthwork and the delivery of materials at the bridge crossings, freeway mainline segments, and interchanges. Several construction staging areas would be needed.

Construction in the vicinity of Marine Drive is expected to include partial closure of this street and/or development of detour routing to accommodate vehicular traffic, particularly trucks moving between the freeway and the Columbia Corridor and Rivergate industrial areas. Temporary access may need to be provided to Delta Park and the residential/business areas on the east side of the freeway and to the Expo Center on the west side. Existing transit, bicycle, and pedestrian connections must also be maintained, including access to the Expo Center light rail station and the 40-mile loop trail.

Construction activities on Hayden Island include reconstruction of the existing I-5 interchange, including the development of a collector-distributor system of auxiliary freeway lanes, modifications to local traffic circulation, and a new light rail station and trackage. Temporary access routes to and from I-5 would need to be maintained to ensure continual multimodal access to the island for residents and businesses, as well as connections on the island between areas to the east and west of the freeway. A high level of truck activity associated with the freeway, bridge, ramp and construction of local facilities is anticipated on Hayden Island.

Transit impacts during construction could include service delays, relocation or temporary elimination of bus stops, street detours, and deterioration in reliability for bus routes using certain roadways and facilities within the corridor. Short-term construction would impact bus operations along I-5 and on Hayden Island.

Mitigation Strategies for Construction Impacts to Traffic, Transit and Bike and Pedestrian Mobility

As highlighted above, short-term construction impacts will likely take the form of roadway closures, detours and/or lane reductions, increased truck traffic, pedestrian access restrictions and local access restrictions. Mitigation measures for construction impacts to traffic and highways could include a variety of activities, ranging from scheduling construction activities to minimize conflicts during peak travel periods to using alternative construction techniques or equipment. The Council finds that measures to mitigate the short-term traffic impacts in the Expo Center/Hayden Island Segment could include, but are not limited to, the following:

- Work with appropriate jurisdictions to obtain approval of traffic control plans.
- Develop and implement a transportation management plan with affected businesses and community interests. This plan would address a variety of traffic, transit, and alternative mode strategies to minimize the transportation impacts of project construction. The plan would also identify detour routes where necessary to maintain traffic movement. This would be particularly important during construction of the Marine Drive interchange that serves the Port of Portland.
- Wherever possible or practical, limit or concentrate work areas to minimize disruptions to vehicular traffic and bus and pedestrian circulation, as well as to business access.
- Identify, provide and/or advertise temporary parking locations to replace parking temporarily displaced by construction.
- As appropriate, develop and implement functional and reasonable alternative construction techniques to minimize traffic impacts. These techniques might include activities such as limiting construction to non-daylight hours in certain locations. Use of two or three shifts per day to reduce construction time could be implemented in critical traffic areas, subject to development of adequate traffic control plans, noise control measures, and budget and schedule allowances.

The Council also finds that TriMet has years of experience helping communities and small businesses overcome the challenges of transit construction activities. Light rail guideway construction may require rerouting the buses on Hayden Island. Minor rerouting of buses would be necessary as new ramps and access points are opened at the Hayden Island interchange.

TriMet and other organizations would conduct a large communications campaign to inform the public about transit changes. The temporary routing, potential for more crowded buses and slower travel times would be communicated through TV, radio, web site, newspaper and other multimedia instruments to broadcast rider alerts to potential impacted customers.

Keeping businesses open and accessible during light rail construction in the Expo Center/Hayden Island Segment would be a top priority. During previous light rail transit construction projects, TriMet has kept construction disruption to a minimum while maintaining access to businesses, and has rapidly responded to concerns and potential issues.

Measures to minimize construction impacts to bicycle and pedestrian mobility through the project areas will also be implemented during construction. Such measures would include:

- Coordination with local jurisdictions and bicycle and pedestrian advocacy groups to disseminate information about construction activities and associated temporary closures and detours near construction zones.
- Temporary enclosures to maximize the safety of bicyclists and pedestrians traveling beneath structures under construction.
- Additional signage and/or lighting along popular bicycle and pedestrian routes that may experience an increase in vehicle traffic due to traffic detours.
- Traffic calming measures in work zones to improve safety for bicyclists, or alternate routes on parallel streets where convenient and effective.

The Council finds that while tolling of I-5 during construction is permissible under federal statutes, no recommendations or decisions about tolling during construction have yet been made. Tolling during construction could serve as a demand reduction measure to reduce traffic during the construction phase. The Council finds that decisions on this issue will be made by the Oregon and Washington Transportation Commissions following consultation with the Project's local partners and a public outreach and education process.

Criterion 4: Noise Impacts

> **"Identify adverse noise impacts and identify measures to reduce noise impacts which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by affected local governments during the permitting process."**

As with any large project, construction of light rail and highway improvements and bridges involves the use of heavy equipment and machinery that result in intense noise levels and occasionally high vibration levels in and around the construction site. Sections of the LRT alignment and highway improvements in the Expo Center/Hayden Island Segment are adjacent to noise sensitive uses such as houseboats and hotel rooms.

As described in the Noise Report, four general construction phases would be required to complete the project: 1) land preparation, 2) constructing new structures, 3) miscellaneous construction activities, and 4) demolition activities.

Major noise-producing equipment used during the preparation stage could include concrete pumps, cranes, excavators, haul trucks, loaders, tractor trailers and vibratory equipment. Maximum noise levels could reach 82 to 86 dBA at the nearest residences (50 to 100 feet) for normal construction activities during this preparation phase. Major noise and vibration-producing activities would occur primarily during demolition and preparation for the new bridges. Activities that have the potential to produce a high level of vibration include pile driving, vibratory shoring, soil compacting, and some hauling and demolition activities.

The loudest noise sources during the phase of constructing new structures would include pile drivers, cement mixers, concrete pumps, pavers, haul trucks, and tractor trailers. Maximum noise levels would range from 82 to 94 dBA at the closest receiver locations.

Following the heavy construction, miscellaneous construction activities such as installation of bridge railings, signage, lighting, roadway striping, and others would occur. These less intensive activities are not expected to produce noise levels above 80 dBA at 50 feet except on rare occasions, and then only for short periods.

Demolition of existing structures would require heavy equipment such as concrete saws, cranes, excavators, hoe rams, haul trucks, jackhammers, loaders, and tractor trailers. Maximum noise levels could reach 82 to 92 dBA at the nearest residences. Demolition would occur at various locations and times during the construction process.

The Council finds that adverse noise impacts associated with construction are temporary and can be effectively mitigated by avoiding construction on Sundays, legal holidays, and during the late evening and early morning hours in noise sensitive areas. Additionally, the Council finds that equipping motorized construction equipment with sound control devices, and developing construction contract documents that include noise limit specifications, reinforced with state/local ordinances and regulations, can be effective techniques for minimizing adverse noise impacts associated with construction.

If specific noise complaints are received during construction, the contractor could be required to implement one or more of the following noise mitigation measures:

- Locate stationary construction equipment as far from nearby noise-sensitive properties as possible.
- Install temporary or portable acoustic barriers around stationary construction noise sources.
- Shut off idling equipment.
- Reschedule construction operations to avoid periods of noise annoyance identified in the complaint.
- Notify nearby residents whenever extremely noisy work will be occurring.

- Operate electrically powered equipment using line voltage power rather than generators.

Criterion 5: Natural Hazards

> **"Identify affected landslide areas, areas of severe erosion potential, areas subject to earthquake damage and lands within the 100-year floodplain. Demonstrate that adverse impacts to persons or property can be reduced or mitigated through design or construction techniques which could be imposed during the NEPA process or, if reasonable and necessary, by local governments during the permitting process."**

Although no *landslide areas* or *areas of severe erosion potential* have been identified in the Expo Center/Hayden Island Segment, construction activities at stream crossings and near water bodies could result in erosion and have detrimental effect on water quality. To avoid and minimize such impacts, the project will prepare and implement stormwater pollution prevention plans and grading plans, hydroseed, manage stockpiled fill, and employ other best management practices (BMPs) for erosion control." Construction activities will specifically comply with:

- WSDOT Standard Specifications for Road, Bridge and Municipal Construction M 41-10
- ODOT Erosion Control Manual
- City of Vancouver VMC Chapter 14.24, Erosion Control
- City of Portland Erosion and Sediment Control Manual

Inspection and observation monitoring and reporting would be conducted throughout the project to ensure the appropriate erosion-control measures are being conducted.

The Council finds that construction-related impacts associated with landslides, earthquakes, and the 100-year floodplain are not anticipated, and potential construction-related impacts associated with erosion can be effectively mitigated for through the measures discussed above.

Criterion 6: Natural Resource Impacts

> **"Identify adverse impacts on significant fish and wildlife, scenic and open space, riparian, wetland and park and recreational areas, including the Willamette River Greenway, that are protected in acknowledged local comprehensive plans. Where adverse impacts cannot practicably be avoided, encourage the conservation of natural resources by demonstrating that there are measures to reduce or mitigate impacts which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the permitting process."**

Natural resource impacts specific to the Expo Center/Hayden Island Segment are addressed in the following section.

Fish and Wildlife Habitat. Short-term impacts to fisheries include the impact pile driving of temporary piles and use of barges. The installation of up to 1,500 temporary steel piles will result in behavioral disturbance and injury or death to ESA-listed and other native fish species. The project will use hydroacoustic attenuation measures, such as bubble curtains, to reduce initial sound levels from impact pile driving, resulting in less severe impacts to fish in the project area. Through timing impact pile driving activities and use of attenuation measures, impacts to ESA-listed fish are minimized to the extent practicable. Due to the extent of in-water work and the presence of many ESA-listed fish, it is acknowledged that adverse effects to individual fish and their critical habitat are likely to occur, but the continued existence of any species will not be jeopardized. Adverse effects are avoided or minimized to the extent practicable. The Council notes that NMFS produced this finding in their Biological Opinion. In addition to this mitigation, the Council finds that the mitigation measures outlined above in Section 6.3.4 of these findings for Threatened, Endangered, and Candidate Fish are available to mitigate adverse impacts to the Expo Center/North Portland Harbor and the Columbia River and could be imposed as conditions of approval during the FEIS process and/or the local permitting process if reasonable and necessary.

The Project would temporarily impact terrestrial resources, such as migratory birds and species of interest, through noise impacts and removal or degradation of habitat. Mitigation measures to address these impacts include impact avoidance and impact minimization. Impact avoidance would be addressed by timing vegetation removal to occur outside of nesting seasons for migratory birds. Demolition of existing structures, if necessary, would likely be scheduled outside of nesting seasons for native migratory birds, to avoid direct impacts to active nests.

Impact minimization would be addressed by implementing best management practices such as erosion and sediment control to protect riparian buffers and sensitive terrestrial habitats (for example, for riparian species such as pond turtles). Swallows may nest on the concrete piers but are assumed not to be nesting on steel portions of the existing I-5 bridges. The I-5 bridges could be inspected at least one full year prior to commencement of construction activities to determine whether any species of interest or migratory birds are using the bridges for nesting or roosting. If such species are present, exclusionary devices may be installed on the bridges during the non-nesting season to prevent them from being used for nesting or roosting during construction activities. If high-disturbance activities must take place during the nesting season, the Columbia River Crossing project team would coordinate with USFWS, Oregon Department of Fish and Wildlife (ODFW), and WDFW to establish work buffer zones around the nest(s) during nesting season.

Scenic and Open Space Areas. During construction the visual quality of views to and from the project area would be temporarily altered. Construction-related signage and heavy equipment would be visible in the vicinity of construction sites. Vegetation may be removed from some areas to accommodate construction of the bridges, new ramps, and the light rail transit guideway. This would degrade or partially obstruct views or vistas.

Nighttime construction would be necessary to minimize disruption to daytime traffic. Temporary lighting may be necessary for nighttime construction of certain project elements. This temporary lighting would affect residential areas by exposing residents to glare from unshielded light sources or by increasing ambient nighttime light levels.

Mitigation for temporary construction-related effects would include:

- Shielding of construction site lighting to reduce spillover of light onto nearby residences and businesses,
- Locating construction equipment and stockpiling materials in less visually sensitive areas, when feasible and in areas not visible from the road or to residents and businesses in order to minimize visual obtrusiveness, and
- Cover exposed soils as soon as possible with vegetation.

Riparian Areas. To address temporary loss of riparian vegetation resulting from project impacts, mitigation measures could include streambank revegetation and reshaping to restore habitat function, removal of noxious weeds in certain areas, and revegetation of disturbed areas with native species.

Wetland Areas. Construction will occur near several identified wetland areas in the Expo Center/Hayden Island Segment. Temporary disturbances to wetland-related wildlife activity, hydrology, and water quality will be avoided as much as possible through the use of Best Management Practices (BMPs) such as silt fences, construction fencing, and wildlife exclusionary netting during the construction process.

Park and Recreational Areas. Temporary effects to park and recreation resources include the temporary use of parkland to stage construction and store materials; increased noise, glare, dust, and vibration; and temporary closures, detours, and congestion that could delay users traveling to parks or recreational activities. Mitigation activities to address these impacts include:

- Restoring landscaping to original condition following construction and protect remaining trees close to construction areas.
- Providing adequate signage for any limited or closed access points and detour routes.
- Adopting a joint public information campaign with parks' jurisdictions for some of the longer closures.
- Maintaining safety for bicyclists and pedestrians traveling on trails and between facilities with temporary enclosures, additional signage and lighting, etc.

Criterion 7: Stormwater Runoff

> **"Identify adverse impacts associated with stormwater runoff. Demonstrate that there are measures to provide adequate stormwater drainage retention or removal and protect water quality which could be imposed as conditions of approval during the NEPA process or, if**

reasonable and necessary, by local governments during the permitting process."

Stormwater runoff impacts specific to the Expo Center/Hayden Island Segment are addressed in the following section.

The in-water construction of bridge piers could stir up sediments from the riverbed, which would increase turbidity. In-water work includes the use of barges and work bridges in the Columbia River and North Portland Harbor, equipment that would be temporarily anchored to the riverbed. Temporary cofferdams would also be installed, but would not be dewatered, for the piers nearest the shoreline, where the water is shallow. Turbidity caused by any activity inside the cofferdams (including installation of permanent shafts as well as temporary piles) would be contained within the cofferdams. Sediment would be disturbed during the installation and removal of the cofferdams. During the demolition of the existing structures, riverbed sediment would be disturbed when the timber piles of the I-5 bridges are cut off below the mudline.

There are no known records of contaminated sediments in the Columbia River portion of the project area. Therefore, there is very little risk that in-water work in the Columbia River would re-suspend contaminated sediments. Contaminated sediments have been identified in the North Portland Harbor, but they are likely outside of the project footprint. If there is potential that in-water work could disturb these sediments, they would be analyzed in accordance with regulatory criteria, and if necessary, removed from the river and disposed of properly. Removed sediments may be disposed of in a permitted upland disposal site, if required.

Potential sources of toxic contaminants associated with in-water work include refueling track-mounted equipment located on the barges or work bridges, lead-based paint from the existing bridges, turbidity and concrete debris from wire-saw-cut concrete during demolition, green concrete (concrete that has not fully cured) associated with bridge construction, potential spills from construction equipment, and materials accidentally entering the Columbia River and North Portland Harbor during over-water work. Full containment of fuel, other hazardous materials, and green concrete would be required to prevent these materials from entering the Columbia River and North Portland Harbor, in accordance with project specifications.

On land, construction activities occurring below-grade may require the removal of groundwater through pumping, a process known as dewatering. Therefore, constructing roads, transit lines, and other infrastructure below the surrounding surface can alter groundwater conditions. If there are nearby hazardous materials sites, dewatering can increase the likelihood of contaminants migrating through the groundwater and into surface waters. The following elements of the Project within the Expo Center/Hayden Island Segments are relatively close to high ranking potential hazardous materials sites and near-surface groundwaters, and work at these sites would require below-grade construction techniques:

- Marine Drive Interchange
- North Portland Harbor Bridges

- Hayden Island Interchange
- Columbia River Crossing

Left unmitigated, construction of these elements could result in moderate risks for the migration of existing contamination, potentially affecting both ground and surface water quality. In addition to existing contamination, the installation of shafts and piles below ground includes the risk of introducing new contamination, for example from green concrete, into groundwater. Further discussion of contamination issues associated with below-grade construction is included in the Hazardous Materials Technical Report.

Without proper management, land-based construction activities may have temporary adverse effects on water quality in nearby water bodies. Construction involves ground disturbances that can increase soil erosion substantially, especially for construction activities along river or stream banks. The Project would involve ground disturbance near North Portland Harbor and the Columbia River within the Expo Center/Hayden Island Segments. If runoff contains extra sediment from erosion, waterways can become turbid (cloudy) and can build up excessive sediment deposits. Runoff and soil erosion can also transport pre-existing hazardous materials and construction-related hazardous materials into water bodies, some of which may dissolve in water or are water-transportable. These materials can be harmful to aquatic life.

The construction of the Columbia River Crossing Project would require at least one large site to stage equipment and materials, and may also need a large site for use as a casting yard for fabricating segments of the new bridges. Each site being considered, including one in Oregon, is adjacent to the Columbia River. The existing conditions on these sites range from a developed and paved port terminal to a currently undeveloped site. Staging and casting/assembly site activities may increase stormwater runoff over existing conditions and may increase pollutant levels in the runoff. However, any staging and/or casting site would be required to meet all applicable stormwater requirements, including the implementation of erosion and sediment controls. All necessary permits would be secured prior to site development and operations for any major staging or casting yard.

The Council finds that water quality degradation resulting from erosion and sedimentation and the release of pollutants can be minimized through the use of BMPs during construction. Construction BMPs include use of barrier berms, silt fencing, temporary sediment detention basins, plastic covering for exposed ground, vegetative buffers (hay bales), and restricting clearing activities to dry weather periods to contain sediment on-site. Further requirements could include diapering of all dump trucks to avoid spillage, and cleaning of heavy equipment tires and trucks before they are allowed to drive off-site. A variety of special BMPs can also be used at crossings or adjacent to streams or watercourses during construction.

Criterion 8: Historic and Cultural Resources

> **"Identify adverse impacts on significant historic and cultural resources protected in acknowledged comprehensive plans. Where adverse impacts cannot practicably be avoided, identify local, state or federal review**

processes that are available to address and to reduce adverse impacts to the affected resources."

Historic and cultural resource impacts specific to the Expo Center/Hayden Island Segment are addressed in the following section.

As discussed above in Section 6.3.6 of these Findings, three significant and protected historic resources exist in the Expo Center/Hayden Island Segment:

- The northbound structure of the I-5 bridge (built in 1917); listed in the National Register of Historic Places (NRHP) in 1982.
- The carousel located at the Jantzen Beach Shopping Center; listed in the National Register of Historic Places.
- The Columbia Slough and Levee System as contributing elements of the Columbia Slough Drainage Districts Historic District.

The impacts to the northbound structure of the I-5 bridge and to the Columbia Slough and Levee System would be permanent, as opposed to temporary. The carousel is located with the Jantzen Beach Shopping Center and would not experience any temporary effects.

Mitigation for any cultural resources impacted during construction is as described in Section 6.3.6 of these LUFO findings.

STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 11-4280, FOR THE PURPOSE OF AMENDING THE 1998 LAND USE FINAL ORDER FOR THE SOUTH/NORTH LIGHT RAIL PROJECT AND ADOPTING A LAND USE FINAL ORDER FOR THE EXPO CENTER-HAYDEN ISLAND SEGMENTS OF THE PROJECT.

Date: July 14, 2011 Prepared by: Andy Cotugno

BACKGROUND

Overview

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and any highway improvements consolidated in environmental statements addressing South/North light rail projects. LUFOs were found to be appropriate so that multi-jurisdiction project-related land use actions could be consolidated into a single decision that would provide more certainty for the project and to provide an expedited land use appeal process. However, the LUFO process does not diminish the need for a light rail project to seek and secure local land use and other permits that may include reasonable and necessary conditions of approval once the light rail route, stations, park-and-ride lots, maintenance facilities and highway improvements have been determined.

It has been the practice of the region to follow approval of a Locally Preferred Alternative (LPA) with consideration of a LUFO action, thereby helping to ensure that the two decisions are consistent. In this instance, however, the LUFO actions follow the decision on the LPA by several years, as the affected local governments needed additional time to determine more specifically the components and scale of the Columbia River Crossing (CRC) Project that includes the Expo Center-Hayden Island segments of the South/North Project and to ensure that certain regional expectations would be satisfied.

There have been four South/North LUFOs approved. The first established the South/North LUFO and the other three were amendments to the original. More specifically, in 1998 the Metro Council approved a LUFO for the South/North Corridor that extended from Clackamas Town Center and Milwaukie north to the Oregon/Washington state line. In 1999, the Council approved an amendment of the South/North LUFO for the northern portion of the corridor, establishing the Interstate MAX (Portland to Expo Center) LRT Project. In 2004, the Council amended the South/North LUFO to add a two-phase element to the southern portion of the corridor, adding the I-205 alignment and making some changes to the Portland-Milwaukie alignment, including revisions that designated study areas in some locations in Milwaukie where additional LRT alignment analysis was needed. Then in 2008 the Council amended the LUFO a third time to approve the Portland-Milwaukie Project, which again made some changes to the alignment from downtown Portland to Milwaukie and extended light rail into unincorporated Clackamas County.

This proposed 2011 South/North LUFO amendment is intended to address changes from the 1998 LUFO so as to be consistent with the improvements to be included in the 2011 CRC Final Environmental Impact Statement (FEIS). This proposed 2011 LUFO relocates the light rail alignment and the Hayden Island station farther to the west between the Expo Center and the Oregon/Washington state line within the Expo Center and Hayden Island segment of the South/North Project. It also authorizes use of the Ruby Junction maintenance facility to serve light rail vehicles needed for the Project, and it adds a number of highway improvements, including new Interstate 5 Columbia River bridges that will extend light rail to Vancouver, Washington; improvements to I-5 that improve access to the Hayden Island and Expo Center stations or are required as a consequence of building the new bridges; and a number of local road improvements providing access and circulation to the light rail stations or necessitated by construction of the new bridges.

Requirements of House Bill 3478

Section 6(1) of House Bill 3478 requires the Council to "establish the light rail route, stations, lots and maintenance facilities, and the highway improvements for the project or project extension, including their locations." Section 6(1)(a) further provides that the locations for each of these facilities and improvements:

"shall be in the form of boundaries within which the light rail route, stations, lots and maintenance facilities, and the highway improvements shall be located. These boundaries shall be sufficient to accommodate adjustments to the specific placements of the light rail route, stations, lots and maintenance facilities, and the highway improvements for which need commonly arises upon the development of more detailed environmental or engineering data following approval of a Full Funding Grant Agreement."

Section 6(2) of the Act addresses amendments to the original LUFO. As relevant to this 2011 LUFO amendment decision, it provides that any siting of the light rail route or a station, lot or maintenance facility or highway improvements outside the boundaries previously established in a LUFO, or any new station, lot or maintenance facility or highway improvement,

> *"shall require a land use final order amendment or a new land use final order which shall be adopted in accordance with the process provided for in subsection (1) of this section."*

Section 7 of HB 3478 requires the Council to apply land use criteria established by the Land Conservation and Development Commission ("LCDC") in making decisions in a land use final order on the light rail route, stations, lots and maintenance facilities, and the highway improvements, including their locations, and to prepare and adopt findings of fact and conclusions of law demonstrating compliance with those criteria. Draft findings, attached as Exhibit B to Resolution No. 11-4280, serve to demonstrate compliance with LCDC's criteria for the modifications selected in this LUFO amendment.

Section 3(1) of HB 3478 provides that the procedures and requirements set out in the Act are the only land use procedures and requirements to which the Council's decisions on the light rail route, the stations, lots and maintenance facilities, and the highway improvements for the Project, including their locations, are subject. Consequently, the findings focus on the matters identified in HB 3478 as land use actions being taken at this time.

ANALYSIS/INFORMATION

This staff report is intended to meet the requirements of HB 3478. This law requires that the LUFO staff report:

> *"...set forth and address compliance with the criteria. The staff report also shall include a description of the proposed boundaries within which the light rail route, stations, lots and maintenance facilities, and the highway improvements shall be located, as recommended by Tri-Met...."*

This LUFO is in response to TriMet's application which is included as Attachment A to the staff report. Also included in Attachment A is TriMet's letter to Metro Council President Tom Hughes requesting consideration by the Metro Council of their application to amend the South/North LUFO, the LUFO Steering Committee recommendation, and ODOT's letter to TriMet recommending approval of the LUFO application in accordance with the Steering Committee's recommendation.

Compliance with the criteria are provided in the form of draft Findings of Fact and Conclusions of Law that have been prepared and are attached as Exhibit B to Resolution No. 11-4280, For the Purpose of Amending the 1998 Land Use Final Order for the South/North Light Rail Project and Adopting a Land Use Final Order for the Expo Center-Hayden Island Segments of the Project.

1. **Known Opposition**

The CRC is a large and complex and there are strong feelings associated with the project. Opposition to the project includes concerns regarding:

- the need for and size of the highway components of the project
- greenhouse gases and air pollution that could be generated by the project
- impacts to low-income and minority populations
- costs and funding
- the aesthetic quality of the bridge type

Additional concerns heard include whether the project would worsen the bottleneck on I-5 in the vicinity of the I-405 and I-84 interchanges. While traffic analysis shows that congestion does not worsen that bottleneck, there remains criticism that the project should not be built if that bottleneck is not addressed. Another concern is whether the project will lead to increased development in Washington and increased travel demand on the new facility. Analysis conducted for the EIS indicated that the tolls proposed would likely reinforce the region's goals of concentrating development in regional centers, reinforce existing corridors, and promote transit and pedestrian development patterns. Nevertheless, opposition by some Metro region residents remains.

However, there is broad public support and an understanding of the need for the project. Reasons heard in support of the project include addressing the severe bottleneck and safety issues on the bridge, improving freight movement, and significantly improving transit service to Vancouver. The Final Environmental Impact Statement reports that 66% of all commenters supported a replacement bridge and 90% supported light rail.

2. **Legal Antecedents**

<u>State</u>
As noted above, at the State level, HB3478 enacted as Chapter 12 of the 1996 Oregon Laws, provides for South/North MAX Light Rail Project LUFOs to decide:

a. the light rail route for the project or project extension;
b. stations, lots and maintenance facilities; and,
c. highway improvements for the project or project extension.

<u>Metro</u>
Following are actions by the Metro Council which relate to the proposed 2011 LUFO:

Resolution No. 98-2633, For the Purpose of Authorizing the Executive Officer to Execute an Intergovernmental Agreement Establishing the South/North Land Use Final Order (LUFO) Steering Committee (adopted May 14, 1998)

Resolution No. 98-2673, For the Purpose of Adopting the Land Use Final Order Establishing the Light Rail Route, Stations, Lots and Maintenance Facilities and the Related Highway Improvements for the South/North Light Rail Project (adopted July 23, 1998)

Resolution No. 99-2853A, For the Purpose of Adopting a Land Use Final Order Amending the Light Rail Route, Light Rail Stations and Park-and-Ride Lots, Including Their Locations, For That Portion of the South/North Light Rail Project Extending from the Steel Bridge to the Exposition Center (adopted October 22, 1999)

Resolution No. 03-3372, For the Purpose of Amending the South/North Land Use Final Order, to Include the Two Phases of the South Corridor Project Consisting of the Addition of the I-205 Light Rail Transit Project from Gateway to Clackamas Regional Center with the Downtown Portland Transit Mall Alignment, and Modification of the Proposed Light Rail Between Downtown Portland and Milwaukie, Deletion of Plans to Extend Light Rail from Milwaukie to Clackamas Regional Center, and to Reflect the Final Interstate MAX Design (adopted January 15, 2004)

Resolution No. 08-3959, For the Purpose of Approving the 2008 Portland-Milwaukie Light Rail Project Locally Preferred Alternative and Finding Consistency with the Metro 2035 Regional Transportation Plan (adopted July 25, 2008)

Resolution No. 08-3960B, For the Purposes of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions (adopted June 5, 2008).

Resolution No. 11-4264, For the Purpose of Concluding that the Concerns and Considerations Raised about the Columbia River Crossing Project in Exhibit A to Resolution No. 08-3960B have been Addressed Satisfactorily (adopted June 9, 2011).

Resolution No. 11-4280, For the Purpose of Amending the 1998 Land Use Final Order for the South/North Light Rail Project and Adopting a Land Use Final Order for the Expo Center-Hayden Island Segments of the Project (proposed for adoption on August 11, 2011).

3. **Anticipated Effects**

Approval of this resolution would advance the CRC Project by addressing the land use impacts of that project within the State of Oregon, and authorizing the Council President to sign the Final Environmental Impact Statement for the CRC Project. Other actions, including completion and issuance of the FEIS, securing federal funding and a final determination of local match sources remain to be addressed before the Project would be able to advance to construction.

4. **Budget Impacts**

None at this time. Metro currently has an intergovernmental agreement with the CRC project for costs incurred for the work performed by Metro to adopt the LUFO, for Metro's role in approving the FEIS, modeling work, and assistance for a New Starts funding submittal.

This project is included within the Financially Constrained System of the Metro 2035 Regional Transportation Plan and the amended 2010-2013 Metropolitan Transportation Improvement Program.

RECOMMENDED ACTION
Adopt Resolution No. 11-4280, For the Purpose of Amending the 1998 Land Use Final Order for the South/North Light Rail Project and Adopting a Land Use Final Order for the Expo Center-Hayden Island Segments of the Project.

Attachment A

TriMet Application to Amend South/North LUFO

Including:

Cover letter to Council President Tom Hughes

TriMet Application for South/North Land Use Final Order Amendment Expo Center/Hayden Island Segments

LUFO Steering Committee Recommendation Concerning the 2011 South/North Land Use Final Order

2011 South/North Land Final Order Amendment ODOT Recommendation

TRIMET

July 13, 2011

Tom Hughes, President
Metro Council
600 NE Grand Avenue
Portland, Oregon 97232-2736

Re: Application to Amend South/North LUFO

Dear Mr. Hughes:

Following consultation with TriMet's Board of Directors, I am pleased to submit TriMet's enclosed application requesting approval of a Land Use Final Order (LUFO) amending the original South/North Project LUFO adopted by the Metro Council in July 1998.

This LUFO application is being submitted to the Metro Council pursuant to provisions in Oregon Laws 1996, Chapter 12 (House Bill 3478) that direct TriMet to submit such an application to the Metro Council after TriMet has received recommendations from the LUFO Steering Committee and the Oregon Department of Transportation (ODOT). I am pleased to report that TriMet has now received and considered both of those recommendations as noted in the application and its attachments.

The enclosed LUFO application is consistent with the recommendations of the LUFO Steering Committee and ODOT, in both the facilities and improvements it proposes and their locations. It will provide the basis for findings to be made as part of the Council's adoption of the subject amendment to the 1998 LUFO. I am requesting that Metro schedule a public hearing and Council action on this application by August 11, 2011.

Thank you for your cooperation and assistance on these very important components of our planned regional integrated multi-modal transportation system.

Very truly yours,

Neil McFarlane
General Manager

Enclosures

C: Dan Blocher
Tamara Lesh
Andy Cotugno
Steve Witter

Application for South/North Land Use Final Order Amendment

Expo Center/Hayden Island Segments

July 13, 2011

This document constitutes TriMet's application to the Metro Council (Council) for approval of amendments to the original South/North Light Rail Project (South/North Project) Land Use Final Order (LUFO)[1], which the Council adopted on July 23, 1998 (the 1998 LUFO).[2] As initially approved, the 1998 LUFO covered an area extending from the Clackamas Town Center in the south through the cities of Milwaukie and Portland to the Oregon/Washington state line in the north.

For ease of analysis, the 1998 LUFO divided the project into nine segments. The area affected by this proposed 2011 LUFO amendment involves the northernmost portion of the project, extending from N. Victory Boulevard to the Oregon/Washington border. This area was contained within the North Portland and Hayden Island segments as identified in the 1998 LUFO. When the Council adopted LUFO amendments for Interstate Avenue in 1999, it renamed that portion of the 1998 LUFO North Portland segment extending from N. Denver Avenue to the Portland Metropolitan Exposition Center (Expo Center) the "Expo Center Segment". This 2011 LUFO amendment retains the name "Expo Center Segment" and extends the area it encompasses to N. Marine Drive. This amendment also retains the name "Hayden Island Segment" for the area from N. Marine Drive to the Oregon/Washington state line. For convenience purposes, the two segments are combined and addressed as a single segment (Expo Center/Hayden Island) in this application.

This is TriMet's fourth proposed amendment to the 1998 LUFO. The Council previously approved South/North LUFO amendments for Interstate MAX (1999), Interstate 205 and Downtown Portland (2004) and Portland to Milwaukie (2008). The proposed modifications are part of a larger, two-state integrated light rail and highway project commonly known as the Columbia River Crossing (CRC) Project. This 2011 LUFO amendment addresses only that portion of the CRC Project within in the State of Oregon.

For light rail, the CRC Project begins at the Expo Center and continues northward to the Oregon/Washington state line on the Columbia River along an alignment located farther west of the alignment that the Council approved in the 1998 LUFO. From the Expo Center station, the light rail alignment proceeds northward under N. Marine Drive and onto a new, integrated multi-modal rail/vehicular/bicycle/pedestrian bridge crossing over the Expo Center Harbor onto Hayden Island west of Interstate 5. The alignment then continues northward, crossing over N. Hayden Island Drive onto the lower deck of the new southbound Interstate 5 bridge, where it continues to and beyond the Oregon/Washington state line.

For highway improvements, the CRC Project begins just south of N. Victory Boulevard and extends northward to the Oregon/Washington border. These highway improvements were not a part of the South/North Project when it was initially considered in 1998. However, HB 3478 provides for

[1] A LUFO is a written order or orders of the Council deciding the light rail route, the light rail stations, park-and-ride lots and maintenance facilities, and the highway improvements for the South/North Project, including their locations.

[2] Metro Resolution No. 98-2673

amendments to the South/North project from time to time and it allows for the inclusion of highway improvements if they are described in a Draft or Final Environmental Impact Statement for the Project. Highway improvements were added to the 2008 amendments for the Portland-Milwaukie Project, and they are added here as well. Much like the Westside Corridor Project that extended light rail to Hillsboro and included highway improvements on US 26 and Oregon 217, which also was approved under a LUFO process pursuant to Oregon Laws 1991, Chapter 3 (Senate Bill 573), the CRC Project is an integrated light rail and highway project, with a number of improvements serving dual rail and highway purposes.

The CRC Project will expand the use of the Ruby Junction Maintenance Facility in Gresham. However, all activity associated with that facility will occur within the light rail maintenance facility boundaries that the Council previously approved in its 2008 LUFO amendments.

B. Requirements of House Bill 3478.

Oregon Laws 1996, Chapter 12 (House Bill 3478), Section 6(1) authorizes the Council, upon application by TriMet, to adopt land use final orders for the South/North Project. The LUFO identifies the light rail route, stations, lots and maintenance facilities, and the highway improvements that comprise the South/North Project, and it further specifies the locations within which these facilities and improvements may be located. As explained in Section 6(1)(a) of the Act:

> "The applied for locations shall be in the form of boundaries within which the light rail route, stations, lots and maintenance facilities, and the highway improvements, shall be located. These boundaries shall be sufficient to accommodate adjustments to the specific placements of the light rail route, stations, lots and maintenance facilities, and the highway improvements for which need commonly arises upon the development of more detailed environmental or engineering data following approval of a Full Funding Grant Agreement."

Section 6(2) of the Act addresses amendments to the original LUFO. As relevant to this proceeding, it provides that any siting of the light rail route or a station, lot, maintenance facility or highway improvement outside the boundaries previously established in a LUFO, or any new station, lot or maintenance facility, or highway improvement, "shall require a land use final order amendment or a new land use final order which shall be adopted in accordance with the process provided for in subsection (1) of this section."

Section 6(1) of House Bill 3478 directs TriMet to file its application with the Council following its receipt of recommendations from the Oregon Department of Transportation and the South/North LUFO Steering Committee (Steering Committee) established pursuant to Section 1(21) of the Act. On June 23, 2011, the Steering Committee adopted its recommendations to TriMet on the light rail route, stations, maintenance facilities and highway improvements for the North Portland Segment that is the subject to this LUFO amendment application. On June 30, 2011, the Oregon Department of Transportation (ODOT) transmitted recommendations in the form of a letter to TriMet from Matt, Garrett, Director, endorsing the LUFO amendments recommended by the LUFO Steering Committee. TriMet has received and considered these recommendations from the Steering Committee and ODOT, copies of which are attached hereto as Attachments A and B. TriMet's application is consistent with those recommendations.

House Bill 3478 further requires the Council to demonstrate that its decisions comply with approval criteria established by the Oregon Land Conservation and Development Commission (LCDC) under Section 4 of the Act. These criteria are identified later in this application.

C. Requested Light Rail and Highway Improvements.

TriMet requests that the Council adopt a 2011 Land Use Final Order amending the 1998 LUFO to authorize the light rail route, station, maintenance facilities and highway improvements identified in this application including their locations. TriMet's proposed amendments are described textually below and shown in location boundary maps attached to the Steering Committee's recommendation (*Figures 1.1 through 1.3*). These maps are printed from a regional geographic information system database (Metro's *Regional Land Information System*, RLIS) and show the recommended boundaries at a scale of one inch equals 500 feet.

Light Rail Improvements. From the Expo Center station, the light rail alignment proceeds northward under N. Marine Drive and onto a combined rail and highway bridge crossing over the North Portland Harbor onto Hayden Island west of Interstate 5. The alignment then continues northward, crossing over N. Hayden Island Drive onto the lower deck of the new southbound Interstate 5 bridge.

A single light rail station is located at the east end of the Jantzen Beach Center west of Interstate 5. No park-and-ride lots or new maintenance facilities are proposed for this segment. The Project will expand the use of the Ruby Junction Maintenance Facility in Gresham. However, all activities associated with that facility will occur within the maintenance facility boundaries that the Council previously approved in its 2008 LUFO amendment for the Portland to Milwaukie Project. See *Figure 2.1* attached to the Steering Committee's recommendation. For that reason, there is no need to approve a new boundary map for the Ruby Junction Maintenance Facility.

Highway Improvements. The highway improvements for which TriMet is requesting Metro Council approval are located in the Expo Center/Hayden Island segments and described below:

- New northbound and southbound Interstate 5 Columbia River bridges and removal of the existing I-5 Columbia River bridges. The new southbound bridge is a two-tier bridge with highway on the upper deck and light rail on the lower deck. The new northbound bridge is a two-tier bridge with highway on the upper deck and bicycle and pedestrian facilities on the lower deck. Each bridge will include three travel lanes and two auxiliary lanes.
- Widening of Interstate 5 in both the northbound and southbound directions from approximately N. Victory Boulevard to the Oregon/Washington state line. Northbound, Interstate 5 will widen from three travel lanes at N. Victory Boulevard to three travel lanes and two auxiliary lanes on the new northbound Interstate 5 Columbia River bridge. Southbound, Interstate 5 will narrow from three travel lanes

and two auxiliary lanes on the new southbound Interstate 5 Columbia River bridge to three travel lanes south of N. Victory Boulevard.

- Newly designed interchanges at Marine Drive and Hayden Island and improvements to the Victory Boulevard Interchange.
- A new integrated light rail/vehicular/bicycle/pedestrian bridge west of Interstate 5 connecting Hayden Island with the Expo Center and N. Expo Road and the N. Vancouver Way extension.
- Realignment, widening and/or modification of N. Marine Drive, N.E. Martin Luther King Boulevard, N. Vancouver Way, N.E. Union Court, N. Jantzen Avenue, N. Jantzen Drive, N. Hayden Island Drive and N. Tomahawk Island Drive.
- New roadway connections between N.E. Martin Luther King Jr. Boulevard and N. Vancouver Way, N.E. Martin Luther King Jr. Boulevard and NE Union Court, N. Jantzen Avenue and N. Hayden Island Drive, and N. Expo Road and N. Force Avenue.

Consistent with Section 6(1)(a) of HB 3478, the boundaries shown on the maps represent the areas within which the light rail facilities and highway improvements may be located. The maps generally show the existing property lines and major buildings to provide orientation and clarity with respect to the proposed project facility locations. The precise locations of the proposed light rail facilities and highway improvements within these boundaries cannot accurately be identified until preliminary engineering and final design have been completed. The LUFO maps accordingly show a larger, more generalized boundary than will actually be needed for the track alignment, stations, park-and-ride lots, maintenance facilities and highway improvements

D. <u>Applicable Land Use Criteria</u>.

On May 30, 1996, pursuant to Section 4 of House Bill 3478, LCDC established the criteria to be used by the Council in making land use decisions establishing or amending the light rail route, stations, lots and maintenance facilities, and the highway improvements for the South/North Project, including their locations. The approved criteria include two procedural, six substantive, and two alignment-specific standards, set out below. In its LUFO, the Council must demonstrate compliance with these criteria.

Procedural Criteria

1. Coordinate with and provide an opportunity for Clackamas and Multnomah counties, the cities of Gladstone, Milwaukie, Oregon City and Portland, the Tri-County Metropolitan Transportation District of Oregon and the Oregon Department of Transportation to submit testimony on the light rail route, light rail stations, park-and-ride lots and vehicle maintenance facilities, and the highway improvements, including their locations.

2. Hold a public hearing to provide an opportunity for the public to submit testimony on the light rail route, light rail stations, park-and-ride lots, vehicle maintenance facilities and the highway improvements, including their locations.

Substantive Criteria

3. Identify adverse economic, social and traffic impacts on affected residential, commercial and industrial neighborhoods and mixed use centers. Identify measures to reduce those impacts which could be imposed as conditions of approval during the National Environmental Policy Act (NEPA) process, or, if reasonable and necessary, by affected local governments during the local permitting process.

    A. Provide for a light rail route and light rail stations, park-and-ride lots and vehicle maintenance facilities, including their locations, balancing (1) the need for light rail proximity and service to present or planned residential, employment and recreational areas that are capable of enhancing transit ridership; (2) the likely contribution of light rail proximity and service to the development of an efficient and compact urban form; and (3) the need to protect affected neighborhoods from the identified adverse impacts.

    B. Provide for associated highway improvements, including their locations, balancing (1) the need to improve the highway system with (2) the need to protect affected neighborhoods from the identified adverse impacts.

4. Identify adverse noise impacts and identify measures to reduce noise impacts which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by affected local governments during the permitting process.

5. Identify affected landslide areas, areas of severe erosion potential, areas subject to earthquake damage and lands within the 100-year floodplain. Demonstrate that adverse impacts to persons or property can be reduced or mitigated through design or construction techniques which could be imposed during the NEPA process or, if reasonable and necessary, by local governments during the permitting process.

6. Identify adverse impacts on significant fish and wildlife, scenic and open space, riparian, wetland and park and recreational areas, including the Willamette River Greenway, that are protected in acknowledged local comprehensive plans. Where adverse impacts cannot practicably be avoided, encourage the conservation of natural resources by demonstrating that there are measures to reduce or mitigate impacts which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the permitting process.

7. Identify adverse impacts associated with stormwater runoff. Demonstrate that there are measures to provide adequate stormwater drainage retention or removal and protect water quality which could be imposed as conditions of approval during the NEPA process or, if reasonable and necessary, by local governments during the permitting process.

8. Identify adverse impacts on significant historic and cultural resources protected in acknowledged comprehensive plans. Where adverse impacts cannot practicably be avoided, identify local, state or federal review processes that are available to address and to reduce adverse impacts to the affected resources.

Alignment-Specific Criteria

9. Consider a light rail route connecting the Clackamas Town Center area with the City of Milwaukie's Downtown. Consider an extension of the light rail route connecting the City of Oregon City and the City of Gladstone with the City of Milwaukie via the Interstate 205 corridor and/or the McLoughlin Boulevard corridor.

10. Consider a light rail route connecting Portland's Central City with the City of Milwaukie's Downtown via inner southeast Portland neighborhoods and, in the City of Milwaukie, the McLoughlin Boulevard corridor, and further connecting the Central City with north and inner northeast Portland neighborhoods via the Interstate 5/Interstate Avenue corridor.

E. <u>Interpretation of Terms</u>.

TriMet assumes that the Council will interpret the terms "light rail route", "stations", "lots", "maintenance facilities" and "highway improvements" as it did in its previous South/North LUFOs, to have the following meanings:

- "***Light rail route***" means the alignment upon which the light rail tracks will be located. The light rail route will be located on land to be owned by or under the operating control of TriMet.
- "***Stations***" means those facilities to be located along the light rail route for purposes of accessing or serving the light rail system. Stations include light rail station platforms; kiss-and-ride areas; bus transfer platforms and transit centers; vendor facilities; and transit operations rooms.
- "***Lots***" means those parking structures or surface parking lots that are associated with a station, owned by or under the operating control of either TriMet or another entity with the concurrence of TriMet, and intended primarily for use by persons riding transit or carpooling. Parking structures may include some retail or office spaces in association with the primary use.
- "***Maintenance facilities***" means those facilities to be located on land to be owned or controlled by TriMet for purposes of operating, servicing, repairing or maintaining the light rail transit system, including but not limited to light rail vehicles, the light rail tracks, stations, lots, and ancillary facilities and improvements. Maintenance facilities include maintenance facility access trackways; storage tracks for light rail vehicles; service, repair and maintenance shops and equipment; office facilities; locker rooms; control and communications rooms; transit district employee and visitor parking lots; and storage areas for materials and equipment and non-revenue vehicles.
- "***Highway improvements***" include new roads, road extensions or road widenings outside existing rights-of-ways that have independent utility in themselves and are not needed to

mitigate adverse traffic impacts associated with the light rail route, stations, lots or maintenance facilities.

Consistent with its previous South/North LUFOs, TriMet asks the Council to determine that implementation of the South/North LUFO under sections 8(1)(a) and (b) of Chapter 12 of the 1996 Oregon Laws (HB 3478), including the construction, operation and maintenance of the light rail route, stations, lots and maintenance facilities and the highway improvements for the Project, necessitates and requires development approval of certain associated actions and the permitting of certain associated or ancillary facilities or improvements. These associated actions or ancillary facilities or improvements generally are required: (1) to ensure the safe and proper functioning and operation of the light rail system; (2) to provide project access; (3) to improve traffic flow, circulation or safety in the vicinity of the Project; or (4) to mitigate adverse impacts caused to the adjoining roadway network resulting from the alignment, stations, lots or maintenance facilities. For these reasons, these actions, facilities or improvements are integral and necessary parts of the Project.

Also consistent with previous South/North LUFOs, TriMet asks the Council to find that the associated actions and ancillary facilities or improvements for the South/North Project include, but are not limited to: ties, ballast, and other track support materials such as tunnels and bridges; modifications to existing tracks; retaining walls and noise walls; culverts and other drainage systems; traction electrification equipment including substations; light rail signals and communications equipment and buildings; lighting; station, lot and maintenance facility accesses, including road accesses, pedestrian bridges and pedestrian and bicycle accessways; roadway crossing protection; and the provision of pedestrian paths, bike lanes, bus stops, bus pullouts, shelters, bicycle storage facilities and similar facilities. They also include temporary LRT construction-related roadways, staging areas and road or lane closures; roadway reconstruction, realignment, repair, widening, channelization, signalization or signal modification, lane reconfiguration or reduction, addition or modification of turning lanes or refuges, modification of traffic circulation patterns, or other modifications or improvements that provide or improve Project access, improve traffic flow, circulation or safety in the vicinity of the Project, facilitate or are necessary for the safe or proper functioning and operation of the Project, or are necessary to mitigate adverse traffic impacts created by the Project; modifications of private roadways adjoining the Project; permanent road, lane or access closures associated with and necessitated by the Project; and other associated actions or associated or ancillary facilities or improvements related to the Project.

Columbia River Crossing Project

Amendments to the 1998 South/North Land Use Final Order for the Expo Center/Hayden Island Segments

LUFO Steering Committee Recommendation Concerning the 2011 South/North Land Use Final Order

June 23, 2011

South/North Land Use Final Order Steering Committee Members

Metro
Rex Burkholder, Metro Councilor

TriMet
Neil McFarlane, General Manager

Oregon Department of Transportation
Matthew Garrett, Director

City of Portland
Sam Adams, Mayor

City of Milwaukie
Greg Chaimov, Councilor

City of Gresham
Shane Bemis, Mayor

Multnomah County
Loretta Smith, Commissioner

Clackamas County
Ann Lininger, Commissioner

City of Oregon City
Doug Neely, Mayor, Ex Officio

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1. Introduction

This document constitutes the South/North Land Use Final Order (LUFO) Steering Committee's recommendation to TriMet regarding TriMet's application to the Metro Council (Council) for amendments to the original South/North Corridor Project LUFO, which the Council adopted on July 23, 1998 (the 1998 LUFO). As initially approved, the 1998 LUFO covered an area extending from the Clackamas Town Center in the south through the cities of Milwaukie and Portland to the Oregon/Washington border in the north.

Since 1998, the Council has amended the 1998 LUFO three times. These include South/North LUFO amendments for Interstate Avenue (1999), Interstate 205 and Downtown Portland (2004) and Portland-Milwaukie (2008). The modifications included in this recommendation for a fourth LUFO amendment are part of a larger, two-state integrated light rail and highway project commonly known as the Columbia River Crossing (CRC) Project. Because Oregon Laws 1996, Chapter 12 (House Bill 3478), which is the law governing Council adoption of South/North Land Use Final Orders, applies only within the jurisdictional boundaries of the State of Oregon, this LUFO amendment addresses only that portion of the CRC Project within the State of Oregon.

This 2011 LUFO Steering Committee recommendation involves an area contained within the North Portland and Hayden Island segments as identified in the 1998 LUFO.[1] When the Council adopted its 1999 LUFO amendments for Interstate Avenue (the 1999 LUFO amendment), it renamed that portion of the 1998 LUFO North Portland segment extending from N. Denver Avenue to the Portland Metropolitan Exposition Center (Expo Center) the "Expo Center Segment." This 2011 LUFO amendment retains the name "Expo Center Segment" and extends the area it encompasses northward to N. Marine Drive.

This recommendation is provided pursuant to Section 6(1) of House Bill 3478, which directs TriMet to apply to the Metro Council for a Land Use Final Order approving the light rail route, stations, lots and maintenance facilities, and the highway improvements for the Project, including their locations, "following receipt of recommendations from the Department of Transportation and the Steering Committee", and Section 6(2), which provides:

> "(2) Any siting of the light rail route, a station, lot or maintenance facility, or a highway improvement outside the locations established in a land use final order, and any new station, lot, maintenance facility or highway improvement, shall require a land use final order amendment or a new land use final order which shall be adopted in accordance with the process provided for in

[1] The 1998 LUFO divided the South/North Project into nine segments. Those segments included the North Portland Segment, which extended from the Edgar Kaiser Medical Facility to N. Marine Drive, and the Hayden Island Segment, which extended from N. Marine Drive to the Oregon/Washington state line at the Columbia River.

subsection (1) of this section."

In May 1998, in accordance with Section 1(21) of House Bill 3478, the South/North LUFO Steering Committee was established through intergovernmental agreement between Metro, TriMet, ODOT, Clackamas County, Multnomah County, the City of Portland, and the City of Milwaukie. In 2008, the Intergovernmental Agreement was amended to add the City of Gresham as a LUFO Steering Committee member. The City of Gresham was added because the project required expansion of the Ruby Junction Maintenance Facility in Gresham. The City of Oregon City is an ex officio member of the Committee.

This recommendation from the LUFO Steering Committee addresses the light rail route, light rail stations and highway improvements in the portion of the Expo Center and Hayden Island segments of the South/North Project located between approximately N. Victory Boulevard and the Oregon/Washington state line. The CRC Project also will expand the use of the Ruby Junction Maintenance Facility in Gresham. However, all activity associated with that facility would occur within the maintenance facility boundaries that the Council previously approved in its 2008 LUFO amendment. For that reason, there is no need to approve a new boundary map for that facility.

2. Requirements of House Bill 3478.

House Bill 3478, Section 6(1) authorizes the Council, upon application by TriMet and following recommendations from the Steering Committee and Department of Transportation, to adopt a Land Use Final Order for the South/North Project. A LUFO is a written order or orders of the Council deciding the light rail route, the stations, lots and maintenance facilities, and the highway improvements for the South/North Project, including their locations. The LUFO identifies the light rail route, stations, lots, maintenance facilities and highway improvements that comprise the South/North project, and it further specifies the locations within which these facilities and improvements may be located. As explained in Section 6(1)(a) of House Bill 3478,

> "The applied for locations shall be in the form of boundaries within which the light rail route, stations, lots and maintenance facilities, and the highway improvements shall be located. These boundaries shall be sufficient to accommodate adjustments to the specific placements of the light rail route, stations, lots and maintenance facilities, and the highway improvements for which need commonly arises upon the development of more detailed environmental or engineering data following approval of a Full Funding Grant Agreement."

3. Recommended South/North Project LUFO Amendments

The LUFO Steering Committee recommends that TriMet apply for, and that the Council adopt, a LUFO amending the 1998 South/North LUFO to approve the light rail route, stations, maintenance facilities and highway improvements identified textually below and in the attached maps, which illustrate the location "boundaries" as required by Section 6(1)(a) of HB 3478. The modified route and station and the highway improvements all are located within the Expo Center and Hayden Island segments of the South/North Project as identified in the 1998 LUFO and the 1999 LUFO amendment. The maintenance facility improvements involve expanded use of improvements at the existing Ruby Junction Maintenance Facility in Gresham, within location boundaries that the Council approved in 2008.

The area affected by these amendments extends from south of N. Victory Boulevard to the Oregon/Washington border. The original light rail alignment within the area subject to this 2011 LUFO amendment is identified in Figures 1.8b on page A-11 of the 1998 LUFO and Figure 1.8 of the 1999 LUFO amendment. The 1999 LUFO amendment extended only as far north as the Expo Center. Because this 2011 LUFO amendment affects a relatively small portion of the Expo Center segment, the LUFO Steering Committee recommends that the analysis of the Expo Center and Hayden Island segments be combined and addressed as a single segment (Expo Center/Hayden Island).

For light rail, the CRC Project begins at the Expo Center and continues northward to the Oregon/Washington state line on the Columbia River along an alignment located west of the alignment boundary that the Council approved in the 1998 LUFO. From the Expo Center station, the light rail alignment proceeds northward under N. Marine Drive and onto a new, integrated multi-modal rail/vehicular/bicycle/pedestrian bridge crossing over the North Portland Harbor onto Hayden Island west of Interstate 5. The alignment then continues northward, crossing over N. Hayden Island Drive onto the lower deck of the new southbound Interstate 5 bridge, where it continues to and beyond the Oregon/Washington state line.

A single light rail station is located at the east end of the Jantzen Beach Center west of Interstate 5. No park-and-ride lots or maintenance facilities are proposed for this segment. However, maintenance facility improvements will be provided at the Ruby Junction Maintenance Facility in Gresham within the boundaries of this facility that the Council approved in the 2008 LUFO amendments for the Portland-Milwaukie Project.

For highway improvements, the CRC Project begins just south of N. Victory Boulevard and extends northward to the Oregon/Washington border. These highway improvements were not part of the South/North Project initially approved in 1998. However, HB 3478 authorizes amendments to the South/North project from time to time, and it authorizes the inclusion of highway improvements if they are described in a Draft or Final Environmental Impact Statement for the Project. Highway improvements were added to the 2008 amendments for the Portland-Milwaukie Project, and they are recommended here as well. Much like the Westside Corridor Project, which extended light rail to Hillsboro, widened and improved US 26 and Oregon 217 and connecting roadways, and was approved under a

LUFO process pursuant to Oregon Laws 1991, Chapter 3 (Senate Bill 573)[2], the CRC Project is an integrated light rail and highway project, with many improvements serving dual rail and highway purposes.

The highway improvements for the Expo Center/Hayden Island segments include the following[3]:

- New northbound and southbound Interstate 5 Columbia River bridges and removal of existing Interstate 5 bridges. The new southbound bridge is a two-tier bridge with highway on the upper deck and light rail on the lower deck. The new northbound bridge is a two-tier bridge with highway on the upper deck and bicycle and pedestrian facilities on the lower deck. Each bridge will include three travel lanes and two auxiliary lanes.
- Widening of Interstate 5 in both the northbound and southbound directions from approximately N. Victory Boulevard to the Oregon/Washington state line. Northbound, Interstate 5 will widen from three travel lanes at N. Victory Boulevard to three travel lanes and two auxiliary lanes on the new northbound Interstate 5 Columbia River bridge. Southbound, Interstate 5 will narrow from three travel lanes and two auxiliary lanes on the new southbound Interstate 5 Columbia River bridge to three travel lanes south of N. Victory Boulevard.
- Newly designed interchanges at Marine Drive and Hayden Island and improvements to the Victory Boulevard Interchange.
- A new integrated light rail/vehicular/bicycle/pedestrian bridge west of Interstate 5 connecting Hayden Island with the Expo Center and N. Expo Road and the N. Vancouver Way extension.
- Realignment, widening and/or modification of N. Marine Drive, N.E. Martin Luther King Boulevard, N. Vancouver Way, N.E. Union Court, N. Jantzen Avenue, N. Jantzen Drive, N. Hayden Island Drive and N. Tomahawk Island Drive.
- New roadway connections between N.E. Martin Luther King Jr. Boulevard and N. Vancouver Way, N.E. Martin Luther King Jr. Boulevard and NE Union Court, N. Jantzen Avenue and N. Hayden Island Drive, and N. Expo Road and N. Force Avenue.

The proposed boundaries within which the above-described light rail facilities and highway improvements would be located are as illustrated on the boundary maps for the Expo Center/Hayden Island segments attached to this recommendation **(Figures 1.1 to 1.3)**

The Ruby Junction Maintenance Facility in Gresham includes light rail tracks, vehicle storage spaces, maintenance bays, an operation center, and related facilities necessary to maintain light rail vehicles. The 2008 South/North LUFO findings for the Portland-Milwaukie Project anticipated use of this facility to serve light rail vehicles needed for

[2] Senate Bill 573 for the Westside Corridor Project served as the model for House Bill 3478 for the South/North Project.
[3] Many of these roadway improvements include associated bicycle and pedestrian improvements.

future light rail transit expansion to Vancouver, Washington. With the CRC project, that expectation becomes a reality. Because all improvements associated with the CRC Project will be located within the locational boundary of the Ruby Junction facility that the Metro Council approved in 2008, there is no need to amend the boundary map to accommodate the expanded use of the facility associated with the CRC project. For informational purposes, the 2008 boundary map that the Council approved is attached to this recommendation as **Figure 2.1.**

South/North Land Use Final Order Amendment Boundary Map

Figure 1.1 **Columbia River Crossing Project**

Light Rail Route
Light Rail Stations
Highway improvements
Potential Alignment
Potential Station Platform

METRO

Feet
0 200 400
1 inch equals 400 feet

South/North Land Use Final Order Amendment Boundary Map

Figure 1.3

Columbia River Crossing Project

Light Rail Route

Light Rail Stations

Highway improvements

Potential Alignment

Potential Station Platform

METRO

Feet

0 200 400

1 inch equals 400 feet

4. Interpretation of Terms

For the purposes of South/North Land Use Final Orders, including the 1998 LUFO and each amendment thereto, the Council has interpreted the terms "light rail route", "stations", "lots", "maintenance facilities" and "highway improvements" to have the following meanings:

- "***Light rail route***" means the alignment upon which the light rail tracks will be located. The light rail route will be located on land to be owned by or under the operating control of TriMet.
- "***Stations***" means those facilities to be located along the light rail route for purposes of accessing or serving the light rail system. Stations include light rail station platforms; kiss-and-ride areas; bus transfer platforms and transit centers; vendor facilities; and transit operations rooms.
- "***Lots***" means those parking structures or surface parking lots that are associated with a station, owned by or under the operating control of either TriMet or another entity with the concurrence of TriMet, and intended primarily for use by persons riding transit or carpooling. Parking structures may include some retail or office spaces in association with the primary use.
- "***Maintenance facilities***" means those facilities to be located on land to be owned or controlled by TriMet for purposes of operating, servicing, repairing or maintaining the light rail transit system, including but not limited to light rail vehicles, the light rail tracks, stations, lots, and ancillary facilities and improvements. Maintenance facilities include maintenance facility access trackways; storage tracks for light rail vehicles; service, repair and maintenance shops and equipment; office facilities; locker rooms; control and communications rooms; transit district employee and visitor parking lots; and storage areas for materials and equipment and non-revenue vehicles.
- "***Highway improvements***" include new roads, road extensions or road widenings outside existing rights-of-ways that have independent utility in themselves and are not needed to mitigate adverse traffic impacts associated with the light rail route, stations, lots or maintenance facilities.

Additionally, for the 1998 LUFO and the amendments thereto, the Metro Council determined that implementation of the South/North LUFO under sections 8(1)(a) and (b) of Chapter 12 of the 1996 Oregon Laws (HB 3478), including the construction, operation and maintenance of the light rail route, stations, lots and maintenance facilities and the highway improvements for the Project, necessitates and requires development approval of certain associated actions and the permitting of certain associated or ancillary facilities or improvements. These associated actions or ancillary facilities or improvements generally are required: (1) to ensure the safe and proper functioning and operation of the light rail system; (2) to provide project access; (3) to improve traffic flow, circulation or safety in the vicinity of the Project; or (4) to mitigate adverse impacts to the adjoining roadway network resulting from the alignment, stations, lots or maintenance facilities. For these reasons, the Metro Council determined that these actions, facilities or improvements are integral and necessary parts of the Project.

The Metro Council has further determined that the associated actions and ancillary facilities or improvements for the South/North Project include, but are not limited to: ties, ballast, and other track support materials such as tunnels and bridges; modifications to existing tracks; retaining walls and noise walls, culverts and other drainage systems; traction electrification equipment including maintenance facility accesses, including road accesses, pedestrian bridges and pedestrian and bicycle stops, bus pullouts, shelters, bicycle storage facilities and similar facilities. They also include temporary construction-related roadways, staging areas and road or lane closures; roadway reconstruction, realignment, repair, widening, channelization, signalization or signal modification, lane reconfiguration or reduction, addition or modification of turning lanes or refuges, modification of traffic circulation patterns, or other modifications or improvements that provide or improve project access, improve traffic flow, circulation or safety in the vicinity of the Project, facilitate or are necessary for the safe or proper functioning and operation of the Project, or are necessary to mitigate adverse traffic impacts created by the Project; modifications of private roadways adjoining the Project; permanent road, lane or access closures associated with and necessitated by the Project; and other associated actions or associated or ancillary facilities or improvements related to the Project.

Oregon
John A. Kitzhaber, M.D., Governor

Department of Transportation
Office of the Director
1158 Chemeketa Street NE
Salem, OR 97301
Phone: (503) 986-3289
Fax: (503) 986-3432

Neil McFarlane, General Manager
TriMet
4012 SE 17th Avenue
Portland, Oregon 97202

Subject: Columbia River Crossing Project LUFO Approval

Dear ~~Mr. McFarlane~~: NEIL,

The Oregon Legislative Assembly (House Bill 3478, Special Session 1996) charged the Oregon Department of Transportation to prepare a recommendation to TriMet on any application for a Land Use Final Order (LUFO) that establishes or amends the light rail route, stations, lots, maintenance facilities and highway improvements that are included as part of the South/North Corridor Project. Metro adopted the original LUFO in 1998. TriMet is currently preparing an application for an amendment to the 1998 LUFO that incorporates both the light rail and highway improvements to be constructed as part of the Columbia River Crossing Project.

We believe the project team has met both the intent and the specific requirements established by the Oregon Legislature concerning the conduct of this project. Following completion of the Draft Environmental Impact Statement, affected local government agencies and the States of Oregon and Washington worked together to revise the project to ensure it meets the needs of the region and state.

The public process, including informational meetings, public hearings, and direct involvement of business, civic, and neighborhood associations, has been comprehensive. This project includes new I-5 bridges across the Columbia River and major improvements to I-5 interchanges and connecting arterials. I-5 is the major facility serving Oregon, Washington and California and performs a vital role to the movement of people and freight. The importance of alleviating the existing safety problems and bottleneck on this critical stretch of the corridor cannot be overstated.

Improvements to state highway facilities included in the Steering Committee recommendation require coordination with and approval by the Oregon Department of Transportation. Therefore, on behalf of the Oregon Department of Transportation, I recommend approval of the LUFO application in accordance with the Steering Committee recommendation at its June 23, 2011, meeting. . The department concurs fully with the light rail and highway improvements and the location boundary maps for those improvements contained in that recommendation.

We at ODOT look forward to continuing our partnership with TriMet, Metro, the City of Portland and our other jurisdictional partners in pursuing this project to its successful conclusion.

Sincerely,

Matthew L. Garrett
Director

Columbia River Crossing Project

Land Use Final Order (LUFO) Public Hearing

The Metro Council will hold a public hearing on Aug. 11, 2011 to consider amending the existing Land Use Final Order for light rail and Interstate 5 bridge replacement and associated highway improvements in the Columbia River Crossing project area in Oregon to reflect changes to the previously adopted South/North Project. These changes include an extension of light rail from the Expo Center to and over the Columbia River, to continue into Vancouver, Wash., replacement of the I-5 Columbia River bridge, and associated highway improvements in North Portland.

You can comment by testifying at the public hearing or submitting your testimony in writing to Metro. Submittal of written testimony for the record in advance of the hearing is strongly encouraged. Written testimony submitted in advance of the hearing must either be mailed or hand delivered to Metro addressed as follows:

Metro, Attention: Laura Dawson Bodner
600 NE Grand Ave.
Portland, Oregon 97232

Public hearing
2 p.m. Thursday, August 11

Metro Regional Center | 600 NE Grand Avenue, Portland
For more information, call 503-797-1916

Only oral testimony at the hearing and written testimony received prior to the close of the public hearing will be included in the record. Those who sign a petition submitted into the public record for the Land Use Final Order will not be considered to have provided oral or written testimony.

At the close of the hearing, the Metro Council will consider adoption of a Land Use Final Order.

Failure of a person to raise an issue orally at the hearing or in writing in advance of the close of the hearing, or failure to provide sufficient specificity to afford the Metro Council an opportunity to respond to the issue raised, will preclude appeal by that person to the Land Use Board of Appeals or the Oregon Supreme Court based on that issue.

Appeals from actions taken by the Metro Council in adoption of a Land Use Final Order must be personally delivered to the Land Use Board of Appeals, the State Court Administrator and the offices of Metro's Council President within 14 days following the date the Land Use Final Order is reduced to writing and bears the necessary signatures.

Staff reports, agency recommendations and findings related to land use criteria will be available for inspection beginning July 14, 2011 at www.oregonmetrolgov/columbiarivercrossing or at Metro, 600 NE Grand Ave., Portland.

Written notice of adoption of the Land Use Final Order will only be sent to those who provide all of the following:

- in writing, a request for written notice of the decision;
- written or oral testimony; and
- a valid mailing address.

Mailed 07-14-11

Columbia River
Crossing Project

Land Use Final Order (LUFO) Public Hearing

2 p.m.
Thursday, Aug. 11

Metro Regional Center
600 NE Grand Ave.
Portland

Columbia River Crossing Project
Metro
600 NE Grand Ave.
Portland, OR 97232

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72611cw-01

BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF AMENDING THE 1998 LAND USE FINAL ORDER FOR THE SOUTH/NORTH LIGHT RAIL PROJECT AND ADOPTING A LAND USE FINAL ORDER FOR THE EXPO CENTER/HAYDEN ISLAND SEGMENT OF THE PROJECT INCLUDING THE I-5 COLUMBIA RIVER CROSSING BRIDGE AND ASSOCIATED HIGHWAY IMPROVEMENTS	)	RESOLUTION NO. 11-4280 INTRODUCED BY COUNCILOR REX BURKHOLDER

WHEREAS, the Oregon Legislature enacted Oregon Laws 1996, Chapter 12 (the Act), establishing procedures for developing the South/North Light Rail Project through adoption by the Metro Council of a Land Use Final Order (LUFO); and

WHEREAS, in accordance with section 4 of the Act, the Oregon Land Conservation and Development Commission adopted criteria to govern Council review of an application for a LUFO for the South/North Light Rail Project, or any segment of it, on May 30, 1996; and

WHEREAS, the Metro Council endorsed a Locally Preferred Alternative (LPA) for the I-5 Columbia River Crossing Project by Resolution No. 08-3960B (For the Purposes of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions), adopted July 17, 2008, that includes extension of South/North Light Rail from the Expo Center to Vancouver, Washington; and

WHEREAS, Metro's Regional Transportation Plan (RTP) calls for extension of light rail from the Expo Center to Vancouver, Washington, as part of the I-5 Columbia River Crossing Project and places the project on the RTP's Financially Constrained Roadway Network; and

WHEREAS, section 6.3.2.1 of the RTP required reconsideration of the I-5 Columbia River Crossing Project and amendment of the RTP if the number and design of auxiliary lanes on the I-5 Columbia River Bridge or approaches to the bridge are inconsistent with the description of the project in the RTP; and

WHEREAS, in accordance with section 6 of the Act, on June 23, 2011, the LUFO Steering Committee recommended that TriMet submit to Metro an application for, and the Metro Council adopt, an amendment to the 1998 South/North Light Rail LUFO to approve the light rail route, a station and highway improvements within the Expo Center/Hayden Island Segment of the South/North Light Rail Project; and

WHEREAS, in accordance with section 6 of the Act, in a letter from Matt Garrett, Director, the Oregon Department of Transportation (ODOT) recommended that TriMet submit to Metro an application for, and the Metro Council adopt, an amendment to the 1998 South/North Light Rail LUFO to approve the light rail route, a station and highway improvements within the Expo Center/Hayden Island Segment of the South/North Light Rail Project; and

WHEREAS, in accordance with section 6 of the Act, on July 13, 1011, TriMet filed an application for a LUFO for the Expo Center-Vancouver segment of the South/North Light Rail Project with the light rail route, station and highway improvements recommended by both the LUFO Steering Committee and ODOT; and

WHEREAS, the light rail route, station and highway improvements are in the form of boundaries within which the light rail route, station and highway improvements will be located, as required by section 6 of the Act; and

WHEREAS, the number and design of auxiliary lanes on the I-5 Columbia River Bridge and the approaches to the bridge project proposed in the TriMet LUFO application are consistent with the I-5 Columbia River Crossing Project described in the RTP; and

WHEREAS, by Resolution No. 11-4264 (For the Purpose of Concluding that the Concerns and Considerations Raised about the Columbia River Crossing Project in Exhibit A to Resolution No. 08-3960B Have Been Addressed Satisfactorily), adopted June 9, 2011, the Council determined that the conditions set forth in Resolution No. 08-3960B ~~had been satisfied~~have been addressed satisfactorily; and

WHEREAS, Metro published a notice in *The Oregonian*, containing all the information required by section 7 of the Act, on July 14, 2011, of a public hearing before the Metro Council to consider TriMet's LUFO application on August 11, 2011;

WHEREAS, Metro provided additional public notice of the August 11, 2011, public hearing by mailing postcards to all persons who own property within 250 feet of the proposed light rail alignment and stations and by posting notice at Metro's website, both on July 14, 2011; and

WHEREAS, Metro sent notice of the public hearing on July 15, 2011, to ODOT, Clackamas and Multnomah counties and the cities of Portland, Milwaukie, Gladstone, Gresham and Oregon City; and

WHEREAS, the Council finds and determines that *The Oregonian* is a newspaper of general circulation in the region and the above-described notices are reasonably calculated to give notice to persons who may be affected substantially by a decision to approve TriMet's LUFO application; and

WHEREAS, on July 14, 2011, Metro made available for public inspection a staff report addressing compliance of TriMet's application with the requirements of the Act; and

WHEREAS, the Council held a public hearing on the TriMet LUFO application on August 11, 2011; and

WHEREAS, the Council President made a statement at the beginning of the hearing containing the information required by section 7 of the Act; and

WHEREAS; the Council considered TriMet's application, the recommendations of the LUFO Steering Committee and ODOT, the staff report, the Findings of Fact and Conclusions of Law and all public testimony presented on the application; now, therefore,

BE IT RESOLVED THAT the Metro Council:

1. Hereby amends the 1998 Land Use Final Order (LUFO) for the South/North Light Rail Project, and adopts the LUFO for the Columbia River Crossing Light Rail Project, Expo Center/Hayden Island Segment of the South/North Light Rail Project, attached and incorporated into this resolution as Exhibit A, including the locations of the light rail route, station and highway improvements extending from the Expo Center to the Oregon-Washington line, and as shown in Exhibit A to be identical to the TriMet LUFO application.

2. Adopts the Findings of Fact and Conclusions of Law, attached and incorporated into this resolution as Exhibit B, as the Council's written findings demonstrating how the application and Council's decision comply with the applicable criteria.

3. Authorizes the Council President to sign the Final Environmental Impact Statement for the I-5 Columbia River Crossing Project.

ADOPTED by the Metro Council this 11th day of August, 2011.

____
Tom Hughes, Council President

Approved as to form:

____
Alison Kean Campbell, Acting Metro Attorney

600 NE Grand Ave.
Portland, OR 97232-2736
www.oregonmetro.gov

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MINUTES OF THE METRO COUNCIL WORK SESSION

July 26, 2011
Metro Council Chamber

Councilors Present: Council President Tom Hughes and Councilors Rex Burkholder, Carlotta Collette, Shirley Craddick, Kathryn Harrington, Carl Hosticka, and Barbara Roberts

Councilors Excused: None

Council President Tom Hughes convened the Metro Council work session at 2:02 p.m.

1. **ADMINISTRATIVE/COUNCIL AGENDA FOR JULY 28, 2011/CHIEF OPERATING OFFICER COMMUNICATIONS**

There were none.

2. **CONSIDERATION OF SUBMITING A GRANT APPLICATION TO THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD) FOR A REGIONAL SUSTAINABLE COMMUNITITES GRANT ON BEHALF OF THE CONSORTIUM**

Mr. Andy Cotugno and Ms. Chris Deffebach of Metro briefed the council on the Housing and Urban Development (HUD) grant information; specifically the steps included in the application process. After the last HUD grant Metro received feedback that more specific information is needed for the next application process. Specifically the deliverables that will be generated on a regional scale will be better defined and a couple of pilot areas will be included.

Two target areas proposed for this grant are the Rockwood/East Portland area and the McLoughlin Area Plan. These projects would allow further investment on projects that have already been started and capitalize on resources previously expended. Further grant investment goals are to connect with areas that have disadvantaged populations.

Primary components of the HUD grant include:
- Housing needs and strategies
- Opportunity area mapping
- Fair housing
- Coordination of rent assistance with workforce training
- Support for community organizations

Councilors discussed the need to learn from the last HUD grant application and that the region needs to be more focused and targeted. Furthermore the steering committee will need to ensure a high level of clarity regarding how the connection between proposed projects and jobs, housing, and economic development.

Further discussion included the desire to improve upon an already existing project rather than creating something from the ground up such as improving upon housing, jobs, and access needs within these key corridors.

3. COLUMBIA RIVER CROSSING LAND USE FINAL ORDER (LUFO)

Mr. Cotugno briefed the committee on Resolution No. 11-4280 regarding the Land Use Final Order (LUFO) for the Columbia River Crossing (CRC). The use of a LUFO is for highway construction and transportation projects. The current action is to amend the first LUFO which was for a stand-alone LRT project to Vancouver; that project no longer exists. That became the framework for the multi-modal project now under construction.

Publishing the Final Environmental Impact Statement (FEIS) is part of the federal requirement and only published when all the co-sponsors are ready to sign off on it. This resolution authorizes the council president to sign off on the document. That document serves as the federal agency mechanism for approving a decision. There will be another level of design specificity such as railing types, sidewalk widths etc... There is still open governance about the mobility council, those will be further actions that need to take place. Any federal funding must go through the Metropolitan Transportation Improvement Program (MTIP).

Ms. Nancy Boyd of the CRC briefed the council about the State of Oregon Treasurer's financial report. In spite of how the media portrayed the report, the CRC staff is happy to see the report and receive the feedback within. The treasurer's report validated a lot of the work that has been done to this point, specifically ensuring that the project is reflective of the current economic situation. The report provided constructive feedback about different funding sources and concluded that the cost estimate appears solid and the contingency plan is on point. The Governor requested for the CRC to prepare a construction sequencing plan which the CRC staff has already started. Further takeaways from the Treasurer's report are to be mindful of cash flow and the effect of cash flow on the project, a reminder that the financial plan isn't set rather there are different scenarios, and to remain flexible enough to make informed decisions within the collaborative effort.

Council discussion focused on what type of impact phasing construction might have on the project, what impact phasing construction might have on the Metro Council's approval process, and whether the phasing of construction will eliminate certain aspects of the project or allow for some potential redesigning. Council members also discussed planning for the mitigation of adverse impacts to the local community, how health impacts from this project will be addressed, and whether health issues are attached to the land use piece of this project.
Mr. Mark Greenfield of TriMet reviewed the contents of the LUFO and the basis in state law and similarity with the LUFO for the Westside project. Mr. Dick Benner of Metro briefed the council on the voting process for the CRC project LUFO. The process update included voting and appeals process timelines, media notification timelines, and public testimony guidelines.

4. COUNCIL BRIEFINGS / COMMUNICATIONS

Councilor communications included an update on the policy ride at last weekend's Sunday Parkways, Councilor Harrington's trip to New York, an update about the City of Damascus' comprehensive planning meeting, and a reminder that the council retreat is schedule for Thursday July 28, 2011.

Prepared by,

Chris Myers
Metro Council Policy Assistant

ATTACHMENTS TO THE PUBLIC RECORD FOR THE MEETING OF JULY 26, 2011

ITEM	DOCUMENT TYPE	DOC DATE	DOCUMENT DESCRIPTION	DOCUMENT NO.
4.0	Handout	n/a	Resolution No. 11-4280	72611cw-01

CRC Messaging 072511.doc

CRC Toll Messaging

- The character of the decision at hand is whether to approve the physical footprint for the proposed project based upon consistency with criteria established by state law and LCDC rulemaking. When there is concurrence on the scope of the project, efforts can turn to actions needed to make financial commitments for the project. When adopting the resolution in June signing off on the conditions imposed by the Metro Council when the Locally Preferred Alternative was approved, there was agreement by the Metro Council that the project should proceed to the next step so that more refined information can be developed. There is no new information between last month when the conditions resolution was considered and now except the Treasurer's Report which is a review of past work not the creation of new analysis.

- All of the expert sources around modeling recognize there is a level of modeling analysis required at this EIS stage of the process and a more rigorous analysis required at the point of making financing commitments when an investment grade analysis will be required. The investment grade analysis will be needed in several years and there is time to determine the work program, budget and cost responsibility to upgrade the models. Metro has a continuous process to upgrade the travel demand models and update future forecasts to reflect current conditions. Changes to the models to better reflect changing conditions during the course of the day are underway. Additional model improvements deemed essential for reliably forecasting the impacts of tolls will need to be identified and programmed into work programs and budgets.

  It is also important to use input data regarding existing traffic, growth forecasts, gas prices, transit coverage, interest rates and other conditions that are as current as possible to the timing of making financial commitments. Anything done at an investment grade level of detail now will have to be redone later to incorporate up to date assumptions. When the investment grade forecast is produced, it will be based upon traffic forecasts to 2035 or 2040 (depending upon when they are done) rather than the 2030 forecast year used for the EIS work.

- The adequacy of the models is sufficient for this EIS step of the process. The expert panel commissioned by the CRC project reached that conclusion. The two respected consultants commissioned by the State Treasurer confirmed that. As part of the analysis for the CRC project, refinements that were recommended by Metro's modeling staff and the CRC project consultants were made to the models. These were incorporated to better account for the value of time which impacts the relation between travel delay and tolls and to more accurately account for origin-destination patterns across the bridge. In addition, a traffic operations model for the full length of I-5 from the Marquam Bridge to the Clark Co. Fairgrounds to better simulate merging, weaving, queuing and accidents at the ramps was developed to assist in the design of the project.

- In addition to the travel demand models, future traffic forecasts take into account population and employment forecasts for the region. The 2030 forecasts used for the CRC project design and EIS were generated pre-recession and current employment forecasts are lower than reflected in the CRC forecasts. Metro's more recent forecasts developed and adopted as part of the Urban Growth Report in December 2010 reflect that reduced employment growth rate and are consistent with the findings of the Treasurer. In order to account for the effects of the recession, the Treasurer has recommended that the CRC project reduce their revenue estimates from tolls for financial planning purposes by 15-25%. The actual revenue estimates at the time revenue commitments will be required will use the most recent employment forecasts as part of an investment grade forecast.

- In addition to the overall regional employment forecasts an important consideration is the location of growth throughout the region. The forecasts for the CRC work must be agreed to by both Metro and SW Washington Regional Transportation Council. The jurisdictions of Clark County have a significant policy initiative to expand their employment base in order to be less dependent upon access to jobs in Oregon and the forecasts used for the CRC analysis reflect this policy initiative. This is an important objective in Clark County for the economic and social stability of their community, the impact on commute patterns and the impact on tax revenues. When employment forecasts are reduced regionwide, they will be disproportionately reduced in Clark County having the effect of shifting more commuting in the forecast from Clark Co. based jobs to Oregon based jobs. Remember, the region's population growth rate has not been dampened during the recession.

  As a routine part of Metro's work program, staff is in the process of updating growth allocations throughout the region to take into account recent policy direction set through the RTP and the Urban Reserves decision in close coordination with local governments. This task is scheduled for completion in February. This will be a fundamental analysis tool that will be used throughout the region for updating local land use and transportation plans and for transportation project analysis. It is a resource that CRC will have access to and will be used as part of the investment grade analysis.

- The Treasurer's Report sets the stage for some key issues to be addressed in the next stage of the project when the focus turns to financial commitments and implementation schedule. The Treasurer has called for taking a more conservative approach to financial planning at this time which will reduce the revenue assumptions that tolls may provide. In light of this, the Treasurer has also identified some remedies to this reduction including consideration of pre-construction tolling (collecting toll revenues during construction) and use of the federal Transportation Infrastructure Finance and Innovation Act (TIFIA) to provide federal credit backing for the toll revenues thereby lowering the cost of borrowing. In addition, the Governor has called for the CRC project to develop a sequencing plan that can adapt to varied cash flow and implement the project incrementally.

Laura Dawson-Bodner

From: Joyce Felton
Sent: Friday, July 22, 2011 12:08 PM
To: tomholmes@michaeljlilly.com
Cc: Pamela Blackhorse; Laura Dawson-Bodner
Subject: FW: Steering Committee meeting 8/11

Mr. Tom Holmes:

The CRC Land Use Final Order (LUFO) Steering Committee was convened by TriMet so you should contact TriMet regarding anything pertaining to the LUFO Steering Committee meeting that we have not provided. We only have the documents TriMet submitted to Metro as a part of their application for the LUFO amendment, which is on the web site Ms. Blackhorse directed you to, and what Ms. Dawson-Bodner provided previously in response to a public record request from your office.

I do not know of a LUFO Steering Committee meeting on August 11. There is a Metro Council meeting and public hearing that will consider adopting a resolution on the LUFO amendment on August 11.

Joyce Felton
Transportation Planner

Planning and Development
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600 NE Grand Avenue
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-----Original Message-----
From: Pamela Blackhorse
Sent: Thursday, July 21, 2011 3:13 PM
To: Joyce Felton
Cc: Laura Dawson-Bodner; Andy Cotugno
Subject: FW: Steering Committee meeting 8/11

Please review the request below.

Thank you,

-----Original Message-----
From: Tom Holmes [mailto:tomholmes@michaeljlilly.com]
Sent: Thursday, July 21, 2011 3:06 PM
To: Pamela Blackhorse
Subject: Steering Committee meeting 8/11

This meeting comes on the same day as the Metro Council meeting planned for discussion of the Columbia River Crossing/ Land Use Final Order.
Will the CRC be on the Steering Committee's agenda also?

And, are you the person to contact for information on prior meetings of the Steering Committee? They produced a recommendation for the CRC-LUFO on June 23rd, 2011. I want to get a copy of the Staff Report related to that recommendation, if there was one.

--
Tom Holmes, Paralegal
Office of Michael J. Lilly
4800 SW Griffith Drive, Suite 325
Beaverton, OR 97005

MAIN NO: 503-746-5977 FAX: 503-746-5970 tomholmes@michaeljlilly.com

Michael J. Lilly
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Email: mikelilly@michaeljlilly.com

July 21, 2011

Metro, Attention: Laura Dawson Bodner
600 NE Grand Ave.
Portland, OR 97232

By U.S. Mail
Re: Columbia River Crossing LUFO
Proposed Metro Council Resolution No. 11-4380

Dear Ms. Laura Dawson Bodner:

I enclose letters to Richard Benner dated July 21, 2011 and July 13, 2011 for the Council's consideration as part of the record in connection with their public hearing on this matter to be held on August 11, 2011.

Please send me written notice of the decision at my address on the letterhead above. Thank you for your attention.

Michael J. Lilly

Michael J. Lilly

Enclosure
cc: Richard Benner – Attorney for Metro
Tamara Lesh – Attorney for TriMet

Michael J. Lilly
Attorney at Law
4800 SW Griffith Drive, Suite 325
Beaverton, OR 97005

Telephone: 503-746-5977
Facsimile: 503-746-5970
Email: mikelilly@michaeljlilly.com

July 21, 2011

Richard Benner
Metro
600 NE Grand Avenue
Portland, OR 97232

By Mail and Email
Re: Columbia River Crossing LUFO
Proposed Metro Council Resolution No. 11-4380

Dear Dick:

I am writing on behalf of Plaid Pantries, Inc. and Chris Girard. I understand that the Metro Council is planning to consider TriMet's LUFO application in a work session on July 26. As you know from my previous letter, I don't think that the LUFO light rail process can be used for approving the new Interstate Bridge, therefore we are objecting to Metro's assumption of jurisdiction over this decision. But if the Council proceeds in spite of this objection, then this LUFO is Metro's last opportunity to consider and review the CRC project. Metro owes it to itself and the public to deliberate with a complete record and follow quasi-judicial procedures.

Quasi-judicial procedures are required because there is a discrete "applicant," a specific "project," and a circumscribed factual situation that, while impacting millions through their pocketbooks, also significantly impacts a discreet group of property owners through land use approval for bridge construction as proposed. Constitutional due process dictates that Metro allow Plaid Pantry and other parties a full opportunity to address the proposal and to rebut the claims of the applicant and Metro staff, and regardless of Metro's disputed *authority* to proceed legislatively, Metro should 'take the high road' in this instance by providing quasi-judicial process and safeguards.

In Fasano v. Washington County, 264 Or 574, 580-81, 507 P.2d 23 (1973) the Court considered whether, and under what circumstances, local governments can make land use decisions in a legislative capacity, and when quasi-judicial procedural safeguards must be provided. In Fasano, the Court stated:

"Ordinances laying down general policies without regard to a specific piece of property are usually an exercise of legislative authority, are subject to limited review, and may only be attacked upon constitutional grounds for an arbitrary abuse of authority. On the other hand, a determination whether the permissible use of a specific piece of property should be changed is usually an exercise of judicial authority and its propriety is subject to an altogether different test."

" '* * * Basically, this test involves the determination of whether action produces a general rule or policy which is applicable to an open class of individuals, interest, or situations, or whether it entails the application of a general rule or policy to specific individuals, interests, or situations. If the former determination is satisfied, there is legislative action; if the latter determination is satisfied, the action is judicial.' (citing 33 Ohio St.L.J. at 137)."

This same principle was discussed in Neuberger v. City of Portland, 288 Or 155,161-62, 603 P2d 771 (1979) which quoted Fasano and also stated:

"When specific facts must be determined in order that pre-existing criteria may be applied, procedures similar to those used in adjudications are important in order to assure that factual determinations will be made correctly."

The seminal case on the legislative/quasi-judicial distinction is Strawberry Hill 4 Wheelers v. Benton Co. Bd. of Comm., 287 Or 591, 602–03, 601 P2d 769 (1979). There the Supreme Court stated:

"Generally, to characterize a process as an adjudication presupposes that the process is bound to result in a decision and that the decision is bound to apply preexisting criteria to concrete facts. * * * [A] further consideration has been whether the action, even when the governing criteria leave much room for policy discretion, is directed at a closely circumscribed factual situation or a relatively small number of persons."

A case commonly cited by LUBA when discussing the quasi-judicial/legislative distinction is Estate of Gold v. City of Portland, 87 Or App 45, 51, 740 P.2d 812 (1987), *rev. den.* 304 Or 405, 745 P.2d 1225 (1987), in which the Court stated:

"The logic of Strawberry Hill 4 Wheelers, as well as its language and our language in Wasco Co. Court, support the opposite answer from the one the city espouses. The language which we have quoted from the opinions contemplates a balancing of the various factors which militate for or against a quasi-judicial characterization and does not create the 'all or nothing' test that the city ascribes to Strawberry Hill 4 Wheelers. That opinion emphasized that the reasons 'for implying procedural safeguards

modeled on adjudications must be kept in sight.' Among those reasons are, first, the assurance of correct factual decisions and, second, the assurance of 'fair attention to individuals particularly affected.' The first reason is directly related to the criterion of 'applying pre-existing criteria to concrete facts'; the second relates directly to the criterion of affecting a 'closely circumscribed factual situation or relatively small number of persons.'"

Since Strawberry Hill 4 Wheelers, the courts and LUBA have on many occasions addressed the issue of whether a proceeding is legislative or quasi-judicial. (see D.S. Parklane Development, Inc. v. Metro, 35 Or LUBA 516, 594 (1999); Hood River Valley v. Board of Cty Commissioners, 193 Or App 485, 492, 91 P3d 748 (2004); State ex rel City of Powers v. Coos County Airport, 201 Or App 222, 228-29, 119 P3d 225 (2005); Kozak v. City of Bend, 231 Or App 163, 178-180, 217 P3d 1118 (2009). As summarized in Kozak, Strawberry Hill establishes three "considerations" for distinguishing legislative from quasi-judicial proceedings:

1. Whether "the process, once begun, calls for reaching a decision";
2. The extent to which the decision-maker is "bound to apply preexisting criteria to concrete facts"; and
3. The extent to which the decision is "directed at a closely circumscribed factual situation or a relatively small number of persons."

The Court in Kozak clarified that: "In all events * * * the number of people affected and the size of the area affected are 'less important' than the other considerations."

In this case, Tri-Met is applying for land use approval, and have initiated a process that calls for a decision. Although there are questions regarding the criteria for approval that LCDC purportedly adopted in 1996, Metro is in this case, expecting to "apply preexisting criteria to concrete facts." This is a "closely circumscribed factual situation," and there are a relatively small number of property owners directly affected, even considering the diminished weight to be allotted to this consideration. This case is not remotely like Parklane, in which the urban reserve decision was (as noted by LUBA): "directed at a vast geographic area and a huge number of factual variables, affecting hundreds of thousands of people * * * [and] the level of factual inquiry * * * [was] relatively abstract." Parklane, at 594.

In this case, Metro staff is proposing that the Council give land use approval for construction of a specific bridge and highway improvements at a specific location—to review a land use application submitted by a specific applicant. Land use approval for the Columbia River Crossing is not a jurisdiction-wide legislative decision. It affects a discrete area and is intended to address a single, circumscribed factual situation. The decision should be made under procedures to safeguard the rights of those directly affected by the project, which approach will ultimately provide maximum protection to the taxpayers of Oregon and Washington and to the traveling public.

Michael J. Lilly
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4800 SW Griffith Drive, Suite 325
Beaverton, OR 97005

Telephone: 503-746-5977
Facsimile: 503-746-5970
Email: mikelilly@michaeljlilly.com

July 13, 2011

Richard Benner
Office of Metro Attorney
600 NE Grand Avenue
Portland, OR 97232

Mark Greenfield
Attorney for TriMet
14745 NW Gillihan Rd.
Portland, OR 97231

By Mail and Email
Re: Columbia River Crossing LUFO

Dear Dick and Mark,

Based upon the presentation to the TriMet Board at its meeting July 13, and Metro Resolution No. 11-4264, it appears that TriMet intends to submit an application to Metro for approval of a "Land Use Final Order" (LUFO) under Chapter 12 Oregon Laws 1996 Special Session (the "Statute"). I am writing on behalf of Plaid Pantries, Inc.

If it applies for a LUFO for CRC, TriMet will have been maneuvered into the position of land use applicant for the entire CRC bridge project, not merely the transit component. The evidence outlined below indicates that the state legislature intended that the LUFO Statute, passed in a special session in 1996, be used for the South North Light Rail transit, not for a massive new bridge project crossing the Columbia River.

1. The definition of "Project" in Section 1 (18) of the special 1996 legislation is limited to areas inside the Urban Growth Boundary. The CRC bridge is north of the UGB, so it cannot be part of the "Project" as defined in the Statute. Therefore the LUFO procedure does not apply to land use approvals for a bridge spanning the Columbia River.

2. The definition of "Highway Improvements" which can be included in a LUFO decision is limited by Section 1 (12) of the Statute. Highway Improvements must be part of the "Project." In the circumstance of the CRC, the Light Rail improvements have little to do with the interstate bridge and accompanying highway improvements. And the bridge is not part of the South North Max Light Rail Project within the Portland Metropolitan Area Urban Growth Boundary.

3. Moreover, the need for the LUFO process was expressly justified by the need for funding from ". .. in the upcoming federal transportation authorization act" in 1996 and the "unique circumstances" then in effect. Section 2 (C) . This time frame became obsolete long ago. This legislative finding makes it obvious that the LUFO process was never intended to be used 15 years later to provide land use review for an interstate bridge that happens to be built alongside of a light rail project.

4. Certain Comprehensive Plan provisions were considered by LCDC in drafting the criteria for LUFO. They are listed in the LCDC staff report, but Comprehensive Plan criteria concerning the bridge were not included in the list, and therefore presumably were not considered relevant in drafting the LUFO approval criteria. This is a strong indication that the LUFO procedure was not intended for use in approving the interstate bridge.

5. In any event it appears that LCDC did not issue a final order establishing the LUFO criteria, pursuant to Section 4 of the Statute. Final orders must be in writing. ORS 183.310(6)(b). My paralegal has conducted a diligent search and inquiry with the LCDC and the State Archives Office. So far as we can determine, there is no LCDC final order adopting the LUFO criteria. If the criteria were not adopted by an LCDC final order, the LUFO procedure cannot be used for land use approvals.

Under the circumstances, the TriMet Board should not submit a LUFO application for approval of the highway improvements and accompanying interstate motor vehicle bridge.

Michael J. Lilly

Michael J. Lilly

cc: Chris Girard

Laura Dawson-Bodner

From: Shirley Craddick
Sent: Friday, July 22, 2011 1:46 PM
To: Laura Dawson-Bodner
Subject: FW: CRC Next Steps

Laura, I am going to forward you emails on CRC and UGB from Councilor Craddick and Collette's inboxes.
--Sheena

From: Ron Buel [ronb@donavoncards.com]
Sent: Thursday, July 21, 2011 12:48 PM
To: 'George Crandall'; 'Joe Cortright'; 'Jim Howell'; 'Bill Scott'; 'Mara Gross'
Cc: sduin@oregonian.com; 'Nigel Jaquiss'; jmanning@oregonian.com; Paul Koberstein; smirk@portlandmercury.com; Barbara Roberts; Shirley Craddick; Carl Hosticka; carlotta.colette@oregonmetro.gov
Subject: RE: CRC Next Steps

Gee, it's amazing how this CRC project takes the hits and keeps on ticking. The project rests on Astro-Turf and has a coat of armor that is undeniably Teflon.

The Oregonian finally assigns a real reporter to it and the Oregon Treasurer takes up the question, and, guess what, in two top-of-the-front-page stories, the opponents turn out to be ***right***, particularly the analysis of Joe Cortright about the very expensive back-loaded tolling revenue bond plan and the underwhelming traffic growth since 2006. None of what we have been saying for the past three years has been contradicted by anything that has been written in the past 90 days by Nigel in Willamette Week, or in The Oregonian by Duin or Manning.

Yet the CRC keeps on ticking. It claims to have reduced its spending on planning, detailed design and the EIS from $3.3 million a month last biennium ($80 million), to $1.8 million a month ($43.2 million) this biennium. Why is it I don't believe this statement of Nancy Boyd? Where is the reporting on the operating allocations of the state transportation commissions to the project for this biennium? Were expenditures really reduced by nearly 50% for this biennium, and if so, how and why?

The Portland Tribune carries a piece by Paul Koberstein, hidden in its Sustainability section under "eco-thoughts," that puts the lie to the air quality and carbon assertions of the project (that there will be reductions in air pollution and greenhouse gas emissions with the new bridge), but in the same issue the Tribune carries an editorial, which gives as a reason to build the project -- all of the money that has already been spent on planning is the new reason to push forward – we just can't waste it.

The CRC recently issued answers to a series of "frequently asked questions" in which it says that half of the bridge lifts are caused by non-commercial craft, and that changes to the railroad bridge would not solve the problem of the lifts, as we opponents have been asserting. No one double checks such work. The same set of CRC assertions claims that there is a serious problem with the existing I-5 bridges if there is an earthquake. It's good someone knows these things, because the experts are a little afraid of making those kinds of predictions, since the scale and type of earthquake, and its effect on the river bed, are uncertain in many expert minds.

The Governor and the labor and business supporters of this project, and Tri-Met and ODOT lobbyists, couldn't even get House Joint Memorial 22, which merely memorialized the President and Congress on behalf of the CRC, out of committee in the two House committees to which it was assigned. Yet The Oregonian editorial page, which in its session-opening editorial said the state needed to give the CRC a construction appropriation, assigns the legislature's handling of the CRC an A-minus. Good luck in getting the $450 million state appropriation the project needs from Oregon taxpayers, now that down-state legislators have awakened to the project, and that Republicans have realized they have been politically hornswoggled by the Governor and ODOT.

In Washington state, the odds for $450 million are even bleaker if one looks at the much higher priority for the under-funded Alaska Viaduct project in Seattle.

And at the federal level, how do you get a Congressional appropriation when neither of the two Representatives in Congress in whose district this project sits – Earl Blumenauer or Jaimie Herrera-Butler -- are supporting the current plan for the CRC. Jaimie wants a public vote on it, and Earl says there isn't a community consensus (he is aware that every major environmental organization in our state opposes the ten-lane project with its billions for interchanges and freeway lane expansions). And even if Earl and Jaimie wanted a federal appropriation at the $800 million level, will the majority House Republicans begin to open up their coffers to infrastructure projects, or does that require dreaded higher taxes?

Tri-Met wants a light rail project to Vancouver and so do I. But Washington state law requires a vote to approve operating funds, and the opposition to tolls in Washington may doom light rail, as it was doomed by a vote there in the 1990s. It's hard to get suburbanites on board with getting out of their cars, even if you build $60 million of park-and-ride lots near the light rail stations. When this vote occurs in November of 2012, what happens if Clark County voters vote no? The 2030 projection of the CRC is that a remarkable 37% of the trips across the bridge will be by light rail, and that very few people will use I-205 instead of paying tolls on I-5. We are all aware that it is tolls and transit that enable the CRC to say that traffic with a new bridge will be less than without one. It was interesting to note that the toll information used by the CRC in their projections was questioned in Manning's article by the tolling consultants hired by the CRC, just as we opponents have been saying.

While I feel confident about predicting Clark County votes, I feel less confident about how the federal courts will deal with the NEPA lawsuit that will hit the Final EIS when it is released. EPA, in grading the draft EIS, raised serious questions about water quality impacts and environmental justice (air toxics in poor neighborhoods, etc.) impacts in North and NE Portland. That was a sign to some that there <u>are</u> vulnerabilities. Those of us who wrote long testimony on the Draft EIS have never received a response. We wonder what the in-water work window is, for example, as salmon runs are clearly affected. It will be interesting to see whether the Final EIS has, indeed, been changed, since the project itself has this Teflon coating that all is okay.

As Metro, without notice by the press so far, says that the carbon, air pollution and traffic modeling questions raised by David Bragdon, Carlotta Collette, Robert Liberty and Carl Hosticka during Metro's LPA consideration have been met by the CRC's ludicrous peer review panel work (has anybody really read these "independent review panel" reports – they're a joke) the Teflon coating grows stronger. In the Land Use Final Order (LUFO) hearings on August 11, the Teflon coating will get stronger yet, an easy prediction with Craddick and Roberts going along with Harringon, Hughes and Burkholder.

Whether it is an independent review panel that picks gaping holes in the project, or the press, it seems to matter not. Our special interest politics simply outweigh public interest concerns on the CRC.

So, in the e-mail below, George Crandall asks an important question. Isn't a consideration of alternatives called for at this time? Who would ask for a <u>true re-set</u>, an open-minded look at a less-expensive project that would take traffic off of I-5 without expanding I-5 and the interchanges in the bridge area? The answer, I fear, to George's question, is that facts don't matter, the truth doesn't matter – it is full-speed ahead for the CRC, with the full approval of all truly powerful people in Oregon, Portland and the region.

Regards, Ron Buel

From: George Crandall [mailto:gcrandall@ca-city.com]
Sent: Thursday, July 21, 2011 10:05 AM
To: Joe Cortright (jcortright@impresaconsulting.com); Ron Buel; 'Jim Howell'; Bill Scott (bscott@zipcar.com); Mara Gross
Subject: CRC Next Steps

All,

Jeff Manning's Oregonian piece today had this cryptic note at the end of the article about reuse of the existing I-5 Hayden Island bridges.

The lower price stems from several cost-cutting steps including delay of work on a new I-5 interchange at
its intersection with State Route 500 in Clark County and the reuse, rather than replacement of the existing
I-5 bridges from Hayden Island south to the Oregon mainland.

This section is 6 to 8 lanes. It would seem that this decision requires a major rework of the crossing concept as interchanges, elevations and construction phasing issues all need to be worked out. It sounds like a start over moment.

Any thoughts about this?

George

George Crandall, FAIA, Principal

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Revitalizing America's Cities

Laura Dawson-Bodner

From: Jeff Horne [mailjeffh@gmail.com]
Sent: Wednesday, July 20, 2011 10:55 PM
To: Trans System Accounts
Subject: LUFO comments.

I'm totally opposed to the CRC proposal. If we build a bigger bridge, more people will move to Vancouver, which means more sprawl and more traffic. If you build it, they will come. We need to toll the existing bridge during peak times to reduce usage, then use this money to make improvements. Not build a bigger bridge. I've lived in LA and Dallas, TX and know what it looks like when planners to just keep building bigger roads and bridges. This new disclosures about inaccurate assumptions regarding tolling revenues, etc., just show that this idea can only lead to disaster.

Thanks for your concern,

Jeff Horne
2936 Se tibbetts st.
Portland, OR 97202

IN RE: COLUMBIA RIVER CROSSING PROJECT

Land Use Final Order

Testimony in Opposition to Project and Final Order And Reduced Cost Greater Public Benefit Alternative

DATE: July 20, 2011

TO: Laura Dawson Bodner
600 NE Grand Avenue
Portland, Oregon 97232

HAND DELIVERED

Dear Ms. Bodner and Member of the Metro Council,
Mayor of the City of Portland, Mayor of the City of Vancouver
All Interested Parties and Members of the Public

The headlong rush to replace the Hwy 5 Interstate Bridge is, in its present form, ill-conceived and improper from a traffic planning perspective, and would constitute a monumental and abjectly irresponsible mis-spending of taxpayer monies.

There are only three (3) lanes on the Portland side of Highway 5 leading from the Columbia River all the way to downtown. As one approaches City Center (immediately south of 405 turnoff), there are only two (2) lanes. As even a layperson observer can clearly see, there is no room whatsoever to expand to a fourth lane, even in a context of staggering expense of any attempt to build higher retaining walls and push back adjoining streets. Consequently, any bridge in excess of three lanes would serve no purpose whatsoever, simply creating a bottleneck as soon as off any bridge, whether three or any number of additional lanes.

Moreover, it is wrong public policy to encourage and propagate irresponsible, much less expanded, use of private automobiles, for commuters. If one chooses to reside in Washington, and commute to Portland, then enhancement of public transportation is the sole viable answer. Private automobiles must be parked on the Vancouver side, with rail and bus service bringing passengers to Downtown Portland.

The staggering numbers being bantered about are nonsensical, bordering on the fiscally reprehensible. Merely dividing the proposed cost of a new bridge by the number of daily users results in a disproportionate burdening of local residents and United States taxpayers, under some auspices of "creating new jobs" (for only a few specialized construction workers), at unconscionable public expense. This problem can be addressed and solved without infusion of the unbelievable millions of dollars being suggested.

The modest cost and correct alternative is as follows:

1. Ensure the current bridge is properly maintained [0 capital cost, maintenance only].
2. Exclude heavy trucks (over 20,000 lbs) during commute hours of 7:00 to 9:00 am and 4:00 pm to 7:00 pm. This may be a slight inconvenience for truckers, but they must adapt their schedules; large trucks have no business being on this thoroughfare during high traffic commute hours, for safety and traffic congestion sake. [0 cost to public]
3. Cease bridge raising for water traffic during those same hours. It is nonsensical when we see the bridge being raised at 5:30 pm when there are lines of traffic already backed up for miles. [0 cost to public].
4. Construct a light-rail MUNI extension bridge parallel to the existing bridge, with terminal in Downtown Vancouver, plus one or two stops to the north and east (where better commuter parking sites are available), to receive and transport incoming commuters and Portland visitors [relatively inexpensive twin track bridge].
5. Construct a small bypass bridge from MLK / Interstate Portland side to Hayden Island to keep this local traffic off main bridge [very low cost alternative, no high span or lift required, as traverses only small boat lagoon, not Columbia River].

This provides a simple, very low cost, very low impact solution, begins the necessary transition away from monumentally large public expenditures supporting and even encouraging the use of private automobiles, with appurtenant fuel usage and toxic exhaust pollutants (heightened by traffic jams of stop-and-go cars & trucks), and provides a solution which will significantly IMPROVE the traffic situation, instead of actually worsening the traffic by propagating a highway system that would encourage and support even more cars & trucks.

Therefore, I submit that the entire concept of any "new bridge" be taken off the table of discussion, and a complete re-analysis from the perspective of economics, best allocation/ reduced use of public funds, cessation of automobile-oriented transportation infrastructure, alternative zero-cost methods of ***reducing*** traffic and practical assessment of highway capacity leading to the Columbia River.

I request that this letter be read into the record at the upcoming public hearing on Thursday, August 11. I am available for discussion and testimony.

Respectfully Submitted,

Charles Barker III
11930 Jantzen Beach Avenue
Portland, Oregon 97217
Tel: 503-847-6360 email: chuck@timberlinefinancial.com

Columbia River Crossing Financial Plan Review

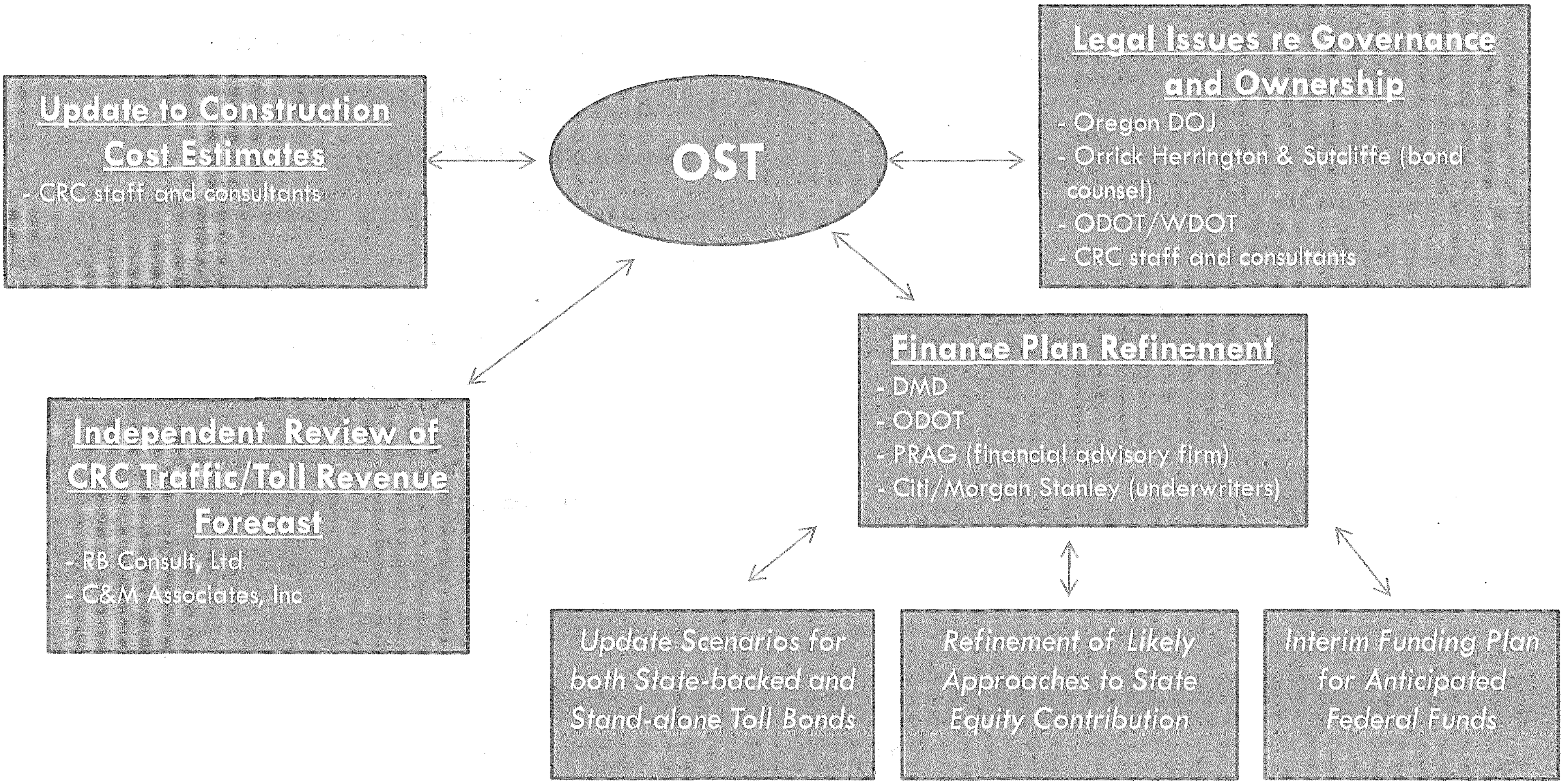
Prepared by the Debt Management Division
of the Oregon State Treasury

July 20, 2011

Elements of OST's Financial Plan Review

1. Update of Construction Cost Estimates
2. Evaluation of CRC's Traffic and Toll Revenue Forecast
3. Refinement of CRC's 2008 Plan of Finance
4. Exploration of Legal Issues regarding Governance and Ownership Framework

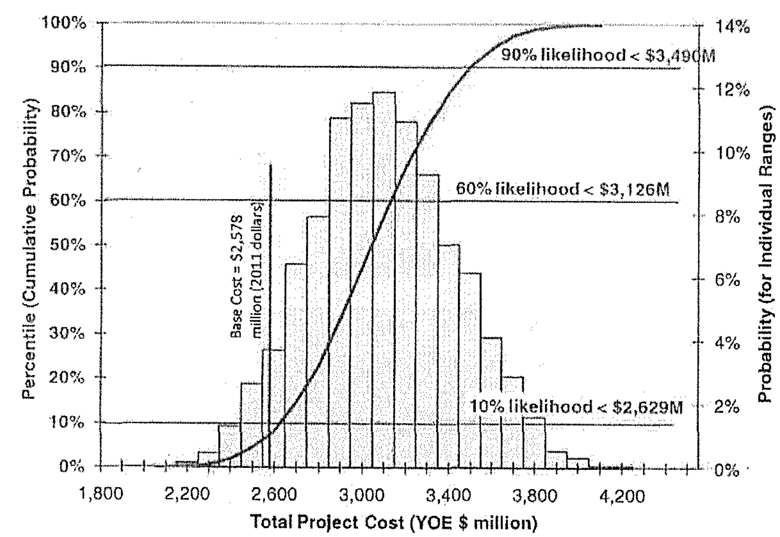
Participants in the OST Review Process



Update to Construction Cost Estimate
Phased Construction Scenario

- Cost Estimation Validation Process (CEVP) is an estimating technique employed by the CRC that uses a probabilistic approach to narrow the range of costs as key project milestones are met
- Assuming phased construction (does not include improvements to SR-500 or the Port of Portland flyover ramp), overall CRC project costs are now estimated to be between **\$2.63 to \$3.49 billion**, with a 60% probability that costs will be **\$3.13 billion or less**

CEVP Results for Phase 1 FEIS:



Uncertainty in Overall Project Cost for Baseline Funding, Phase 1 FEIS. Includes previous costs of \$120.35 million

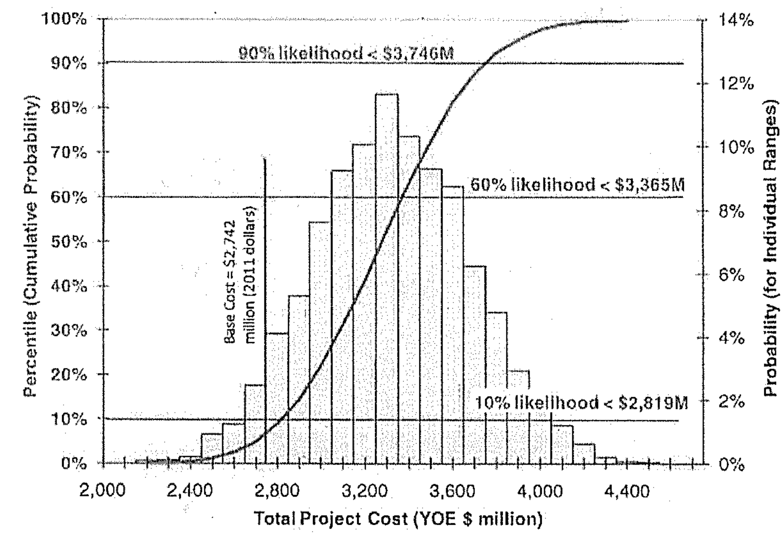
Update to Construction Cost Estimate

Full Build Scenario

5

- Under the full build scenario, which does include improvements to SR-500 and the Port of Portland flyover ramp, overall CRC project costs are estimated to be between **$2.82 to $3.75 billion**, with a 60% probability that costs will be **$3.37 billion or less**
- Final decision about size and scope of project will be determined upon further refinement of overall project costs and the future availability of various federal and state funds

CEVP Results for Full Build FEIS:



Uncertainty in Overall Project Cost for Baseline Funding, Full Build FEIS. Includes previous costs of $120.35 million

Initial CRC Financial Plan

based on the 2008 Adopted Draft Environmental Impact Statement (DEIS)

Sources of Funds	Estimated Amt ($M)	Construction Funds Spent
Federal Funds		
Discretionary Highway Funds	$ 400	FY 2012 - 15
New Starts Transit Grant	850	FY 2013 - 17
State Funds		
Equity Contribution (50% per state)	900	FY 2012 - 15
State-backed (G.O.) Toll Bonds (50% per state)	1,300	FY 2015 - 19
Total	**$ 3,450**	

Toll Bonding Considerations

- General Obligation (G.O.) bonds vs. stand-alone toll revenue bonds
  - Repayment of either type of bond comes from tolls paid by I-5 bridge users
  - State-backed G.O. bonds can be sold at higher credit ratings and therefore, significantly lower interest costs, than stand-alone toll revenue bonds
  - Each DOT (and ultimately, each state's General Fund) are obligated to cover toll revenue shortfalls over the life of these G.O. bonds
- An "investment grade" traffic and toll revenue forecast prior to the initial sale of toll bonds is essential
  - Bonds must be structured and sized prudently so that neither states' long-term credit ratings are impacted by the CRC project
- Establishing a strong coverage requirement can also help mitigate potential toll revenue shortfalls by providing a substantial revenue cushion
  - CRC financing model assumes 1.25 debt service coverage level for State-backed G.O. toll bonds
- The initial CRC finance plan phased toll bonds towards the latter parts of the construction project in order to minimize the use of capitalized interest (borrowing for interest payments on the bonds until the imposition of tolls on bridge users)

Background on CRC's Traffic and Toll Revenue Forecasting

- A 4-step traffic and toll revenue forecast was developed in 2005 by Stantec using the Portland Metro traffic model
  - Model modified upward using "VIS SIM" micro-simulation to adjust traffic flows by 6% based upon planned improvements to the I-5 corridor upon project completion
  - 2008 DEIS conservatively used Stantec's baseline forecast without this predicted improvement in traffic flows to calculate projected toll revenues
- Some economists are nevertheless critical of the current 4-step traffic forecast model's ability to accurately predict traffic growth and toll revenue over time
  - By its very nature, this type of model assumes a steady growth rate in annual population, employment, traffic, and GDP
  - Cumulative impacts of relatively small differences in assumptions about traffic growth can have a significant impact on forecast revenues over the 30-year forecast horizon
  - Changes in land use and employment patterns as well as periodic changes in economic conditions can have a profound impact on driving patterns and thus, toll revenue generation
  - Many toll roads around the world have not met their forecast revenues due to these unanticipated conditions

OST's Evaluation of CRC's Traffic and Toll Revenue Forecasting to Date

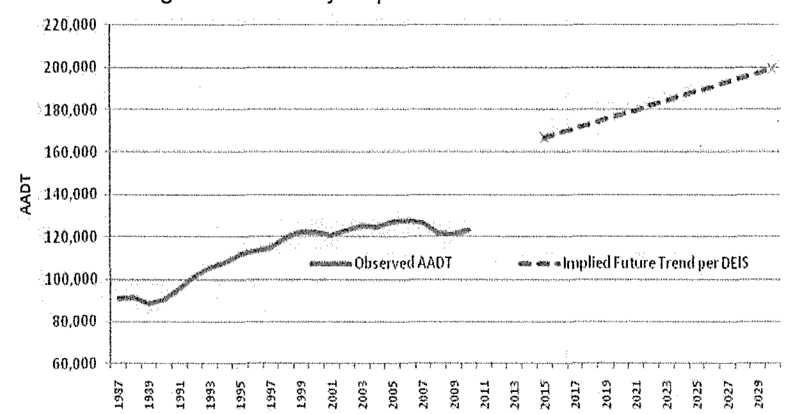
- OST hired two respected independent consulting firms to conduct desktop reviews of the CRC forecasts from both the credit analysis and traffic engineering perspectives
  - Robert Bain, RB Consult Ltd (former S&P ratings analyst who has published widely on problems with the traffic and toll forecasting process)
  - Herb Vargas and Carlos Contreras, C&M Associates, Inc. (traffic engineering firm with international experience in investment grade studies)
- Each firm independently reviewed CRC's traffic modeling approach as well as key socioeconomic and land use factors which drive the forecast of long-term trends in traffic growth in the Columbia River corridor
- While both firms agreed that CRC's modeling thus far has been adequate for EIS purposes, they also noted that a far more robust modeling approach (i.e., the investment grade traffic and toll revenue study) will be required prior to the initial toll bond financing planned for FY 2015

Summary of the Consultants' Findings

- Portland Metro's 2002 long-term employment projections, which were relied upon for the 2008 DEIS, are very outdated
- Traffic counts on the I-5 and I-205 bridges have not grown at the rates predicted in the 2008 DEIS
- Both firms recommend that the CRC lower its baseline traffic and toll revenue forecasts in recognition of the unanticipated depth of the recent recession and the resulting impact on Portland Metro's long-term employment and traffic growth trends
- For planning purposes, it was suggested that the CRC assume that projected annual gross toll revenues will be somewhere between <u>**15% to 25% lower**</u> than the baseline forecast assumed at the time the 2008 DEIS was adopted

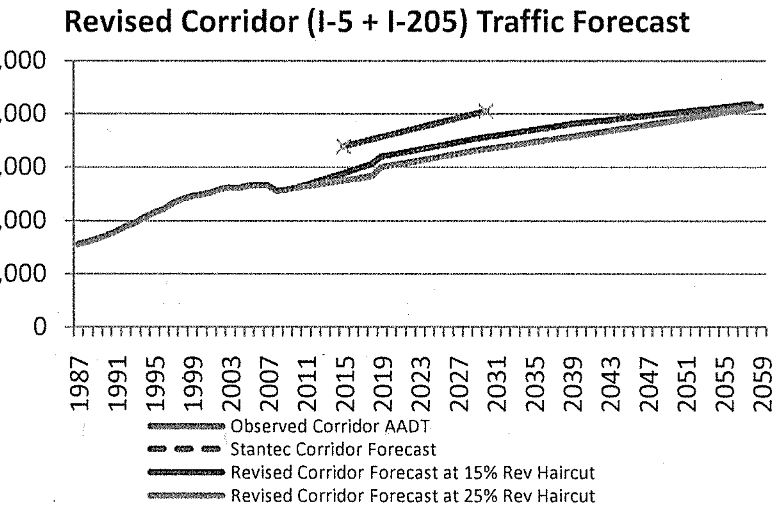
Socioeconomic Data	Source		
	Metro	Moody's	Global Insight
Households			
2005	767,000	805,000	815,300
2030	1,134,100	1,240,000	1,180,500
Growth	48%	54%	45%
Population			
2005	1,906,600	2,074,400	2,072,300
2030	2,853,900	3,142,700	2,977,800
Growth	50%	51%	44%
Employment			
2005	1,032,200	987,200	987,200
2030	1,691,900	1,262,100	1,292,200
Growth	64%	28%	31%

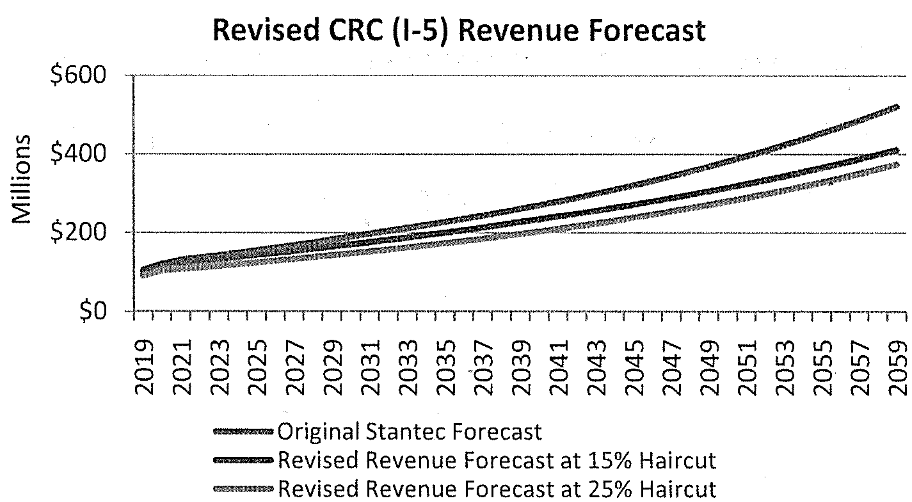
Actual vs. Projected I-5 Bridge Traffic
Average Annual Daily Trips



Next Steps in Refining the CRC Traffic and Toll Forecast Model

- The key difference between OST's two consultants was their assumption regarding the likely shift in traffic to the I-205 bridge upon tolling of the new I-5 bridge
- The original Stantec forecast assumed the new I-5 bridge would still "capture" 45% - 47% of traffic in the overall corridor
  - For each 1% reduction in the I-5 bridge "capture" rate, our consultants' estimate that gross toll revenues drop by approximately 2%
- An investment grade study that incorporates the latest forecast of long-term employment trends and examines the impact of tolling on bridge users of different income levels will allow the CRC to narrow and refine projected I-5 toll revenues prior to the initial sale of bonds in FY 2015





Impact of Lowering the I-5 Bridge Toll Revenue Forecast on the CRC Finance Plan

- All else being equal, a 15% reduction in gross toll revenues reduces the amount of proceeds that can be generated for the project through sale of state-backed G.O. toll bonds by 18.5%, or approximately **$240 million** compared to the CRC's original finance plan
- The percentage differential between the reduction in revenues vs. project proceeds is due to certain annual and periodic fixed costs associated with operation and maintenance of the I-5 toll bridge that will need to be funded regardless of overall traffic levels
- At a 25% toll revenue reduction, estimated project proceeds are reduced by 31% or approximately **$407 million**

Other Bond Structuring Considerations Impacting CRC Project Financing

- The original CRC finance plan envisioned that State-backed GO bonds would be "back-loaded" (i.e. structured with ascending annual debt service linked to ascending toll revenues over time), with the following assumptions:
  - I-5 bridge traffic would grow annually by 1.3%
  - Toll rates would increase annually by 2.5%
- Based on Washington's experience with toll revenue shortfalls on the Tacoma Narrows project, Washington State Treasurer McIntire is now requiring WDOT to use more conservative revenue growth assumptions on all new state bond tolling projects
- Eliminating the toll escalation assumption from the CRC financing model reduces the risk of toll revenue shortfalls, but also reduces the amount of toll bond proceeds that can be generated by approximately **$318 million**
- When combined with the impacts of the aforementioned 15% - 25% potential reduction in projected toll revenues, CRC toll bond proceeds are estimated to be **$468 to $598 million lower** than predicted in the 2008 DEIS

Potential Solutions to the CRC Funding Gap

Pre-Completion Tolling

- CRC has estimated that pre-completion tolling of the I-5 bridge could generate up to **$200 million** in additional revenue for the project

TIFIA Loan

- The Transportation Infrastructure Finance and Innovation Act (TIFIA) established a Federal program that provides direct loans to surface transportation projects of national and regional significance
- TIFIA loans provide competitive interest rates and flexible repayment terms (no interest payments are required during construction, up 35 years for repayment upon project completion, and debt service coverage of 1.1x revenues on a subordinate basis to the states' G.O. bonds)
- A TIFIA loan of $704 to $833 million, repaid from I-5 toll revenues, would substantially reduce the need for state-backed G.O. bonds and limit the exposure of each state's General Fund to the project, while restoring project funding by **$194 to $238 million**
- Given the increasingly competitive nature of the TIFIA loan approval process, the CRC team – if it opts to pursue this option -- should initiate efforts to secure US DOT and Congressional approval for this loan at the same time it seeks other Federal funding commitments for the project

Potential Modifications to CRC's Plan of Finance

Sources of Funds	Original CRC Plan ($M)	Combined Impact of Debt Structuring Limitations and Toll Revenue Reductions on CRC Original Plan ($M)		Potential Modifications to CRC Plan ($M)
		At a 25% Revenue Reduction	At a 15% Revenue Reduction	
Federal Funds				
Discretionary Highway Funds	$ 400	$ 400	$ 400	$ 400
New Starts Transit Grant	850	850	850	850
State Funds				
Equity Contribution (50% per state)	900	900	900	900
State-backed (G.O.) Toll Bonds (50% per state)	1,300	702	832	190 - 230
TIFIA Loan (secured by tolls & back-up pledge of ODOT/WDOT revenues)	-	-	-	704 - 833
Pre-Completion Tolling (estimated)	-	-	-	200
Total	**$ 3,450**	**$ 2,852**	**$ 2,982**	**$ 3,244 - 3,413**

Other CRC Financing Issues

- Securing Federal transit funding is now on the critical path
  - $850M in New Starts grant is key to moving ahead with the overall project as currently conceived
  - Vote on tax to generate $3M in annual transit operating funds by Clark County residents is critical to getting the New Starts money
- Failure to win Federal funding for the transit portion of the project may require rethinking of the overall project scope, timeline and financing plan
- Assuming the CRC is successful in securing a commitment of all anticipated Federal funding, the two states will nevertheless need to provide interim financing to pay significant portions of the CRC's construction costs prior to receiving $1.25 billion of transit and discretionary highway money

Other CRC Financing Issues (continued)

- The current CRC plan envisions equity contributions of $450 million by each state in FY 2013 to fund initial phases of design and construction
- ODOT's preferred option appears to be issuing state-backed G.O. bonds to cover its equity contribution
  - Under the Oregon Constitution, ODOT is allowed to issue G.O. bonds to fund "permanent roads" within the state
  - Both the G.O. bond sale and source of debt repayment will require legislative approval
  - A 1.5 cent per gallon dedicated increase in state gas tax (or equivalent weight-mile fees) generates $40.6 million per year and is estimated to support up to **$522 million** in self-supporting 25-year G.O. bonds at a 1.10x coverage level
- Alternatively, ODOT could issue 12-year "GARVEE" Bonds which are a type of grant anticipation note that gets repaid from future federal discretionary highway revenues
  - GARVEEs are frequently issued by states and local governments for large transportation projects and will likely be the source of interim funding used for other Federally-funded aspects of the project
  - Each $10 million in annual Federal Funds pledged would generate roughly $94 – 99 million in equity towards the project

Governance and Ownership Framework

- ODOT/WDOT continue to meet to develop the IGA for governance and ownership of the project
  - Oregon's Department of Justice and ODOT's bond counsel, Orrick, Herrington and Sutcliffe, are now included in the CRC governance planning process
- CRC's current plan envisions that toll collection, bridge ownership and on-going maintenance will be done by the State of Washington but that Oregon will share in a 50/50 split of all CRC project costs, including cost overruns and revenue shortfalls
  - Oregon Constitution prohibits use of state gas tax for projects outside state borders
  - Preliminary cost allocation between project elements suggests this will not be a problem
- Regardless of whether the CRC project is funded in part through state-backed G.O. toll bonds or a Federal TIFIA loan, the CRC's governance plan must include a robust toll-setting mechanism to assure that all toll-related debt service is paid in full each year through toll revenues

Conclusions

- CRC's construction cost estimating process appears solid, with contingency plans being developed for project phasing depending upon the finalized estimate of project costs and the availability of various state and federal funds
- Key assumptions in the traffic and toll revenue forecast used in the 2008 DEIS are now outdated, given the unanticipated depth of the recent recession
  - Completion of an investment grade study over the next two years will allow the CRC to refine its estimate of anticipated I-5 bridge toll revenues over time, which in turn will allow us to refine the amount of toll bond proceeds that can be generated for the project
- The combined impact of Washington State Treasurer McIntire's requirement that CRC adopt a more conservative toll bond debt structure and the potential toll revenue reduction of 15% – 25% is a $468 to $598 million reduction in projected CRC funding resources

Conclusions (continued)

- Pre-completion tolling of the I-5 bridge and the shift from state-backed GO toll bonds to a primarily TIFIA loan funding approach may be able to restore between $394 to $438 million in CRC funding, while greatly reducing the financial risk to both states' General Funds and credit ratings
- Securing Federal funding for the project remains on the critical path, with an important vote on taxes to fund annual transit operating costs coming up this fall in Clark County
- Both state-generated and federal transportation funds can be leveraged to provide Oregon's $450 million equity contribution to the CRC project
- The CRC's governance plan must include a robust toll-setting mechanism to assure that all toll-related debt service is paid in full each year through toll revenues

Laura Dawson-Bodner

From:	Governor Kitzhaber Press Office [Amy.Wojcicki=state.or.us@mcsv117.net] on behalf of Governor Kitzhaber Press Office [Amy.Wojcicki@state.or.us]
Sent:	Wednesday, July 20, 2011 4:21 PM
To:	pmccaig@easystreet.net
Subject:	NEWS RELEASE: Kitzhaber Statement on Treasurer Wheeler's CRC Report

Governor Kitzhaber Press Release

Is this email not displaying correctly?
View it in your browser.

NEWS RELEASE

July 20, 2011

Media Contact:
Christine Miles, 503-559-8795
Amy Wojcicki, 503-689-5324

Governor Kitzhaber Statement on Treasurer Wheeler's CRC Report

Governor accepts recommendations and directs CRC to move forward with them

(SALEM, Ore.) — Governor Kitzhaber released the following statement on Treasurer Wheeler's CRC Report:

'I want to thank Treasurer Wheeler for his good work and helpful recommendations for the Columbia River Crossing project. His review validates much of the CRC's work but also makes tangible recommendations that reduce and manage risk, which will be very useful as we clarify the next steps for the project. The Treasurer's updated work reflects a slower rate of employment; clearly, this recession has been deeper and longer than expected.

The CRC is incorporating the Treasurer's recommendations, which means a less risky, more conservative approach. The work will incorporate a level debt service and revenue projections that reflect the impacts of the recession on traffic projections.

The Treasurer also identified potential replacement revenue strategies, which I appreciate and am willing to explore. But I believe that if we are going to get the CRC done, it is time to start planning for a project that adapts to the available resources and fits into today's economic reality. To that end, I am going to ask the Oregon Department of Transportation and the CRC to prepare a sequencing plan that accommodates anticipated cash flow. This work will be part of a conversation with Governor Gregoire and our respective interim legislative committees."

###

TRIMET

July 19, 2011

Tom Holmes, Paralegal
Office of Michael J. Lilly
4800 SW Griffith Drive, Suite 325
Beaverton, OR 97005

Dear Mr. Holmes:

Thank you for your July 13, 2011 email to Kelly Runnion. I am enclosing copies of the written materials regarding the CRC project presented to the Board at yesterday's briefing.

At the Board Briefing, my staff and I updated the Board on the project, including the Land Use Final Order (LUFO) process. I fully informed the Board of the intention to submit the application to Metro for a LUFO amendment and the Board offered no objections. Consequently, in accordance with the procedures contained in 1996 Oregon Laws HB 3478, TriMet has submitted the LUFO application to Metro under my signature. The decision was not reduced to an order or resolution of the Board, but is reflected in my letter to Metro transmitting the application. A copy of that letter is also enclosed.

We appreciate your interest in the Columbia River Crossing (CRC) project.

Very truly yours,

Neil McFarlane
General Manager

Enclosures

C: Dan Blocher
Andy Cotugno
Steve Witter

TRI MET

July 13, 2011

Tom Hughes, President
Metro Council
600 NE Grand Avenue
Portland, Oregon 97232-2736

Re: Application to Amend South/North LUFO

Dear Mr. Hughes:

Following consultation with TriMet's Board of Directors, I am pleased to submit TriMet's enclosed application requesting approval of a Land Use Final Order (LUFO) amending the original South/North Project LUFO adopted by the Metro Council in July 1998.

This LUFO application is being submitted to the Metro Council pursuant to provisions in Oregon Laws 1996, Chapter 12 (House Bill 3478) that direct TriMet to submit such an application to the Metro Council after TriMet has received recommendations from the LUFO Steering Committee and the Oregon Department of Transportation (ODOT). I am pleased to report that TriMet has now received and considered both of those recommendations as noted in the application and its attachments.

The enclosed LUFO application is consistent with the recommendations of the LUFO Steering Committee and ODOT, in both the facilities and improvements it proposes and their locations. It will provide the basis for findings to be made as part of the Council's adoption of the subject amendment to the 1998 LUFO. I am requesting that Metro schedule a public hearing and Council action on this application by August 11, 2011.

Thank you for your cooperation and assistance on these very important components of our planned regional integrated multi-modal transportation system.

Very truly yours,

Neil McFarlane
General Manager

Enclosures

C: Dan Blocher
Tamara Lesh
Andy Cotugno
Steve Witter

TRI MET

July 19, 2011

Ronald A. Buel
2817 NE 19th Avenue
Portland, Oregon 97212

Dear Mr. Buel:

The TriMet Board forwarded your July 13, 2011 letter concerning the CRC LUFO Amendment Application to me for response. We appreciate your interest in the Columbia River Crossing (CRC) project.

The Oregon portion of the CRC project is an extension of the South North MAX Light Rail Project. The procedures for adoption and amendment of a Land Use Final Order (LUFO) for the South North project are contained in 1996 Oregon Laws HB 3478. With respect to TriMet's submission of an application for a LUFO Amendment to Metro, Section 6(1)(a) of the statue provides that "TriMet shall apply to the council for a land use final order approving the light rail route, stations, lots and maintenance facilities, and the highway improvements, including their locations." There is no statutory requirement that TriMet's application be approved by formal resolution and vote of the TriMet Board.

You also quote Metro Resolution 98-2633 suggesting that the TriMet Board must approve submittal of the Application to Metro. Under TriMet's enabling statute, specifically ORS 267.140, the general manager has full charge of (1) the acquisition, construction, maintenance and operation of the transit system of the district, and (2) the administration of the business affairs of the district, among other things. Submittal of the LUFO Application to Metro is within the general manager's statutory authority. Nevertheless, at the Board Briefing you attended yesterday, my staff and I updated the Board on the project, including the LUFO process. I fully informed the Board of the intention to submit the application to Metro for a LUFO amendment and the Board offered no objections. Following that, TriMet submitted the LUFO application to Metro under my signature. The decision was not reduced to an order or resolution of the Board, but is reflected in my letter to Metro transmitting the application, a copy of which is enclosed.

We expect the Metro council to hold its hearing on the LUFO on August 11, 2011. Metro is required to publish notice of the hearing at least 14 days prior to the hearing. We understand that Metro wishes to provide a longer public comment period than required by statute, and we accommodated that desire by consulting our Board about TriMet's application at the Board Briefing yesterday, in advance of our July 27 Board meeting.

Very truly yours,

Neil McFarlane
General Manager

Enclosure

C: Dan Blocher
Andy Cotugno
Steve Witter

TRI MET

July 13, 2011

Tom Hughes, President
Metro Council
600 NE Grand Avenue
Portland, Oregon 97232-2736

Re: Application to Amend South/North LUFO

Dear Mr. Hughes:

Following consultation with TriMet's Board of Directors, I am pleased to submit TriMet's enclosed application requesting approval of a Land Use Final Order (LUFO) amending the original South/North Project LUFO adopted by the Metro Council in July 1998.

This LUFO application is being submitted to the Metro Council pursuant to provisions in Oregon Laws 1996, Chapter 12 (House Bill 3478) that direct TriMet to submit such an application to the Metro Council after TriMet has received recommendations from the LUFO Steering Committee and the Oregon Department of Transportation (ODOT). I am pleased to report that TriMet has now received and considered both of those recommendations as noted in the application and its attachments.

The enclosed LUFO application is consistent with the recommendations of the LUFO Steering Committee and ODOT, in both the facilities and improvements it proposes and their locations. It will provide the basis for findings to be made as part of the Council's adoption of the subject amendment to the 1998 LUFO. I am requesting that Metro schedule a public hearing and Council action on this application by August 11, 2011.

Thank you for your cooperation and assistance on these very important components of our planned regional integrated multi-modal transportation system.

Very truly yours,

Neil McFarlane

Neil McFarlane
General Manager

Enclosures

C: Dan Blocher
Tamara Lesh
Andy Cotugno
Steve Witter

Tri-County Metropolitan Transportation District of Oregon • 4012 SE 17th Avenue, Portland, Oregon 97202 • 503-238-RIDE • TTY 503-238-5811 • trimet.org

Laura Dawson-Bodner

From: Dylan Rivera
Sent: Friday, July 15, 2011 3:15 PM
To: Dylan Rivera
Subject: CRC at Metro: Aug 11 hearing on Land Use Final Order

This is a notice about an upcoming decision and a public hearing on the Columbia River Crossing project.

Dear colleague,
Metro has updated its web site with background on a proposed Land Use Final Order on the Columbia River Crossing project. Public comments are being accepted on the proposal in writing through the end of a public hearing on Aug. 11. The Metro Council will also have a work session on the order July 26. Work sessions are informational without action items. They are open to the public, though the council does not take public testimony.

To comment on the LUFO by email, send a message to trans@oregonmetro.gov with "LUFO comments" in the subject line.

The Land Use Final Order is the second of two actions on the crossing project the council is considering this summer. First, on June 9, the council approved a resolution saying the concerns it raised in the past had either been met or would be met during the next phase of planning. Those concerns are part of the council's endorsement of the locally preferred alternative, selected as part of developing a federally required Environmental Impact Statement. Some of those concerns have been addressed, while others the council feels confident project and Metro staff will address -- some in coming weeks and others in subsequent phases of planning.

Secondly, in August, the council will consider amending a Land Use Final Order, which is a process in Oregon law that consolidates local land use decision making. Interested in commenting in person or in written form on the Land Use Final Order? Comments must be received no later than the close of a public hearing on Aug. 11 at the Metro Council Chambers. Interested in receiving notice of the land use decision and information on how to appeal to the state land use officials? See the legal notice here:

http://library.oregonmetro.gov/files//crc-lufonotice.pdf

For more information on the Columbia River Crossing at Metro, and the Land Use Final Order and related upcoming meetings, see:

www.oregonmetro.gov/columbiarivercrossing

Thank you for your attention.

Dylan Rivera
Public Affairs Specialist, Transportation Planning

Metro
600 NE Grand Ave.
Portland, OR 97232-2736
503-797-1551
www.oregonmetro.gov

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You are receiving this because you have expressed interest in receiving updates on transportation planning at Metro or updates related to the Columbia River Crossing project.

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www.oregonmetro.gov

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July 15, 2011

The Honorable Sam Adams
City of Portland
1221 SW 4th Avenue, Room 340
Portland, OR 97204

Dear Mayor Adams:

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and associated highway improvements consolidated in environmental statements addressing South/North light rail projects. The Metro Council is scheduled to consider approval of a LUFO amendment for the South/North Project to approve the extension of light rail, a new light rail station, and highway improvements in the vicinity of the Expo Center, Hayden Island and Delta Park that are all part of the Columbia River Crossing Project. This LUFO represents the fourth time the Metro Council's original LUFO in 1998 on the South/North Project is being amended. Earlier amendments include Interstate MAX (1999), I-205 and downtown Portland (2004), and Portland to Milwaukie (2008). The Columbia River Crossing LUFO amendment contains modifications to the previously approved Locally Preferred Alternative for this project to reflect regional concerns about the Project.

The Metro Council will be considering an amendment to the 1998 LUFO on August 11, 2011. We are writing specifically to request the city's input on this amendment. A notice for the hearing concerning the proposed LUFO amendment is attached. Draft LUFO documents are available on line at www.oregonmetro.gov/columbiarivercrossing.

If you would like more information about the hearing, please call Karen Withrow at 503-797-1932.

Sincerely,

Tom Hughes
Metro Council President

600 NE Grand Ave.
Portland, OR 97232-2736
www.oregonmetro.gov

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July 15, 2011

The Honorable Shane Bemis
City of Gresham
1333 NW Eastman Parkway
Gresham, OR 97030

Dear Mayor Bemis:

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and associated highway improvements consolidated in environmental statements addressing South/North light rail projects. The Metro Council is scheduled to consider approval of a LUFO amendment for the South/North Project to approve the extension of light rail, a new light rail station, and highway improvements in the vicinity of the Expo Center, Hayden Island and Delta Park that are all part of the Columbia River Crossing Project. This LUFO represents the fourth time the Metro Council's original LUFO in 1998 on the South/North Project is being amended. Earlier amendments include Interstate MAX (1999), I-205 and downtown Portland (2004), and Portland to Milwaukie (2008). The Columbia River Crossing LUFO amendment contains modifications to the previously approved Locally Preferred Alternative for this project to reflect regional concerns about the Project.

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If you would like more information about the hearing, please call Karen Withrow at 503-797-1932.

Sincerely,

Tom Hughes

Tom Hughes
Metro Council President

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Portland, OR 97232-2736
www.oregonmetro.gov

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July 15, 2011

The Honorable Wade Byers
City of Gladstone
525 Portland Avenue
Gladstone, OR 97027

Dear Mayor Byers:

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and associated highway improvements consolidated in environmental statements addressing South/North light rail projects. The Metro Council is scheduled to consider approval of a LUFO amendment for the South/North Project to approve the extension of light rail, a new light rail station, and highway improvements in the vicinity of the Expo Center, Hayden Island and Delta Park that are all part of the Columbia River Crossing Project. This LUFO represents the fourth time the Metro Council's original LUFO in 1998 on the South/North Project is being amended. Earlier amendments include Interstate MAX (1999), I-205 and downtown Portland (2004), and Portland to Milwaukie (2008). The Columbia River Crossing LUFO amendment contains modifications to the previously approved Locally Preferred Alternative for this project to reflect regional concerns about the Project.

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If you would like more information about the hearing, please call Karen Withrow at 503-797-1932.

Sincerely,

Tom Hughes
Metro Council President

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Portland, OR 97232-2736
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July 15, 2011

The Honorable Greg Chaimov
City of Milwaukie
10722 SE Main Street
Milwaukie, OR 97222

Dear Mayor Chaimov:

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and associated highway improvements consolidated in environmental statements addressing South/North light rail projects. The Metro Council is scheduled to consider approval of a LUFO amendment for the South/North Project to approve the extension of light rail, a new light rail station, and highway improvements in the vicinity of the Expo Center, Hayden Island and Delta Park that are all part of the Columbia River Crossing Project. This LUFO represents the fourth time the Metro Council's original LUFO in 1998 on the South/North Project is being amended. Earlier amendments include Interstate MAX (1999), I-205 and downtown Portland (2004), and Portland to Milwaukie (2008). The Columbia River Crossing LUFO amendment contains modifications to the previously approved Locally Preferred Alternative for this project to reflect regional concerns about the Project.

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If you would like more information about the hearing, please call Karen Withrow at 503-797-1932.

Sincerely,

Tom Hughes

Tom Hughes
Metro Council President

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Portland, OR 97232-2736
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July 15, 2011

Mr. Matthew Garrett
ODOT
355 Capitol St NE, Room 135
Salem, OR 97301

Dear Mr. Garrett:

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and associated highway improvements consolidated in environmental statements addressing South/North light rail projects. The Metro Council is scheduled to consider approval of a LUFO amendment for the South/North Project to approve the extension of light rail, a new light rail station, and highway improvements in the vicinity of the Expo Center, Hayden Island and Delta Park that are all part of the Columbia River Crossing Project. This LUFO represents the fourth time the Metro Council's original LUFO in 1998 on the South/North Project is being amended. Earlier amendments include Interstate MAX (1999), I-205 and downtown Portland (2004), and Portland to Milwaukie (2008). The Columbia River Crossing LUFO amendment contains modifications to the previously approved Locally Preferred Alternative for this project to reflect regional concerns about the Project.

The Metro Council will be considering an amendment to the 1998 LUFO on August 11, 2011. We are writing specifically to request the agency's input on this amendment. A notice for the hearing concerning the proposed LUFO amendment is attached. Draft LUFO documents are available on line at www.oregonmetro.gov/columbiarivercrossing.

If you would like more information about the hearing, please call Karen Withrow at 503-797-1932.

Sincerely,

Tom Hughes

Tom Hughes
Metro Council President

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Portland, OR 97232-2736

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July 15, 2011

The Honorable Ann Lininger
Clackamas County
2051 Kaen Road
Oregon City, OR 97045

Dear Commissioner Lininger:

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and associated highway improvements consolidated in environmental statements addressing South/North light rail projects. The Metro Council is scheduled to consider approval of a LUFO amendment for the South/North Project to approve the extension of light rail, a new light rail station, and highway improvements in the vicinity of the Expo Center, Hayden Island and Delta Park that are all part of the Columbia River Crossing Project. This LUFO represents the fourth time the Metro Council's original LUFO in 1998 on the South/North Project is being amended. Earlier amendments include Interstate MAX (1999), I-205 and downtown Portland (2004), and Portland to Milwaukie (2008). The Columbia River Crossing LUFO amendment contains modifications to the previously approved Locally Preferred Alternative for this project to reflect regional concerns about the Project.

The Metro Council will be considering an amendment to the 1998 LUFO on August 11, 2011. We are writing specifically to request the county's input on this amendment. A notice for the hearing concerning the proposed LUFO amendment is attached. Draft LUFO documents are available on line at www.oregonmetro.gov/columbiarivercrossing.

If you would like more information about the hearing, please call Karen Withrow at 503-797-1932.

Sincerely,

Tom Hughes

Tom Hughes
Metro Council President

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Portland, OR 97232-2736

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July 15, 2011

Mr. Neil McFarlane
TriMet
4012 SE 17th Avenue
Portland, OR 97202

Dear Mr. McFarlane:

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and associated highway improvements consolidated in environmental statements addressing South/North light rail projects. The Metro Council is scheduled to consider approval of a LUFO amendment for the South/North Project to approve the extension of light rail, a new light rail station, and highway improvements in the vicinity of the Expo Center, Hayden Island and Delta Park that are all part of the Columbia River Crossing Project. This LUFO represents the fourth time the Metro Council's original LUFO in 1998 on the South/North Project is being amended. Earlier amendments include Interstate MAX (1999), I-205 and downtown Portland (2004), and Portland to Milwaukie (2008). The Columbia River Crossing LUFO amendment contains modifications to the previously approved Locally Preferred Alternative for this project to reflect regional concerns about the Project.

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If you would like more information about the hearing, please call Karen Withrow at 503-797-1932.

Sincerely,

Tom Hughes

Tom Hughes
Metro Council President

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July 15, 2011

The Honorable Doug Neeley
City of Oregon City
PO Box 3040
Oregon City, OR 97045

Dear Mayor Neeley:

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and associated highway improvements consolidated in environmental statements addressing South/North light rail projects. The Metro Council is scheduled to consider approval of a LUFO amendment for the South/North Project to approve the extension of light rail, a new light rail station, and highway improvements in the vicinity of the Expo Center, Hayden Island and Delta Park that are all part of the Columbia River Crossing Project. This LUFO represents the fourth time the Metro Council's original LUFO in 1998 on the South/North Project is being amended. Earlier amendments include Interstate MAX (1999), I-205 and downtown Portland (2004), and Portland to Milwaukie (2008). The Columbia River Crossing LUFO amendment contains modifications to the previously approved Locally Preferred Alternative for this project to reflect regional concerns about the Project.

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If you would like more information about the hearing, please call Karen Withrow at 503-797-1932.

Sincerely,

Tom Hughes

Tom Hughes
Metro Council President

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Portland, OR 97232-2736
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July 15, 2011

The Honorable Loretta Smith
Multnomah County
501 SE Hawthorne Boulevard, Suite 600
Portland, OR 97214

Dear Commissioner Smith:

In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and associated highway improvements consolidated in environmental statements addressing South/North light rail projects. The Metro Council is scheduled to consider approval of a LUFO amendment for the South/North Project to approve the extension of light rail, a new light rail station, and highway improvements in the vicinity of the Expo Center, Hayden Island and Delta Park that are all part of the Columbia River Crossing Project. This LUFO represents the fourth time the Metro Council's original LUFO in 1998 on the South/North Project is being amended. Earlier amendments include Interstate MAX (1999), I-205 and downtown Portland (2004), and Portland to Milwaukie (2008). The Columbia River Crossing LUFO amendment contains modifications to the previously approved Locally Preferred Alternative for this project to reflect regional concerns about the Project.

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If you would like more information about the hearing, please call Karen Withrow at 503-797-1932.

Sincerely,

Tom Hughes

Tom Hughes
Metro Council President

July 14, 2011

TO: Laura Dawson-Bodner, Metro
FROM: CRC Project Staff
SUBJECT: CRC (Oregon) Project Summary for Metro Land Use Final Order (Preliminary)

This memorandum includes a brief project summary of the Columbia River Crossing project for the purpose of providing documentation as part of the application for approval of a Land Use Final Order (LUFO). This memo only focuses on project components and impacts that are located within the State of Oregon.

The Locally Preferred Alternative

The following are the primary transportation improvements included in the LPA; these are described in more detail in the following sections, in the order listed.

- The new river crossing over the Columbia River and the I-5 highway improvements, including improvements to seven interchanges, north and south of the river, as well as related enhancements to the local street network.
- Extension of light rail from the Expo Center in Portland to Clark College in Vancouver, and associated transit improvements, including transit stations, park and rides, bus route changes, and expansion of a light rail transit maintenance facility.
- Bicycle and pedestrian improvements throughout the project corridor.
- A toll on motorists using the river crossing.
- Transportation demand and system management measures to be implemented with the project.

The LPA includes local vehicular access between Marine Drive and Hayden Island on a local multimodal bridge. In addition, the LPA also includes the potential for phasing construction, that is, building part of the project in an initial phase and constructing the remaining elements of the project at a later date. It has become increasingly evident that there may not be adequate funding to construct all elements of the LPA in a single phase and it is common for large projects to be built in phases. Possible phasing options for the CRC project are numerous, and the actual phasing cannot be known until the precise timing and availability of funding are finalized, which will occur sometime after the Record of Decision (ROD). However, the project team, working with stakeholder groups, identified several highway elements of the LPA that could be reasonably postponed to reduce initial construction costs. The LPA with highway phasing option would build most of the LPA in the first phase, but would defer construction of specific elements of the project, including:

- Construction of the I-5 braided on- and off-ramps at Victory Boulevard.
- Construction of the Marine Drive interchange flyover.

The phasing scenario is a reasonable expectation of what could be constructed in the first phase if full funding is not available. Reasonable phasing options are not likely to result in any new significant adverse impacts beyond those delineated for the LPA. The primary result of construction phasing would be to delay some of the benefits that the full LPA would provide.

Multimodal River Crossing and Highway Improvements

River Crossing Structures

The LPA includes construction of new bridges across the main channel of the Columbia River and new structures across North Portland Harbor, along with improvements to the existing I-5 bridges across North Portland Harbor. These improvements are described in detail below.

Columbia River bridges

The parallel bridges that form the existing I-5 crossing over the Columbia River would be replaced by two new parallel bridges. The eastern structure would accommodate northbound highway traffic on the bridge deck, with a bicycle and pedestrian path underneath; the western structure would carry southbound traffic on the bridge deck, with a two-way light rail guideway below. Whereas the existing bridges have only three lanes each, with virtually no shoulders, each of the new bridges would be wide enough to accommodate three through lanes and two add/drop lanes. Lanes and shoulders would be built to full Oregon Department of Transportation (ODOT) design standards (i.e., no reduced width lanes or shoulders will be constructed).

The southbound (western) bridge would accommodate a two-way guideway for light rail vehicles (LRVs) beneath the highway deck. Similarly, the northbound (eastern) bridge would accommodate a bicycle and pedestrian path approximately 16 to 20 feet wide below the highway deck, located within the support structure under the highway deck. The width of the path will depend on the width of the support structure itself. The proposed bridge type of the two new main river crossing bridges is a composite deck truss design in which the "walls" are constructed of diagonal steel members. This allows for a partially open-sided, covered passage for bicyclists and pedestrians beneath the eastern bridge deck and for light rail transit beneath the western bridge deck. This bridge type would allow for natural light and ventilation as well as views to the east from the bicycle and pedestrian path and views to the west from the light rail trains.

The height of the new bridges was established to give adequate clearance for river traffic below and for air traffic above. The top of deck of the new bridge would range in elevation from approximately 100 to 140 feet over the Columbia River. The new bridges would be high enough to provide approximately 95 feet of vertical clearance for river traffic beneath, but not so high as to impede take-offs and landings by aircraft using Pearson Field and Portland International Airport (PDX) to the east. Unlike the existing bridge over the Columbia River, the new structures would not include lift spans.

The existing bridges over the Columbia River have nine pier sets. Each of the new bridges would be built on six pairs of in-water piers plus two pairs of piers on land. Each of these pier sets would be supported by a foundation of approximately sixteen 10-foot-diameter drilled shafts. Each group of shafts would be tied together with a concrete cap measuring approximately 75 feet by 75 feet at the water line. Slender columns would rise from the shaft caps and connect to the superstructure of the bridges. During final design, project staff will further explore the potential for reducing the diameter of the Columbia River bridges' in-water piers.

North Portland Harbor bridges

The existing highway structures over North Portland Harbor would not be replaced; instead, they would be retained and would accommodate all mainline I-5 traffic. As discussed at the beginning of this chapter, the Hayden Island and Marine Drive interchanges have been further evaluated based on public involvement and input. The LPA includes local vehicular access between Marine Drive and Hayden Island on a local multimodal bridge.

LPA: Four new, narrower parallel structures would be built across the waterway, three on the west side and one on the east side of the existing North Portland Harbor bridge. The LPA would not widen or seismically upgrade the existing North Portland Harbor bridge.

Three of the new structures would carry on- and off-ramps to mainline I-5. Two structures west of the existing bridge would carry traffic merging onto I-5 southbound from Hayden Island or exiting off of I-5 southbound to Marine Drive. The new structure on the east side of I-5 would serve as an on-ramp for traffic merging onto I-5 northbound from Marine Drive and Martin Luther King Jr. Boulevard and would carry the multi-use path underneath the bridge deck.

The fourth new structure would be built slightly farther west and would include a two-lane local multimodal bridge for local traffic to and from Hayden Island, light rail transit, and would include bicycle lanes and sidewalks. The length of each new structure would be between 800 and 1,000 feet, depending on its location and the angle relative to the channel. Spans would vary by bridge, and the existing navigation channel would be preserved. All of the new structures would have at least as much vertical clearance over the river as the existing North Portland Harbor bridges.

Highway, Interchange, and Local Street Improvements

The LPA includes improvements to seven interchanges along a 5-mile segment of I-5 between Victory Boulevard in Portland and SR 500 in Vancouver. These improvements result in some reconfiguration of adjacent local streets to complement the new interchange designs, and include new street extensions, added travel lanes, and new and extended turn pockets at key intersections. The new facilities increase accessibility and mobility for vehicular, bicyclist and pedestrian travel.

In addition to interchange improvements, a series of auxiliary (add/drop) lanes would be sequentially added and then dropped at strategic locations through the corridor. The add/drop lanes would allow vehicles to travel between given points without merging into mainline interstate traffic, and would allow vehicles exiting or entering to minimize conflicts with through traffic. From the south end of the project area, I-5 northbound would have one added auxiliary lane starting where the Victory Boulevard/Denver Avenue on-ramp enters I-5. Another auxiliary lane would be added where the Marine Drive on-ramp enters I-5. One of these lanes would be dropped at the Mill Plain Boulevard/Fourth Plain Boulevard off-ramp. An auxiliary lane would be added where the Mill Plain on-ramp enters I-5. One auxiliary lane would be dropped at the SR 500 interchange and the second would be dropped north of the Main Street off-ramp. Lanes would be added or dropped as the various on-ramps and off-ramps enter or exit I-5 with each subsequent interchange. Southbound I-5 and the associated interchanges and ramps would have a similar series of add/drop lanes. If highway construction is phased, construction of some auxiliary lanes would be deferred, as characterized within the corresponding description of interchange improvements.

The southern extent of the CRC highway improvements is the Victory Boulevard interchange in Portland. Improvements at this interchange would be limited to two of the ramps. The Marine Drive to I-5 southbound on-ramp would be braided over the I-5 southbound to Victory Boulevard/Denver Avenue off-ramp. Braiding these two movements would eliminate the existing short (substandard) weave distance and improve traffic safety. Braiding the two movements would also eliminate direct access from the Marine Drive interchange to the Victory Boulevard interchange. Motorists would instead use local roads to travel from Marine Drive to Victory Boulevard. Local roads would also connect the Bridgeton Neighborhood to the Kenton Neighborhood.

Currently, the existing Victory Boulevard/Denver Avenue on-ramp merges with I-5 mainline northbound traffic; this improvement would bring this ramp on as an add lane, acting as an auxiliary lane within the project limits to provide additional capacity and a safer roadway.

Phased highway construction option: To reduce project construction costs, construction of the aforementioned southbound braided ramp improvements to the Victory Boulevard interchange could be deferred. If these improvements are not included in initial project construction, then this would leave a weave section on the main highway between Marine Drive and Victory Boulevard. The braided ramp connection could be constructed separately in the future as funding becomes available. The braided ramp improvement is included in the LPA, but is assumed to be deferred if the project has to be phased.

Marine Drive Interchange

All movements within this interchange would be reconfigured to reduce congestion and improve safety for trucks and other motorists entering and exiting I-5. The proposed configuration is a single-point urban interchange (SPUI) with a flyover ramp serving the eastbound to northbound movement. With this configuration, three legs of the interchange would converge at a point on Marine Drive over the I-5 mainline. This configuration would allow the movements with the highest volumes in the interchange to move freely without being impeded by stop signs or traffic signals.

Specific changes to traffic movements at this interchange include:

- The northbound flyover ramp would allow trucks and motorists to travel from Marine Drive eastbound to I-5 northbound without stopping. Currently this movement is served by a double left turn at a signalized intersection.
- The Marine Drive eastbound to I-5 southbound ramp would also provide trucks and motorists with access to I-5 southbound without stopping. This ramp would touch down south of Victory Boulevard and is also described as part of the Victory Boulevard southbound braided ramp.
- Motorists traveling on Martin Luther King Jr. Boulevard westbound to I-5 northbound would access I-5 without stopping at the intersection. Currently this movement is served by a loop that goes under the freeway. The new configuration would have less out of direction travel for this movement.
- Travel safety and mobility between the Marine Drive interchange and Hayden Island would be improved by eliminating the local movement between interchanges from the I-5 mainline and accommodating the connection with a local multimodal bridge. Additional safety and mobility improvements would occur by braiding the on- and off-ramps between Marine Drive and Hayden Island. Separating this traffic would reduce the number of potential collisions and reduce congestion that can occur from a high number of conflicting traffic movements.
- The new interchange configuration changes the westbound Marine Drive (east of I-5) and westbound Vancouver Way connections to Martin Luther King Jr. Boulevard and to northbound I-5. Rather than merging onto Martin Luther King Jr. Boulevard, which then loops on the west side and back to the east side of I-5 before entering northbound I-5, these two streets would instead access westbound Martin Luther King Jr. Boulevard farther east. Martin Luther King Jr. Boulevard would have a new direct connection to I-5 northbound.
- In the new configuration, the connections from Vancouver Way and Marine Drive would be served, improving the existing connection to Martin Luther King Jr. Boulevard east of the interchange. The improvements to this connection would allow traffic to turn from Vancouver Way and accelerate onto Martin Luther King Jr. Boulevard. On the south side of Martin Luther King Jr. Boulevard, the existing loop connection would be replaced with a new connection farther east, connecting to Union Court at Hayden Meadows Drive. A new undercrossing of Martin Luther King Jr. Boulevard would replace the existing one at Marine Way.
- Improvements to the local street system around the interchange, including an extension of Vancouver Way under I-5 to connect to the new north-south street adjacent to the Expo Center.
- Improvements and a realignment of Expo Road. The proposed realignment of the west end of this road may be adjusted in final design, in coordination with the Expo Center. Expo Road is located largely on Expo Center property in an area where Metro is currently refining parking and access plans as part of their Master Plan process.

LPA: Local traffic between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel via a local multimodal bridge over North Portland Harbor.

Phased highway construction option: To reduce initial project construction costs, construction of the aforementioned eastbound to northbound flyover ramp could be deferred. If the flyover is not included in the first phase of project construction, then the eastbound Marine Drive to northbound I-5 movement would be accommodated through the signal-controlled SPUI. The flyover could be constructed separately in the future as funding becomes available. The construction of this flyover would require the reconstruction of the Martin Luther King Jr. Boulevard westbound to I-5 northbound ramp farther to the east in order for it to merge into the ramp north of where the flyover connects.

Hayden Island Interchange

The Hayden Island interchange would be reconfigured to lengthen the ramps and improve merging speeds by building longer ramps parallel to the highway. The current Hayden Island interchange off of I-5 contains substandard features, including short on- and off- ramps. The existing short ramps do not provide ample distance for some vehicles, especially trucks, to reach mainline speed before merging onto the mainline lanes, which results in a safety hazard. The combination of short ramps and lack of add/drop lanes to the north of the interchange requires traffic entering and exiting the highway to accelerate quickly when entering and decelerate quickly when exiting, or to back up along the ramps and mainline. These conditions result in congestion and higher crash rates on the highway and local streets.

All movements for this interchange would be reconfigured. The new configuration would be a split tight diamond interchange. Specific changes to traffic movements at this interchange would include:

- Improvements to Jantzen Drive would include additional through, left-turn, and right-turn lanes. Currently, Jantzen Drive does not connect to highway ramps. Ramp connections are made to Hayden Island Drive and Center Avenue. Ramps to/from southbound I-5 would connect to Jantzen Drive. Jantzen Drive would also connect to northbound I-5. Jantzen Drive would be improved from the existing two- to three-lane roadway to a three- to five-lane roadway, depending on the location. Double left-turn lanes and a right-turn lane would be provided at the northbound entrance.
- Hayden Island Drive would be improved from a three-lane roadway to a three- to five-lane roadway, depending on the location. Ramps from I-5 northbound would connect to Hayden Island Drive. On-ramps from Hayden Island Drive would connect to I-5 southbound. Right-turn lanes would be provided at the southbound ramp entrance and at Jantzen Drive, and double left-turn lanes would be provided at the southbound entrance.
- A new local road, Tomahawk Island Drive, located through the middle of the island, would provide an east-west link under the I-5 mainline for travelers to access both sides and would improve connectivity for local traffic, pedestrians, and bicyclists.

LPA: A proposed local multimodal bridge with two lanes of traffic, one in each direction, would allow vehicles to travel between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island without accessing I-5. Tomahawk Island Drive would connect to the local multimodal bridge and the local street system.

Transit

The transit element of the LPA is primarily an extension of light rail to Clark College in Vancouver from the Expo Center in north Portland, where the MAX Yellow Line currently terminates. To accommodate and complement this major addition to the region's transit system, a variety of additional improvements are also included in the project. These include expansion of the current TriMet light rail maintenance base in Gresham, and upgrades to the existing Steel Bridge light rail crossing over the Willamette River in Portland.

Light Rail Alignment and Stations

Operating characteristics

The project would include a 2.9-mile extension of the existing MAX Yellow Line from the Expo Center station across the North Portland Harbor, over Hayden Island, across the Columbia River, and through downtown Vancouver, ending near Clark College. Nineteen new light rail transit vehicles (LRVs) would be purchased as part of the CRC project to operate this extension of the MAX Yellow Line. These vehicles would be similar to those currently used on the MAX light rail transit system. Trains would operate in a two-car configuration.

With the LPA, LRVs in the new guideway and in the existing Yellow Line alignment would be planned to operate with 7.5-minute headways during the "peak of the peak" (the 2-hour period within the 4-hour morning and afternoon/evening peak periods when demand for transit is the highest) and with 15-minute headways at all other times. This compares to 12-minute headways in "peak of the peak" and 15-minute headways at all other times for the existing Yellow Line (and No-Build Alternative).

Oregon Light Rail Alignment and Station

A double-track light rail guideway for north and southbound trains would be constructed to extend northward from the existing Expo Center MAX station. The alignment would curve eastward toward I-5 as it passes beneath a newly reconstructed Marine Drive. North of Marine Drive the profile would rise as the guideway transitions onto a bridge structure to cross North Portland Harbor. The two-way guideway over Hayden Island would be elevated at approximately the height of the rebuilt mainline of I-5. A station would be constructed on Hayden Island immediately west of the reconstructed I-5/Hayden Island interchange.

The alignment would extend northward on Hayden Island, along the western edge of I-5, until it transitions into the new bridge over the Columbia River. It would be located on the lower deck of the western bridge, which would service southbound highway traffic on the top deck.

Ruby Junction Maintenance Facility Expansion

The CRC project would expand the existing Ruby Junction Maintenance Facility in Gresham, Oregon to accommodate the additional LRVs associated with the operations of the CRC project. The proposed expansion of the Ruby Junction facility would also accommodate the additional LRVs associated with the separately proposed Portland-Milwaukie Light Rail Project. Improvements would include additional storage for LRVs, maintenance equipment and materials, an expansion of LRV maintenance bays, and expanded parking for additional personnel. The Portland-Milwaukie Light Rail Project is considering phasing the maintenance facility expansion to first build only the capacity required for their initial operations, as described in the Portland-Milwaukie Final EIS (FTA 2010). Their initial phase would expand the facility to the west but defer the development of some track, internal roadway, parking facilities, and other structures. If the Portland-Milwaukie project implements phased construction, that would not change the total impacts at the site, but it would change the timing of some of the impacts. Phasing will be determined by the Portland-Milwaukie Light Rail Project and its timing relative to the CRC project construction. A new operations command center would be located at the existing TriMet Center Street location. This would not require any new building construction or expansion of the existing Center Street facility.

Steel Bridge Improvements

In addition to extending the MAX Yellow line, the CRC project would include minor modifications to a critical element of the existing MAX light rail transit system located outside the main project area. These modifications would improve the existing light rail transit track and electrical system on the Steel Bridge, which is located approximately 4 miles south of the crossing of the Columbia River. These improvements would allow the Yellow Line trains, as well as all other MAX line trains that would use these tracks, to increase their travel speed over the Steel Bridge.

Since the publication of the DEIS, a Documented Categorical Exclusion (DCE) from the NEPA process was requested for the work on Steel Bridge. The DCE evaluation determined that there would be minimal environmental impacts from improvements to the bridge trackway and controls. A determination that the work would be excluded from the NEPA process was made by FTA in February 2011. The Steel Bridge improvements were included in the CRC 2008 Federal New Starts application.

Currently, all light rail transit lines within the regional MAX system cross the Willamette River in downtown Portland via the Steel Bridge. The Steel Bridge was built in 1912 and was retrofitted in 1984 to receive LRVs. When the first light rail line opened in 1986, 40 LRVs crossed the bridge during the 4-hour PM peak period; in 2007, with the Red and Yellow Lines opened, 116 LRVs crossed the bridge during the 4-hour PM peak period. In 2009, TriMet opened the I-205 South Corridor Project, increasing the number of vehicles that cross the Steel Bridge to 152 during the 4-hour PM peak period. With a "peak of the peak" headway of 7.5 minutes, the CRC project would increase the number of LRVs that cross the Steel Bridge in 2030 during the 4-hour PM peak period to 176 trains. To accommodate these additional trains, the CRC project would retrofit the existing rails on the Steel Bridge to increase the allowed light rail transit speed over the bridge, increasing the LRV throughput of the bridge.

The Steel Bridge has a lift span that requires lift joints in the MAX rails within the track bed. These lift joints limit the crossing speed of LRVs to no more than 10 miles per hour (mph). This limitation is because the vibrations at these joints disrupt the signaling and electrification system. Modifications to reduce the wheel rise from the lift joint would decrease the bridge vibration, allowing MAX trains a maximum speed of 15 mph on the Steel Bridge, thus improving the speed of all MAX lines crossing the bridge. There is also an existing signal case on the lift span that cannot withstand high levels of vibration. The overhead catenary system (OCS) that supplies electrical power to the trains is also not designed to withstand the high levels of vibration that are generated with speeds above 10 mph. The work needed to increase the speed limits from 10 mph to 15 mph over the Steel Bridge lift spans would include the following:

1. Grind the transit rails within the track bed to remove the lift joint bumps, rail corrugation, and any rough field welds.
2. Install a vibration pad under the signal case to dissipate vibration.
3. Stiffen the OCS brackets to allow for greater impact as the catenary transfers from the fixed to movable span.
4. Make light rail transit and traffic signal adjustments for NW Everett Street and N Interstate Avenue to accommodate the higher speeds.

Pedestrian and Bicycle Improvements

Many bicycle and pedestrian improvements are included in the CRC project. These include new facilities such as the multi-use pathway across the Columbia River and connections to existing and future pathways, street improvements around the rebuilt interchanges, and new facilities for bicyclists and pedestrians around the new light rail stations and park and rides. The proposed improvements are described below from the south end of the project to the north end.

North Portland

With the LPA, the proposed Marine Drive interchange area would be entirely grade-separated, with the local road network and multi-use paths running below the interchange. Pedestrian and bicycle improvements at the Marine Drive interchange would include a multi-use path constructed from the Marine Drive interchange, over North Portland Harbor and Hayden Island and the Columbia River, to SE Columbia Way in downtown Vancouver. The path would be a minimum of 16 feet wide when on structure and would direct users with pavement markings and signage. Horizontal and vertical curves would be built to provide improved sight distance and flow, and path components would meet Americans with Disabilities Act (ADA) accessibility standards.

The multi-use path in north Portland would begin at Delta Park with a connection to Whitaker Road. Heading northeast, the path would cross below Martin Luther King Jr. Boulevard at the existing Marine Way location. Marine Way would be removed, along with the loop ramps connecting to Martin Luther King Jr. Boulevard, in this area. After crossing below Martin Luther King Jr. Boulevard, the multi-use path continues on to the intersection of Marine Drive and Vancouver Way. The path would then continue west along the north side of the new local road extension of Vancouver Way. After the pathway crosses the intersection of Anchor Way and the Vancouver Way extension, there would be a pathway intersection. To the east, a spur would be built to connect to the future Bridgeton Trail. To the west, a path would continue under I-5 to a connection to the 40mile loop trail-Mile Loop Trail. The multi-use path would continue north underneath the new eastern bridge crossing of the North Portland Harbor, to Hayden Island.

The connection to the west crosses below I-5, and would provide an off-street route for pedestrian and bicycle traffic through the Marine Drive interchange. After crossing underneath I-5, the path continues west to an at-grade crossing of the light rail tracks and local multimodal bridge roadway, and connects to the existing west leg of the 40-Mile Loop Trail along North Portland Harbor. The connection to the Expo Center light rail station would be made via on-street bicycle lanes and sidewalks along a new roadway running north/south along the eastern edge of the Expo Center. Bicycle lanes and a sidewalk on the local multimodal bridge would provide a second connection to Hayden Island and would also carry the light rail transit guideway over North Portland Harbor.

Sidewalks would be constructed along the southern side of the new Vancouver Way road extension. All elements would meet ADA accessibility standards.

Hayden Island

With the LPA, from North Portland Harbor, the new multi-use path would continue on the new local multimodal bridge located parallel to and west of I-5. The multi-use path across Hayden Island would be entirely grade-separated from vehicle traffic. This elevated path would connect the North Portland Harbor bridges and the Columbia River bridges. Pedestrians and bicyclists could access the multi-use path at the North Hayden Island Drive ramp; at the stairs or ramp at the Hayden Island light rail transit station; or at the stairs at Jantzen Drive. The multi-use pathway across Hayden Island would be entirely grade-separated from vehicle traffic, and would enter the easternmost cell below the bridge deck in the northbound bridge over the Columbia River at the north end of the island.

To improve east-west connections on Hayden Island, a 6- to 8-foot-wide sidewalk would be provided along Jantzen Drive and Hayden Island Drive. A 6-foot minimum width sidewalk would be provided along Tomahawk Island Drive. Several island streets would also include bicycle lanes where improvements are made.

River Crossing

The new northbound bridge over the Columbia River would also accommodate a multi-use pathway under the highway deck. This path would be 16 to 20 feet wide, located within the superstructure above the bridge columns and below the bridge deck. The multi-use path would separate pedestrians and bicyclists from vehicle noise and avoid proximity to moving vehicles. The path would also separate pedestrians and casual bicyclists from higher speed bicyclists through pavement markings and possibly different colored pavement. All bicycle and pedestrian improvements would meet ADA accessibility standards.

The composite deck truss bridge would use a series of discrete, steel diagonal members, instead of solid walls, on the sides of the superstructure. This bridge type would afford a partially open-sided, covered pathway for bicyclists and pedestrians.

Ramps would connect the multi-use path to Hayden Island Drive on Hayden Island. Having the multi-use path beneath the highway deck would shorten connections, as the pathway's elevation would be lower than the roadway deck. Separating the multi-use path from highway traffic would reduce exposure to motor vehicle noise. The wide multi-use path would also reduce conflicts between pedestrians and bicyclists by affording enough space to accommodate two-way travel for both.

Tolling

Tolling of cars and trucks that use the I-5 river crossing is proposed as a method to help fund the CRC project and to encourage the use of alternative modes of transportation. Tolls would be collected using an electronic toll collection system, so that toll collection booths would not be required. Instead, motorists could obtain a transponder that would sense each time the vehicle crosses the bridge; the vehicle owner would be billed automatically. Cars without transponders would be tolled by a license-plate recognition system that would bill the address of the owner registered to that license plate; a processing fee would be charged for cars without transponders.

The LPA proposes to apply a variable toll on vehicles using the I-5 crossing. Tolls would vary by time of day, with higher rates during peak travel periods and lower rates during off-peak periods. Medium and heavy trucks would be charged a higher toll than passenger vehicles. The traffic-related impact analysis is based on tolling in both directions, and on toll rates that, for passenger cars with transponders, would range from $1.00 during off-peak times to $2.00 during peak travel times (in 2006 dollars).

The DEIS evaluated four tolling scenarios: no toll; a standard variable rate toll on the I-5 crossing (ranging from $1.00 to $2.00 throughout the day, as described above); a higher variable rate toll on the I-5 crossing (ranging from $1.00 to $2.50 throughout the day); and a standard variable rate on both the I-5 and I-205 crossings.

The authority to toll the I-5 crossing is set by federal and state laws. Federal statutes permit a toll-free bridge on an interstate highway to be converted to a tolled facility following the reconstruction or replacement of the bridge (USC 129(a)(1)(C)); the CRC project would meet these conditions. Prior to tolling I-5, WSDOT and ODOT would have to enter into a toll agreement with the U.S. Department of Transportation (DOT). In Oregon, the Oregon Transportation Commission has the authority to toll a facility and to set the toll rates (ORS 383). It is anticipated that prior to tolling I-5, ODOT and WSDOT would enter into a bi-state tolling agreement to establish a cooperative process for implementing tolls, setting toll rates, and guiding the use of toll revenues.

With few exceptions, federal statutes do not permit tolling of an existing interstate highway without associated improvements. FHWA does have pilot programs that allow state departments of transportation to apply for the approval to toll a facility. The project sponsors are not proposing to toll the I-205 crossing as part of the CRC project. It is possible that a toll could be placed on the I-205 crossing in the future separate from the CRC project.

In addition, tolling prior to or during construction can be used to manage demand and begin collecting revenue. This is not currently proposed but could be implemented if approved.

Transportation System and Demand Management Measures

Many well-coordinated transportation demand management (TDM) and transportation system management (TSM) programs are already in place in the Portland-Vancouver metropolitan region and are supported by various agencies and adopted plans. In some cases, the impetus for the programs is from two state-mandated programs: Oregon's Employee Commute Options (ECO) rule, and Washington's Commute Trip Reduction (CTR) law. However, TDM and TSM projects, by themselves, would not solve the many problems identified in the CRC project's Purpose and Need, including seismic vulnerability, poor bicycle and pedestrian facilities and connections, poor transit mobility, and safety issues because of substandard highway design features.

The CRC Project Sponsors Council (PSC) supports creation of a local advisory Mobility Council to provide recommendations and advise the WSDOT, ODOT, and transit districts on the optimal long-term performance of all modes of transportation on the Columbia River Crossing and the adjoining city streets and highways. The PSC supports practical and measureable performance standards to maintain long-term system performance.

The intended purpose of the Mobility Council would be to help maximize the long-term benefits of the new multimodal crossing for all users and affected stakeholders in an equitable manner by recommending actions on the part of WSDOT, ODOT, transit agencies, and cities in support of the agreed upon goals.

The physical and operational elements of the CRC project provide the greatest TDM opportunities by promoting other modes to fulfill more of the travel needs in the project corridor. These include:

- A new light rail line with connections to express bus and feeder routes operated by C-TRAN and TriMet.
- Modern bicycle and pedestrian facilities that accommodate more bicyclists and pedestrians, and improve connectivity, safety, and travel time.
- Park and ride facilities.
- A variable toll on the highway crossing.

In addition to these fundamental elements of the project, facilities and equipment would be implemented that could help existing or expanded TSM programs maximize capacity and efficiency of the system. These could include:

- Replacement or expanded variable message signs or other traveler information systems in the CRC project area.
- Continued incident response capabilities.
- Queue jumps or bypass lanes for transit vehicles where multi-lane approaches are provided at ramp signals for entrance ramps.
- Expanded traveler information systems with additional traffic monitoring equipment and cameras.

A TDM Committee was convened specifically to address TDM as a solution to the possible loss of capacity during the construction phase of the project. The TDM Committee met 14 times, beginning in December 2008, and presented its recommendation to the PSC in March 2010.

The TDM Committee's work focused on developing specific strategies that could be employed to offset the possible loss of capacity associated with construction in the corridor. The Committee's recommendations focused on reducing vehicle trips during the southbound, 4-hour morning peak period and the northbound, 4-hour afternoon peak period. Focusing mostly on work trips, the TDM program is expected to result in trips saved in the peak travel direction during both peak periods. Congestion reduction strategies would be utilized during construction. These actions will include some or all of the following:

- Providing alternatives to single-occupancy vehicle (SOV) trips, for example, vanpools and/or increased transit service.
- Providing incentives to reduce automobile trips and encourage mode shifts to non-SOV trips, for example, supporting and/or providing information regarding localized transportation options, including transit, walking, biking, and carpools.
- Managing traffic and lane closures to avoid congestion and delay.
- Providing traveler information at key junctions to encourage traffic diversion from the I-5 corridor and crossing routes.
- Promoting continuous information campaigns to alert motorists of delay times within the corridor and of upcoming traffic pattern changes and detours.
- Incorporating transit priority measures where feasible.
- Working with employers whose employees must commute through the area to promote alternative work schedules.
- Instituting contractor incentives to shorten construction durations and encourage the use of lower-emitting construction equipment.

Mitigation

The project includes mitigation measures to address the adverse impacts that the LPA would cause. In addition to mitigation, measures to minimize impacts have been incorporated into the project design and construction approach.

Construction Methods

The CRC project encompasses the reconstruction of interstate highway and interchanges, construction of over-land and over-water bridges, new pedestrian and bicycle facilities, and light rail. The precise character of construction impacts depends on design details and methods that are not likely to be finalized until final design, construction contracting, or construction itself. However, it is possible to identify key aspects of construction that allow for the evaluation of potential impacts and identify appropriate mitigation. This section explains the anticipated sequencing and duration of construction and the types of activities involved in building the major elements of this project.

Construction Sequence and Duration

The construction timeline is estimated at 6 to 7 years. The construction of the river crossing sets the sequencing for other project components. The first construction activities would be associated with building the Columbia River bridges, although other elements of the project would be started well before these bridges are finished. Construction of the Columbia River bridges is estimated to last approximately 4 years. The general sequence of constructing the bridges would likely entail the following steps:

- Initial preparation – Mobilize construction materials, heavy equipment and crews; prepare staging areas; install temporary piles to support work and anchor barge platforms.
- Installation of drilled shafts – Install drilled shafts to support the bridge pier columns.
- Shaft caps – Construct and anchor concrete foundations on top of the drilled shafts to support pier columns.
- Pier columns – Construct or install pier columns on the shaft caps.
- Bridge superstructure – Build or install the horizontal structure of the bridge spans across the piers; the superstructure would be steel or reinforced concrete; concrete could be cast-in-place or precast off site and assembled on site.

This sequence would be staggered, with pier construction generally expected to occur at two pier locations at once. The bridge deck would be constructed in sequence as well, once adjacent pier sets are completed.

Interchanges on each end of the bridge would first be partially constructed so that all I-5 traffic could be temporarily re-routed onto the new southbound (western) Columbia River bridge. Constructing the southbound approaches for the Hayden Island interchanges would require approximately 3 years. Certain portions of the Hayden Island interchanges must be completed before traffic can be moved onto the new southbound lanes and construction of the remaining northbound lanes and interchange ramps can proceed. Once I-5 traffic in both directions is rerouted to the new western I-5 bridge, the new northbound segments of the Hayden Island would be constructed.

Similarly, the Marine Drive interchange construction would need to be coordinated with construction of the southbound lanes coming from Vancouver. While this interchange can be constructed independently from the work described above, the completion and utilization of the ramp system between Hayden Island and Marine Drive requires the work to occur in the same period. Early construction of the local multimodal bridge between Marine Drive and Hayden Island, so that it can be used as an alternate access route during the remaining construction period, will be analyzed during final design. The interchange reconstruction also needs to occur so that Marine Drive can be elevated, allowing the light rail extension to cross under Marine Drive. The Marine Drive interchange is expected to take a little more than 3 years to construct, including work at the Victory Boulevard interchange.

The northbound bridge and the northbound off-ramp to SR 14 must be completed and opened before traffic can be routed to the new bridges. Removal of the existing bridges is expected to take about 1.5 years. It can commence after traffic is rerouted to the new Columbia River bridges near the completion of the SR 14 and Hayden Island interchanges. During removal of the bridges, there would likely be weekend closures of I-5. Traffic would be encouraged to take I-205 during these periods rather than navigate around the closed I-5 section. Detour routes would be signed. Extensive outreach would be made prior to any closure, and traffic advisories and updates would be made available to the public to inform travel choices.

Construction of the light rail component would require about 5 years for completion. A shorter construction period is possible if work on either side of the river precedes the completion of the Columbia River bridges. Any bridge structure work would be separate from the actual light rail construction activities on the bridge and must be completed first.

The shortest total project construction timeline is approximately 6 years if the project sequencing is staged as efficiently as possible. This would require construction of all interchanges before the completion of the Columbia River bridges. Funding will be a major factor in determining the overall sequencing and construction duration. Contractor schedules, weather, materials, and equipment could also influence construction duration. Approximately 6 years is also the time required to complete the smallest usable segment of roadway, which is the Hayden Island through SR 14 interchanges. Timelines are in part dependent on how much work can be funded and commenced at any given time. Estimation of timelines may be revisited once funding and other factors are more fully defined. The overall construction timeline is not expected to significantly change with the LPA with highway phasing.

Road Closures and Detours

Constructing the project would entail many different activities, some of which would disrupt traffic. Typical construction methods would require shifting I-5 traffic onto temporary alignments, narrowing lanes and shoulders to accommodate equipment and workers, shortening merge and exit distances, reducing posted speed limits, and closing or detouring some traffic movements. For I-5, it is anticipated that three southbound and three northbound lanes would be maintained during all weekdays, except when the final changeover occurs between the old bridges and the new bridges. When temporary lane closures are needed to accommodate construction and ensure safety, they would typically occur at night and on weekends. It is expected that all of the current movements at each interchange would remain open during construction, with the exception of those movements that would be permanently changed.

Construction Activities

Over-water Bridge Construction

The following describes the types of activities anticipated to construct the bridges over the Columbia River and North Portland Harbor.

Temporary piles ranging from 24 to 48 inches in diameter and driven to depths of 80 feet or more beneath the riverbed would be required to support work platforms and/or to stabilize work and material barges during construction of the Columbia River and new North Portland Harbor bridges. In addition, temporary cofferdams consisting of interlocking sections of sheet piles would be used during construction of the piers closest to the shorelines.

The in-water bridge piers would be founded on drilled shafts installed deep into the riverbed. Large diameter (approximately 10 feet) steel casing would be installed to a specified depth, likely into the top of a competent geological layer known as the Troutdale Formation, which varies in depth from approximately 80 feet to 240 feet beneath the riverbed. For drilled shafts, a vibratory hammer, oscillator, or rotator, rather than an impact hammer (pile driver), would be used to advance the casing. Once the casing has been installed to the required depth, all soil would be removed from the inside of the casing and transferred onto a barge. Excavation inside the casing would continue past the lower end of the casing into the Troutdale Formation to a specified elevation. After the excavation phase, reinforcing steel would be installed into the shaft and then the shaft would be filled with concrete. The steel casing may be removed, depending on the installation method. Approximately 16 of these shafts would be needed for each of the six in-water pier sets.

Concrete drilled shaft caps would either be cast-in-place or precast concrete. Both methods would require cranes, work barges, and material barges in the river to place or set the caps on the shafts. The concrete would tie all the piles together and provide a base of support for each bridge column.
The superstructure would be constructed of structural steel, cast-in-place concrete, or precast concrete. This would require cranes, work barges, and material barges in the river to place or set the structures spanning the piers.

The final stage of the Columbia River bridge construction would include finishing the bridge decks for freeway traffic, installing signage and lighting, installing trackwork and electrification for the light rail transit, and other activities completed either on or under the bridge decks.

Over-water Bridge Demolition of the I-5 Bridges

The components of the existing I-5 bridges would be dismantled and removed. The main components include the bridge decks, the counterweights for the lift span, towers, deck, trusses, piers, and piles. Removal of the counterweights would likely occur first, and would involve dismantling the counterweights and removing them from the tower structure by trucks and/or barges. The lift towers would be removed by cutting them into manageable pieces and loading these pieces onto barges. Deck removal would be done by cutting the deck into manageable pieces and removing these pieces by barge or truck; a second option would be to demolish the deck in sections using a breaker, in which case debris would be caught on a barge or other containment system below the work area.

After demolition of the concrete decks, the trusses could be cut into manageable pieces and loaded onto barges to be transported to and dismantled at an appropriate upland site accessible to the river. Alternately, the trusses could be lifted whole off the piers and transported via barge to another location for reuse, if a new use can be found for them.

Reinforced concrete approach spans connect each end of each bridge to the highway on either side of the river. There is one overland span on the Washington shore and four overland spans on Hayden Island. Two different methods could be used to remove the existing bridges' piers:

- After removing the trusses, the piers could be broken up and removed. Timber piles could then be extracted or cut off below the mud line. If it is deemed necessary for water quality purposes, cofferdams could be installed around the piers and the piers removed from within the cofferdam. If cofferdams are not deemed necessary, the piers could be removed without cofferdams.

- After removing the trusses, a diamond wire/wire saw could be used to cut the piers into manageable chunks that would be transported offsite. Timber piles could then be extracted or cut off below the riverbed.

Factors that would be considered in final pier removal include site-specific considerations (such as depth), safety, phasing constraints, and impacts to aquatic species.

Temporary piles would be required to support work and material barges necessary to install and remove cofferdams and move equipment during bridge demolition.

The existing Columbia River bridge piers are supported on timber piles driven into the river bottom. Approximately 200 existing timber piles at each of nine piers means there would be approximately 1,800 total piles to be removed or cut off below the mudline. It is unknown whether these timber piles have been treated with creosote. Depending on whether piles have been treated and/or whether they pose hazards to navigation, there may be options to leave piles in place. If piles are extracted, methods could include use of a vibratory extractor, direct pull, or a clam shell dredge. To minimize stirring up sediment, cofferdams may be installed around the existing piers once the superstructure (trusses) are removed. With either method, the pieces of the piers and piles would be removed by barge.

Over-water Bridge Renovation of the Existing North Portland Harbor Bridge

The highway bridge crossing North Portland Harbor was constructed in the 1980s, primarily of pre-stressed concrete girders and reinforced concrete piers. The longest span over the navigation channel is 230 feet long; the remaining eight spans range in length from 115 feet to 185 feet. The piers are supported by driven steel piling.

LPA: The project would not widen the existing bridge. The bridge would accommodate mainline I-5 traffic, but would not require the widening of the existing structure.

Highway and Over-land Bridge Construction

The reconstruction of mainline I-5 and associated interchanges would involve a sequence of activities that would be repeated several times, including on-land bridge and retaining wall construction, the excavation of embankments, and laying the pavement driving surface. Over-land bridges would be built throughout the project area. Most bridges would be constructed on pile or drilled shaft foundations, though some would be built on spread footings. Spread footings distribute the weight of the bridge over a larger surface area and do not require deep drilling. Drilled shaft installation on land would be similar to that in the Columbia River, as described above. Large cranes would support drilling equipment that would drill large diameter holes in the ground, followed by placement of reinforcing steel and concrete. Columns would then be constructed on the shafts to support the new superstructure.

The superstructures of the over-land bridges would either be steel cast-in-place or precast. For cast-in-place techniques, temporary falsework would be erected and concrete forms built on top of them. Reinforcing steel and concrete would be placed in the forms to construct the superstructure. Precast beams would be cast off site at existing facilities or casting yards constructed for the project, then driven to the site in special vehicles that can accommodate the long loads. The beams would be lifted in place by cranes. Concrete for the roadway deck would then be poured on top of the beams, with temporary formwork between the beams to support the deck with reinforcing bars placed in the forms to construct the superstructure.

Construction of the LPA would require the use of at least four types of retaining walls: Mechanically Stabilized Earth (MSE) walls, tieback soldier pile walls, cantilever soldier pile walls, and secant pile walls. As for over-land bridges, many of the walls would have to be constructed in sections to accommodate shifting of traffic in its various stages. Noise walls, either cast-in-place or precast, would be built on top of the finished walls, or at grade.

Where walls are not necessary, earthwork equipment would build embankments. Embankments must be built in layers with thorough compaction to ensure stability. Because of the lack of space to construct these embankments in the narrow corridor, large earthmoving equipment is not envisioned for use in this work. Wheel type loaders, back hoes and similar type equipment would be used.

In some locations, especially Hayden Island, it is likely that ground improvements would be necessary. Ground improvements are utilized where soil has the possibility of liquefying during an earthquake. Below-ground sediment is mechanically stabilized in order to decrease the seismic vulnerability of the structures. Various techniques could be employed, including excavating land around a structure and burying stone columns into the ground, or boring into the ground and inserting a stabilizing material, such as a concrete slurry, into the bored holes.

A pavement driving surface would be laid to connect each interchange. This driving surface would be constructed on top of a base layer of material called the subgrade. Dump trucks would be used to transport material to and from the project to construct the subgrade. Rock would be placed by dump trucks on the subgrade and compacted with rollers, followed by several lifts of asphalt or concrete pavement and compaction. Illumination, intelligent transportation systems, and signal conduits are generally placed prior to final surfacing operations. Final drainage fixtures would be placed during final surfacing. Placement of concrete barriers, guardrails and other safety devices is done following the surfacing work, as is landscaping the exposed earthen slopes.

Construction would require staging areas to store construction material, to load and unload trucks, and for other construction support activities. Multiple staging areas would be needed, given the linear nature of the project and that much of it could be under construction at the same time. The existing I-5 right-of-way would likely accommodate most of the common construction staging requirements. The interchange area at Marine Drive has enough room for staging most typical earthwork, drainage, utility, and structure activities. However, some construction staging would likely be needed outside the existing right-of-way, and temporary property easements from adjacent or nearby property owners may be required.

Light Rail Construction
Construction of the light rail alignment over North Portland Harbor and Hayden Island is described with the river crossing and highway improvements, since these elements are so closely tied to the adjacent highway structures.

Haul Routes
Existing transportation corridors consisting of highways and arterials would be the major routes into and out of the construction areas. Trucks would be the primary and predominant carrier of goods and services. I-5, SR 14, SR 500, Martin Luther King Jr. Boulevard, and Marine Drive would serve as the major corridors into and out of the construction areas. Road networks in Vancouver and on Hayden Island would provide access to individual work areas and provide circulation for construction vehicles.

Bicycle and Pedestrian Mobility
Bicycle and pedestrian movements through the project area would remain during construction, although rerouting would be necessary. Detours would lengthen the distance of some bicycle and pedestrian routes. Temporary routes may be narrower in some places than exist today. There would be the occasional need for enclosures to protect users from debris. Bicycle and pedestrian traffic that is currently separated northbound from southbound on the bridge crossing would be shifted for extended periods to one pathway accommodating traffic in both directions.

Major Staging Sites and Casting Yard
Most of the staging of construction equipment and materials would occur in existing or newly acquired right-of-way or other vacant parcels located along the project corridor. In addition, river crossing construction and some of the other construction activities described above would require at least one large site to stage equipment and materials. In addition, if the bridge is constructed using precast techniques, then a large casting yard for fabricating elements of the bridges would also be needed. The major staging site would be as close as possible to the construction zone but would likely not be within the public right-of-way, and would thus require temporary use of a nearby parcel. If bridge

construction uses cast-in-place techniques, then the bridge staging site would likely include a concrete batch plant, or the batch plant could be located on a barge. Suitable site characteristics include:

- A large open site suitable for heavy machinery and material storage.
- Waterfront property with access for barges (either a slip or a dock capable of handling heavy equipment and material) to convey material to the construction zone.
- Roadway or rail access for landside transportation of materials by truck or train.

One site in Oregon has been identified as a major staging area:

1. Vacant Thunderbird Hotel site on Hayden Island: A large portion of this 5.6-acre parcel is required for new right-of-way necessary for the LPA. It is also a relatively large parcel and is adjacent to the river and the construction zone. The same types of activities could occur on this site as on the Red Lion hotel site.

A casting yard would be required for construction of the over-water bridges if a precast concrete segmental girder bridge design is used. With a precast concrete bridge design, the superstructure segments spanning the bridge piers would be cast on an upland site (casting yard), transferred to a barge, shipped to the bridge construction site, and then lifted into place. A casting yard would require similar characteristics as the major staging area, specifically, access to the river for barges (either a slip or a dock capable of handling heavy equipment and material), a large area suitable for a concrete batch plant and associated heavy machinery and equipment, and access to a highway and/or railway for delivery of materials. If the bridge is built with precast members, a concrete batch plant would likely be located on the casting yard site rather than on a separate staging site or on a barge.

One site in Oregon been identified as possible casting/staging yards:

1. Sundial site: This 50-acre site is located between Fairview and Troutdale, just north of the Troutdale Airport, and has direct access to the Columbia River. It has been used by Gresham Sand and Gravel as an aggregate quarry in recent years. The site already has a barge docking facility, but this would require improvements to accommodate the ability to load barges for hauling precast bridge sections.

If the construction contractor intends to use a staging site other than those evaluated in this environmental review process, prior to active use of that site, the contractor will seek and obtain permission from the state departments of transportation or project owner. The project owner will obtain concurrence from the Federal NEPA lead agencies prior to giving concurrence to the contractor.

Laura Dawson-Bodner

From:	Richard Benner
Sent:	Thursday, July 14, 2011 9:31 AM
To:	Laura Dawson-Bodner
Cc:	mark greenfield (mark@lostlagoonfarm.com)
Subject:	FW: jurisdiction reference
Attachments:	CRC_Metro_Jurisdiction.jpg
Follow Up Flag:	Follow up
Flag Status:	Flagged

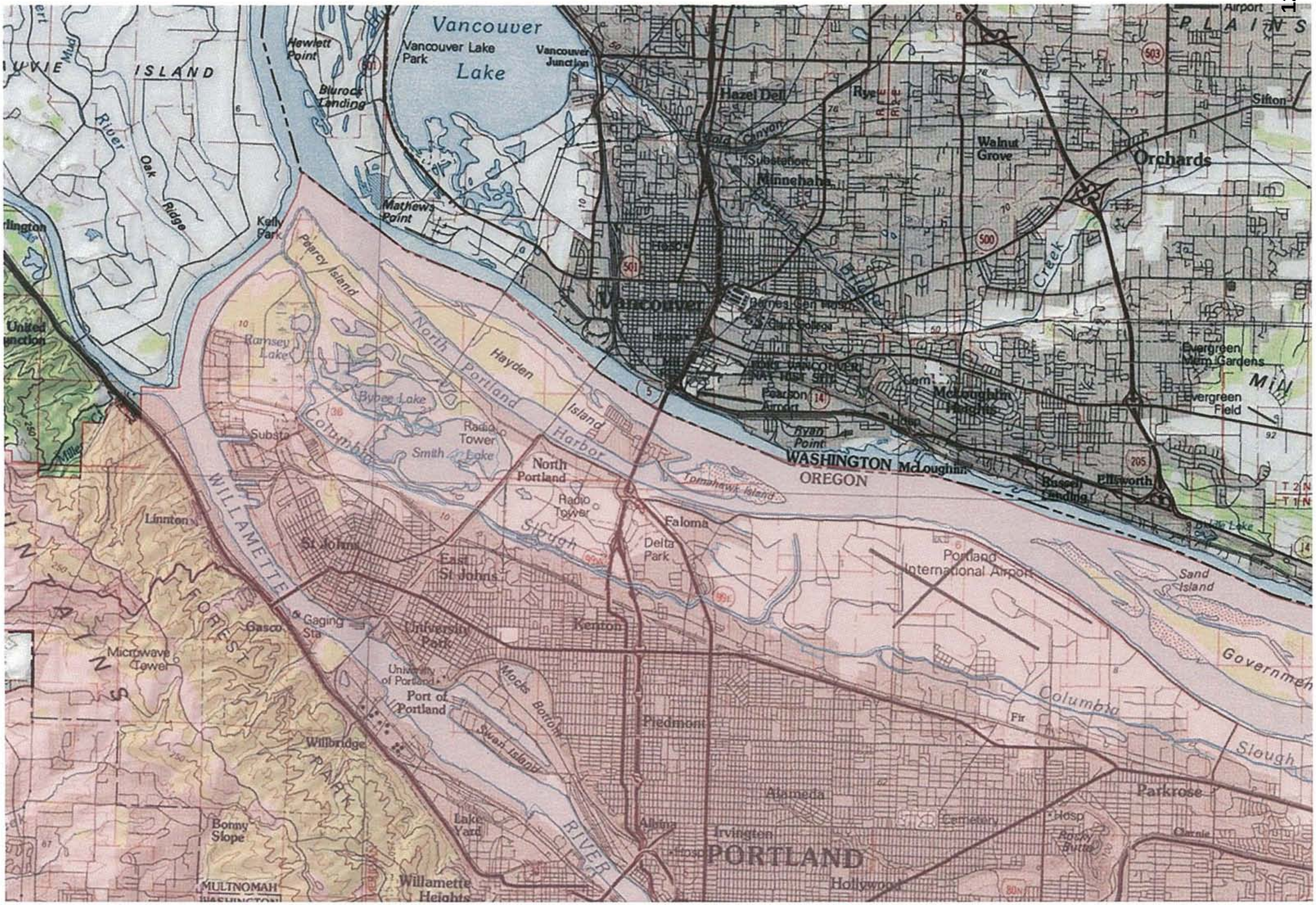
Laura,
Please add Clint's email and the attachment to the LUFO record.
Dick

From: Clinton Chiavarini
Sent: Thursday, July 14, 2011 9:25 AM
To: Richard Benner
Subject: jurisdiction reference

In case you need documentation, here's the jurisdictional boundary (in pink) overlaid on the USGS Topographic Maps.
-Clint

Clint Chiavarini
Metro - Data Resource Center
600 NE Grand Ave
Portland, OR 97232
503-797-1738
clinton.chiavarini@oregonmetro.gov

www.oregonmetro.gov
Metro|People places. Open spaces.


Vancouver Lake
Vancouver Lake Park
Vancouver Junction
Hewlett Point
Bluroc Landing
ISLAND
River
Oak Ridge
Kelly Park
Mathews Point
Hazel Dell
Rye
Walnut Grove
Orchards
Sifton
PLAINS
Airport
Minnehaha
Substation
Vancouver
Barnes Gen Hosp
Clark College
Fort Vancouver Nat Hist Site
Pearson Airport
McLoughlin Heights
Ryan Point
WASHINGTON
OREGON
Russell Landing
Ellsworth
Evergreen Mem Gardens
Evergreen Field
Creek
Pearcy Island
North Portland Harbor
Hayden Island
Tomahawk Island
Ramsey Lake
Bybee Lake
Smith Lake
Radio Tower
Columbia
North Portland
Substa
United Junction
Linnton
WILLAMETTE
St Johns
East St Johns
Faloma
Delta Park
Slough
Portland International Airport
Sand Island
Government
Gasco
Gaging Sta
Microwave Tower
University Park
University of Portland
Port of Portland
Mocks Bottom
Swan Island
Kenton
Piedmont
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Bonny Slope
Albina
Irvington
PORTLAND
Hollywood
RIVER
MULTNOMAH
WASHINGTON
Willamette Heights

Columbia River Crossing Project

Land Use Final Order (LUFO) Public Hearing

The Metro Council will hold a public hearing on Aug. 11, 2011 to consider amending the existing Land Use Final Order for light rail and Interstate 5 bridge replacement and associated highway improvements in the Columbia River Crossing project area in Oregon to reflect changes to the previously adopted South/North Project. These changes include an extension of light rail from the Expo Center to and over the Columbia River, to continue into Vancouver, Wash., replacement of the I-5 Columbia River bridge, and associated highway improvements in North Portland.

You can comment by testifying at the public hearing or submitting your testimony in writing to Metro. Submittal of written testimony for the record in advance of the hearing is strongly encouraged. Written testimony submitted in advance of the hearing must either be mailed or hand delivered to Metro addressed as follows:

Metro, Attention: Laura Dawson Bodner
600 NE Grand Ave.
Portland, Oregon 97232

Public hearing
2 p.m. Thursday, August 11

Metro Regional Center | 600 NE Grand Avenue, Portland
For more information, call 503-797-1916

Only oral testimony at the hearing and written testimony received prior to the close of the public hearing will be included in the record. Those who sign a petition submitted into the public record for the Land Use Final Order will not be considered to have provided oral or written testimony.

At the close of the hearing, the Metro Council will consider adoption of a Land Use Final Order.

Failure of a person to raise an issue orally at the hearing or in writing in advance of the close of the hearing, or failure to provide sufficient specificity to afford the Metro Council an opportunity to respond to the issue raised, will preclude appeal by that person to the Land Use Board of Appeals or the Oregon Supreme Court based on that issue.

Appeals from actions taken by the Metro Council in adoption of a Land Use Final Order must be personally delivered to the Land Use Board of Appeals, the State Court Administrator and the offices of Metro's Council President within 14 days following the date the Land Use Final Order is reduced to writing and bears the necessary signatures.

Staff reports, agency recommendations and findings related to land use criteria will be available for inspection beginning July 14, 2011 at www.oregonmetrolgov/columbiarivercrossing or at Metro, 600 NE Grand Ave., Portland.

Written notice of adoption of the Land Use Final Order will only be sent to those who provide all of the following:

- in writing, a request for written notice of the decision;
- written or oral testimony; and
- a valid mailing address.

Columbia River
Crossing Project

Land Use Final Order (LUFO) Public Hearing

2 p.m.
Thursday, Aug. 11

Metro Regional Center
600 NE Grand Ave.
Portland

Columbia River Crossing Project
Metro
600 NE Grand Ave.
Portland, OR 97232

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Phone	503-797-1700	**Phone**	503-797-1700
Fax	503-797-1930		
E-mail	Karen.Withrow@oregonmetro.gov	**PO Number**	

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Run Dates 7/14/2011
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Run Schedule Invoice Text Notice of Public Hearing Before the Metro Council Regarding Ado

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Online:All:Full Run	C-NoticeAds - Classified	C008-PublicNotices	1

Run Dates 7/14/2011
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Run Schedule Invoice Text Notice of Public Hearing Before the Metro Council Regarding Ado

The Oregonian

The Oregonian Order Confirmation for Ad #0003201277

Notice of Public Hearing

Before the Metro Council Regarding Adoption of a Land Use Final Order For the Columbia River Crossing Project

Notice is hereby given that on August 11, 2011, the Metro Council will hold a public hearing to consider adopting a Land Use Final Order (LUFO) for the Columbia River Crossing Project. The Columbia River Crossing Project would extend the light rail from the Expo Center to and over the Columbia River, to continue into Vancouver, WA and includes replacement of the I-5/Columbia River bridge and associated highway improvements in North Portland. The public hearing will begin at 2:00 p.m. in the Metro Council Chambers, Metro Regional Center, 600 NE Grand Avenue, Portland, Oregon 97232.

During the hearing, testimony will be taken from the public regarding the proposed Columbia River Crossing Project LUFO as provided by OR Laws 1996, Chapter 12. Testimony may be submitted orally or in written form during the hearing, or in advance of the hearing as noticed below. At the close of the hearing, the Metro Council will consider adoption of a Land Use Final Order determining these facilities and improvements to be consistent with criteria established by the Oregon Land Conservation and Development Commission.

TriMet's application, recommendations from ODOT and the LUFO Steering Committee, Metro's staff report and the land use criteria adopted by the Oregon Land Conservation and Development Commission that are applicable to this hearing will be all available for inspection on or before July 14, 2011 at **www.oregonmetro.gov/columbiarivercrossing** or at Metro's offices, located at 600 NE Grand Avenue, Portland.

Submittal of written testimony for the record in advance of the hearing is strongly encouraged. Written testimony submitted in advance of the hearing must either be mailed or hand delivered to Metro addressed as follows: Metro, Attention: Laura Dawson Bodner, 600 NE Grand Avenue, Portland, Oregon 97232.

Only written testimony received prior to the close of the public hearing will be included in the record. Written notice of adoption of a land use final order will be provided only to persons who provide oral or written testimony at the hearing and who also provide, in writing, a request for written notice and a valid mailing address to which the notice should be sent.

Appeals from actions taken by the Metro Council in adoption of a Land Use Final Order must be personally delivered to the Land Use Board of Appeals, the State Court Administrator and the offices of Metro's Council President within 14 days following the date the Land Use Final Order is reduced to writing and bears the necessary signatures.

Failure of a person to raise an issue orally in person at the hearing, or in writing at the hearing or in advance of the hearing, or failure to provide sufficient specificity to afford the Metro Council an opportunity to respond to the issue raised, will preclude appeal by the person to the Land Use Board of Appeals or the Oregon Supreme Court based on that issue. Persons whose names appear on petitions submitted into the public record will not be considered by that action to have provided oral or written testimony at the hearing.

STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 11-4280, FOR THE PURPOSE OF AMENDING THE 1998 LAND USE FINAL ORDER FOR THE SOUTH/NORTH LIGHT RAIL PROJECT AND ADOPTING A LAND USE FINAL ORDER FOR THE EXPO CENTER-HAYDEN ISLAND SEGMENTS OF THE PROJECT.

Date: July 14, 2011 Prepared by: Andy Cotugno

BACKGROUND

Overview
In 1996, the Oregon Legislature passed legislation that enabled the Metro Council to approve Land Use Final Orders (LUFO) to address multi-jurisdictional light rail projects in the South/North corridor and any highway improvements consolidated in environmental statements addressing South/North light rail projects. LUFOs were found to be appropriate so that multi-jurisdiction project-related land use actions could be consolidated into a single decision that would provide more certainty for the project and to provide an expedited land use appeal process. However, the LUFO process does not diminish the need for a light rail project to seek and secure local land use and other permits that may include reasonable and necessary conditions of approval once the light rail route, stations, park-and-ride lots, maintenance facilities and highway improvements have been determined.

It has been the practice of the region to follow approval of a Locally Preferred Alternative (LPA) with consideration of a LUFO action, thereby helping to ensure that the two decisions are consistent. In this instance, however, the LUFO actions follow the decision on the LPA by several years, as the affected local governments needed additional time to determine more specifically the components and scale of the Columbia River Crossing (CRC) Project that includes the Expo Center-Hayden Island segments of the South/North Project and to ensure that certain regional expectations would be satisfied.

There have been four South/North LUFOs approved. The first established the South/North LUFO and the other three were amendments to the original. More specifically, in 1998 the Metro Council approved a LUFO for the South/North Corridor that extended from Clackamas Town Center and Milwaukie north to the Oregon/Washington state line. In 1999, the Council approved an amendment of the South/North LUFO for the northern portion of the corridor, establishing the Interstate MAX (Portland to Expo Center) LRT Project. In 2004, the Council amended the South/North LUFO to add a two-phase element to the southern portion of the corridor, adding the I-205 alignment and making some changes to the Portland-Milwaukie alignment, including revisions that designated study areas in some locations in Milwaukie where additional LRT alignment analysis was needed. Then in 2008 the Council amended the LUFO a third time to approve the Portland-Milwaukie Project, which again made some changes to the alignment from downtown Portland to Milwaukie and extended light rail into unincorporated Clackamas County.

This proposed 2011 South/North LUFO amendment is intended to address changes from the 1998 LUFO so as to be consistent with the improvements to be included in the 2011 CRC Final Environmental Impact Statement (FEIS). This proposed 2011 LUFO relocates the light rail alignment and the Hayden Island station farther to the west between the Expo Center and the Oregon/Washington state line within the Expo Center and Hayden Island segment of the South/North Project. It also authorizes use of the Ruby Junction maintenance facility to serve light rail vehicles needed for the Project, and it adds a number of highway improvements, including new Interstate 5 Columbia River bridges that will extend light rail to Vancouver, Washington; improvements to I-5 that improve access to the Hayden Island and Expo Center stations or are required as a consequence of building the new bridges; and a number of local road improvements providing access and circulation to the light rail stations or necessitated by construction of the new bridges.

Requirements of House Bill 3478

Section 6(1) of House Bill 3478 requires the Council to "establish the light rail route, stations, lots and maintenance facilities, and the highway improvements for the project or project extension, including their locations." Section 6(1)(a) further provides that the locations for each of these facilities and improvements:

"shall be in the form of boundaries within which the light rail route, stations, lots and maintenance facilities, and the highway improvements shall be located. These boundaries shall be sufficient to accommodate adjustments to the specific placements of the light rail route, stations, lots and maintenance facilities, and the highway improvements for which need commonly arises upon the development of more detailed environmental or engineering data following approval of a Full Funding Grant Agreement."

Section 6(2) of the Act addresses amendments to the original LUFO. As relevant to this 2011 LUFO amendment decision, it provides that any siting of the light rail route or a station, lot or maintenance facility or highway improvements outside the boundaries previously established in a LUFO, or any new station, lot or maintenance facility or highway improvement,

> *"shall require a land use final order amendment or a new land use final order which shall be adopted in accordance with the process provided for in subsection (1) of this section."*

Section 7 of HB 3478 requires the Council to apply land use criteria established by the Land Conservation and Development Commission ("LCDC") in making decisions in a land use final order on the light rail route, stations, lots and maintenance facilities, and the highway improvements, including their locations, and to prepare and adopt findings of fact and conclusions of law demonstrating compliance with those criteria. Draft findings, attached as Exhibit B to Resolution No. 11-4280, serve to demonstrate compliance with LCDC's criteria for the modifications selected in this LUFO amendment.

Section 3(1) of HB 3478 provides that the procedures and requirements set out in the Act are the only land use procedures and requirements to which the Council's decisions on the light rail route, the stations, lots and maintenance facilities, and the highway improvements for the Project, including their locations, are subject. Consequently, the findings focus on the matters identified in HB 3478 as land use actions being taken at this time.

ANALYSIS/INFORMATION

This staff report is intended to meet the requirements of HB 3478. This law requires that the LUFO staff report:

> *"...set forth and address compliance with the criteria. The staff report also shall include a description of the proposed boundaries within which the light rail route, stations, lots and maintenance facilities, and the highway improvements shall be located, as recommended by Tri-Met...."*

This LUFO is in response to TriMet's application which is included as Attachment A to the staff report. Also included in Attachment A is TriMet's letter to Metro Council President Tom Hughes requesting consideration by the Metro Council of their application to amend the South/North LUFO, the LUFO Steering Committee recommendation, and ODOT's letter to TriMet recommending approval of the LUFO application in accordance with the Steering Committee's recommendation.

Compliance with the criteria are provided in the form of draft Findings of Fact and Conclusions of Law that have been prepared and are attached as Exhibit B to Resolution No. 11-4280, For the Purpose of Amending the 1998 Land Use Final Order for the South/North Light Rail Project and Adopting a Land Use Final Order for the Expo Center-Hayden Island Segments of the Project.

1. **Known Opposition**

The CRC is a large and complex and there are strong feelings associated with the project. Opposition to the project includes concerns regarding:

- the need for and size of the highway components of the project
- greenhouse gases and air pollution that could be generated by the project
- impacts to low-income and minority populations
- costs and funding
- the aesthetic quality of the bridge type

Additional concerns heard include whether the project would worsen the bottleneck on I-5 in the vicinity of the I-405 and I-84 interchanges. While traffic analysis shows that congestion does not worsen that bottleneck, there remains criticism that the project should not be built if that bottleneck is not addressed. Another concern is whether the project will lead to increased development in Washington and increased travel demand on the new facility. Analysis conducted for the EIS indicated that the tolls proposed would likely reinforce the region's goals of concentrating development in regional centers, reinforce existing corridors, and promote transit and pedestrian development patterns. Nevertheless, opposition by some Metro region residents remains.

However, there is broad public support and an understanding of the need for the project. Reasons heard in support of the project include addressing the severe bottleneck and safety issues on the bridge, improving freight movement, and significantly improving transit service to Vancouver. The Final Environmental Impact Statement reports that 66% of all commenters supported a replacement bridge and 90% supported light rail.

2. **Legal Antecedents**

<u>State</u>
As noted above, at the State level, HB3478 enacted as Chapter 12 of the 1996 Oregon Laws, provides for South/North MAX Light Rail Project LUFOs to decide:

a. the light rail route for the project or project extension;
b. stations, lots and maintenance facilities; and,
c. highway improvements for the project or project extension.

<u>Metro</u>
Following are actions by the Metro Council which relate to the proposed 2011 LUFO:

Resolution No. 98-2633, For the Purpose of Authorizing the Executive Officer to Execute an Intergovernmental Agreement Establishing the South/North Land Use Final Order (LUFO) Steering Committee (adopted May 14, 1998)

Resolution No. 98-2673, For the Purpose of Adopting the Land Use Final Order Establishing the Light Rail Route, Stations, Lots and Maintenance Facilities and the Related Highway Improvements for the South/North Light Rail Project (adopted July 23, 1998)

Resolution No. 99-2853A, For the Purpose of Adopting a Land Use Final Order Amending the Light Rail Route, Light Rail Stations and Park-and-Ride Lots, Including Their Locations, For That Portion of the South/North Light Rail Project Extending from the Steel Bridge to the Exposition Center (adopted October 22, 1999)

Resolution No. 03-3372, For the Purpose of Amending the South/North Land Use Final Order, to Include the Two Phases of the South Corridor Project Consisting of the Addition of the I-205 Light Rail Transit Project from Gateway to Clackamas Regional Center with the Downtown Portland Transit Mall Alignment, and Modification of the Proposed Light Rail Between Downtown Portland and Milwaukie, Deletion of Plans to Extend Light Rail from Milwaukie to Clackamas Regional Center, and to Reflect the Final Interstate MAX Design (adopted January 15, 2004)

Resolution No. 08-3959, For the Purpose of Approving the 2008 Portland-Milwaukie Light Rail Project Locally Preferred Alternative and Finding Consistency with the Metro 2035 Regional Transportation Plan (adopted July 25, 2008)

Resolution No. 08-3960B, For the Purposes of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions (adopted June 5, 2008).

Resolution No. 11-4264, For the Purpose of Concluding that the Concerns and Considerations Raised about the Columbia River Crossing Project in Exhibit A to Resolution No. 08-3960B have been Addressed Satisfactorily (adopted June 9, 2011).

Resolution No. 11-4280, For the Purpose of Amending the 1998 Land Use Final Order for the South/North Light Rail Project and Adopting a Land Use Final Order for the Expo Center-Hayden Island Segments of the Project (proposed for adoption on August 11, 2011).

3. **Anticipated Effects**

Approval of this resolution would advance the CRC Project by addressing the land use impacts of that project within the State of Oregon, and authorizing the Council President to sign the Final Environmental Impact Statement for the CRC Project. Other actions, including completion and issuance of the FEIS, securing federal funding and a final determination of local match sources remain to be addressed before the Project would be able to advance to construction.

4. **Budget Impacts**

None at this time. Metro currently has an intergovernmental agreement with the CRC project for costs incurred for the work performed by Metro to adopt the LUFO, for Metro's role in approving the FEIS, modeling work, and assistance for a New Starts funding submittal.

This project is included within the Financially Constrained System of the Metro 2035 Regional Transportation Plan and the amended 2010-2013 Metropolitan Transportation Improvement Program.

RECOMMENDED ACTION

Adopt Resolution No. 11-4280, For the Purpose of Amending the 1998 Land Use Final Order for the South/North Light Rail Project and Adopting a Land Use Final Order for the Expo Center-Hayden Island Segments of the Project.

600 NE Grand Ave.
Portland, OR 97232-2736
www.oregonmetro.gov

Metro | *Agenda*

Meeting: Metro Council
Date: Thursday, July 14, 2011
Time: 2 p.m.
Place: Metro Council Chambers

CALL TO ORDER AND ROLL CALL

1. **INTRODUCTIONS**
2. **CITIZEN COMMUNICATIONS**
3. **CONSIDERATION OF THE MINUTES FOR JUNE 30, 2011**
4. **RESOLUTIONS**

4.1 **Resolution No. 11-4265**, For the Purpose of Adopting the Regional High Capacity Transit System Expansion Policy Implementation Guidance. — **Collette**

4.2 **Resolution No. 11-4279**, For the Purpose of Authorizing the Metro Chief Operating Officer to Execute an Agreement with the Oregon Zoo Foundation. — **Craddick**

5. **CHIEF OPERATING OFFICER COMMUNICATION**
6. **COUNCILOR COMMUNICATION**

ADJOURN

Television schedule for July 14, 2011 Metro Council meeting

Clackamas, Multnomah and Washington counties, and Vancouver, WA Channel 11 – Community Access Network *Web site*: www.tvctv.org *Ph*: 503-629-8534 *Date*: 2 p.m. Thursday, July 14 (Live)	**Portland** Channel 11 – Portland Community Media *Web site*: www.pcmtv.org *Ph*: 503-288-1515 *Date:* 8:30 p.m. Sunday, July 17 *Date*: 2 p.m. Monday, July 18
Gresham Channel 30 - MCTV *Web site*: www.metroeast.org *Ph*: 503-491-7636 *Date*: 2 p.m. Monday, July 18	**Washington County** Channel 30– TVC TV *Web site*: www.tvctv.org *Ph*: 503-629-8534 *Date*: 11 p.m. Saturday, July 16 *Date*: 11 p.m. Sunday, July 17 *Date*: 6 a.m. Tuesday, July 19 *Date*: 4 p.m. Wednesday, July 20
Oregon City, Gladstone Channel 28 – Willamette Falls Television *Web site*: http://www.wftvmedia.org/ *Ph*: 503-650-0275 Call or visit web site for program times.	**West Linn** Channel 30 – Willamette Falls Television *Web site*: http://www.wftvmedia.org/ *Ph*: 503-650-0275 Call or visit web site for program times.

PLEASE NOTE: Show times are tentative and in some cases the entire meeting may not be shown due to length. Call or check your community access station web site to confirm program times.

Agenda items may not be considered in the exact order. For questions about the agenda, call the Metro Council Office at 503-797-1540. Public hearings are held on all ordinances second read and on resolutions upon request of the public. Documents for the record must be submitted to the Clerk of the Council to be included in the decision record. Documents can be submitted by e-mail, fax or mail or in person to the Clerk of the Council. For additional information about testifying before the Metro Council please go to the Metro web site www.oregonmetro.gov and click on public comment opportunities. For assistance per the American Disabilities Act (ADA), dial TDD 503-797-1804 or 503-797-1540 (Council Office).

600 NE Grand Ave.
Portland, OR 97232-2736
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METRO COUNCIL MEETING
Meeting Summary
July 14, 2011
Metro Council Chambers

Councilors Present:	Deputy Council President Carl Hosticka and Councilors Barbara Roberts, Rex Burkholder, Carlotta Collette and Shirley Craddick
Councilors Excused:	Council President Tom Hughes and Councilor Kathryn Harrington

Deputy Council President Carl Hosticka convened the regular Council meeting at 2 p.m.

1. INTRODUCTIONS

There were none.

2. CITIZEN COMMUNICATIONS

Art Lewellan 3205 SE 8th Ave., Apt. 9, Portland: Mr. Lewellan stated that he was not opposed to the Columbia River Crossing (CRC) project, but that the Hayden Island interchange – as currently proposed – is below standards. He was in support of the Hayden Island Concept "D" interchange. He recommended building a southbound bridge only; he cited reduced costs are reasoning. (Written testimony included as part of the meeting record.)

Council recommended that Mr. Lewellan forward his comments to the CRC project, as the Metro Council is not involved in the technical design of the bridge.

John Charles, Cascade Policy Institute: Mr. Charles addressed the Council on high capacity transit and Resolution No. 11-4265. Mr. Charles was not in support of the resolution citing lack of consumer demand for HCT, lack of ridership despite Transit Oriented Development (TOD) investments, and Metro's definition of HCT. He was in support of increased bus service verses HCT. (Written testimony included as part of the meeting record.)

3. CONSIDERATION OF THE MINUTES FOR JUNE 30, 2011

Motion:	Councilor Barbara Roberts moved to adopt the June 30, 2011 Council Minutes
Vote:	Deputy Council President Hosticka and Councilors Roberts, Collette, Craddick, and Burkholder voted in support of the motion. The vote was 5 aye, the motion passed.

4. RESOLUTIONS

4.1 **Resolution No. 11-4265**, For the Purpose of Adopting the Regional High Capacity Transit System Expansion Policy Implementation Guidance.

Motion:	Councilor Carlotta Collette moved to adopt Resolution No. 11-4265.
Second:	Councilor Rex Burkholder seconded the motion.

Councilor Collette introduced Resolution No. 11-4265. In June 2010, the Metro Council adopted the 2035 Regional Transportation Plan which included a framework for expanding the region's high capacity transit system. The RTP called for Metro to develop the details and a refined, systematic approach for the system expansion policy. Approval of the resolution would accept the HCT SEP implementation guidance – a report that is intended to prepare local jurisdictions for potential future transit investments and illustrate how local communities can build their capacity to support HCT. While the report does not guarantee funding, the implementation guidance will help inform future decisions in advancing the next HCT corridor when resources become available. The Joint Policy Advisory Committee on Transportation (JPACT) unanimously approved Resolution No. 11-4265 on July 14, 2011.

Vote:	Deputy Council President Hosticka and Councilors Roberts, Collette, Craddick, and Burkholder voted in support of the motion. The vote was 5 aye, the motion passed.

4.2 **Resolution No. 11-4279**, For the Purpose of Authorizing the Metro Chief Operating Officer to Execute an Agreement with the Oregon Zoo Foundation.

Motion:	Councilor Shirley Craddick moved to adopt Resolution No. 11-4279.
Second:	Councilor Collette seconded the motion.

Councilor Craddick introduced Resolution No. 11-4279. Over the past year, Metro, the Oregon Zoo and the Oregon Zoo Foundation have work diligently to update the joint operating agreement originally executed in 1985. The agreement, which supports each entity to further the zoo's mission of "inspiring the community to create a better future for wildlife", will:

- Establish clearer defined and understood roles and responsibilities that reflect the joint vision of creating a world-class zoo;
- Represent a sincere commitment by the partners to meet specific objectives in a collaborative manner while maintaining autonomy;
- Establish a new fiscal relationship that is mutually supportive of operational efficiency and focused on the achievement of the Oregon Zoo's mission; and
- Increase accountability and transparency between the two organizations through semi-annual meetings between the Metro Council and the OZF board.

Approval of the resolution would authorize the Metro Chief Operating Officer to execute an agreement between Metro and the OZF.

Council thanked the OZF for their work, contributions to date, and their continued partnership.

Vote:	Deputy Council President Hosticka and Councilors Roberts, Collette, Craddick, and Burkholder voted in support of the motion. The vote was 5 aye, the motion passed.

5. CHIEF OPERATING OFFICER COMMUNICATION

Mr. Scott Robinson of Metro provided an update on the upcoming ZooLaLa event, recent Diversity Action Team meetings, and the City of Portland's decision to delay action on the Recology composting facility's land use appeal.

6. COUNCILOR COMMUNICATION

Council discussion included updates on the recent Metro Policy Advisory Committee (MPAC) and JPACT meetings, Oregon City's community development projects, and Metro's Oxbow Park.

7. ADJOURN

There being no further business, Deputy Council President Hosticka adjourned the regular meeting at 2:37 p.m. The Metro Council will hold a retreat on July 28. Council will reconvene the next regular council meeting on Thursday, August 4 at 2 p.m. in the Metro Council Chambers.

Prepared by,

K. Newell

Kelsey Newell,
Regional Engagement Coordinator

ATTACHMENTS TO THE PUBLIC RECORD FOR THE MEETING OF JJULY 14, 2011

Item	Topic	Doc. Date	Document Description	Doc. Number
2.0	Testimony	N/A	Written testimony submitted by Art Lewellan	71411c-01
2.0	Testimony	7/14/11	Written testimony submitted by John Charles	71411c-02

Ronald A. Buel
2817 NE 19th Ave.
Portland, OR
July 13, 2011

TO: TriMet Board of Directors

SUBJECT: CRC Land Use Final Order (LUFO) Amendment Application

Please be aware that if TriMet intends to submit an application for a LUFO Amendment to Metro, it should be done by resolution and vote of the TriMet Board. This procedure has been followed in all prior LUFO and LUFO Amendment applications, and ensures accountability for this significant action.

Metro Resolution 98-2633 authorized the intergovernmental agreement creating the LUFO Steering Committee. Let me quote from the Staff Report for Resolution 98-2633:

"The act provides for a LUFO adoption process by the Metro Council which includes the following generalized steps:

1. Recommendation of the South/North Project's LUFO by the LUFO Steering Committee and ODOT to the Tri-Met Board of Directors;

2. Approval by the Tri-Met Board of Directors of an application for the South/North Project's LUFO to be submitted to the Metro Council; and

3. Metro Council adoption of the LUFO."

This process was followed most recently on July 9, 2008, when TriMet adopted resolution 08-07-57 "Authorizing an Application to be filed with Metro Requesting an Amendment of the South/North Light Rail Project Land Use final Order."

Any deviation from this past practice would call into question the motives of TriMet in avoiding accountability for their role in the Columbia River Crossing project.

There is a significant legal question as to whether the LUFO Law (Oregon Laws 1996 Chapter 12) has any application to the freeway components of the Columbia River Crossing. I hereby request the TriMet Board hold a hearing on any LUFO amendment application that includes freeway components, so that the public may offer testimony on this important issue.

Sincerely,
Ronald A. Buel

Ronald A. Buel

Laura Dawson-Bodner

From: Lesh, Tamara [LeshT@tri-met.org]
Sent: Wednesday, July 20, 2011 11:05 AM
To: Lesh, Tamara
Subject: FW: 7/13 Columbia River Crossing Update

-----Original Message-----
From: Tom Holmes [mailto:tomholmes@michaeljlilly.com]
Sent: Wednesday, July 13, 2011 11:03 AM
To: Runnion, Kelly
Subject: 7/13 Columbia River Crossing Update

On the agenda for today's TriMet board meeting was an update of the Columbia River Crossing Project. The presenters for this item were Dan Blocher and Alan Lehto. I would like to get copies of the written materials presented to the board at the meeting.
I understand also from someone who was present at the meeting that there was a decision to submit an application to Metro for a Land Use Final Decision for the light rail crossing. Will that decision be reduced to an order or resolution of the board? Is there some other form that the decision would be made? I'd like to get a copy of that decision also.

--
Tom Holmes, Paralegal
Office of Michael J. Lilly
4800 SW Griffith Drive, Suite 325
Beaverton, OR 97005

MAIN NO: 503-746-5977 FAX: 503-746-5970
tomholmes@michaeljlilly.com

Laura Dawson-Bodner

From: Michael Lilly [mikelilly@michaeljlilly.com]
Sent: Thursday, July 14, 2011 5:19 PM
To: Lesh, Tamara
Subject: Columbia River Crossing -- Trimet LUFO application
Attachments: DOC071311.pdf

Dear Ms. Lesh,

I sent this email and attached letter to Mark Greenfield yesterday under the mistaken belief that he represents Trimet. I have now been told that he does not, and you do, so I am forwarding the email to you.

Thank you for your attention.

****
Michael J. Lilly
Attorney at Law
4800 SW Griffith Drive, Suite 325
Beaverton, OR 97005
Ph: 503-746-5977
Fax: 503-746-5970
cell: 503-752-2515
Skype: MichaelLillyBeaverton
e-mail: mikelilly@michaeljlilly.com

------ Forwarded Message
From: Michael Lilly <mikelilly@michaeljlilly.com>
Date: Wed, 13 Jul 2011 17:52:02 -0700
To: Richard Benner <richard.benner@oregonmetro.gov>, <markgreenfield@involved.com>
Subject: CRC -- LUFO application

Dear Dick and Mark,

A letter to both of you is attached.

I attended the Trimet Board meeting today and was disappointed that the Board apparently decided to file the LUFO application without public input and without a vote on the question of whether it should be filed. General Manager Neil McFarlane told the Board that he would file the LUFO application unless someone on the Board had an objection, and then without pausing, he went on to another topic. That was the extent of their public decision making process.

Perhaps nothing more is required, but it seems awfully hasty. At any rate I didn't have an opportunity to raise these issues with the Board, so I decided to raise them with you now rather than wait until August 11.

My paralegal Tom, never was able to find a copy of the final order of LCDC adopting the LUFO Criteria. He looked at DLCD and the State Archives, so I have concluded that it doesn't exist. I told Tom to look in one more place by filing a public records request for copies of the notices that DLCD should have sent to the affected jurisdictions. Presumably those notices would have a copy of the order.

****

Michael J. Lilly
Attorney at Law
4800 SW Griffith Drive, Suite 325
Beaverton, OR 97005
Ph: 503-746-5977
Fax: 503-746-5970
cell: 503-752-2515
Skype: MichaelLillyBeaverton
e-mail: mikelilly@michaeljlilly.com

------ End of Forwarded Message

Michael J. Lilly
Attorney at Law
4800 SW Griffith Drive, Suite 325
Beaverton, OR 97005

Telephone: 503-746-5977
Facsimile: 503-746-5970
Email: mikelilly@michaeljlilly.com

July 13, 2011

Richard Benner
Office of Metro Attorney
600 NE Grand Avenue
Portland, OR 97232

Mark Greenfield
Attorney for TriMet
14745 NW Gillihan Rd.
Portland, OR 97231

By Mail and Email
Re: Columbia River Crossing LUFO

Dear Dick and Mark,

Based upon the presentation to the TriMet Board at its meeting July 13, and Metro Resolution No. 11-4264, it appears that TriMet intends to submit an application to Metro for approval of a "Land Use Final Order" (LUFO) under Chapter 12 Oregon Laws 1996 Special Session (the "Statute"). I am writing on behalf of Plaid Pantries, Inc.

If it applies for a LUFO for CRC, TriMet will have been maneuvered into the position of land use applicant for the entire CRC bridge project, not merely the transit component. The evidence outlined below indicates that the state legislature intended that the LUFO Statute, passed in a special session in 1996, be used for the South North Light Rail transit, not for a massive new bridge project crossing the Columbia River.

1. The definition of "Project" in Section 1 (18) of the special 1996 legislation is limited to areas inside the Urban Growth Boundary. The CRC bridge is north of the UGB, so it cannot be part of the "Project" as defined in the Statute. Therefore the LUFO procedure does not apply to land use approvals for a bridge spanning the Columbia River.

2. The definition of "Highway Improvements" which can be included in a LUFO decision is limited by Section 1 (12) of the Statute. Highway Improvements must be part of the "Project." In the circumstance of the CRC, the Light Rail improvements have little to do with the interstate bridge and accompanying highway improvements. And the bridge is not part of the South North Max Light Rail Project within the Portland Metropolitan Area Urban Growth Boundary.

3. Moreover, the need for the LUFO process was expressly justified by the need for funding from ". .. in the upcoming federal transportation authorization act" in 1996 and the "unique circumstances" then in effect. Section 2 (C) . This time frame became obsolete long ago. This legislative finding makes it obvious that the LUFO process was never intended to be used 15 years later to provide land use review for an interstate bridge that happens to be built alongside of a light rail project.

4. Certain Comprehensive Plan provisions were considered by LCDC in drafting the criteria for LUFO. They are listed in the LCDC staff report, but Comprehensive Plan criteria concerning the bridge were not included in the list, and therefore presumably were not considered relevant in drafting the LUFO approval criteria. This is a strong indication that the LUFO procedure was not intended for use in approving the interstate bridge.

5. In any event it appears that LCDC did not issue a final order establishing the LUFO criteria, pursuant to Section 4 of the Statute. Final orders must be in writing. ORS 183.310(6)(b). My paralegal has conducted a diligent search and inquiry with the LCDC and the State Archives Office. So far as we can determine, there is no LCDC final order adopting the LUFO criteria. If the criteria were not adopted by an LCDC final order, the LUFO procedure cannot be used for land use approvals.

Under the circumstances, the TriMet Board should not submit a LUFO application for approval of the highway improvements and accompanying interstate motor vehicle bridge.

Michael J Lilly

Michael J. Lilly

cc: Chris Girard

Laura Dawson-Bodner

From: Shirley Craddick
Sent: Friday, July 22, 2011 1:49 PM
To: Laura Dawson-Bodner
Subject: FW: Please approve Council Resolution No. 11-4264

From: wevans@phx1-ss-2-lb.cnet.com [wevans@phx1-ss-2-lb.cnet.com]
Sent: Saturday, July 09, 2011 12:10 AM
To: Shirley Craddick
Subject: Please approve Council Resolution No. 11-4264

Dear Metro Councilor Shirley Craddick,

On behalf of Pacific Northwest International Trade Association, our region's leading advocate ofr higher payimg jobs that are created fr international trade through the Columbia River's lower river ports, I am writing to urge you to approve Council Resolution No. 11-4264 at your meeting this Thursday.

Your approval of this resolution will keep the Columbia River Crossing on schedule and help ensure that Oregon and Washington can maximize federal funding opportunities for this project.

I want CRC to proceed because our exporters and importers are losing their competitive edge when trucks carry products to or fr the ports are stuck in traffic on or near the old I-5 bridge.

Efficient cargo movement fr factory to export port-- which may well involve carrying the cargo across the river-- is one of the ways a state or region can impact competitiveness of our rewgion's goods.

The Columbia River Crossing represents a long term comprehensive solution to a transportation bottleneck that currently is crippling our ability to compete in a global economy and does little to provide transportation options for citizens of Oregon and SW Washington.

When the Metro Council approved the Locally Preferred Alternative (LPA) in 2008 they did so with a series of important conditions. Resolution No. 11-4264, Exhibits A, B and the Staff Report clearly articulate how these conditions have been addressed by the project and stakeholders and provides a solid foundation for a yes vote on this resolution.

Please ensure that the Metro Council keeps this project moving forward so we can improve our region's quality of life, get goods and services moving again, and put our citizens back to work.

Thank you for considering the views of exporters who need an efficient local transportation system to make our PNW goods more competitive.

Walt Evans, chair,
Trade Policy Committee
PNITA

Walt Evans

First Name: Walt
Last Name: Evans
City: portland

1274

Laura Dawson-Bodner

From: Doug Klotz [dklotz@rdrop.com]
Sent: Thursday, June 30, 2011 8:54 PM
To: Barbara Roberts
Subject: Latest newsletter, CRC support

Dear Ms. Roberts:

Your latest constituent newsletter reminded me to write to you of my disappointment and chagrin at your actions in putting your name up for the Metro Council seat for the district I live in, and of my further disappointment in your support of the CRC.

When my friend Robert Liberty left his Metro Council seat, I thought the Bob Stacey was the best choice to replace him. Robert Liberty had been a strong voice on the Council, and especially endeared himself to the Richmond Neighborhood by his skepticism and distrust of the Columbia River Crossing Project.

When you announced you wanted the Council seat, it was a big disappointment that Bob Stacey withdrew his name. You had earned my enmity for that, but I was willing to give you a chance to represent me on the Council.

However, your actions regarding the CRC have further reinforced my feeling that you do not represent the citizens of your district. Your naive trust of the staff of the project to work out the details, indeed even your feeling that the project as a whole is the right direction for the region show how out of touch you are with your new constituents.
The Richmond Neighborhood Association, for instance, is on record as opposing the CRC, and I would wager that a large portion of the residents support that position.

You have shown a willingness to trust the staff and hired consultants in this ODOT/WSDOT-driven project, and given away any real control that Metro could exercise over the project.

I will actively work to oppose your re-election and hope a better candidate, one who understands how the district feels regarding transportation, climate change, land use and dwindling energy resources, runs for the office in the next election.

Sincerely,

Doug Klotz

Laura Dawson-Bodner

From: Sharonnasset [sharonnasset@aol.com]
Sent: Wednesday, June 29, 2011 10:11 AM
To: John.McAvoy@dot.gov
Cc: Phillip.Ditzler@dot.gov; Michelle.Eraut@dot.gov; james.saxton@dot.gov; Tom Hughes; Shirley Craddick; Carlotta Collette; Carl Hosticka; Barbara Roberts; Kathryn Harrington; Rex Burkholder
Subject: Re: I need to ask for clarification concerning the Columbia River Crossing Signatory Agencies.

Hi John,

I resent this because your letter really didn't answer the questions. It was at the Metro Council last week where I am sure it was said, if not definitely implied they had no ability for oversight or real input in to the process that was taking place now except to veto..... Citizen with questions, concerns, and issues were directed to CRC because they had nothing they could really do. They had not ability to affect the on going process except veto.

I am sure you are aware that CRC has not answered back any of the issues raised in the DEIS by citizens, and that would include the 240 pages of concerns and inconsistency I personal sent in. The process is suppose to be open, and reasonable alternative that where not thoroughly can be entered into the process at any time before FEIS.... What is the process....? As well as the list below

Thanks I appreciate you help in this matter.

Sharon

-----Original Message-----
From: Sharonnasset <sharonnasset@aol.com>
To: John.McAvoy@dot.gov
Cc: Phillip.Ditzler@dot.gov; Michelle.Eraut@dot.gov; james.saxton@dot.gov
Sent: Mon, Jun 27, 2011 2:56 pm
Subject: Re: I need to ask for clarification concerning the Columbia River Crossing Signatory Agencies.

> So can ....
> The Sponsor Signatory Agencies together or separately have the abilities to set-up oversight, sub-committee, and advisory committees.
> Example the Governors' have set up the Governor CRC Project Sponsor Committee. It is not that the Governors' have more power. It is that the Governors' set-up the committee.
>
> The Sponsor Signatory Agencies have publicly stated they only have VETO power that they have no ability to make changes, demand changes, set-up oversight committees, or insist on a Supplemental Environmental Impact Statement. The Sponsor Signatory Agencies have no input.... Just veto power.
>
> The Federal Register / Vol. 70, No. 186 / Tuesday, September 27, 2005/Notices. List the FHWA and FTA as co-lead agencies, then the Signatory Agencies are identifies. It does not state that the state Departments of Transportation (the Governors') are in charge and have control.
>
> Would you be so kind as to clarify the ....
> Sponsor Signatory Agencies rights and obligations.
> If there is a description in writing
> The process is supposed to be open until FEIS what is the procedure to put project in for a thorough comparison?
> What is the process for starting a new Supplemental EIS?
>
> Several State Senators and Representatives in both States have major problems with the current CRC process and they want changes now. It would be better have changes now then to just end the project

for several years. Who should elected officials send their letters and concerns to affect the process?

Thanks for you help in this matter Phil, I greatly appreciate your attention.
Peace,
Sharon Nasset
503.283.9585

-----Original Message-----
From: John.McAvoy@dot.gov
To: sharonnasset@aol.com
Cc: Phillip.Ditzler@dot.gov; Michelle.Eraut@dot.gov; james.saxton@dot.gov
Sent: Mon, Jun 27, 2011 12:02 pm
Subject: RE: I need to ask for clarification concerning the Columbia River Crossing Signatory Agencies.

Sharon,

Recently you sent an email to FHWA-Oregon Division Administrator Phil Ditzler. Phil forwarded that email to me for my response. First of all, I'd like to thank you for the e-mail.

Second, your e-mail states, "The Sponsor Signatory Agencies have no input. . . . Just veto power." I find this statement to be inaccurate as all persons and agencies have input into the Columbia River Crossing project. A wide variety of opportunities for public comment have been made available throughout the life of the project. In fact, the CRC project team has recorded over 900 public events with over 27,000 distinct interactions with the public. You and I have met and conversed at Project Sponsors Council meetings, Open Houses, Independent Review Panel meetings and Bridge Expert Review Panel meetings. The FHWA views the Sponsor Signatory Agencies as project partners that hold the project as having a high degree of significance for their respective entities. The sponsoring agencies have played a key role in both developing the purpose and need for the project as well as crafting a solution to meet the intended purpose. The sponsoring agencies roles are ongoing.

Determinations of the need for supplemental NEPA documents lie with the federal agencies with NEPA responsibilities. In the case of the Columbia River Crossing, these agencies are the Federal Transit Administration and the Federal Highway Administration. Recently, after a thorough analysis, these co-lead agencies concluded that the CRC is not required to provide a supplemental draft environmental impact statement.

Finally, your e-mail asks where comments on the project can be submitted. Comments on the project can be submitted to: feedback@columbiarivercrossing.org; to FHWA at: john.mcavoy@dot.gov; or to FTA at: james.saxton@dot.gov.

Sincerely,

-John

John McAvoy, PE
Major Project Manager
FHWA-Oregon Division
610 E. 5th Ave.
Vancouver, WA 98661
Office: (360) 619-7591
Cell: (503) 949-5980

From: Sharonnasset [mailto:sharonnasset@aol.com]
Sent: Thursday, June 16, 2011 4:45 PM
To: Ditzler, Phillip (FHWA); McNamee, Ruth (FHWA)
Subject: Fwd: I need to ask for clarification concerning the Columbia River Crossing Signatory Agencies.

I have not received a responds did you receive this request? Please send a response.
Thanks,
Sharon

-----Original Message-----
From: Sharonnasset <sharonnasset@aol.com>
To: phillip.ditzler@fhwa.dot.gov
Cc: ruth.Mcnamee@fhwa.dot.gov; tom.hughes@oregonmetro.gov; shirley.craddick@oregonmetro.gov; carlotta.collette@oregonmetro.gov; carl.hosticka@oregonmetro.gov; barbara.roberts@oregonmetro.gov; kathryn.harrington@oregonmetro.gov; Rex.Burkholder@oregonmetro.gov
Sent: Sun, Jun 12, 2011 3:40 pm
Subject: I need to ask for clarification concerning the Columbia River Crossing Signatory Agencies.

Hello Phil,

I hope you are well and all is good. I need to ask for clarification concerning the Columbia River Crossing Signatory Agencies.

The Final Signatory Agencies
Federal Transit Administration and Federal Highway Administration

The Sponsor Signatory Agencies
SW WA Regional Transportation Council
Metro
CTRAN
TRI-MET
WADOT
ODOT

Columbia River Crossing is a highway and transit project.

So can ....
The Sponsor Signatory Agencies together or separately have the abilities to set-up oversight, sub-committee, and advisory committees.
Example the Governors' have set up the Governor CRC Project Sponsor Committee. It is not that the Governors' have more power. It is that the Governors' set-up the committee.

The Sponsor Signatory Agencies have publicly stated they only have VETO power that they have no ability to make changes, demand changes, set-up oversight committees, or insist on a Supplemental Environmental Impact Statement. The Sponsor Signatory Agencies have no input.... Just veto power.

The Federal Register / Vol. 70, No. 186 / Tuesday, September 27, 2005/Notices. List the FHWA and FTA as co-lead agencies, then the Signatory Agencies are identifies. It does not state that the state Departments of Transportation (the Governors') are in charge and have control.

Would you be so kind as to clarify the ....
Sponsor Signatory Agencies rights and obligations.
If there is a description in writing
The process is supposed to be open until FEIS what is the procedure to put project in for a thorough comparison?
What is the process for starting a new Supplemental EIS?

Several State Senators and Representatives in both States have major problems with the current CRC process and they want changes now. It would be better have changes now then to just end the project for several years. Who should elected officials send their letters and concerns to affect the process?

Thanks for you help in this matter Phil, I greatly appreciate your attention.
Peace,
Sharon Nasset
503.283.9585

Laura Dawson-Bodner

From:	Nikolai Ursin
Sent:	Thursday, June 30, 2011 9:48 AM
To:	Laura Dawson-Bodner
Subject:	FW: June 29 Letter on Council Resolution 11-4264
Attachments:	Cortright_to_Metro_June 29.pdf; ODOT_Tolling_White_Paper_2009.PDF; Cortright Exhibit 1 .pdf

For the CRC record

-----Original Message-----
From: Joe Cortright [mailto:jcortright@gmail.com]
Sent: Wednesday, June 29, 2011 3:51 PM
To: Metro Council; Tom Hughes; Shirley Craddick; Carlotta Collette; Carl Hosticka; Kathryn Harrington; Rex Burkholder; Barbara Roberts
Subject: June 29 Letter on Council Resolution 11-4264

Attached please find a letter addressed to President Hughes and Metro Council members. In addition, there are three other documents which are referenced in the letter, which are attached to this email.

I have obtained new information that casts significant doubt on the reliability of CRC traffic projections. A report prepared in 2009 for ODOT concludes that current models, including those used by CRC are not sufficient to model traffic for tolled facilities. I believe this information should lead the Metro Council to reconsider its decision on this resolution.

Please add this to the record for council resolution 11-4264.

Thank you.

Joe Cortright
Impresa, Inc.
1424 NE Knott Street
Portland, OR 97212

IMPRESA
ECONOMICS

June 29, 2011

Metro President Hughes
Metro Councilors Burkholder, Colette, Craddick, Harrington, Hosticka, Roberts
Metro
800 NE Grand Avenue
Portland, OR 97232

RE: Resolution 11-4264

Dear President Hughes and Metro Councilors:

I recently discovered a very significant study that relates directly to your recent action on Resolution 11-4264, as well as your ongoing involvement and responsibilities relating to the Columbia River Crossing project ("CRC"). This study not only supports and validates my previous analysis and testimony, but it raises additional critical concerns about the CRC.

In February 2009, the Oregon Department of Transportation received a report prepared by Parsons Brinckerhoff, David Evans and Associates Inc., and Stantec Consulting Services Inc. The authors of this report all happen to be contractors for the Columbia River Crossing project. The report is entitled *Tolling White Paper 3: Travel Demand Model Sufficiency.* This document is available on the Internet at the following address: http://www.oregon.gov/ODOT/TD/TP/docs/LRPU/twp3.pdf

ODOT's report finds that the current models used to forecast traffic in Oregon, and specifically in the Portland Metropolitan Area, including the Metro model, are inadequate to accurately predict traffic volumes on tolled facilities, such as the proposed Columbia River Crossing. Consider ODOT's summary of this report:

> Existing models in Oregon are rated as excellent for the purposes they were designed, and some are internationally recognized. However, Oregon models have not been specifically designed to evaluate toll projects, so **planners are not able to confidently forecast travel patterns for projects that are considering tolling/pricing. Existing models are not able to determine how travelers would change their mode, route, travel time, or destination in response to tolling/pricing.**
> Oregon Department of Transportation, Tolling and Travel Demand Model Sufficiency, Highlights of Tolling White Paper 3, March 2009, page 1, http://www.oregon.gov/ODOT/TD/TP/docs/LRPU/Highlight3.pdf#Tolling_White_Paper_3
> (Emphasis added)

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Exhibit 1 presents excerpts from the ODOT report illustrating the specific technical reasons current models are incapable of accurately predicting traffic on tolled facilities.

One of the most important issues in the Council's consideration of this resolution was its judgment as to the reliability and accuracy of CRC traffic projections – and associated revenue estimates. I have shown that the CRC models have failed to accurately predict traffic levels over the past five years. CRC advocates, including Councilor Burkholder, maintain that the traffic projections for the Columbia River Crossing had been validated by independent outside reviews.

We now know that very important and relevant information contained in the ODOT report was not considered in the Council's analysis and deliberation. Presentation of the ODOT report would put the validity of the CRC projections in an entirely different light, and may have resulted in a different staff analysis. Further, the Council's action, which was based on incomplete and inaccurate information, would likely have been different.

As the ODOT study shows, the Oregon Department of Transportation and the principal contractors for the Columbia River Crossing are in strong agreement with the points made in my analysis, written testimony, and in my June 16 letter: the traffic forecasting methods used by the CRC are not accurate or reliable. Accurate estimates of future traffic levels are central to assessing the need for this project, justifying its size, evaluating its environmental impacts, and most crucially, determining the viability of its financial plan.

Furthermore, in light of this information, it is clear that the analysis that was provided to the Metro Council, on page 2 of Exhibit B, of Resolution 11-4264, was incorrect. That page recites findings from CRC's Tolling Study, which relied on the existing Metro model. It is simply damning that the CRC's and ODOT's own consultants have determined current models are not able to accurately determine travel behavior for tolled facilities. The consultants conclude: "We specifically propose a method that would help to eliminate built-in optimistic biases and produce reliable and conservative forecasts," but that has not been done for the CRC. Inasmuch as the Council relied on incomplete and inaccurate information in voting to adopt this resolution, I would strongly urge you to reconsider the action you took in approving Resolution 11-4264.

Please include this letter in the record on this matter. I am also providing a printed copy of the ODOT report and an electronic copy as an attachment to this letter.

Best regards,

Joseph Cortright

Exhibit 1: Excerpts and Comments from ODOT White Paper

Parsons Brinckerhoff, David Evans and Associates Inc., and Stantec Consulting Services Inc. for the Oregon Department of Transportation. *Tolling White Paper 3: Travel Demand Model Sufficiency.* February 2009.

The report's key conclusion about existing traffic models:

> None of these models, however, was specifically developed for evaluating tolling applications, and therefore **all of them lack to varying degree one or more of the essential modeling features** described in this paper. Furthermore, given the requirements placed upon travel demand models by the financial community, and recent advances in bringing travel behavior research into practice, Oregon statewide and MPO **models could and should be improved prior to using them to forecast toll traffic and revenue**.
>
> Equally as important as the improvement of the models in and of themselves is the undertaking of a fundamental shift in how models are used to produce toll traffic and revenue forecasts. **A thorough analysis of the risks associated with the forecast needs to become an integral part of the forecasting process.** Typical risks associated with toll projects are related to the model itself, to the model input data, and to specific circumstances associated with particular projects.
> (Parsons Brinckerhoff, et al, page 50)

The full report and its appendices are over 100 pages long, and provide a detailed analysis of the current modeling practice and the requirements needed to accurately forecast traffic levels, and associated revenues for tolled facilities. This report shows that the current Metro model, despite being "state of practice" is not adequate to accurately predict traffic levels for a tolled facility such as the CRC. Models need to be improved in a variety of ways, including:

- Point estimates need to be replaced with probabilistic range forecasts (pages 31-32). The CRC models use a single point estimate, not ranges.

- Current models use too few categories of travelers and as a result are susceptible to aggregation bias (page 30). The current CRC modeling does not include a sufficient range of categories to accurately predict demand.

- The forecast should include a range of scenarios of employment and population growth in the corridor (page 36). The current CRC forecast contains no analysis of different future population or employment levels.

- Value of time (VOT) estimates are out-dated and need to be better segmented; point estimates of value of time need to be replaced with ranges (page 37).

  > "All existing Oregon models use VOT estimated from surveys dating from the mid-1990s, or borrowed from other metropolitan areas in the state, and therefore, are considered high risk." (page 37).

- The current Metro model does not address time of day choice.

  "Time-of-day choice, instead, is insensitive to level of service attributes (time or costs). Therefore, as currently specified, this model assumes that tolls do not effect shifts in traffic demand across time periods." (pages 17-18)

- The model needs to be subjected to systematic risk analysis to evaluate the effects of underlying variation in model estimates (page 38). The CRC modeling effort has not been subjected to systematic risk analysis.

- The model needs to be validated for the specific facility and corridor in question, and be shown to accurately produce traffic patterns

  "Therefore a critical step before initiating a road pricing or traffic and revenue study is ensuring that the model is well-validated at a geographic scale commensurate with the scale of the project." (page 41)

- The current model is inadequate for financial analysis of the CRC. The current CRC modeling has not been calibrated based on actual, post 2005 traffic levels, which show a 17,000 vehicle shortfall from CRC projections.

  "Extensive, newly collected data and more rigorous corridor-focused model calibration. It is essential to recalibrate the model based on the most recently collected data, including traffic counts, special surveys (e.g., users of a particular toll facility), and speed measurements." (page 29).

- The model needs to address uncertainty. The current CRC model does not address uncertainty or bias.

  "**Considerable uncertainty exists in traffic forecasts for new highway projects.** A review of forecasts using data from highway and transit projects across the globe found that the different between forecasted and actual traffic is more than 20% for about one half of the highway projects examined, and about 40% for approximately one-quarter of all highway projects (Flyvbjerg et al., 2005 and 2006). **While such uncertainty is not unexpected, it is often largely ignored by designers and transportation planners.** This appendix provides more detail on this discussion.

  Even greater uncertainty characterizes forecasts of the demand for tolled roadways, compared to other roadways, because of the presence of additional unknown variables, such as the toll schedule and motorists' willingness to pay for using the road." (page 89 emphasis added).

- The model needs to include an explicit risk analysis to eliminate optimism bias and produce reliable conservative forecasts. This has not been done.

  "Risk analysis adds a layer of complexity to the forecasting process, but it is not beyond the modeling resources already available at the state and MPO levels. We specifically propose a method that would help to eliminate built-in optimistic biases and produce reliable and conservative forecasts." (Page 51)

Tolling and Travel Demand Model Sufficiency

Highlights of Tolling White Paper 3

March 2009

Travel models

State, regional and local transportation planners rely on travel models to evaluate future traffic patterns. Models allow planners to see how people will behave if changes are made to the transportation system.

Existing models in Oregon are rated as excellent for the purposes they were designed, and some are internationally recognized. However, Oregon models have not been specifically designed to evaluate toll projects, so planners are not able to confidently forecast travel patterns for projects that are considering tolling/pricing. Existing models are not able to determine how travelers would change their mode, route, travel time, or destination in response to tolling/pricing.

Tolling, reliability and travel choices

Measuring and understanding how highway users value and respond to travel time savings and changes in reliability are key to updating travel demand models. (This issue is explored in more detail in White Paper 4.) Although there is general agreement that it's important to measure the value of reliability, the best way to quantify reliability is not known at this time. A handful of approaches have been identified through practice or research, though each has some short-comings in application. What is understood is that there are first and second-level choices that people make in response to the option of a tolled facility.

First order choices are immediate responses. These include whether to take the tolled route or the free route, whether transit is a better option, and what time to travel. The tolled route might be more reliable, but it has a fee. Traveling during rush hour might involve a higher toll than other hours.

Seven technical tolling and pricing white papers were prepared for ODOT in February 2009 as a way to consider concerns and issues for Oregon to address prior to developing a tolling/pricing policy in the future.

1. Is tolling an effective means of reducing greenhouse gas emissions?
2. Where, geographically, could tolling work and under what circumstances?
3. Forecasting change – how do we incorporate tolling and pricing into our regional transportation models?
4. What are the economics of transportation system reliability?
5. How should the economic and social effects of broad applications of congestion pricing be assessed?
6. How do you determine if tolling a project is a better alternative than other non-tolled options and how would you choose between a number of tolled alternatives?
7. Are truck-only toll lanes a viable option for Oregon?

This document highlights White Paper 3 about the sufficiency of travel demand models to accommodate tolling. Find all papers online and provide your comments: www.oregon.gov/ODOT/TD/TP/Tolling_Background.shtml

Second order responses depend on the tolling application. These responses could include deciding to change the trip destination, cancel the trip, or combine the trip with other purposes (in order to reduce the cumulative effect of paying a toll for every trip). Second order choices are more difficult to measure and require more "feedback loops" in the model.

These responses are important in order to understand the effects tolling will have on traffic, but are also needed to meet certain thresholds regarding revenue estimates if a project is to be financed with bonds and paid back by toll revenues. Investors will need confidence that the model is accurate in order to provide the funds. The quality of the travel demand model is one consideration in assigning bond ratings.

Conclusions

White Paper 3 reviews characteristics of travel models in several of Oregon's major cities/geographic regions and assesses their current capabilities compared to the types of data most likely needed to estimate travel behaviors in a tolled environment. Although the models meet state-of-the-practice standards they were not developed to evaluate tolling applications.

White paper 3 recommends improvements to the existing models so that they can account for tolling:

- Improve the models to better account for first and second order responses to tolling/pricing conditions.
- Improve the ability to group motorists into categories based upon their value of travel time reliability. This would increase confidence in model results.
- Confirm that the model accurately estimates traffic and transit at the corridor level before evaluating tolling/pricing projects.
- Implement a data collection program to encourage model improvements across the state.
- Implement a process that would identify and systematically analyze risk factors. This would produce conservative estimates that planners and decision makers could rely on.

For More Information

- Visit the Web site to read the white papers and complete a comment form: www.oregon.gov/ODOT/TD/TP/Tolling_Background.shtml
- Email: Robert.A.Maestre@odot.state.or.us

Tolling White Paper 3

Travel Demand Model Sufficiency

Prepared for the Oregon Department of Transportation

by

Parsons Brinckerhoff
and
David Evans and Associates Inc.
Stantec Consulting Services, Inc.

February 2009

Executive Summary

Increasing highway congestion and the projected shortfall in gasoline tax revenues and other traditional sources of highway financing have renewed interest in tolls as both a revenue source and a demand management strategy. The Oregon Transportation Commission (OTC) seeks to understand the opportunities that highway tolling offers for improving the state's transportation infrastructure and managing its growing demand for travel. In recent years the OTC has taken steps to create the institutional and policy framework necessary to study how toll projects can support and advance Oregon's economic, environmental, and social welfare objectives.

Recent technological advancements have enabled the tolling or value pricing of highways in a variety of forms, including different combinations of managed and general purpose lanes, vehicle eligibility by type and occupancy, and toll differentiation by congestion levels or time of day, among others. Tolls are being used both for generating revenue and managing congestion. Pricing scenarios represent a challenge for demand forecasting, because traditional travel models are characterized by simplified representations of pricing and limited capabilities for predicting how travelers would change mode, route, departure time, destination, or even trip frequency in response to pricing.

When tolling is a factor of analysis, travel demand models will produce the necessary information regarding the patronage of the toll facility, as well as the impacts of tolling and pricing on corridor and regional travel demand for different groups of travelers. The accuracy of toll traffic and revenue (T&R) forecasts, however, is crucial for understanding how well the proposed project meets its policy objectives, and for the continued success of a tolling program once the State of Oregon has committed to its implementation.

In addition to the planning, public perception, and political aspects common to all major infrastructure investments, for tolling projects there is added scrutiny by private investors, bond rating agencies, and parties concerned about environmental justice. Bond or finance rating agencies and project sponsors in particular put T&R forecasting procedures under a high level of scrutiny that is in many respects quite different from the model evaluation/validation criteria applied in the public sector. In particular, the financial community seeks a good understanding of the uncertainty in the toll T&R forecast.

The Oregon Department of Transportation (ODOT) and the state's Metropolitan Planning Organizations (MPOs) have developed travel demand models to examine important questions related to the impact of transportation investments and of population and economic growth on the existing transportation infrastructure. Because there is little recent history of tolling in the state, other than the Cascade Locks and Hood River Bridges (currently), and several other Columbia River bridges (in the past), the travel demand models developed throughout the state are largely untested in terms of their sufficiency to predict motorist behavior for tolling situations. These models cannot be assessed by establishing how well they match current travel behavior or traffic patterns, since nowhere in the state are travelers required to choose between toll and free roads. Instead, the models need to be compared to national best practices for modeling and forecasting of toll traffic. In addition, opportunities for incorporating recommendations from recent research on toll traffic forecasting methods should be investigated.

This paper examines current travel demand modeling practices in Oregon with regard to tolling applications. This assessment evaluates the capability of the existing models to produce T&R forecasts for a wide range of tolling applications. It provides a detailed assessment of current modeling practices in Oregon, including a comparison to the national state-of-the-practice. Included are an explanation of technical aspects of travel demand models, an evaluation of the capability of existing models across a range of potential tolling applications, a description of the requirements placed upon the models by private investors, and general recommendations for improving model performance.

Our assessment of the sufficiency of Oregon's travel demand models to evaluate tolling applications is not limited to comparing the state's models to prevailing modeling practice. Nor are our recommendations for model improvement solely intended to upgrade these models to the state-of-the-practice. Advanced modeling practice and even state-of-the-art methods have been included among the recommended model improvements whenever relevant and applicable to overcome some of the known limitations and deficiencies of state-of-the-practice models.

We find that all of Oregon's MPO models meet state-of-the-practice modeling standards, when compared to models for metropolitan regions of similar size. The Portland Metro model goes a step beyond the state-of-the-practice, by including advanced modeling features. The Statewide Integrated Model (SWIM) is in a category all by itself; it is in fact among the most advanced integrated land use/transport models worldwide, and incorporates many of the characteristics recommended for state-of-the-art, yet practical activity based models. None of these models, however, was specifically developed for evaluating tolling applications, and therefore all of them lack to varying degree one or more of modeling features essential for road pricing analyses. Furthermore, given the requirements placed upon travel demand models by the financial community, and recent advances in bringing travel behavior research into practice, Oregon statewide and MPO models could and should be improved to reflect state-of-the-practice tolling methodologies, and even some advanced features, prior to using them to forecast toll traffic and revenue.

A model structure that adequately incorporates all the known, relevant responses to road pricing – which include selection of route, trip departure time, mode, and destination, among others, is a necessary condition, and in our opinion the most important factor that contributes to the sufficiency of a travel demand model. For this reason much of this paper is dedicated to a discussion of essential and desirable model features. Another important contributing factor to model sufficiency is related to how well a model reproduces current travel conditions at a regional, corridor and facility level. Regional travel demand models are typically evaluated in terms of how well they reproduce regional travel patterns. However, this level of model validation may be insufficient for the specific facility, corridor, or subarea under study. Therefore a critical step before initiating a road pricing or traffic and revenue study is ensuring that the model is well-validated at a geographic scale commensurate with the scale of the project.

Equally as important as the improvement of the models themselves is the undertaking of a fundamental shift in how models are used to produce toll traffic and revenue forecasts. A thorough analysis of the risks associated with the forecast needs to become an integral part of the forecasting process. Typical risks associated with toll projects are related to the model itself, to the model input data, and to specific circumstances associated with particular projects. This paper offers specific recommendations for implementing a toll application risk analysis program.

The development of better models through more behaviorally-based model structures and improved model validation, and a more rigorous risk assessment approach, will help increase the credibility of toll traffic and revenue forecasts, as well as better integrate the transportation modeling culture with the culture of the investment analysis community.

Introduction

Increasing highway congestion and the projected shortfall in gasoline tax revenues and other traditional sources of highway financing have renewed an interest in tolls as both a revenue source and a demand management strategy. The Oregon Transportation Commission (OTC) seeks to understand the opportunities that highway tolling offers for improving the state's transportation infrastructure and managing its growing demand for travel. In recent years the OTC has taken steps to create the institutional and policy framework necessary to study how toll projects can support and advance Oregon's economic, environmental, and social welfare objectives.

Recent technological advancements have enabled the tolling or value pricing of highways in a variety of forms, including different combinations of managed and general purpose lanes, vehicle eligibility by type and occupancy, and toll differentiation by congestion levels or time of day, among others. Tolls are being used both for generating revenue and managing congestion. Such pricing scenarios represent a challenge for demand forecasting, because traditional travel models are characterized by simplified representations of pricing and limited capabilities for predicting how travelers would change mode, route, departure time, destination, or even trip frequency in response to pricing.

This paper examines current travel demand modeling practices in Oregon with regard to tolling applications. Because there is little recent history of tolling in the state, other than the Cascade Locks and Hood River Bridges (currently), and several other Columbia River bridges (in the past), it is difficult to validate the ability of current travel demand models to predict motorist behavior for tolling situations based on actual tolling applications. These models cannot be assessed by establishing how well they match current traffic patterns; instead, the models need to be compared to national best practices for modeling and forecasting of toll traffic. In addition, opportunities for incorporating recommendations from recent research on toll traffic forecasting methods should be investigated whenever relevant and applicable to overcome some of the known limitations and deficiencies of state-of-the-practice models.

This paper is organized as follows:

- Current state of the practice for modeling, including a summary of best-practice modeling principles related to tolling and an overview of how the Oregon-based travel demand models incorporate tolls or road prices in the model structure
- Types of tolling applications applicable to Oregon and related travel demand model needs
- Modeling requirements for investment-grade forecasts
- Incorporation of travel time reliability on travel demand models
- Sources of uncertainty and systematic bias in T&R forecasts
- Evaluation of the capability of Oregon's travel demand models to estimate tolling impacts
- Recommendations for improving Oregon's travel demand models for tolling applications
- Recommendations for a data collection program to support model improvements

Section 1.0: Current State of Oregon's Travel Demand Models

1.1. A Primer on Travel Demand Forecasting

In order to understand how Oregon's models assess tolling, a basic understanding of how travel demand models work is needed.

A travel demand model predicts the number of trips between trip origins and destinations, such as between a place of residence and work. Trips are estimated by time of day for an average weekday, and then are distributed around the geographical area being analyzed (trip distribution), assigned to a travel mode (mode choice), and then to a route taken (trip assignment).

By definition, the scope of a travel demand model is regional; that is, it forecasts trips for the entire population of a metropolitan (or larger) region using all relevant facilities and transit services.

As graphically summarized in **Figure 1**, there are two major approaches for structuring a demand model:

- Traditional ***trip-based*** models constitute the majority of travel models used by most Metropolitan Planning Organizations (MPOs) and states in the United States. All regional models in Oregon are trip-based models. This type of model is often referred to as a four-step model because its original formulation included four submodels: trip generation, trip distribution, trip mode choice and trip assignment.

- Activity-based or ***tour-based*** models have been used since the early 2000s and currently constitute the majority of newly developed models in large metropolitan areas. The Oregon statewide model is an activity-based model. An activity-based model was developed for the Portland metropolitan region in the 1990s but was not widely used; a new generation activity-based model for the Portland region is currently under development. These types of models are often referred as tour-based models, because the unit of analysis is a sequence of trips (a tour) that starts and ends at home.

Both trip-based and tour-based models are essentially sequences or chains of submodels, applied in the order shown in Figure 1 (first trip generation, then trip distribution, etc.). To ensure consistency between the inputs to any given submodel and the results of submodels down the chain, the model uses "feedback loops". For example, after highway assignment, travel time on every road segment is calculated as a function of the estimated road volume, and then the entire sequence of models is repeated, using the newly estimated travel times. When the travel times between consecutive highway assignments are approximately the same, it is said that the model has achieved "convergence". Convergence is very important when modeling tolling applications, because the effect that charging a toll has on road volumes, and consequently on travel times, is known only after the highway assignment step.

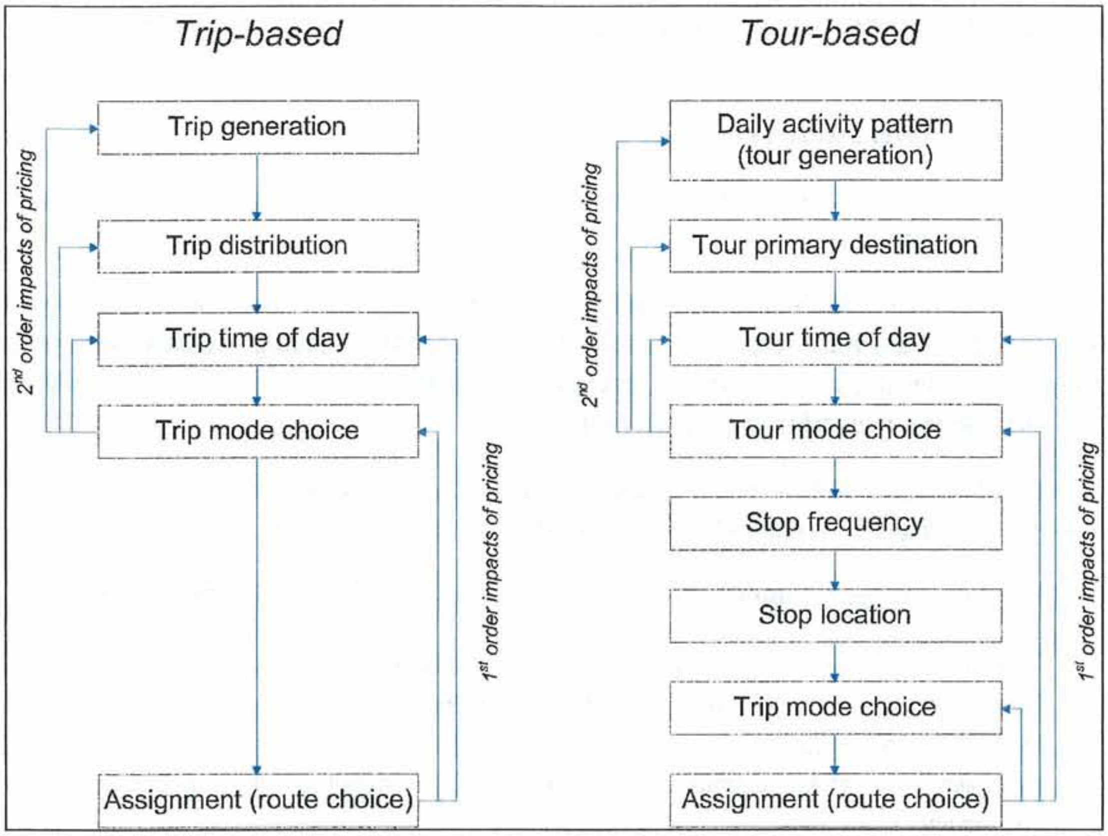


Figure 1: Typical Demand Mode Structures

When tolling is a factor of analysis, travel demand models will produce the necessary information regarding the patronage of the toll facility, as well as the impacts of tolling and pricing on corridor and regional travel and for different groups of travelers. How ***well*** the model predicts patronage and revenues depends on the structure of the model, how well it is calibrated and validated, and how it is applied to quantify the uncertainty inherent in any forecast of future economic activity:

- A ***model structure*** that adequately incorporates all the relevant responses to road pricing is a necessary condition, and in our opinion the most important factor that contributes to the sufficiency of a travel demand model. Three structural characteristics are most important, and are discussed below in detail in Sections 1.2 to 1.4: representation of relevant travel choice decisions, representation of travel costs, and representation of travelers' willingness to pay.

- Another important contributing factor to model sufficiency is related to ***model calibration and validation***; that is, how well the model reproduces current travel conditions at a regional, corridor and facility level. Regional travel demand models are evaluated in terms of how closely they reproduce regional travel patterns, such as traffic volumes on major facilities, transit ridership, and origin-destination person movements. However, this level of model validation may be insufficient for the specific facility, corridor, or subarea under study. Therefore a critical step before initiating a road pricing or traffic and revenue study is ensuring that the model is well-validated at a geographic scale commensurate with the scale of the project.

- A traffic forecast is necessarily made under conditions of uncertainty. Therefore the ***quantification of uncertainty*** and its impact on toll road traffic and revenue should be an integral part of the forecasting process, and provides important information to investors and decision-makers about the likelihood of achieving the anticipated revenue and other goals related to the realized traffic volume. Uncertainty and risk analysis are treated in more detail in Sections 3.0 and 5.0.

1.2 Travel Decisions Influenced by Tolling and Congestion Pricing

How travel demand models estimate tolling effects can be classified into ***first-order*** and ***second-order*** responses. A ***first-order*** response estimates how a traveler would immediately or most directly react to being tolled. This response includes the following travel choices: route choice (whether to use the toll road or an alternative free route), mode choice (for example, if pricing is applied, some users may choose to use a reasonable transit alternative instead of paying the toll), and time-of-day choice (for example, a traveler may choose to travel at a different time of day when tolls may be reduced).

Tolling models incorporate a "feedback loop" in which the results of the initial travel assignments, resultant travel times, and costs are fed back through the model until the input and output travel times and costs do not fluctuate much (called "convergence").

The ***second-order*** responses are the additional pricing impacts that can affect almost any travel choice. For example, as a response to tolling, travelers can change the destination of their trip, decide not to implement the trip and substitute it with some other activity, or link the trip to another tour or outing as a stop on the way to their final destination. These impacts are characterized by little or no immediate change in behavior to pricing, though the accumulated effects over a long time period can still be very significant and even affect the population's residential choices and the region's land use development. They are also more difficult to directly measure and require more extensive feedback iterations to achieve the model's convergence.

Table 1 below summarizes the wide range of possible responses to congestion and pricing that can be incorporated into a travel demand model.

Most of the models used to evaluate road pricing up to this time, both in research and in practice, have focused on trip-level short-term responses and therefore capture the most direct effects of pricing on travel demand. To date, there are only a few examples of full integration across all the short-term choices listed in Table 1; two examples are the models developed for Columbus, Ohio, and Montreal, Quebec.

Table 1: Possible Responses to Congestion and Pricing

Choice Dimension	Time Scale for Modeling	Expected Impact
	First Order Responses	
Route choice	Short-term – trip episode	Likelihood of choosing the toll road is expected to vary by type of traveler (single vs. multiple occupant vehicle; family carpool, transit user, etc.)
Pre-route choice (toll vs. non-toll)	Short-term – trip episode	Likelihood of choosing the toll road is expected to vary by type of traveler (single vs. multiple occupant vehicle; family carpool, transit user, etc.)
Car occupancy	Short-term – tour/trip episode	Increased likelihood of forming carpools, or increased likelihood of existing carpools to choose the toll road
Mode choice	Short-term – tour/trip episode	Shift to transit, especially to rail and among low/medium income groups
Time-of-day / schedule choice	Short-term – tour/trip episode	Increased likelihood of traveling during non-peak hours (peak spreading).
	Second Order Responses	
Destination / stop location	Short-term – tour/trip episode	Improved accessibility effect combined with negative pricing effect on trip distribution for non-work trips
Joint travel arrangements	Short-term – within day	Planned carpool or carpool formed as a result of tolling
Tour frequency, sequence, and formation of trip chains	Short-term – within day	Lower tour frequency and higher chaining propensity
Daily pattern type	Short-term – weekly (day to day)	More compressed workdays and work from home
Usual locations and schedule for non-mandatory activities	Medium-term – 1 month	Compressed / chain patterns; weekly planned shopping in major outlets
Household / person mobility attributes (transponder, transit path, parking arrangements at work)	Medium-term – 1 to 6 months	Higher percentage of transponder users and parking arrangements for high incomes, higher percentage of transit path holders for low incomes
Household car ownership choice	Long-term – 1 year	Stratified response by income group (higher car ownership for high incomes, lower car ownership for low incomes)
School / university location and schedule	Long-term – 1 to 5 years	Choice by transit accessibility; flexible schedules
Job /usual workplace location and schedule	Long-term – 1 to 5 years	Local jobs for low incomes; compressed / flexible schedules
Residential location	Long-term – 5 years +	Income stratification (high income suburbs around toll roads, low income clusters around transit)
Land use development	Long-term – 5 years +	Urban sprawl if no transit; otherwise shift to transit

Other important travel choices and mobility attributes have been less explored. These include responses that go beyond a single trip-related decision, such as joint travel arrangements; the role of subsidized parking, transit passes, electronic toll collection transponders, and other personal/household mobility attributes; and long-term impacts such as those related to work and residential location decisions. All of these dimensions represent fundamental changes in travel behavior patterns that cannot be captured and understood at the single-trip level. Depending on the project scale and time horizon, the second-order responses might become as significant as the first-order responses in a travel demand model. These choice dimensions can be more fully described as follows:

- Trip/tour ***destination choice*** relates to switching a trip destination to avoid a toll. Mandatory trips, such as those for work or school, are generally less likely to change destination in the short to medium term than trips for shopping or recreational activities.
- Short-term choices that relate to ***trip frequency and activity participation on a daily basis*** that cannot be fully captured at the elemental trip level. For example, these choices include decisions to stay at home on a given day, decisions to link activities or errands in order to reduce return trips home (trip chaining), and explicit joint travel arrangements. It is important to address these dimensions along with the conventional trip dimensions, particularly when the pricing forms under study are not trip-based.
- Medium-term choices that relate to choice of ***usual location and schedule*** for activities (like shopping or entertainment) that are not mandatory.
- Medium-term and long-term choices that relate to ***person/household mobility attributes*** such as car ownership, transponder use, transit passes, subsidized parking, etc.
- ***Long-term location choices*** of residential place, workplace, and school as well as land use development impacts.

Several of these dimensions represent relatively new choice models that have not yet been widely accepted and explored, and that can be applied only in an activity-based, or tour-based, model framework. It is nonetheless possible to extend traditional trip generation models to investigate some of these congestion and pricing impacts.

1.3 Measuring Travel Costs in a Demand Model

Before examining the impact of tolling or pricing on travel decisions, it is necessary to model a representation of the total cost of going from one place to another. This includes travel time, distance, tolls, parking, fuel, and vehicle maintenance and depreciation costs, as well as fares and waiting times when transit is used, combined in a ***generalized cost function***. When included in the core demand model, the generalized cost function helps to determine the impact of tolls on all choice decisions. The specific nature of the generalized cost function varies with each choice decision.

For route choice, the generalized cost associated with using any given road segment includes the cost of travel time, in addition to the tolls, fuel costs, and other monetary costs. Travel time is expressed as a dollar cost using a concept termed the ***value of time (VOT)***; a VOT of $15, for example, means that a traveler would be willing to pay $15 to reduce her travel time by one hour. Generalized costs may vary for different vehicle types, such as private auto (single occupant, two-person carpool, three-person carpool, etc.), light truck, heavy truck, etc. for the following reasons:

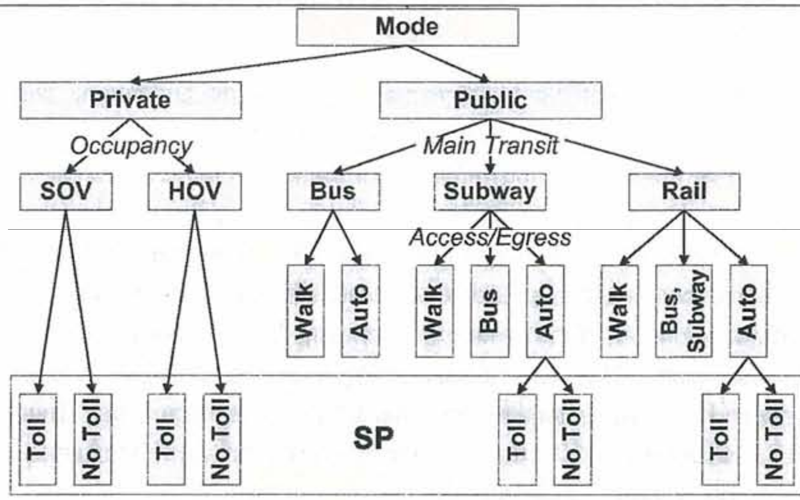
- Different vehicle types and occupancy classes may have very different ***values of time (VOTs)***. For example, commercial trucks tend to exhibit higher VOTs than personal vehicles.
- ***Toll rates might be differentiated*** by vehicle types and/or occupancy classes, for example, such as when a high occupancy toll (HOT) lane allows three-person carpools to travel for free, allows two-person carpools to pay half of the toll, and single occupant vehicles pay a full toll.
- General ***prohibitions and eligibility*** rules can be applied for certain vehicle types on certain facilities (for example, trucks prohibited on expressways or truck-only toll (TOT) lanes) or auto occupancy classes (for example, HOT lanes).

A priced, or tolled, facility may represent a more attractive option because of the enhanced reliability and other considerations that are not directly measured by average time and cost. The approach that has been applied in many models is to estimate an additional ***bias constant*** associated with priced facilities. This bias constant can be most effectively incorporated in a model element that is frequently referred to as pre-route choice, commonly placed between mode choice and route choice.

To study traveler responses to pricing, which may include changes in mode, destination, time of day, and/or trip frequency, all of these choice decisions must be sensitive to generalized costs. There are two key steps to accomplish this: first, to include the toll costs along with all other modal attributes in the mode choice submodel; and second to calculate the accessibility from each origin to each possible destination by all available travel modes.

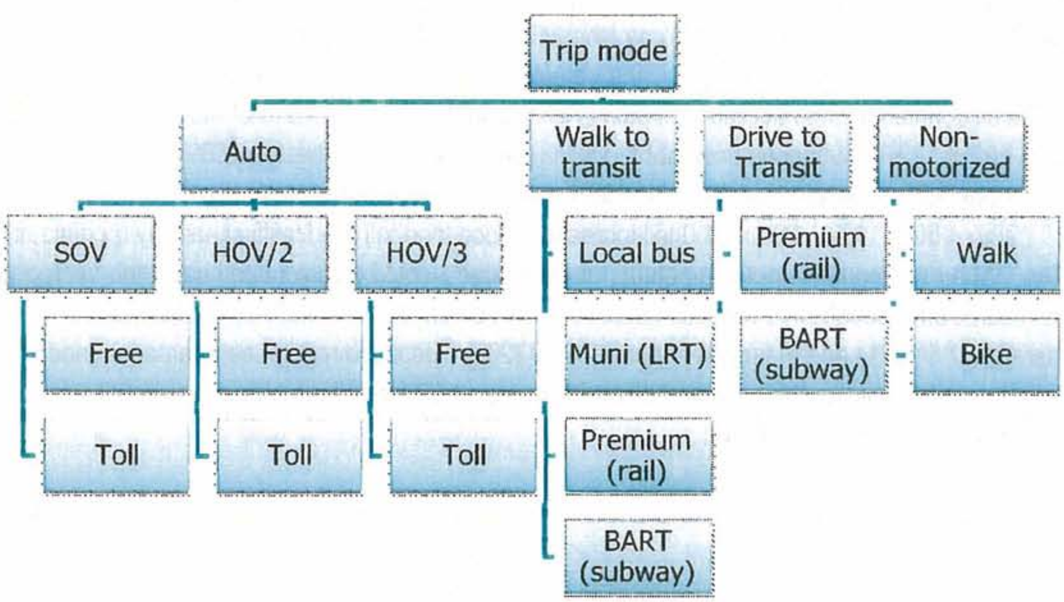
Accessibility is often expressed in minutes, yet besides travel time it also includes toll costs, transit fares, and modal preferences for all modes. For example, if a toll is charged to cross a bridge, all destinations beyond the bridge are considered less accessible than before, when one could cross the bridge for free. However, if as a result of the toll, there are no longer delays at the bridge then accessibility will have actually improved for those persons willing to pay the toll. Accessibility is derived from the mode choice submodel because this is where information about all potential travel modes for a given trip resides. Examples of the Montreal and San Francisco mode choice models are shown in **Figure 2** and **Figure 3**.

Once these multimodal accessibilities are known, they are used to represent generalized costs in destination, time-of-day, and trip frequency decisions. Another option, frequently used in practice, is to employ the highway generalized cost itself in the destination choice or time-of-day choice. This simplified option, however, is recommended only if transit usage is very low. A detailed explanation of how to incorporate generalized costs in destination and time-of-day choice models is presented in **Technical Appendix 1**.



SOV: Single-occupant vehicle
HOV: high-occupancy vehicle

Figure 2
Montreal Mode Choice Model
Nested Structure Incorporating Free vs. Toll (Pre-Route) Choice



SOV: Single-occupant vehicle
HOV/2: high-occupancy (2 person) vehicle
HOV/3: high-occupancy (3 or more persons) vehicle

LRT: light rail transit
BART: Bay Area Rapid Transit

Figure 3
San Francisco Mode Choice Model
Nested Structure Incorporating Free vs. Toll (Pre-Route) Choice

1.4 Travelers' Willingness to Pay

Willingness to pay refers to the tradeoff that travelers make between time and money, and it is a critical factor for tolling applications. For the price of the toll fee, travelers are "buying" travel time savings or travel time reliability, or some other trip-related improvement. The value of time (VOT) can be thought of as the "price" of travel time savings. The value of reliability (VOR) has a similar interpretation, but it measures willingness to pay for increased travel time reliability for a given trip. Travelers exhibit different VOT and VOR, partly as a function of personal and household characteristics (such as income, gender, worker status, etc.), and partly as a function of the context in which a trip is made (trip purpose, time of day, time pressure, outbound versus inbound trip, etc.), (Spear, 2005; Vovsha, et al, 2005). A person's response to a tolling situation will depend to a large extend on his or her VOT, all else being equal. Therefore, a good travel demand model classifies trips and/or travelers into groups of relatively homogeneous VOT or VOR. This is referred to as ***travel market segmentation***.

How to appropriately segment the travel market is a critical modeling issue. The term "aggregation bias" identifies the error that results when travelers with very dissimilar attributes are treated as exhibiting a common "average" attribute value. This error arises from the non-linear nature of travelers' response to road pricing. A typical toll diversion curve, such as that shown in **Figure 4**, has the steepest (most elastic) part in the middle, while the ends are quite flat. This type of curve gives the likelihood of choosing a toll road as a function of the toll, all else (time savings, distance traveled, etc.) held equal. To illustrate the magnitude of aggregation bias, consider the following example. We assume that the market for this road is composed of two types of users: people who pay the full toll ($4.00), and people who pay a discounted toll ($1.00) because their costs are reimbursed by their employer. If 50% of the market pays the full toll and 50% pays the discounted toll, the average toll paid is $2.5, and the toll road share of the market is 46% (50% * 80% + 50% * 12%). Suppose now that the toll is raised by $1.0, so that now 50% of the people pay $2.0 and 50% pay $5.0. The average toll paid is $3.0, and the toll road share of the market would now be 40% (50% * 70% + 50% * 10%). So a $1.0 toll increase reduced the toll road traffic share by 6 points, from 46% to 40%. When the market is not segmented, market shares would be calculated using the average toll paid. This results, erroneously, in a reduction in toll traffic of 30 points, or the difference between the market share at $2.5 (50%) and the market share at $3.0 (20%). Because market segmentation tends to move distinct groups "away from the middle," all else being equal, it tends to dampen the overall price sensitivity across the modeled population.

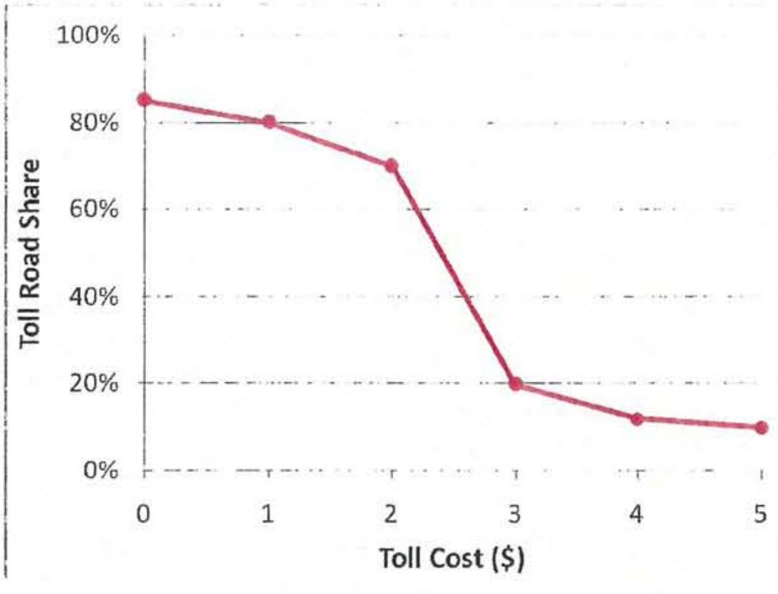


Figure 4 - Sample Toll Diversion Curve

A variety of traveler and trip type dimensions are understood to be important market differentiators. These dimensions can be grouped into attributes of the traveling population (income, age, etc.), attributes of their activities, and attributes of their trips:

Population attributes. These characteristics are independent of any trip-related decision. Thus, their effect on travel choices is achieved either by partitioning the travel market into subgroups (for example high income vs. low income households), or by using them as explanatory variables in the model. The following are the better understood socioeconomic differentiators:

- ***Income, age, and gender.*** A higher income is normally associated with higher VOT [Brownstone & Small, 2005; Dehghani et al, 2003]. Women and middle-age travelers also tend to exhibit higher VOT than all other travelers (Mastako, 2003; PB Consult, 2003).
- ***Worker status.*** Employed persons (even when traveling for nonwork purposes) are expected to exhibit a higher VOT compared to nonworkers because of the tighter time constraints.
- ***Household size and composition.*** Larger households, with children, are more likely to carpool and take advantage of managed lanes (Stockton et al., 2000; Vovsha et al., 2003).
- ***Household auto ownership.*** Although an attribute of the household, car ownership is oftentimes a modeled decision. Persons without cars, or in households where there are fewer vehicles than workers, are more likely to carpool and use transit.

Activity attributes. These are attributes of the specific activity for which one is traveling, but independent of the trip itself. Activity attributes include the following:

- ***Travel purpose.*** Work trips, and, in particular, business-related trips, normally are associated with higher VOT (Dehghani et al., 2003; PB Consult, 2003 and 2004). Another, frequently cited high VOT trip purpose is a trip to the airport, to catch an outbound flight (Spear, 2005). The list of special trip purposes with high VOT might also include escorting passengers, visiting a place of worship, going to a medical appointment, and other fixed-schedule events (theater, sport event, etc). Some recreational or discretionary, flexible schedule trips, such as incidental shopping, tend to exhibit lower VOTs.

- ***Day of week: weekday vs. weekend.*** There is statistical evidence that VOT for the same travel purpose, income group, and travel party size on weekends is systematically lower than on weekdays (Stefan et al., 2007). This would be an important consideration for a toll road expected to attract large numbers of recreational travelers. Since most travel demand models focus on weekday travel, separate procedures are developed to estimate toll facility traffic and revenue for weekend travelers.
- ***Activity/schedule flexibility.*** Fixed-schedule activities are normally associated with higher VOT because of the associated "penalty" of being late. This association has manifested itself in many previous research works when VOT for the morning commute proved to be higher compared to the evening commute. For similar reasons, a trip to the theater might exhibit a high VOT, while a shopping trip might be more flexible and exhibit a lower VOT.

Trip attributes. Given that a travel demand model is a sequence or chain of sub-models (as illustrated in **Figure 1**), attributes of trips that are modeled in one submodel can be used as segmentation variables further down the model chain. For example, if the time-of-day (TOD) model is placed after mode and occupancy choice, then mode and occupancy can be used to segment the TOD model. If the order of models is reversed (TOD choice before mode and occupancy choice), the segmentation restrictions also need to be reversed. Some important trip attributes include:

- ***Trip frequency.*** More regular trips, and their associated costs, may receive more – or less – formal consideration than those that occur infrequently. For example, a $1.50 toll for an auto trip to work may be perceived as $3.00 per day (assuming the same toll each way on a round trip) and $60 per month, thus receiving special consideration. This perceptional mechanism is likely very different for infrequent and irregular trips, where the toll is perceived as a one-time payment.
- ***Time of day.*** Prior research confirms that travel during morning and evening peak periods is associated with a higher VOT, as compared to off-peak periods. Also, commuters on their way to work (typically during the morning peak hours) are more sensitive to travel time and, specifically, reliability than on their return home trip (Brownstone et al., 2003).
- ***Vehicle occupancy and travel party composition.*** While a higher occupancy normally is associated with higher VOT (though not necessarily in proportion to party size), it is less clear how travel party composition (for example, a mother traveling with children, rather than household heads traveling together) affects a party's VOT.
- ***Trip length/distance.*** For short distances, VOT is comparatively low since the travel time is insignificant and delays are tolerable; for trip distances around 30 miles, VOT reaches the maximum. For longer commutes, however, VOT goes down again, because commuters presumably have self-chosen residential and work places based on the long-distance travel (Steimetz & Brownstone, 2005).
- ***Toll payment method.*** The toll payment method is an important additional dimension that has not yet been explored in detail. The pricing experiment of the Port Authority of New York & New Jersey has definitively shown that the introduction of E-Z Pass as a toll payment method attracted a significant new wave of users despite a relatively small discount (Holguin-Veras et al., 2005). As with perceived time, the influence of the perceived value of money on road pricing-related choices needs to be examined.

- ***Situational context: time pressure versus flexible time.*** This trip attribute is recognized as probably the single most important factor determining VOT that has proven difficult to measure and estimate explicitly, as well as to include in applied models (Spear, 2005; Vovsha et al., 2005). There is evidence that even a low-income person would probably be willing to pay a lot for travel time savings if he or she is in a danger of being late for a job interview or is escorting a sick child. This factor is correlated with the degree of flexibility in the activity schedule but does not duplicate it.

Choosing the appropriate level of market segmentation for any given model is a function of several factors, and therefore compromises are inevitable. In addition to a desire to create relatively homogenous travel groups, other primary considerations include the number of person and household attributes that can realistically be forecasted, the size and quality of the home interview survey and other data used to estimate and calibrate the model, the most likely type of forecasting applications, model run time, model complexity, and travel demand software limitations. Tour-based models have the advantage over trip-based models in that additional segmentation can be achieved at a relatively low cost.

Another important issue in segmenting the market relates to ***consistency in VOT assumptions*** between the ***segmentation applied in highway assignment or route choice*** and the ***segmentation applied in the mode choice model***. Ideally VOT is treated consistently across both choices. The standard practice, however, has been to ignore all mode choice dimensions (mode, trip purpose, household income, etc.) in highway assignments, and to use classes differentiated by auto occupancy alone (single occupant, two occupants, three or more occupants) and vehicle type (private auto and truck types). This practice unnecessarily introduces aggregation biases in route choice. **Technical Appendix 1** describes an approach for constructing vehicle classes for assignment that maintains consistency with mode choice VOT segmentation.

1.5. Structure and Tolling-Related Features of Oregon's Travel Demand Models

In the State of Oregon there are travel demand models that operate at the statewide, MPO, and small urban area levels. Most of the current MPO models were originally developed within the past 10 to 15 years, following home interview surveys conducted throughout the metropolitan areas of Portland, Salem, Eugene, and Medford, and in 11 additional counties in Oregon and Southwest Washington. A single, joint model was developed pooling the data for the four MPOs and then individually calibrated and validated for each MPO region. Recently, travel demand models have been calibrated and validated for the two newly designated MPOs, Bend and Corvallis.

The ***Portland Metropolitan Area (Metro) Model*** is a state-of-the-practice trip-based model that estimates average weekday travel within the Portland-Vancouver metropolitan area. Since its initial development in 1998, it has undergone various updates. This discussion is based on the 2008 ("Ivan") model version. **Table 2** shows the major model components and characteristics most critical for modeling tolling applications.

The following characteristics of the Portland Metro model are relevant to its tolling application sufficiency:

- Three of the first-order responses described in **Table 1** are explicitly modeled: route choice, mode choice, and generalized costs; all are sensitive to tolls. Time-of-day choice, instead, is insensitive to level of service attributes (time or costs). Therefore, as currently specified, this model assumes that tolls do not effect shifts in traffic demand across time periods. This is a common simplification among trip-based models, but methods do exist to incorporate time and cost sensitivity in time-of-day choice.

- No pre-route choice model is applied. Instead, the choice of route itinerary or path is determined by the equilibrium highway assignment as a function of travel time and cost only. This is a weakness of the model whenever applied in a context where there is a real choice between toll and free routes because it over-simplifies the time-to-cost tradeoff and ignores other factors that affect toll route choice such as trip distance and reliability.
- As with other mode choice models that lack a specific toll/no toll choice, sensitivity to tolls is largely a function of the magnitude of the time and cost coefficients, and of the tradeoff between travel time and travel cost (essentially, VOT). In the Metro model, VOT varies by trip purpose and household income, as shown in **Table 2**. VOTs tend to be low, while both time and cost coefficients (not shown in Table 2) are relatively high. Both of these factors tend to increase the cost sensitivity of the model, possibly to the point where it may be more sensitive to cost than is appropriate.
- The destination choice model is sensitive to tolls (a second-order response). This is achieved by using multi-modal accessibilities. Unlike route and mode choice, the destination choice models are not segmented by time period, but they are segmented by trip purpose. Use of multi-modal accessibilities in destination choice is a desirable feature. One needed improvement is a re-evaluation of the accessibility coefficients; as currently implemented the destination choice model may be overly sensitive to changes in level of service (time, cost) factors. An additional improvement would be to introduce time-of-day specific accessibilities.
- The network simulation (highway assignment) is based on four vehicle classes—SOV, HOV, medium trucks, and large trucks—and is typically performed for three time periods (AM peak, midday hour, and PM peak). However, the VOT segmentation considers only two classes: automobiles and trucks. Toll costs are converted to time-equivalent delays prior to highway assignment, so the time delay can be made to vary by each of the four vehicle classes, thus reflecting some of the actual class differences in the toll schedule. As is the case with most trip-based models, the use of additional vehicle classes would reduce aggregation biases and consequently also reduce the model's cost-sensitivity.
- An ancillary model for airport ground access (excluding airport employees) segments these trips into four classes, business/non-business and resident/non-resident, with VOT values showing significant differences only across the trip purpose dimension. Furthermore, contrary to expectation, VOT for non-business trips is larger than for business trips. A more recent air traveler model, not formally adopted at the time of this write-up, exhibits VOTs more consistent with previous expectations.
- Consistency between input and output travel times is achieved by feeding the highway assignment results back into the accessibility functions, and iterating the model from destination choice until the differences between model run iterations is small (typically three to four iterations of the model).
- The development of the truck trip tables takes place outside of the regional travel demand model. The truck model is largely unaffected by transport level of service factors. This is consistent with the state of freight modeling practice. Therefore, the only measurable effect of tolling on truck flows is the choice of route implemented at the assignment stage.

Table 2: Portland Metro Travel Demand Model Tolling-Related Features

Major model feature	Detailed feature /submodel	Model characteristics
Spatial scale		Regional
Demand model structure		Aggregate trip-based four-step
Modeled pricing impacts	Route choice	No pre-route choice. Route itinerary is obtained from the highway assignment. Toll costs are included in the generalized cost function.
	Mode choice and auto occupancy	Toll costs can be incorporated in the utility equations for the three auto modes: drive alone, drive with passenger, and auto passenger. Toll cost incurred when choosing drive with passenger and auto passenger modes is half the toll cost of the drive-alone mode.
	Destination choice	Toll costs affect destination choice through multi-modal accessibility functions.
Willingness to pay / VOT and user segmentation	By vehicle class in the network simulation ($1994)	Auto (SOV or HOV) - $ 9.9 / hr
		Trucks - $ 26.6 / hr
	By trip purpose and income level, in mode choice ($1994)	Home-based work: $3.3/hr - $5.4/hr
		Home-based school: N/A
		Home-based college: $22.8
		Home-based other: $2.7/hr - $5.2/hr
		Non-home-based: $5.2/hr
	By trip purpose ($1994), airport trip mode choice VOT expressed as a function of income. Values shown correspond to a $40,000 income level.	Business travel: $18/hr
		Non-business travel: $27/hr

The ***Salem-Keizer Area Transportation Study (SKATS)*** model follows a structure similar to that of the Portland Metro model and therefore shares many of the strengths and weaknesses discussed above. The model was estimated and calibrated with the same home interview survey data, complemented by 1990 and 2000 U.S. Census data, as well as land use data maintained in SKATS's geographic information system (GIS) database. The model was validated to 1997 traffic counts and observed ridership on Salem Mass Transit. The SKATS model has not been used on any toll-related project, and therefore it is not set up to handle tolls or road prices. However, the application software is sufficiently flexible to allow for the inclusion of toll costs in mode choice and assignment. From a tolling application perspective, the critical structural differences relative to the Portland Metro model are:

- The destination choice models use travel times, instead of multimodal accessibilities, as the travel accessibility measure. Thus these models are not sensitive to toll costs, and would need to be re-specified and calibrated if one were interested in this second-order effect.
- The mode choice models are segmented by trip purpose and household income, but not by time of day. Instead, all home-based work trips are modeled using peak level of service, while all nonwork trips assume off-peak level of service. Time-of-day segmentation would need to be introduced before these models could be used to study any time-of-day variable pricing scheme.
- Two vehicle classes are used in the user equilibrium assignment—autos and trucks. Generalized cost is a function of travel time only, and therefore no assumptions are made about possible auto or truck VOTs. It would be relatively simple to add toll cost terms to the generalized cost function. This model would benefit from the introduction of more finely segmented vehicle classes, as discussed for the Portland Metro model.

The model of the ***Lane Council of Governments*** maintains a simple, straightforward four-step model. As is the case for SKATS, tolling applications have not been under study in the Eugene-Springfield area, and therefore the model is not currently set up to handle highway pricing. The most critical model features, from a tolling application perspective, are:

- Gravity models are used for trip distribution and currently use highway travel time to measure destination accessibility. Using a generalized cost function, instead of highway travel time, would introduce toll sensitivity. However use of the gravity model could lead to incorrect distributional responses to tolls. A preferred approach would be to implement destination choice models based on multi-model accessibilities.
- The core demand model is fully segmented into peak and off-peak periods, which allows for testing some variation in tolls by time of day, but only in terms of modal and route shifts.
- The mode choice models are further segmented by trip purpose and income, so they already capture the principal VOT differences.
- Highway route choice is implemented in a single-class user equilibrium assignment (travel-time-only cost functions). Segmentation into vehicle classes, consistent with the VOTs used in the mode choice model, as well as implementation of generalized costs would be necessary prior to using this model for tolling applications.

- Even with the implementation of generalized cost functions in assignment, the lack of a pre-route choice model over-simplifies the time-to-cost tradeoff and ignores other factors that affect toll route choice such as trip distance and reliability.
- Estimated link travel times are fed back to trip distribution; typically two to three iterations are required to achieve equilibrium.

The travel demand models for the ***Rogue Valley MPO***, ***Bend MPO***, and ***Corvallis MPO*** all follow a model implementation similar to the Portland Metro model's, albeit somewhat simplified. None of these models has been applied in a road pricing project, and they are therefore not currently set up to handle tolls. These models could be made sensitive to tolls, as has been done in Portland. Their critical model features are:

- Destination choice models use multimodal accessibility functions, similar to those used in the Portland Metro model. The home-based work (HBW) models are segmented by three income levels and therefore reflect three different VOTs. None of the destination choice models is segmented by time of day, so they would not be sensitive to variable tolls.
- The mode choice models use similar VOTs and segmentation as the Metro model; therefore, they could be modified following the Metro model's implementation to handle toll costs.
- The model uses a single-class equilibrium highway assignment. As discussed above, highway assignment would need to be improved (apply segmentation and generalized cost functions) before using this model for tolling applications.
- As discussed for the previous models, the lack of a pre-route choice model is a weakness that needs to be addressed.
- Travel time feeds back to destination choice.

The ***Statewide Integrated Model (SWIM)*** is an integrated land use and transport model covering the entire state of Oregon, and only one of two such models developed in the United States. It is a second generation model, drawing on previous work done on Oregon1, the first generation statewide model [*Parsons Brinckerhoff, 1999, PBQD, 2001*] and the Eugene-Springfield UrbanSim model [*Waddell et al., 1998*]

SWIM includes a substantially different, and more advanced, travel demand model than the models currently in use at the MPO level. SWIM combines a spatial economic model with transport models: it models the economic interactions between Oregon and the rest of the world; changes in land use, population, and employment growth; and commercial and person travel. SWIM is disaggregate in nature – each household and person is micro-simulated, allowing for far more market segmentation than is practical with a trip-based model. The transport models are based on tours, instead of trips, so that there is consistency of all the various travel decisions (times of travel, destinations and modes) among all trips within a tour.

The four modules most germane to this discussion are the following:

- The Production Allocations and Interactions (PI) module represents the regional economic relationships among industry, households, and institutions. The PI module locates industry and households in space, generates a set of economic flow matrices for each commodity, and determines the commodities made and used by each activity, including labor. The PI module is informed by travel accessibilities, including toll costs, in the form of multi-modal accessibilities between origins and destinations.

- The Transport Supply (TS) module performs the trip assignment function. The module also produces travel time and cost for each available mode, for each origin and destination.

- The Person Transport (PT) module generates travel for all household members, in the form of "tours" that start and end at home. Work tours are based on labor flows produced by other modules and influenced by travel times, distances, and costs by all modes of transport from the TS module, and multimodal accessibilities calculated by the PT. The PT module consists of two jointly run subcomponents: short distance transport (SDT), which predicts all regular work commutes regardless of length and noncommute travel patterns less than or equal to 50 miles in length, and long distance transport (LDT), which predicts noncommute travel patterns greater than 50 miles. Toll costs affect PT both directly (in the mode choice model), and indirectly through multimodal accessibility functions.

- The Commercial Transport (CT) module is a micro-simulation model of freight travel demand. Given commodity flow movements, the model attempts to replicate several freight travel choices made by different agents, especially trip linking and the use of intermediate distribution and warehousing centers. Production flows are converted to discrete shipments by commodity and mode of transport. The shipments are further allocated to tour origins, tour destinations, intermediate stops, and vehicles. There is no direct linkage between toll costs and CT; instead, the production and consumption locations of commodities are determined by the PI module, which does so informed by multimodal accessibility functions.

The PT module is a sequence of discrete choice decision models that implement a tour-based approach similar to the one shown in **Figure 1**. The travel decisions of each person in the state are micro-simulated, with the exception of route choice, which relies on aggregate network assignments similar to those applied by the MPO models. All models in PT except the mode choice models were originally estimated for the state of Ohio and were calibrated and validated using the 1994/96 set of home interview surveys, 2000 Census Transportation Planning Package (CTPP) and Public Use Micro Sample (PUMS) data, American Travel Survey (ATS), and recent observed traffic volumes and transit ridership. The tour and trip mode choice models are based on the first generation models estimated with Oregon data.

The most relevant tolling-related features of SWIM are shown in **Table 4**. SWIM is the most toll-sufficient model of all the models currently implemented in Oregon, and its disaggregate nature lends itself to various advanced treatments, as is discussed in **Section 6**. Important tolling-related characteristics of SWIM include:

- SWIM is an activity-based model, and therefore treats individuals on a disaggregated basis (rather than as several homogeneous groups), thus offering the potential for a more accurate representation of the toll travel market.
- The time-of-day choice for work tours could be made sensitive to toll costs within the current structure of the model. Currently, it is sensitive to travel time, in addition to various other person,

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trip, and household attributes. Time-of day choice for non-work tours is applied before tour destination choice, so in the current model sequence non-work tour scheduling cannot be sensitive to level-of-service attributes.

- No pre-route choice model is applied. Therefore the weaknesses that arise from relying on the assignment step for the toll vs. free road choice, and discussed before in the context of the MPO models, apply also to SWIM.
- Toll costs influence the choice of tour mode and trip mode. Both the tour mode choice and trip mode choice models are fully segmented by time of day. Their respective VOTs are shown in **Table 4**. Some of these VOTs, particularly for the low income travelers and non-work purposes appear low and may need to be revised.

Table 4: Oregon Statewide Integrated Model Tolling-Related Features

Major model feature	Detailed feature / submodel	Model characteristics
Spatial scale		Regional
Demand model structure		Disaggregate activity-based, integrated with a spatial model
Modeled pricing impacts	Route choice (TS)	No pre-route choice. Route itinerary is obtained from the highway assignment. Link-based toll costs included in the generalized cost function.
	Mode choice and auto occupancy (PT) *Tour and trip level decisions*	The tour mode choice and trip mode choice utility functions include toll costs for all the auto modes.
	Destination choice (PT) *Primary tour destination decision*	Toll costs affect tour destination choice through multi-modal accessibilities
	Time-of-day choice (PT) *Tour departure time and duration*	Toll costs affect the work tour scheduling models through multimodal accessibilities
	Workplace location (PI/PT)	Toll costs affect the dollar flows of labor between residential and industrial activities via multi-modal accessibilities
	Industry location (PI)	Toll costs affect the dollar flows of labor and commodities between activities via multimodal accessibilities.

Major model feature	Detailed feature / submodel	Model characteristics
Willingness to pay / VOT and user segmentation	By vehicle class in the network simulation ($1994)	Auto: SOV and HOV
		Trucks: Light, Medium, and Heavy
	By tour purpose and income level, in tour mode choice ($2000)	Work and College: $1.5/hr - $11.5/hr
		Non-Work: $1.0/hr - $7.5/hr
	By tour purpose and income level, in trip mode choice ($2000)	Work: $2.0/hr - $3.9/hr
		School: $1.7/hr
		Other: $1.3/hr - $1.4/hr
		Work-based tours: $0.9/hr - $3.0/hr

- Link-based toll costs are included in the generalized cost function used in highway assignment. Vehicle trips are segmented into five classes by VOT. These classes have been constructed largely ignoring VOT segmentation, and therefore could be improved by applying the segmentation scheme described in **Technical Appendix 1**.
- The nonwork destination choice models are fully segmented by time of day, and use period-specific multimodal accessibility functions; therefore, these models are sensitive to peak versus off-peak toll differences.
- The workplace location model is influenced by toll costs through the allocation of labor flows forecasted by the PI module.
- SWIM includes a state-of-the-art commercial transport model (CT). Trips by truck class are derived from the simulated flow of commodities within the state and to/from out-of-state origins and destinations. These commodity flows are influenced by multi-modal accessibilities. Efforts are on-going to fully validate CT to base year conditions, and to test its sensitivity to tolls.

Section 2.0: Modeling Requirements for Oregon Tolling Applications

An assessment of modeling requirements must necessarily start with a good understanding of the types of tolling applications under study. The tolling applications that are being considered in Oregon are described in a companion paper (Paper 5), and in studies that preceded these White Papers (Cambridge Systematics, 2007). In terms of modeling requirements, the potential tolling applications can be classified as follows:

- Traditional projects: new toll roads and new toll bridges
- Existing freeways or bridge tolling
- Tolled managed lanes: HOT lanes, express lanes, and truck-only lanes
- Cordon or area pricing: at an inner cordon or at the urban growth boundary
- Mileage-based road pricing

There are model requirements that apply to any road pricing study, while others are relevant only for specific applications. Some model requirements are considered essential, while others may be left for advanced stages of the study. **Table 5** lists the modeling requirements corresponding to the typology of tolling applications listed above. At a minimum, the mode choice and assignment models must be sensitive to the toll cost through the use of generalized cost functions and adequate VOT segmentation. Inclusion of a pre-route toll versus no toll choice model is also highly desirable. A more advanced treatment would include considering the delays at toll plazas and access ramps (if any), further developing the VOT segmentation, addressing travel time reliability, and equilibrating generalized cost through trip distribution, in addition to mode choice equilibration. There are several examples of U.S. travel demand models that already incorporate at least some of these features, with the exception of travel time reliability.

From a modeling perspective, these applications can be further grouped into two general classes: facility-specific tolling (one or more roads), or cordon/area pricing tolls, which would include mileage-based pricing. The main difference between these two groups is the importance of the trip frequency/trip generation decision. Under cordon/area pricing or ubiquitous mileage-based schemes, it is essential to model the trip suppression effect of the toll. On the other hand, pre-route choice is less important because all possible routes would be tolled, and therefore there would be no free alternative. **Table 5** lists the specific requirements for cordon/area pricing schemes, which are understood to be in addition to the requirements listed for all pricing projects, with the exception of pre-route choice. Advanced modeling of the long-term effects of these types of schemes necessarily requires integration with the land use model, so that decisions about residential location and commercial land use can be informed by the region-wide changes in the cost of travel. This is particularly important when the policy under consideration seeks to influence land use patterns. Oregon is well ahead of all other states when it comes to the integration of land use and transport models, both at the MPO and at the statewide level.

Table 5: Model Features Relevant for Oregon Pricing Applications

Type of Pricing Application	Model Features	
	Essential	Advanced
All Road Pricing Studies	Toll facilities coded in the highway network with toll incorporated in the generalized cost functions	Toll plazas and access ramps coded with realistic delay functions
	Segmented VOT by travel purpose and income group in demand model	Perceived highway time by congestion levels/reliability
	Segmented VOT by vehicle class in traffic assignment	Additional vehicle class stratification by VOT
	Pre-route (toll vs. no toll) subchoice	
	Mode choice and assignment equilibration	Inclusion of trip distribution in equilibration through multi-modal accessibilities
Cordon and Area Pricing	Trip generation sensitive to accessibility/generalized cost	Accounting for trends in flexible/ compressed work schedules and telecommuting
		Residential location and commercial land use models integrated with the transport model and sensitive to generalized travel costs
Congestion Pricing – road-, area-, or cordon-based	Peak spreading model	Time-of-day choice model Accounting for trends in flexible/ compressed work schedules and telecommuting
Dynamic (Real-Time) Pricing – road-, area-, or cordon-based		Special network/toll equilibration procedure
HOT/Express Lanes	Car occupancy (SOV, HOV2, HOV3+) subchoice in mode choice	Additional vehicle class stratification by occupancy in assignment
	Mode choice sensitive to household size	Explicit modeling of joint household travel
Truck-Only Lanes	Segmented VOT by truck classes in traffic assignment Pre-route (toll vs. no toll) choice	Agent-based models
Road Pricing in Parallel with Transit Improvements	Mode choice with developed transit nest	Parking location choice model for drive-to-transit trips
	Bus speeds linked to highway congestion	
Road Pricing in Parallel with Parking Policies	Parking cost inclusion in mode choice, and in trip distribution through multi-modal accessibilities	Parking location choice model for auto and drive-to-transit trips with parking constraints

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Two other equally important aspects of travel model design are ***the nature of the toll schedule***, in particular differences in toll or price across vehicle types and vehicle occupancy, time of day, and static versus dynamic pricing, and ***the nature of policies that complement the pricing application***, such as improvements to transit service or parking restrictions. The requirements for the most likely tolling options are also listed in **Table 5**. These tolling application options cut across the types of projects listed above. For example, a peak spreading and/or time-of-day choice model would be required if the study is considering variable time-of-day pricing, regardless of whether the application is freeway- or cordon-based.

Specific modeling requirements related to the toll schedule and complementary policies are summarized as follows:

- Congestion pricing necessarily implies that tolls would vary by time of day, and possibly by vehicle type; therefore, the model needs to be sensitive to time-of-day travel decisions, whether just within the peak periods (peak spreading model) or across time periods (time-of-day choice model).
- Dynamic pricing requires that the toll be set as a function of congestion levels in a real-time basis. This type of tolling schedule can only be modeled using advanced toll equilibration procedures between the network simulation and the demand model.
- HOT and express lane studies, where the tolls may vary by car occupancy levels, require specific modeling of the occupancy choice, as well as assignment stratification by occupancy levels to restrict unallowed vehicle types from using the managed lanes. Sensitivity to household size is highly desirable, since opportunities to form carpools as well the need to do so are greater in large households and among families with children.
- Transit improvements and restrictive parking policies are often studied as policies complementary to road pricing. To do so requires adequate treatment of the transit options and parking costs throughout the model.

The modeling requirements listed in **Table 5** as "essential" for the analysis of truck-only lanes may appear fairly modest, but they reflect the state of the practice. There is a high degree of complexity associated with how the freight transport sector responds to tolls and other road transport level of service attributes, and we are not aware of any operational or even research trip-based model with a proven ability to capture these effects. Among activity-based models, the state-of-the-art is exemplified by CT, the commercial transport model embedded in SWIM. CT can be characterized as an agent-based approach.

The evaluation of what are commonly referred to as "greenfield" projects - new roads and new bridges - does not require any additional model features beyond those listed in **Table 5**. However, relative to tolling applications implemented on corridors with well-established travel demand, greenfield projects require more detailed, in-depth analysis devoted to the identification of risk factors and the quantification of demand uncertainty. The reasons for this are explained in detail in **Technical Appendix 3**.

The ***geographic scale*** of the project also plays a role in the design of the travel demand model. More specifically, while geographic scale does not influence the selection of the relevant modeled travel decisions, it does affect the scale and resolution needed to adequately represent impacted facilities and trip origins and destinations. Geographic scale also affects the level of effort and resolution employed for calibrating and validating the travel demand model. We can distinguish five levels of geographic scale: statewide, regional, subarea, corridor and facility. It is important to clarify that this classification identifies the geographic distribution of the relevant (tolled) trip origins and destinations, and not the tolled facilities themselves. For example, the impacts of tolling a single facility of regional importance need to be analyzed at the regional level, in addition to the corridor and facility level. It would not be sufficient to limit the study to an evaluation of very localized impacts. In this respect the evaluation of truck-only lanes poses a significant challenge, due to the large share of medium and long-haul trucks with origins and/or destinations outside of the model area of a typical MPO model.

A comparison of the SWIM and MPO models relative to the requirements listed here is the subject of **Section 6.0**, which evaluates the capability of Oregon's travel demand models.

Section 3.0: Modeling Requirements for Investment-Grade Studies

3.1 Rules of the Financial World

A toll traffic and revenue (T&R) study is considered to be "Investment Grade" if the appropriate level of diligence has been taken so that the results of the study can be used to determine the financial viability of the project. The three major rating agencies—Fitch Ratings, Moody's, and Standard & Poor's—conduct various tests on traffic and revenue forecasts and examine variations in many input parameters as well as the model structure itself to assess revenue forecast reasonableness and financial risk (Standard and Poor's, 2002-2005; Fitch Ratings, 2003-2005). It should be understood that the quality of the forecast may directly affect the project bond rating (i.e., the possibility to obtain the necessary loans and the interest rate associated with them). It should also be understood that a project may ultimately not be rated "investment grade" even if a high quality forecast has been produced.

Investment-grade studies require an advanced and well-calibrated travel model integrated with the network simulation to be able to support the level of analysis required by investors and bond rating agencies. While a general principle that "a good model for an investment-grade study should first of all be a good behavioral model in a common sense" holds true, it is applicable only as a starting point. Investment-grade studies place specific requirements on the travel demand model itself and the way in which the model is applied. These requirements relate to the model structure and calibration, to the way in which the model is applied, and to a number of post-modeling steps that convert the model outputs into the inputs needed for a financial plan.

3.1.1 Model structure and calibration requirements:

- Presence of all three major relevant choice dimensions (route, mode, and time-of-day) that represent first-order responses of the travelers as described in **Section 1**. Additional relevant features include:
    - More elaborate ***time-of-day choice*** or ***peak-spreading*** model distinguishing between the peak hour and time periods immediately before and after the peak;
    - ***Trip generation*** model sensitive to accessibility improvements; and
    - ***Trip distribution*** model sensitive to multimodal accessibilities.
- ***User segmentation by VOT*** across travel purposes, income groups, times of day, vehicle type, and occupancy.
- Extensive, newly collected data and more rigorous ***corridor-focused model calibration***. It is essential to recalibrate the model based on the most recently collected data, including traffic counts, special surveys (e.g., users of a particular toll facility), and speed measurements.

3.1.2 Model application requirements:

- ***Toll rate optimization*** and multiple sensitivity tests with different toll and toll escalation scenarios.
- ***Risk analysis and risk mitigation*** measures. This includes identification and quantification of risk factors. A good overview of the common risk factors in travel forecasting is provided in the periodical publications of the rating agencies (Standard and Poor's, 2002-2005; Fitch Ratings, 2003-2005), as well as in Washington State's Tolling Study (Cambridge Systematics, 2006). The following general risk factors are under scrutiny by rating agencies:
  - *Start-up Facilities*. Start-up toll facilities are considered the most risky and therefore are very closely scrutinized.
  - *Context*. For example, accurate T&R forecasting in dense urban areas will be less reliable than a river crossing with a clear competitive advantage over limited alternatives.
  - *Established Corridors*. Traffic patterns associated with well-defined, strong radial corridors appear to be more reliable.
  - *Optimism Bias*. Travel demand forecasts prepared by project sponsors and bidders (interested parties) are generally higher than those prepared by investors and bankers; this "optimism bias" is estimated at 20% or more. More aggressive forecasts can be accepted for public-private partnerships that do not need rating.
  - *Aggregation Bias*. VOT miscalculation and improper aggregation across different income groups and travel markets is a common bias. Proper model segmentation is essential.
  - *Economic Outlook*. The economic outlook predicts the likelihood of recessions and economic downturns and their effect on toll road revenues.
  - *Land Use and Population Forecasts*. Reconsideration of population, employment, and income growth forecasts prepared by the MPO or department of transportation for the region/corridor is one of the frequent requests.
  - *Time Savings*. The rating agencies often use lower time savings assumptions or expectations than the modeled ones.
  - *Competition*. Free roads and/or transit services that serve the same markets as the toll road may develop in the future, potentially reducing the anticipated revenue.
  - *Off-Peak and Weekend Traffic*. The rating agencies often use lower off-peak and weekend traffic assumptions (40-50% of weekday) than are normally assumed (70-75% of weekday).
  - *Truck Market*. Assessment of specific risk factors for the trucking market is essential if trucks constitute a significant traffic share:
    - Less reliability should be placed on the forecast if the trucking market is composed of a large number of small, owner-driver general haulers.
    - Markets consisting of several, very large haulage companies transporting high-value or time-sensitive commodities are likely to be less volatile.

3.1.3 Model output processing requirements:

- ***Annualization*** of revenues, including assumptions on weekend and holiday revenues, seasonality, within-week variability, etc.
- ***Extrapolation of the early T&R stream.*** A very long-term forecast (40 to 50 years and longer) is needed for the financial plan. Capacity constraints and adverse effects of congestion when traffic volume approaches capacity should be taken into account.
- Detailed consideration of a ***ramp-up*** period. Various ramp-up durations are tested, depending on previous regional experience with tolls, implementation of electronic toll collection (ETC), and other factors. Long ramp-up periods are indicative of high risk projects.
- Detailed consideration of bulk discounts, person/vehicle type discounts, toll evasion (if any), and other ***revenue loss factors*** such as accidents/incidents, extreme weather, or special events, among others.
- Consideration of how toll rates escalate over time (based on Consumer Price Index, gross domestic product, and a minimum versus maximum change in rate) compared to population ***income (and VOT) growth*** over a long period of time.
- Processing of the model output in a form suitable for the subsequent analysis. It is important to ensure transparency of the results and identify key areas (origin-destination pairs, core travel markets) for which the calculations can be demonstrated for interested parties (i.e., "open the black box").

3.2 Recommended Steps for Complying with the Financial World Rules

Complying with the specific requirements of private investors and bond rating agencies requires a fundamental shift in how travel demand forecasts are prepared and presented. A review of existing models nationwide (NCHRP, 2008), as well as the tracking history of model applications and associated well-published criticism from the bond rating agencies, demonstrates the need to improve modeling tools and forecasting practice in ways that better address travel behavior decisions, and that account for uncertainty in the forecast explicitly. It should be understood that any model used for investment-grade forecasts must meet the structural requirements listed above. In terms of forecasting practice, the following areas have been identified as those that could most productively be improved:

- ***Revenue forecasts have to be presented in a probabilistic form*** (not as point estimates, as is typically done) suitable for subsequent investment risk analysis and rating. The current practice is characterized by a sequential implementation of T&R forecast followed by an independent/simplified risk analysis. A better practice would be to conduct a systematic risk analysis that is integrated with the forecasting process.
- Rating agencies and private investors consider ***stand-alone start-up projects as the most risky***, uncertain, and subject to over-optimistic modeling assumptions. It must be recognized that static validation of a transportation model for the base year does not guarantee that the model will properly respond to changing travel conditions, including those associated with a new toll road or pricing action, or the construction of a competing free roadway. Therefore, a thoughtful risk factor analysis, examining both model inputs and model parameters, must be employed.

Therefore the forecast needs to be presented as a distribution of outcomes, with associated probabilities that indicate the most and least likely outcomes. For example, instead of predicting annual average daily traffic of 10,000 vehicles per day, given certain assumptions on population growth, VOTs, travel time savings, etc., the forecast required by the financial world is an assessment of how annual average daily traffic will vary with plausible and varying scenarios of population growth, VOT, etc., along with the likelihood that any combination of the input assumptions will be realized. For example, the forecast would say that there is a 50% probability that average annual daily traffic will be between 8,000 and 13,000, a 20% probability that it will be less than 8,000 vehicles, and a 30% probability that it will be more than 13,000 vehicles.

The development of better models and a more rigorous risk assessment approach will help increase the credibility of T&R forecasts, as well as better integrate the transportation modeling culture with the culture of the investment analysis community. Procedures to integrate T&R forecasting with risk analysis for a wide range of parameters and events will be discussed in **Section 6**, along with the risk factors that have been identified in the literature.

Section 4.0: Incorporating Travel Time Reliability in Travel Demand Models

Measurement of highway time reliability and its impact on travel choices is now considered one of the most important strategic directions for travel model improvement. Several published and ongoing research projects (NCHRP 8-57, NCHRP 8-64, NCHRP Report 618, SHRP2 CO4, SHRP2 LO4) as well as FHWA guidance are devoted to reliability issues. There is a considerable body of research regarding the definition of travel time reliability, its measurement, as well as the computation and treatment of travel time reliability in modeling tools. The suggested reliability measures have been analyzed in the context of effectiveness related to transportation projects and policies, as well as the entire highway system performance. A companion paper (Paper 4) provides detailed definitions of travel time reliability and its economic impacts. This section discusses ways to incorporate reliability into travel demand models. This topic is treated more in-depth in **Technical Appendix 2**.

4.1. Measuring Highway Time Reliability

In general, there are four methodological approaches for quantifying reliability that are suggested in either research literature or already applied in operational models:

- ***(Indirect measure) Perceived highway time*** by congestion levels. This concept is based on statistical evidence that in congestion conditions, travelers perceived each minute with a certain weight (NCHRP, 1999; Axhausen et al., 2006; Levinson et al., 2004; McCormick Rankin Corporation & Parsons Brinckerhoff, 2008). Perceived highway time is not a direct measure of reliability, because only the average travel time is considered, though it is segmented by congestion levels. Perceived highway time can, however, serve as a good instrumental proxy for reliability since the perceived weight of each minute spent in congestion is a consequence of associated unreliability.
- ***(1st direct measure) Time variability (distribution)*** measures. This is considered the most practical direct approach and has received considerable attention in recent years. This approach assumes that several independent measurements of travel time are known, which allow one to create the travel time distribution and calculate some derived measures, like buffer time (Small et al., 2005; Brownstone & Small, 2005; Bogers et al., 2008). One significant technical difficulty is that even if the link-level time variations are known, it is not a trivial task to synthesize the origin/destination level time distribution (reliability "skims") because of the dependence of travel times across upstream/downstream links.
- ***(2nd direct measure) Schedule delay cost***. This approach has been adopted in academia for many research works on individual behavior (Small, 1982; NCHRP,1999). According to this concept, the direct impact of travel time unreliability is measured through cost functions (penalties expressed in monetary terms) of being late (or early) compared to the planned schedule of the activity. This approach assumes that the desired schedule is known for each person and activity in the course of the modeled period. This assumption, however, is difficult to meet in practical model settings.
- ***(3rd direct measure) Loss of activity participation utility***. This method can be thought of as a generalization of the schedule delay concept. It is assumed that each activity has a certain temporal utility profile and individuals plan their schedules to achieve maximum total utility over the modeled period (for example, day) taking into account expected (average) travel times. Then, any deviation from the expected travel time due to unreliability can be associated with a loss of participation in the

corresponding activity; or gain, if travel time proved to be shorter (Supernak, 1992; Kitamura & Supernak, 1997; Tseng & Verhoef, 2008).

A detailed analysis of all four approaches described above, with application examples, can be found in **Technical Appendix 2**. A good example of the time variability measure was presented in Small et al. (2005). In that case, the adopted quantitative measure of variability was the upper tail of the distribution of travel times, such as the difference between the 80th and 50th percentile travel times (see **Figure 4**). The authors argue that this measure is better than a symmetric standard deviation, because in most situations arriving "late" is less preferable than arriving "too early," and many regular travelers will tend to build a "safety margin" into their departure times that will leave them an acceptably small chance of arriving late (i.e., planning for the 80th percentile travel time would mean arriving late for only 20% of the trips). Reliability, as defined above, proved to be valued by travelers as highly as the median travel time.

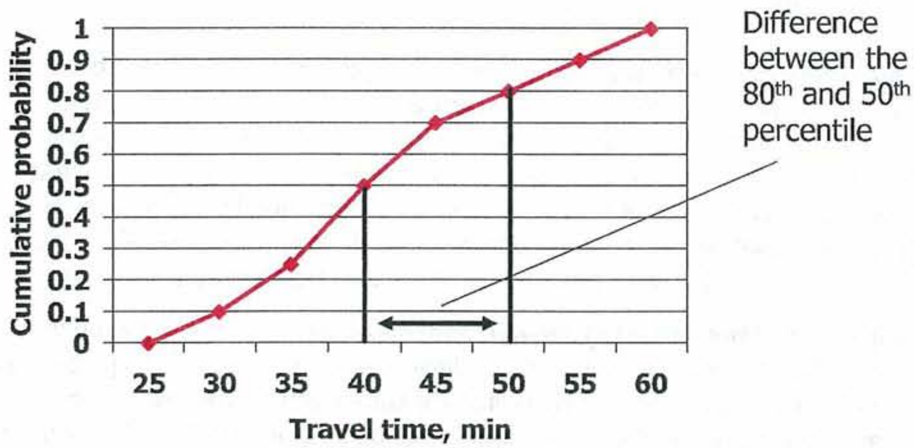

Figure 4: Travel Time Variability Measure

4.2 Including Highway Time Reliability in Operational Models

The research and practice on travel time reliability to date suggests that the best method for incorporating highway travel time reliability in operational models is perceived highway time. The concept in itself is similar to the treatment of time components for transit travel, where time waiting for a bus is perceived as more onerous than time riding in the vehicle, for example. The analogy for highway travel is that time spent in congested conditions is perceived as more onerous than time spent in free-flow traffic.

To use perceived highway time in an operational model, travel time needs to be separated into at least two components, where one measures the minimum travel time needed to reach a destination (assuming, for

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example speeds close to the speed limit), and the second measures the additional time it takes due to traffic congestion. A more fine-grained treatment would further classify congested time by level of congestion, measured, for example, by the volume-to-capacity ratio. The travel demand model would then be specified so that congested travel time is perceived as X times more inconvenient than free-flow time, where the parameter X could increase with the volume-to-capacity ratio.

If the demand model is already set up to produce free-flow travel times, then there is very little additional overhead (in terms of computation time) required to implement this method. However, depending on the number of levels used to classify the degree of congestion, run time would increase proportionally to the number of highway assignments needed to produce the various time components. There would also be demands on storage space, since additional travel time matrices will need to be saved.

Section 5.0: Uncertainty, Systematic Bias, and Risk Analysis

The evaluation of model quality and capability is directly related to the degree of accuracy and likely sources of error. This section discusses the most likely sources of risk and uncertainty and methods developed to eliminate built-in optimistic biases and produce more realistic and conservative forecasts.

5.1. Sources of Risk and Uncertainty

While significant uncertainty in traffic forecasts clearly exists, the causes of such uncertainty vary. Numerous studies have identified and examined several sources of forecast error (see for example Flyvbjerg et al., 2006 and 2006; Bain & Wilkins, 2002; George et al., 2003; and George et al., 2007). For the most part, these sources of error are similar for tolled and non tolled highways, but differences do exist. A detailed and extensive survey of literature on sources of risk and uncertainty can be found in **Technical Appendix 3**.

Overall, the top drivers of forecast failure are:

- Poorly estimated VOTs, or reliance on a single VOT (as opposed to segmenting user groups);
- Economic downturns;
- Erroneous prediction of future land use conditions;
- Lower-than-predicted time savings;
- Added competition (e.g., improvements to competing roads or the addition of new roads);
- Lower-than-anticipated truck usage;
- Tolls being set at a different level than what was assumed in the T&R model;
- High variability in traffic volumes (by time of day or by day of the year);
- Complexity of the tolling regime;
- Underestimation of the duration and severity of the ramp-up period; and
- Use of a travel demand model developed for other planning purposes.

5.2 Relevant Risk Factors for Toll Projects in Oregon

The first step in formulating a risk mitigation plan is the identification of risk factors. While a full accounting of such factors in specificity can be accomplished only on a project basis, these factors generally fall within the following groups:

- ***Population growth*** in the relevant project corridor. This growth should be compared to the observed tendencies in the past in the entire region and the corridor. If the projected growth is significantly higher than the observed trends, it should be considered as a high risk factor. Creating "optimistic" and "pessimistic" scenarios, with estimated probability of each of these to occur is recommended.
- ***Employment growth*** in the relevant project corridor. As was with population growth, realistic comparisons of employment growth to the observed trends should be made. Each case where growth rates are higher than the observed trends should be carefully substantiated; otherwise, high risk is assigned to this factor. Creating "optimistic" and "pessimistic" scenarios, along with their estimated probability to occur, is recommended.

- ***Special markets growth*** in the relevant project corridor. This factor is important when a significant share of the toll traffic consists of travel to a destination external to the model area, such as weekend/holiday travel, airport travel, and other markets that are not well captured by the regional model.
- ***Competing highway and transit projects*** in the corridor. This factor is relevant for pricing projects located in corridors where another significant and competing project may take place (including a significant improvement of the existing free road or transit service). If this is a realistic option, the competing projects should be described, coded, and included in the "pessimistic" network scenarios.
- ***Complementary (feeding) highway projects*** in the corridor and beyond. This factor is relevant for the pricing projects that are located in such a way that a substantial share of travelers might use this facility in combination with some other future projects. It specifically affects such projects and policies as HOV/HOT lanes, where the network connectivity is essential. If this is a real factor, the complementary projects should be described, coded, and included in the "optimistic" network scenarios.
- ***VOT*** estimates and the related travel time and cost coefficients used in the traffic assignment, mode choice, time-of-day choice, and other models. This factor is a fundamental behavior parameter in the travel model that always represents a source of uncertainty simply because of the randomness inherent to travel behavior. All existing Oregon models use VOT estimated from surveys dating from the mid-1990s, or borrowed from other metropolitan areas in the state, and therefore, are considered high risk. First, it should be ensured that the average VOT values applied for each segment are reasonable. A high risk is assigned to this factor if the VOT value was not estimated but rather was assumed or borrowed (SWIM), or if it was estimated by pulling data from different metropolitan regions, as is the case for various Oregon MPO models. No matter how well structured and segmented the model system is, a ±20% variation in VOT (due to situational factors alone) should be considered as the minimum level of variation. For simple models with poor segmentation, the range should be extended to at least ±40%. Variation of VOT values also incorporates uncertainty associated with real income growth, possible economic recession, and other related factors if they are not considered explicitly.
- ***Toll escalation*** scenarios that may be affected by economic conditions or government intervention. Ability to escalate tolls over years represents a risk factor even if the toll escalation strategy is well defined in the contract between the toll road operator and the government. Normally, it is assumed that the toll rates will automatically grow every year with the gross domestic product, the Consumer Price Index, or other index (with some "floor" and "ceiling" thresholds). In reality, tolls might be frozen for several years and reconsidered only intermittently. A sensitivity test with tolls updated only every 10 years is recommended.
- ***Ramp-up period***, especially for start-up projects and policies, represents a risk factor that can significantly affect the revenue stream for the most precious first years of the project that are the least discounted. It is recommended, depending on the project type, to establish a realistic ramp-up period, and then run a sensitivity test with a longer (at least two more years) ramp-up period. As discussed above, longer ramp-up behaviors are expected in regions where tolling is not ubiquitous, as is the case anywhere in Oregon. These situations are the most risky and have historically resulted in the largest toll traffic and revenue over-predictions.

5.3 Risk Analysis Methods

Several risk analysis methods have been proposed, and are discussed in detailed in **Technical Appendix 3**. The method described here combines the ability to measure the effect of individual factors and combinations of factors in a timely fashion. Timeliness is important, given the need to run the model multiple times to assess all the different effects within the typical timeframe of a feasibility study.

First, the risk factors should be identified and then measured on a one-at-a-time basis. For each of the factors, at least three possible scenarios, or states, should be defined, and probabilities assigned to them: optimistic, average, and pessimistic. The optimistic and pessimistic scenarios do not have to be the best and worst possible scenario, respectively. The absolutely worst and absolutely best scenarios are not extremely informative for the risk analysis, because they are normally characterized with a very low probability of occurring. Optimistic and pessimistic scenarios should rather capture an average of the region that yields approximately one-third in probabilistic terms. With respect to the model parameters, the average scenario should correspond to the model calibrated for the base year with a good level of fidelity.

Then, depending on the number of risk factors and the model run time, two strategies can be applied to assess the effect of likely combinations of factors on toll revenue and its associated probability:

- Run the model for ***each possible combination*** of the input factors and relate the results (T&R forecast) to the joint probability of the scenario to happen. The joint probability can be calculated as the product of assigned probabilities for each factor (assuming the factors are independent; otherwise a more complicated conditional calculation is needed). This method is a theoretically preferable, but it may result in an infeasible number of scenarios to test. For example, with five factors and three possible states (optimistic, average, and pessimistic) for each of them, the total number of scenarios to test will be $3^5 = 243$.

- Run the model for ***several combinations*** of the input factors and use auxiliary regression for interpolation of the results for the other (nonmodeled) combinations, as described above. It is important for each particular factor state to appear at least once in the modeled combinations. For example, with the same example of five factors (denoted as A, B, C, D, and E) and three possible states for each of them (denoted as 1=optimistic, 2=average, 3=pessimistic), the total number of scenarios to explore will be 5×3=15. All these scenarios can be covered in three model runs with the following combinatorial logic. The first run would combine A1, B2, C3, D1, E2; the second run would combine A2, B3, C1, D2, E3; the third run would combine A3, B1, C2, D3, E1. These three runs would normally provide enough information about possible interactions between the risk factors versus the base scenario of A2, B2, C2, D2, E2. In order to provide more variation for the auxiliary regression, the base run and three runs described above could be complemented by two extreme runs – optimistic (A1, B1, C1, D1, E1) and pessimistic (A3, B3, C3, D3, E3). The six combinations described above are normally enough to approximate all of the possible 243 combinations.

Section 6.0: Evaluation of Modeling Capability

6.1 Capability of Oregon's Travel Models to Analyze Tolling Projects

Our assessment of the capability of Oregon's models to adequately forecast toll traffic and revenue focuses on the structural characteristics of the models, more so than meeting specific requirements related to how the model is applied. The treatment of risk, for example, is largely a function of how the model is run - identification of risk factors, selection of risk scenarios, etc. An assessment of specific model run procedures can only be conducted on a project-by-project basis.

In terms of model structure, there are two considerations. The first is whether the model, as is, has the necessary characteristics in terms of modeled decisions and market segmentation, and whether it meets the requirements for the preparation of investment-grade forecasts. The second consideration is whether, in the absence of the first set of characteristics, the models could be improved to handle tolling applications without undertaking a large model development effort.

As currently designed and implemented, only SWIM and the Portland Metro model are configured to handle tolls. Both of these models have well-developed mode choice models, which are critical for the creation of generalized costs. Neither SWIM or Portland Metro, however, include a pre-route choice model. The choice of whether to use a toll road or not is left up to the network simulation. This considerably limits the simulation of diversion behavior at the route level, because the static assignment procedures represent the time/cost tradeoff only in a rather crude way, and completely ignore other factors known to influence the toll choice.

SWIM includes all the relevant first-order decisions, route choice (assignment level only) and time-of-day choice, and many of the relevant second-order decisions, including feedback to changes in land use due to its seamless integration with economic/spatial models. Due to its disaggregate nature, SWIM lends itself also to a more accurate representation of travelers' characteristics than is possible with a trip-based model. For example, a continuous distribution of VOTs could be used, instead of segmenting the population into three groups, each with its own VOT.

The Portland Metro model includes only one first order decision, route choice, though handled in the assignment process instead of as a discrete choice. The Metro time-of-day model is not sensitive to tolls or travel times. Time of day models based on invariant diurnal factors are the norm among state-of-the-practice MPO models. However the state-of-the-art has progressed enough that time-of-day models sensitive to level of service can be implemented in practical models. The Metro model is also capable of forecasting changes in trip destination due to tolls, an important second-order effect.

The other MPO models are not currently configured to handle tolls. However, their structure and implementation allows for the introduction of tolls in the trip distribution, mode choice, and highway assignment steps with a relatively modest effort. The only exception may be the Eugene-Springfield model, because of its use of the gravity model for trip distribution. Before this model could be used to evaluate tolls, development of a destination choice model to replace the gravity model would be highly desirable.

In terms of market segmentation, we find again that SWIM and the Portland Metro model already use the minimum recommended segmentation of the travel market by time of day, trip purpose, and income levels. However, in both models the VOTs that are currently specified do not distinguish between these various segments. For example, in the Metro model, home-based shopping, recreation, and other trips all share the same VOT, even though separate trip tables are generated at the distribution level. We also find that the VOTs are relatively low, which tends to make the models overly sensitive to cost. It is highly recommended that these VOTs be revised based on current, locally gathered data.

The models for the smaller MPOs use more aggregate market segmentation than SWIM or Portland Metro. For example, in the MPO models the nonwork purposes may not be segmented by income level. None of the models exhibit VOTs that vary by time of day. Again, this structure reflects the general state of the practice nationwide, but more disaggregate representation of the toll markets is essential for toll applications.

All of the models under study suffer from relatively aggregate representation of market segments at the highway assignment (route choice) step. The extent of this aggregation varies from a single vehicle class (in the case of the Medford, Corvallis, and Bend models) to five vehicle classes in the statewide model. Where segmentation is present, it is typically along vehicle type (autos versus trucks), which correlates with VOT only to some degree. This limited segmentation almost ensures a large degree of aggregation bias in the forecasts, because the number of classes currently available may not be sufficient to model both the full toll regime and differences in VOT.

We find, in summary, that all of Oregon's MPO models are state-of-the-practice models, when compared to models for metropolitan regions of similar size. SWIM goes beyond the state of the practice; it is in fact among the most advanced integrated land use/transport models worldwide, and incorporates many of the characteristics recommended for practical, advanced activity based models. Nonetheless, given the specific requirements placed upon travel demand models by the financial community, and recent advances in bringing travel behavior research into practice, there are several areas where the statewide and MPO models could be and should be improved before they are used to forecast toll traffic and revenue.

6.2 Recommended Travel Demand Model Improvements

Recommended model improvements are classified into those that would be required for any type of tolling study and those that would be desirable for specific types of studies, in reference to the requirements for the types of pricing applications shown in **Table 5**. It is understood that the project-specific improvements would be in addition to the general model improvements, unless otherwise indicated. Given the similarities between the various models, the various improvements are described together, rather than model by model. **Table 6** indicates the recommended improvements for each model. In this table, the number indicates the level of priority (1 being the highest priority) for making the improvement, while a check mark indicates that the model already incorporates the corresponding feature.

6.2.1 Recommended improvements for all types of tolling applications:

- ***Pre-route choice***. A pre-route choice model provides the ability to include attributes other than time and cost in the decision of whether to use a toll road or a free road. In many instances, a bias constant in pre-route choice may be used instead of explicitly modeling travel time reliability. The importance attached to this modeling improvement is largely project-specific: It is critical when there is a real choice between a free road and a toll road, but considerably less critical when all likely routes are tolled. This model improvement is essential for all the types of tolling applications being considered for Oregon, with the possible exception of mileage-based and area-wide pricing.

- ***Additional mode choice segmentation***. It is highly desirable to consider the following purposes separately, with purpose-specific VOTs: home-based work, home-based school, home-based shop, home-based recreation, home-based other, non-home-based work and non-home-based other. Aggregation into fewer purposes would ideally be guided by model estimation analysis. In addition, it is highly desirable to segment the travel market for each purpose by income group. This recommendation applies primarily to the small MPO models.

- ***Distributed VOTs***. One significant advantage of the SWIM model is that it has the ability to vary VOT per person, as opposed to per travel market. Rather than assign VOT to each market, one can assign a VOT to each person, drawn from a distribution of VOTs. This feature has the potential to greatly reduce aggregation bias. The VOT distributions can be estimated from stated preference (SP) data, and would be conditional on trip purpose and income group, among other possible factors.

- ***Additional vehicle class segmentation***. The designation of vehicle classes for highway assignment should be guided by differences in VOT and differences in (potential) toll fees, rather than simply by vehicle type (i.e., autos or trucks). All of the models reviewed here could be improved by the implementation of a well-designed vehicle class segmentation.

- ***Model estimation***. Most of the current models were originally estimated with home interview data collected in the period of 1994 through 1996. Other models use parameters that were transferred from other metropolitan areas. Over the last 15 years, various model components and procedures have been updated, but VOT parameters have remained unchanged from their original estimation. Estimation that is based on more recent survey data would help update the VOTs to account for real income growth over the last 15 years. It would also be an opportunity to explore differences in VOT among the various metropolitan areas in the state and to better segment the travel market.

- ***Speed validation***. In addition to traffic volume validation, it is highly desirable to validate the model's estimated speeds to observed speeds. Depending on the results of this validation, the volume-delay functions may need to be updated to better reflect congestion levels. Portland Metro has conducted speed studies and developed its volume-delay functions based on these data. A similar level of speed validation is desirable for SWIM and the small MPO models.

- ***Model validation***. The level of model validation typical for regional models may be insufficient for tolling applications, particularly for the specific facility, corridor, or subarea under study. Therefore a critical step before initiating a road pricing or traffic and revenue study is ensuring that the model is well-validated at a geographic scale commensurate with the scale of the project. The validation should not be limited to a comparison of model output to daily traffic volumes, as is customary, but extended to examine how well the model reproduces diurnal traffic patterns. Another important validation criteria is establishing that the model adequately captures the major travel markets in the project influence area. Sensitivity tests are often also used to ensure that the model responds adequately to changes in tolls and corresponding changes in other level of service attributes.

- ***Incorporation of travel time reliability***. A practical method for incorporating travel time reliability has been proposed (see **Section 4**). This method relies on estimates of congested travel time, and therefore, a first step would be to ensure that the model adequately reproduces observed volume-to-capacity ratios.

- ***Time-of-day choice model***. A time-of-day choice model that is sensitive to tolls and levels of service is highly desirable for projects that consider variable time-of-day tolls. Scheduling models similar to the one implemented in SWIM can be adapted for trip-based models. This method estimates time-of-day choice in one-hour increments, and therefore would also serve as a peak spreading model. A time-of-day choice model could be estimated with revealed preference (RP) data, or a combination of RP and SP data. Depending on where in the model chain this model is placed, it may be necessary to restructure the trip distribution model.

- ***Assignment periods***. While the standard four periods (AM Peak, Midday, PM Peak, and Night) are typically sufficient for most planning applications, a more fine-grained segmentation of time periods for the assignment process may be needed in order to study peak spreading and time-of-day effects due to tolls. The additional information to be gained from increasing the number of assignment periods needs to be weighed against the additional model run time that would result. It should be noted that recent advances in computing procedures allow to distribute a single model run across several processors, significantly reducing model run times.

- ***Trip distribution segmentation***. It would be desirable, though not critical, to segment the trip distribution models by time of day, for example peak versus off-peak trips. Alternatively, rather than using "blended" multimodal accessibilities (peak and off-peak combined into a single accessibility measure), the models could be based on "representative" multi-modal accessibilites (separate peak and off-peak accessibilities), with parameters derived through model estimation.

6.2.2 Recommended improvements for congestion/area pricing and mileage-based projects:

- ***Flexible trip generation***. An important response to cordon/area pricing and ubiquitous mileage-based fees is the trip suppression effect, that is, forgoing to make a trip altogether. In order to measure this effect, the trip generation model needs to be sensitive to levels of accessibility. Currently SWIM is the only model with a flexible trip generation component, though its sensitivity is limited to home-to-work travel time.

- ***Integrated land use model***. One likely response to cordon/area pricing schemes is for businesses to locate outside of the priced area. These effects are best captured with an integrated spatial or land use model. In the Metro region, these effects could potentially be modeled using Metroscope, the spatial economic model currently in use for Portland. At the statewide level, SWIM already provides this functionality. For the other MPOs, these effects can be modeled with the Land Use Scenario

Developer (LUSDR), a land use model developed by Oregon DOT (Gregor, 2007). LUSDR uses transportation accessibility measures obtained from travel demand models, and in turn provides estimates of household and employment at the TAZ level that can be fed back into the transport models. LUSDR can be coupled with any of the MPO models so that it would essentially function as an integrated land use / transport model.

6.2.3 Recommended improvements for HOT lane projects:

- ***Car occupancy segmentation***. Explicit treatment of the costs incurred as a function of the number of vehicle passengers becomes critical if the toll regime differentiates by occupancy levels, as is typically the case for HOT lanes (as well as for projects in which carpools are allowed to bypass toll plazas). Both the mode choice and the highway assignment models would need to be segmented by occupancy levels.

- ***Joint household travel***. A potential improvement for the statewide model would be to explicitly consider joint household travel. It has been shown that most carpools involve members of the same household, and that many carpooling instances are due to the need to serve passengers (such as taking a child to school or a spouse to work), and therefore involve substantial activity coordination among household members. This type of improvement is beyond the scope of a trip-based model; at most household size could be used to explain the likelihood of carpooling, as is done in the Metro model.

6.2.4 Recommended improvements for evaluating complementary transit and/or parking policies:

- ***Corridor-level transit validation***. The specific structural components for evaluating complementary transit services as part of a tolling project are already in place in all Oregon models. However, additional data and effort is likely needed to achieve a rigorous corridor-level transit validation.

- ***Parking costs and parking choice***. Additional attention would be needed to ensure that parking costs are adequately represented in the model. The model would need to include differentiation of daily and hour rates by zone, mode and destination choice models sensitive to parking costs, and, in the case of SWIM, possible segmentation of the model by free or discounted parking eligibility. A more advanced treatment, which can be left for the final stages of project development, would be the development of a parking location choice model that could explicitly account for lot capacity constraints and trade-offs between parking downtown, parking at the city boundary (for free), and commuting into the city by transit.

Table 6 – Recommended Oregon Model Improvements

Model Improvement	Priority Level *		
	SWIM	Portland Metro	Other MPO
All pricing studies			
Pre-route choice	1	1	1
Additional mode choice segmentation	✔	✔	1
Distributed VOTs	2		
Additional vehicle class segmentation	1	1	1
Model re-estimation	2	2	2
Speed validation	1	✔	1
Travel time reliability	4	4	4
Time-of-day choice	✔	3	3
Additional assignment period segmentation	3	3	3
Trip distribution segmentation	✔	3	3
Detailed model validation (project-specific)	1	1	1
Cordon/area pricing and mileage-based tolls			
Flexible trip generation	1	1	1
Integrated land use model	✔	✔	1
HOT lanes			
Car occupancy segmentation	1	1	1
Joint household travel	4		
Pricing with complementary transit and/or parking policies			
Corridor-level transit validation	1	1	1
Parking costs and parking choice	3	3	3

(*) Level 1 indicates the highest priority for model improvement. A check mark indicates an already existing model feature.

Section 7.0: Recommended Data Collection Efforts

7.1 Overview of Data Collection Techniques for Highway Pricing Studies

One of the major factors affecting model accuracy relates to the quality of the data used in model estimation, calibration, and validation. Tremendous progress has been made in recent years with respect to data collection technology and new types of surveys, to the point that it is cost-effective to consider such data collection efforts. This section will discuss the advantages of complementing traditional data sources (home interview surveys and annual average daily traffic counts) with sources that better target potential toll customers. These sources include GPS-assisted surveys, information available from electronic toll collection systems, combined revealed and stated preference surveys, and traffic choices experiments (like the one recently implemented in Seattle as part of the Traffic Choices Study). Techniques that significantly improve the quality and comprehensiveness of the data will improve the accuracy of the travel model.

The following major types of surveys are applied to support pricing studies and models developed for these studies:

- Travel Pattern Surveys (Revealed Preferences, or RP) including:
  - Household-Based Travel/Activity Surveys,
  - Origin-Destination Surveys on specific facilities and existing toll roads,
- Stated Preference (SP) Surveys that vary significantly across the following dimensions:
  - Choice Dimensions and Scenario Design,
  - Trip Attributes Relevant for Pricing Studies,
  - Choice Context,
  - Instrument Design,
  - Sampling,
- Special Survey Types including:
  - Surveys of Commercial Vehicles,
  - Behavioral Experiments and Follow-up Surveys,
  - Attitudinal/Public Opinion Surveys

7.1.1 Travel Pattern Surveys:

A comprehensive ***Household Travel Survey*** is generally needed to develop a regional transportation model that can serve as the source for VOT and other relevant model parameter estimates. However, there is a growing recognition that the household survey data must be supported by complementary, project-specific RP and/or SP surveys. These project-specific surveys are especially crucial for start-up projects in regions with no previous experience with highway pricing, where the RP survey cannot provide direct information about behavior under pricing conditions. SP surveys are typically designed to address willingness-to-pay factors relevant for road pricing (VOT savings, value of reliability) and are used to supplement the RP data. Survey data collection can also support other model development data needs, including HOV/HOT lane usage and payment media choice.

GPS-based supplements are included with some household surveys and these provide detailed route information for all recorded trips. Either vehicle-based or person-based GPS data collection can be used, but vehicle-based GPS data collection is generally more useful for collecting route information, assuming that tracking routes for transit and pedestrian/bicycle alternatives is not necessary.

Surveys that collect information about ***origins, destinations,*** and other details have been widely used to determine the characteristics of trips that are observed at selected locations (Hagen, 2006). These types of surveys are particularly useful for characterizing the trips that currently travel in particular corridors that are, or might be, served by a toll facility and the trips that cross into or out from a cordon that might be subjected to area pricing. This type of focused information is especially useful in estimating the numbers and types of trips that might be affected by facility or area pricing. Although regional travel forecasting models can also be used to provide this information synthetically, those models are typically not refined sufficiently to estimate these details as precisely as can be done with an origin-destination survey. Also, as the experience of several recent origin-destination surveys have shown, ETC registration can allow access to the current toll facility users, thus making sampling strategy, questionnaire distribution, and post-survey development of expansion factors easier and more accurate.

There are several objective ***limitations associated with RP surveys***:

- First and foremost, they are not applicable for model estimation/calibration in new corridors located in regions where there are no current toll facilities.
- Another associated problem is that with the survey of existing toll facility users, a very specific choice-based sample is created, because it can be difficult to define and access nontoll users.
- It is difficult to collect data associated with time-of-day choice because generally only a single trip is observed and surveyed; otherwise the origin-destination survey would need to be extended into a Household/Person Interview Survey.
- With RP surveys, it is also difficult to support data that is necessary for measurement of travel time reliability and estimation of its impact on traveler's choices.
- Lastly, RP surveys are not very helpful for understanding and modeling mid-term choice, such as transponder acquisition.

7.1.2 Stated Preference Surveys:

For more than 20 years, ***Stated Preference*** surveys have been used to estimate values of travel time and other parameters related to the effects of tolls and road pricing (see, for example, Adler and Schaevitz, 1989). SP surveys include a set of hypothetical scenarios in which conditions (e.g., travel times, tolls) are varied and respondents are asked to indicate what they would most likely choose under those specified conditions. The conditions are varied according to an experimental plan that optimizes the information about the respondents' preferences that each scenario provides.

SP surveys are especially useful in applications in which an alternative, such as a toll facility, does not currently exist but is being planned for the future. In those types of applications, RP surveys are not useful for estimating price effects because road prices, which are the variables of interest, do not vary across trips within the region. While other cost elements such as operating costs do vary across trips, those variations are highly correlated with trip lengths and travel times and thus generally do not provide reliable indications of the effects of price on travel choices.

With respect to ***choice dimensions***, the SP surveys that have been conducted to support road pricing projects have most often focused on the choice between tolled and toll-free routes. For conventional toll facility studies, these surveys would typically present two alternatives; a toll-free route with a given travel time and an alternative tolled route with a lower travel time and a toll at some level. However, many road pricing projects involve more complex effects beyond simply influencing route choice. Some projects, such as HOT lanes, affect occupancy and mode. Therefore, the stated preference scenarios should include other modes and occupancy levels as available choice alternatives. For projects that have time-varying prices, different travel periods should be included among the stated preference alternatives. For area pricing projects, the scenarios could allow alternative destinations. In some special cases, effects on trip frequency also may be included in the SP experiments.

Travel times and toll prices are the primary ***attributes*** in most road pricing SP experiments. However, there are other attributes that may also be significant in travelers' choices in the presence of road pricing. Some of the other attributes or features that have been tested in SP experiments for road pricing projects include:

- Travel time components – time in free-flow conditions and time in congested traffic;
- Travel time reliability;
- Occupancy-based toll levels;
- Fair lanes policy;
- Commercial vehicle restrictions;
- ETC discounts;
- Travel time variability;
- Driving distance along the route; and
- Nontoll "running" costs.

Recent advances in SP survey design and technology have made this tool significantly more attractive and practical, particularly in the following respects:

- Computer-based SP surveys customize choice experiments around specific contexts (choice of toll road/lanes versus non toll road/lanes, choice between toll road and transit, switching to other time-of-day periods in presence of congestion pricing, etc).
- The SP framework is extremely convenient for multiple/repeated experiments with the same person that can be effectively employed for screening inherent randomness in travelers' preferences.
- The SP framework is convenient for estimation of value of reliability (VOR), along with VOT and other possible impacts.
- SP allows for more efficient experimental design with multiple alternatives, while the RP sample structure is bound to the observed frequencies of different alternatives.
- SP surveys can be designed to include transponder acquisition in the model's choice hierarchy.
- SP surveys are an effective tool in capturing different price perceptions, for example, ETC users versus cash users.

SP surveys have their own limitations. Incorporating all relevant choices leads to complex designs that may confuse respondents. Thus, an SP survey is only effective as a focused tool. SP surveys also have inherent strategic biases. For these reasons, the most promising direction for model estimation is to use a combination of SP and RP surveys that allows for elimination of strategic biases by statistical scaling procedures.

7.2 Recommended Data Collection Program for Model Improvement in Oregon

Together, the several survey and data collection methods described above constitute a suite of options that can be used to support the analysis of road pricing programs. The decision about which of these methods to employ depends on several factors, including the stage of decision-making that the analysis must support, the types of data and models available for use and, of course, the schedule and budget for the work. **Table 7** below provides some general guidelines for the types of data that might be used to support the different stages of project development. In this table, the large check marks represent items that are generally required in some form to support the stage, and the small check marks represent items that may be appropriate depending on the project importance and complexity.

Table 7: Highway Pricing Survey and Data Collection Needs

Project Stage	Survey Type					
	Household Interview	Origin-Destination	Stated Preference	Opinion	Highway Speed	Traffic Counts
Exploratory screening	✔					✔
Preliminary feasibility	✔	✓	✓	✓		✔
Feasibility evaluation	✔	✔	✓	✓	✔	✔
Investment Grade	✔	✔	✔	✓	✔	✔

✔ *represents surveys required to support a given project stage;* ✓ *represents optional surveys.*

Specifically for Oregon, the recommended data collection program would include the following:

- ***Home interview survey***. The most critical need to improve Oregon's models is an update of the home interview survey; the last one was conducted in the mid-1990s. A statewide survey is, in fact, already in the planning stages and nearing implementation. The survey should be used to update all the MPO models and the statewide model, and to explore additional market segmentation opportunities.

- ***Traffic counts***. The need for up-to-date traffic counts is ongoing. All MPOs have traffic count programs in place, and they are expected to continue gathering these data on a continuous basis. One possible improvement would be to report observed vehicle volumes by time of day, and then validate the models separately for each time period. The Portland Metro model already performs time-of-day validations. For the other MPOs, the additional effort for gathering these data needs to be weighed against the potential uses of their models. To the extent that the evaluation of tolling projects, and in particular variable time-of-day tolls, is a realistic application, serious consideration

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should be given to time-of-day highway validation. The trafic count database will need to include weekend data to support the prediction of weekend toll road usage, if weekend forecasts are desired.

- ***Stated preference survey***. Given the absence of toll facilities in the state, which precludes directly observing how motorists respond to tolls, the need for SP surveys before starting preliminary feasibility studies of tolling projects is paramount. An SP survey would directly measure willingness to pay for tolls and identify markets and conditions under which tolling would be most successful.

- ***Special market surveys***. More specific surveys, addressing special markets (visitor travel, truck travel) would need to be considered on a project-by-project basis.

- ***Speed studies***. Speed studies are highly desirable to ensure that the model is adequately reproducing observed speeds. While a region-wide speed study effort may not be practical, at a minimum corridor-level speeds should be gathered as part of a tolling project, assuming, of course, that the facility already exists.

Section 8.0: Conclusions and Overall Recommendations for Model Applications

We find that all of Oregon's MPO models meet state-of-the-practice modeling standards, when compared to models for metropolitan regions of similar size. The Portland Metro model goes a step beyond the state-of-the-practice, by including advanced modeling features. SWIM is in a category all by itself; it is in fact among the most advanced integrated land use/transport models worldwide, and incorporates many of the characteristics recommended for practical, advanced activity based models. None of these models, however, was specifically developed for evaluating tolling applications, and therefore all of them lack to varying degree one or more of the essential modeling features described in this paper. Furthermore, given the requirements placed upon travel demand models by the financial community, and recent advances in bringing travel behavior research into practice, Oregon statewide and MPO models could and should be improved prior to using them to forecast toll traffic and revenue.

Equally as important as the improvement of the models in and of themselves is the undertaking of a fundamental shift in how models are used to produce toll traffic and revenue forecasts. A thorough analysis of the risks associated with the forecast needs to become an integral part of the forecasting process. Typical risks associated with toll projects are related to the model itself, to the model input data, and to specific circumstances associated with particular projects.

The development of better models and a more rigorous risk assessment approach will help increase the credibility of toll traffic and revenue forecasts, as well as better integrate the transportation modeling culture with the culture of the investment analysis community.

Overall recommendations for model and forecasting practice improvement cut across all of the state's models, at the MPO and statewide level. Given the disaggregate, probabilistic nature of the statewide model, there are opportunities to take advantage of it to better reflect recent advances in research related to travel behavior under pricing conditions, time-of-day choice, and travel time reliability. Our recommendations, which are detailed throughout the paper, fall into the following groups:

Improvement of the model structure and its parameters. This improvement includes better representation of first-order behavioral responses (route choice and time-of-day choice) and of the relevant second-order responses, which may vary depending on the tolling application. Re-estimation of the mode choice models is a critical need.

Improved market segmentation. Minimization of aggregation biases should be a driving concern. Additional segmentation, at the mode choice and route choice levels, and for the statewide and MPO models, is highly recommended.

Improvement of the model validation, particularly at the corridor level. We highly recommend that any toll application study begin with a thorough review of how well the model estimates traffic flows (and possibly also transit ridership) in the corridor of interest. While all models are validated at a region-wide level, corridor-specific biases need to be addressed.

Implementation of a data collection program to support model improvements.

Identification and systematic analysis of risk factors, related to the model, the model's inputs, and the project. Several risk factors have already been identified in the literature. A comprehensive list of the most likely risks can only be prepared on a project-by-project basis. Risk analysis adds a layer of complexity to the forecasting process, but it is not beyond the modeling resources already available at the state and MPO levels. We specifically propose a method that would help to eliminate built-in optimistic biases and produce reliable and conservative forecasts.

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Tolling White Paper 3

Travel Demand Model Sufficiency

Technical Appendices:

Appendix 1 - Representation of Travel Costs in Travel Demand and Network Simulation Models

Appendix 2 - Incorporating Travel Time Reliability in Travel Demand Models

Appendix 3 - Methods to Evaluate Uncertainty, Systematic Biases and Risk Associated with Pricing Projects

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Appendix 1: Representation of Travel Costs in Travel Demand and Network Simulation Models

Before examining the impact of tolling or pricing on travel decisions, it is necessary to model a representation of the total cost of going from one place to another. Highway pricing should be first incorporated in network assignments using generalized cost functions. Then, through generated travel time and cost origin-destination matrices (i.e., "skims"), pricing will affect all other choice dimensions, specifically mode choice, time-of-day choice, trip/tour distribution, and other upper level choices. This appendix provides detail on how various components of travel costs are formulated in travel demand and network simulation models.

1.1 Representation of Generalized Costs in Highway Assignment and Route Choice

In highway assignment generalized cost is defined for each network link and further calculated for each origin-destination pair. Generalized cost consists of two cost elements: travel time and out-of-pocket cost. Typically the out-of-pocket cost consists only of tolls, but it may also include a portion of vehicle operating costs (that typically vary with the distance traveled) and other monetary costs, if pertinent. The generalized cost function can be written in the following general way:

$$G_k = a_k \times T_k + b_k \times C_k \qquad (1)$$

where:

k	=	vehicle class, typically defined by vehicle types (auto, truck) and auto occupancy,
T_k	=	travel time,
C_k	=	travel cost,
a_k	=	travel time coefficient,
b_k	=	travel cost coefficient.

The marginal rate of substitution between time and money (in this case the ratio of the travel time to cost coefficients, a_k / b_k), is the value of time (VOT). The time and cost coefficients could be obtained from the estimation of a route choice model; for example a binary toll/no-toll choice embedded in a nested mode choice model. Another critical consideration is the definition of the vehicle classes. There should be enough classes to keep aggregation bias to a minimum, yet not so many as to negatively impact model run times in a significant way. For highway tolling and pricing projects the vehicle classes should comprehend vehicle type (private auto, light truck, heavy truck, taxi, etc.), and auto occupancy classes (single occupant, two person carpool, three person carpool, etc.) for the following reasons:

- Different vehicle types and occupancy classes may have very different ***values of time (VOTs)***. For example, commercial trucks tend to exhibit higher VOTs than personal vehicles.

- ***Toll rates might be differentiated*** by vehicle types and/or occupancy classes, for example, such as when a high occupancy toll (HOT) lane allows three-person carpools to travel for free, allows two-person carpools to pay half of the toll, and single occupant vehicles pay a full toll.
- General ***prohibitions and eligibility*** rules can be applied for certain vehicle types on certain facilities (for example, trucks prohibited on expressways or truck-only toll (TOT) lanes) or auto occupancy classes (for example, HOT lanes).

In order to satisfy all these conditions, traffic assignment should be implemented as a multi-class procedure with 6 to 12 or even more classes, depending on the model structure. While this is a certain complication, it is essential for proper modeling of all related choices. If different vehicle types and auto occupation classes are mixed together (with some average VOT) it is not only a source of bias in the route choice, but it will also distort mode choice, time-of-day choice, and all other choices that rely on the skimmed level-of-service (LOS) variables.

Equation 1 corresponds to the general expression of ***highway utility*** in its most common form. This expression constitutes a key component in all travel choice models. In the context of traffic assignment when choice is modeled between alternative routes, the travel time coefficient is normally set to 1.0. This convention does not affect the all-or-nothing choice embedded in the conventional Static User Equilibrium assignment[1]. With this simplification, the highway generalized cost function can be written in the following way:

$$G_k = T_k + b_k \times C_k = T_k + \frac{1}{VOT_k} \times C_k \qquad (2)$$

While the all-or-nothing route choice embedded in the conventional assignment procedure is frequently applied in practice to distinguish between free and tolled routes, it has been recognized that this is not an adequate tool in itself, because highway utility is not a simple linear combination of time and cost. In particular, toll roads or managed lanes represent a more attractive option than free roads because of their enhanced reliability and other considerations that are not directly measured by average time and cost. Explicit inclusion of travel time reliability in the highway generalized cost function represents a technical challenge; possible ways to accomplish this are discussed in **Appendix 3**. A simpler but useful (and common) approach is to estimate an additional ***bias constant associated with priced facilities***. This bias can be most effectively incorporated in a binary choice model frequently referred to as pre-route choice, and placed between mode choice and route choice. It can also be included as the lower-level sub-nest in the mode choice nested structure. An additional argument is favor of this binary choice model is that its probabilistic nature helps to avoid the "lumpiness" of all-or-nothing assignment associated with unstable routes.

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[1] Stochastic assignment methods are sensitive to the values of both time and cost parameters, and therefore when using these assignment methods the time coefficient should not be arbitrarily set to any value. The values of these coefficients are instead determined by statistical estimation based on observed data.

With the addition of the toll bias constant, the highway generalized cost function can be written in the following way, where γ_k represents the toll bias:

$$G_k = \begin{cases} a_k \times T_k^{free}, & if \quad C_k = 0 \\ \gamma_k + a_k \times T_k^{toll} + b_k \times C_k, & if \quad C_k > 0 \end{cases} \quad (3)$$

Since in a discrete choice framework only the difference between utilities matters, the expressions in **Equation 3** can be rewritten in terms of ***relative travel time savings*** where the generalized cost of the free route is set to zero, as a reference point:

$$G_k = \begin{cases} 0 & if \quad C_k = 0 \\ \gamma_k + a_k \times \left(T_k^{toll} - T_k^{free}\right) + b_k \times C_k, & if \quad C_k > 0 \end{cases} \quad (4)$$

Equation 4 constitutes the essence of many models applied in practice for T&R forecasting. This cost function can be modified in several different ways, oftentimes to overcome the limitation of assuming a linear disutility with respect to time and/or cost. One alternative non-linear specification, adopted for many pricing studies in Texas and Colorado, takes the following form (Wilbur Smith Associates, 2001; Vollmer Associates, 2001):

$$G_k = \begin{cases} 0 & if \quad C_k = 0 \\ \gamma_k + a_k \times \ln\left(1 + T_k^{toll} - T_k^{free}\right) + b_k \times (C_k)^2, & if \quad C_k > 0 \end{cases} \quad (5)$$

1.2 Representation of Generalized Costs in Mode Choice

The generalization of Equation 4 for ***mode choice*** is achieved by including the generalized highway cost in the mode choice utility for highway modes, as follows:

$$U_m^p = \gamma_m^p + a_m^p \times T_m + b_m^p \times C_m + \sum_v \lambda_{vm}^p S_v, \quad (6)$$

where:

m	=	mode (including auto occupancy classes),
p	=	travel purpose (work, school, shopping, etc) and other possible segments,
v	=	person, household, and zonal variables,
T_m	=	travel time by mode,
C_m	=	travel cost by mode,
S_v	=	values of the person, household, and zonal variables,
γ_m^p	=	mode-specific constant for each purpose/segment,
a_m^p	=	coefficient for travel time by mode and purpose/segment,

b_m^p = coefficient for travel cost by mode and purpose/segment,

a_m^p / b_m^p = VOT,

λ_{vm}^p = coefficients for person, household, and zonal variables for each mode by purpose.

The most frequently used person, household, and zonal variables in 4-step models include income, car ownership, household size and urban density. In research works, AB models and a few advanced trip-based models (such as Portland Metro), the set of explanatory variables and also possible dimensions for segmentation has been significantly extended, and may include gender, age, worker status, electronic vs. manual toll collection, and accessibility to mixed or retail land uses, among others. Travel time and cost variables in themselves include many components. In particular, for auto modes, travel time can include parking search and parking time as well as additional time for collecting and dropping-off passengers (for carpool modes) while travel cost can include toll, parking cost, and vehicle operating cost (fuel and some fraction of maintenance cost that depends on the mileage).

An important issue that is difficult to fully resolve in practice relates to maintaining ***consistency*** between the ***segmentation applied in traffic assignment*** (vehicle and occupancy classes k) and the ***segmentation applied in the mode choice model*** (modes m and purposes/segments p). While it is comparatively straightforward to use the same auto modes (occupancy classes) in both procedures, the additional segmentation by travel purpose, income group, and other possible dimensions pertinent to mode choice is difficult to preserve in the assignment procedure since it would result in an infeasible number of vehicle classes. Possible reasonable compromises are discussed below.

Table 1 illustrates an ideal segmentation structure that maintains consistency across the mode choice and assignment model components. The VOT estimates shown for each segment are meant primarily to illustrate approximate relative differences observed among these segments. The market segmentation shown in Table 1 is typically simplified in practice because of assignment/skimming run time constraints. The mode choice models may also use additional segmentation, for example further classifying non-mandatory purposes into shopping, eating out, recreation or other discretionary activities. The network simulation models rarely include more than three to six vehicle classes.

Table 1: Coordinated Segmentation of Mode Choice and Assignment Procedures

Time of Day/Mode Choice Segments		Assignment Vehicle Classes	
Trip /Tour Purpose	Vehicle Occupancy	Vehicle Occupancy	Approximate VOT ($2008)
Commuting – low income workers	SOV	SOV	$10
	HOV2	HOV2	$10× O_2
	HOV3+	HOV3+	$10× O_3
Commuting – medium income workers	SOV	SOV	$15
	HOV2	HOV2	$15× O_2
	HOV3+	HOV3+	$15× O_3
Commuting – high income workers	SOV	SOV	$20
	HOV2	HOV2	$20× O_2
	HOV3+	HOV3+	$20× O_3
Work-based sub-tours	SOV	SOV	$30
	HOV2	HOV2	$30× O_2
	HOV3+	HOV3+	$30× O_3
University / school tours	SOV	SOV	$6
	HOV2	HOV2	$6× O_2
	HOV3+	HOV3+	$6× O_3
Non-mandatory tours – low income	SOV	SOV	$8
	HOV2	HOV2	$8× O_2
	HOV3+	HOV3+	$8× O_3
Non-mandatory tours – medium income	SOV	SOV	$10
	HOV2	HOV2	$10× O_2
	HOV3+	HOV3+	$10× O_3
Non-mandatory tours – high income	SOV	SOV	$12
	HOV2	HOV2	$12× O_2
	HOV3+	HOV3+	$12× O_3

The scaling parameters to account for vehicle occupancy, O_2 and O_3, should be statistically estimated along with other mode choice model parameters. More often, these parameters are not estimated but assumed equal to the actual occupancy because of the lack of good quality data to support model estimation. Recent statistical evidence suggests that VOT is not directly proportional to vehicle occupancy, and that the actual coefficient values stand lower than 2 and 3.

The logic behind the market segmentation structure shown in **Table 1** is to treat VOT consistently across all choices while avoiding an excessive proliferation of travel segments and vehicle classes. Additional segmentation of the behavioral choice models in the AB framework is less onerous than in 4-step models, but issues associated with the multiplication of vehicle classes in the assignment procedure are shared by both AB and 4-step models.

The choice of the number of vehicle occupancy categories in the assignment procedure should be based on the expected nature of carpool and/or pricing policies. If projects that give preferential treatment to three+ person carpools (HOV3+) are anticipated (whether exclusive lanes or free/discounted tolls) then the model may require explicit segmentation of trip tables by single occupant, two person carpool, and three or more person carpool classes. Otherwise all carpools may be collapsed into a single class. However, even in the absence of specific traffic restrictions or pricing policies, segmentation by vehicle occupancy may be desirable to capture VOT differences.

Market segments with similar VOT may be combined prior to highway assignment to reduce the impact of the proliferation of segments on assignment runtimes. This aggregation should also consider additional vehicle classes associated with non-passenger travel such as heavy and light commercial trucks. **Table 2** shows a possible aggregation of vehicle classes based on the values of time shown in **Table 1** and assuming scaling coefficients equal to occupancy. For simplicity, a value of 3.0 for occupancy of the HOV3+ category is used, although in reality the average occupancy of these carpools is approximately 3.2. In the assignment and skimming procedures, each vehicle class table is assigned based on the weighted average VOT across all components. In this example the 24 demand trip tables are collapsed into 6 vehicle classes, with minimal VOT aggregation. It is possible to make the VOT weighting specific to each assignment time-of-day period to ensure a better reflection on the differential mix of purposes across time of day.

Table 2 Example of Vehicle Class Aggregation

Purpose	Vehicle Occupancy	Approximate VOT	Trip Tables by Occupancy and VOT					
			SOV $6-12	SOV $15-30	HOV2 $12-24	HOV2 $30-60	HOV3+ $18-36	HOV3+ $45-90
Commuting – low income workers	SOV	$10	X					
	HOV2	$10×2=$20			X			
	HOV3+	$10×3=$30					X	
Commuting – medium income workers	SOV	$15		X				
	HOV2	$15×2=$30				X		
	HOV3+	$15×3=$45						X
Commuting – high income workers	SOV	$20		X				
	HOV2	$20×2=$40				X		
	HOV3+	$20×3=$60						X
Work-based sub-tours	SOV	$30		X				
	HOV2	$30×2=$60				X		
	HOV3+	$30×3=$90						X
University / school tours	SOV	$6	X					
	HOV2	$6×2=$12			X			
	HOV3+	$6×3=$18					X	
Non-mandatory tours – low income	SOV	$8	X					
	HOV2	$8×2=$16			X			
	HOV3+	$8×3=$24					X	
Non-mandatory tours – medium income	SOV	$10	X					
	HOV2	$10×2=$20			X			
	HOV3+	$10×3=$30					X	
Non-mandatory tours – high income	SOV	$12	X					
	HOV2	$12×2=$24			X			
	HOV3+	$12×3=$36					X	

1.3 Representation of Generalized Costs in Time of Day and Destination Choice

Mode utility functions that include travel time savings and costs associated with highway pricing (Equation 6) represent the basis of a theoretically consistent formation of impedance functions for destination choice (trip distribution) and/or time-of-day choice. Specifically, the logsums of the lower-level choices (mode choice, for example) are used as explanatory variables on the utility functions in the upper-level choices (destination or time-of-day choice). We will illustrate the basic representation of generalized costs assuming a model system where trip distribution is the upper level choice, followed by time of day choice and then mode choice.

The ***time-of-day choice*** utility can be formed using mode choice logsums in the following way:

$$V_t^p = \mu \times \ln\left[\sum_m \exp\left(U_{mt}^p\right)\right] + \sum_v \lambda_{vt}^p S_v, \qquad (7)$$

where:

t	=	time of day periods (TOD),
$0 < \mu \leq 1$	=	scaling coefficient that should be in the unit interval,
λ_{vt}^p	=	coefficients for person, household, and zonal variables for each TOD.

In 4-step model systems, TOD choice models normally operate with broad 3-4 hour periods. An additional peak spreading or peak-hour factoring sub-model may be required to adequately capture time savings and/or toll differentials between the peak hour and the shoulders of the peak. In disaggregate AB model systems, TOD choice models operate with a temporal resolution of 60 or even 30 minutes, which is usually fine enough for all applications of a regional model (Vovsha & Bradley, 2004). Variables such as income, occupation, industry, gender, presence of school-age children in the household and density (especially at the destination end) have proven to be significant. When utilities are constructed as shown in **Equation 7**, the mode choice logsums provide the appropriate and desired TOD choice sensitivity to tolls and associated travel time savings.

The ***destination choice*** utility (or trip distribution impedance functions) can be formed using a logsum over all TOD periods. While it is possible to calculate this logsum and it would represent the most consistent impedance measure, it is computationally very intensive since it should be implemented for each origin-destination pair. A more practical approach for a 4-step model (also adopted for some AB models) is to use the mode choice logsum of representative TOD periods for each travel purpose in order to economize on calculations. For example, for work trips/tours AM peak period and PM peak period mode choice logsums can be used, while for non-work trips the midday (off-peak) period mode choice logsum is assumed. Weighted linear interpolations of LOS variables between several periods can also be used. The destination choice utility can be generalized in the following way:

$$W_{od}^p = \eta \times \ln\left[\sum_m \exp\left(U_{odm,t(p)}^p\right)\right] + \ln\left(A_d^p\right), \qquad (8)$$

where:

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o, d = origin and destination TAZs,

$0 \leq \eta \leq 1$ = scaling coefficient that should be in the unit interval,

$t(p)$ = representative TOD period for each purpose,

A_d^p = destination TAZ attraction (size variable) for each purpose.

The size variables represent destination TAZ attractions for each purpose. The most frequently used attraction size variables are total employment for work purpose, enrollment for school purpose, and retail employment for non-work purposes. Advanced trip-based models and AB models provide examples of more complicated size variables that mix several employment and population variables as well as segmented by urban type and density. Size variables are not added to the impedance function in doubly-constrained gravity models of trip distribution since they are applied directly as constraints on the destination side. The destination choice utility is sensitive to tolls and associated travel time savings through the mode choice logsum variables.

When the transit share is very low, the highway generalized cost itself (Equation1) can be used instead of the mode choice logsum in the utility function of time-of-day or destination choice models.

1.4. Representation of Generalized Costs in Other Upper-Level Choices

When the destination choice utilities are sensitive to highway pricing and travel time savings, zonal accessibility indices can be calculated and used as an explanatory variable for trip generation, activity pattern, car ownership, and land-use development models. Accessibility indices essentially represent mode destination choice logsums calculated by trip purpose in the following way:

$$Z_o^p = ln\left[\sum_d exp\left(W_{od}^p\right)\right] \qquad (9)$$

If **Equation 9** is directly applied in combination with **Equation 8** it may result in very intensive calculations. For this reason, in most model systems the destination choice utilities used in accessibility calculations are simplified in such a way that they could be pre-calculated based on a limited number of origin-destination skims and for a limited number of modes, purposes, and population segments. Even with these simplifications accessibility measures represent useful explanatory variables, and allow upper-level choices to be sensitive to highway pricing and travel time savings.

Appendix 2: Incorporating Travel Time Reliability in Travel Demand Models

Measurement of highway time reliability and its impact on travel choices is now considered one of the most important strategic directions for travel model improvement. Several published and ongoing research projects (NCHRP 8-57, NCHRP 8-64, NCHRP Report 618, SHRP2 C04, SHRP2 L04) as well as FHWA guidance are devoted to reliability issues. This appendix provides details on the different ways to incorporate reliability into travel demand models.

3.1 Perceived Highway Time

Perceived *transit* time has been long recognized and used in travel models. For example, in most mode choice models and transit assignment algorithms, out-of-vehicle transit time components like wait time and walk time are weighted compared to in-vehicle travel time. It is not unusual to apply weights in the range of 2.0 - 3.5 reflecting the fact that the travelers' perceive out-of-vehicle time as more onerous than in-vehicle time.

Contrary to the transit modeling practice, practically all travel models include a generic highway time coefficient; that is, the same coefficient is applied for each minute of highway time regardless of the travel conditions. There is however compelling statistical evidence indicating that highway users perceive travel time in congested conditions as more onerous than free-flowing travel time (National Cooperative Highway Research Program [NCHRP], 1999; Axhausen et al, 2007; Levinson et al, 2004; McCormick Rankin Corporation [MRC] & Parsons Brinckerhoff [PB], 2008). Also, recent analyses of RP travel surveys have found that the respondents' perception of time saved is about twice the actual measured time saved (Small et al., 2005; Sullivan, 2000). The larger disutility associated with increasing congestion levels that these studies have found can be interpreted in two ways: as a negative psychological perception (similar to the walk or wait time weight associated with a transit trip), or as a proxy for travel time reliability.

Two examples of estimated perceptions of travel time are discussed below in order to illustrate the magnitude of the congestion level time weights as well as possible approaches to differentiate travel time by congestion levels. It should be noted that in both cases the approaches are very simple on the supply side and could be easily applied with both AB and 4-step models.

The first example was documented in NCHRP Report 431 (1999). The study examined route choice in a SP survey context. Travel time was broken into two parts:

- Time in uncongested conditions (LOS A-D), T_1
- Time in congested conditions (LOS E-F), T_2.

Highway utility included total time, cost, and the percentage of total time spent in congestion, as follows:

$$U = a \times (T_1 + T_2) + b \times C + c \times \frac{T_2}{T_1 + T_2}. \qquad (10)$$

where a, b and c are the coefficients for total time, cost and percentage of congestion time, respectively.

The coefficient on percentage of congestion time exhibited high significance, confirming that travelers perceive congestion time as more onerous than free-flow time. The authors translated it into a recommended mark-up value of 2.5 to VOT savings under congested conditions compared to uncongested conditions. More detailed estimation results are summarized in **Table 3**. By virtue of the specified utility function, the cost of shifting one minute from uncongested to congested time is dependent on the total travel time. For an average time of 30 minutes, the VOT equivalent of the additional perceived burden associated with congestion itself is about $15/hour, or roughly equal to the average commuting VOT applied in most models.

Table 3: Cost of Shifting Time from Uncongested to Congested Conditions

Total Travel Time (min)	Cost of Shifting 1 minute from Uncongested to Congested Time	VOT Equivalent ($/hour)
10	$0.77	$46.2
15	$0.51	$30.6
20	$0.30	$18.0
30	$0.26	$15.6
45	$0.17	$10.2
60	$0.13	$7.8

The second example is taken from the recently completed travel demand model for the Ottawa-Gatineau, Canada, region (MRC & PB, 2008). The model framework, choice context, and utility formulation were different from those used in the 1999 NCHRP report. However, the bottom line results are in many respects similar. In the Ottawa-Gatineau study, a mode choice model was estimated for 5 travel purposes and 2 time-of-day periods (AM and PM) based on RP data from a large household travel survey (approximately 23,870 households, representing 5% of the population). Travel time and cost variables were obtained from modeled static assignment equilibrium skims.

The highway utility included travel cost with one generic coefficient and travel time broken into the following two components (note that this breakdown of travel time is different from the one adopted in NCHRP (1999):

- Free-flow (minimal) time, T_1
- Extra delay, calculated as congested time minus free-flow time for the entire origin-destination path, T_2.

The highway utility function had the following form:

$$U = a_1 \times T_1 + a_2 \times T_2 + b \times C + \sum_s (d_s \times h_s) \qquad (11)$$

where:

s = additional mode-specific constants and household/zonal variables,

h_s = values of additional variables,

d_s = estimated coefficients.

The estimation results are shown in **Table 4** expressed in terms of free-flow and congested VOT. These results confirm that for several segments, specifically AM and PM work trips, as well as PM discretionary trips, each minute of congestion delay is perceived as about twice as onerous as the free-flow (minimal) time component. For the other segments the statistical tests did not show a significant difference between free-flow and congestion time components, thus the two coefficients were pooled together.

Table 4: VOT Estimates for Free-Flow Time and Congestion Delay

Trip Purpose	VOT ($/hour)			
	AM		PM	
	Free-flow time	Congestion delay	Free-flow time	Congestion delay
Work	22.2	42.7	19.4	40.0
University	10.0	10.0	11.0	11.0
School	5.1	5.1	5.1	5.1
Maintenance	10.7	10.7	12.1	12.1
Discretionary	9.0	9.0	11.4	29.3

3.2 Time Variability

Time variability can be measured by any statistic of a travel time distribution (for example any combination of the mean, standard deviation, skewness, and higher moments). Taking into account such considerations as behavioral realism and simplicity of the model estimation (specifically, formulation of SP alternatives), as well as application, three main measures of time variability have been proposed and tested so far:

- Standard Deviation. This is a symmetric reliability measure that assumes that being early or late is equally undesirable; it is unlikely to be a realistic assumption for many trips and underlying activities.
- Buffer Time. This reliability measure is defined as the difference between 80-95th and 50th travel time percentile. Buffer time is asymmetric and therefore more behaviorally appealing than the standard deviation because it specifically targets late arrivals and is less sensitive to early arrivals.
- Delay Probability. This asymmetric reliability statistic simply states the probability of given delays, for example the likelihood of incurring a 15 minute delay or a 30 minute delay.

The following example illustrates the Standard Deviation approach, applied in the context of binary route choice [*NCHRP Report 431, 1999*]. The following utility function was adopted:

$$U = a \times T + b \times C + c \times SD(T) \qquad (12)$$

where $SD(T)$ is the standard deviation of travel time.

The standard deviation of travel time was calculated based on the set of 5 travel times presented in the SP questionnaire for each highway route alternative. The estimation results showed that highway users assign a very high value on each minute of standard deviation. The value of standard deviation is comparable with or even higher than the VOT associated with average travel time itself (i.e. $c \geq a$). Also a certain logical variation across trip purposes and income groups was captured. **Table 5** summarizes the results for one of the several reported model specifications.

Table 5: Value of Reliability Measured as Standard Deviation of Time

Trip Purpose and Income Group	Value of Reliability	
	$ per min SD	$ per hour SD
Work trips, high income	0.258	15.5
Work trips, low income	0.215	12.9
Non-work trips, high income	0.210	12.6
Non-work trips, low income	0.167	10.0

A good example of the Buffer Time measure was used in a study of binary route choice between the managed (tolled) lanes and general purpose (free) lanes on SR-91 in Orange County, CA (Small et al., 2005). The adopted quantitative measure of variability was the upper tail of the distribution of travel times, such as the difference between the 80th and 50th percentile travel times (see **Figure 1**). The authors argue that this measure is better than a symmetric standard deviation, since in most situations being "late" is more crucial than being "early", and many regular travelers will tend to build a "safety margin" into their departure times that will leave them an acceptably small chance of arriving late (i.e. planning for the 80th percentile travel time would mean arriving late for only 20% of the trips).

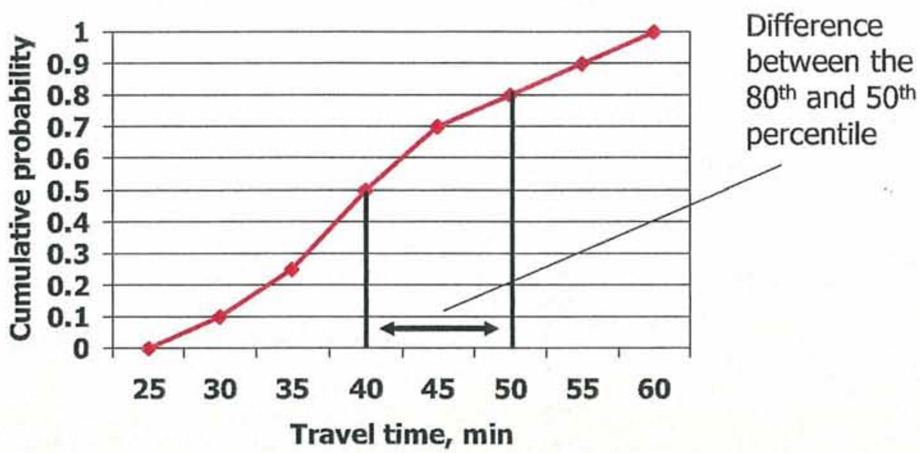

Figure 1: Buffer Time

The binary route choice model was estimated using a mix of RP and SP data. The variation of travel times and tolls was significantly enriched by combining RP data from actual choices with SP data from hypothetical situations. The distribution of travel times was obtained from field measurements on SR-91 taken at many times of day, on 11 different days. It was assumed that this distribution was known to the travelers because they are habitual SR-91 users. The utility function was specified as follows:

$$U = a \times T + b \times C + c \times R(T) \qquad (13)$$

where $R(T)$ is the difference between the 80th and 50th travel time percentile.

Reliability, as defined above, proved to be valued by travelers as highly as the average travel time; that is VOT was approximately equal to VOR, or $a \approx c$. This condition of equal VOT and VOR could be exploited to obtain a simplified model form. If the willingness to pay for saving one minute of average travel time (the 50th percentile) is equal to the willingness to pay for one minute of reduction in the difference between the 80th and 50th percentile, then **Equation 13** reduces to **Equation 14**. In this case, the underlying decision-making variable is the travel time value at the 80th percentile.

$$U = a \times T^{80th} + b \times C \qquad (14)$$

Rather than estimating two separate terms (average travel time and additional time associated with 80th-50th percentile), a single travel time statistic could be used, whether the 80th percentile or any other percentile larger than the 50th that yields the best statistical fit. For example, the 90th travel time percentile was used in a similar choice context (Brownstone & Small, 2005).

The approach suggested by Equation 14 is illustrated in **Table 6**. In this example, motorists have to choose between two roads for commuting that are characterized by different time distributions. Road A is longer but more reliable – its travel time varies from 41 minutes to 50 minutes. Road B is shorter but its travel time is less predictable and varies from 29 minutes to 52 minutes. Motorists are familiar with both roads and make their choice based on a rational consideration of the known time distributions.

Table 6: Illustration of Travel Time Reliability Impact on Route Choice

Percentile	Travel time (minutes)		Road Preference
	Road 1	Road 2	
10	41	29	
20	42	30	
30	43	35	
40	44	39	
50	45	40	Road B (better average travel time)
60	46	41	
70	47	45	
80	48	50	Road A (better 80th percentile travel time)
90	49	51	
100	50	52	

While Road B has a shorter average travel time and would be the preferred road in most conventional modeling procedures, Road A has a better 80th travel time percentile. Therefore motorists would probably prefer Road A, because it offers more reliable service than Road B.

This simplified buffer time framework is based on the plausible assumption that travelers under congestion conditions characterized by travel time uncertainty behave so as to rationally minimize risk. They do not base their decisions on average values. However, they do not adopt the extreme mini-max approach (minimize risk and choose according to the worst possible case) either. The decision point probably lies somewhere between 80th and 90th percentile.

It is important to note that making this approach operational within the framework of regional travel models requires explicit modeling of travel time distributions, as well as making assumptions about how travelers acquire information about the uncertain situation they are about to experience. Dynamic traffic assignment (DTA) and traffic microsimulation tools are crucial for the application of models that include explicit travel time variability, since static assignment can only predict average travel times.

There are other approaches similar in concept to the one described above, but that use a different technique in both the estimation and the application stages. For example, in a T&R study in Montreal (PB Consult, 2003), the probability of experiencing delays longer than 15 minutes and 30 minutes was introduced in the SP questionnaires for truckers. The subsequent estimation of the choice model revealed that the coefficient on this variable was highly significant. The magnitude of the delay probability coefficient was comparable with the total trip time coefficient, as found in the VOR estimation for SR-91 motorists (Small et al., 2005). The application of the Montreal model required developing probability-of-delay skims. These skims were calculated based on the observed statistics of delay as a function of the modeled volume-to-capacity (V/C) ratio. Although this technique requires a multi-day survey of travel times and speeds, it can be applied in combination with the static assignment method. Many regions with continuous traffic monitoring equipment now have such data available for important highway segments. There is a problem yet to be resolved however: when calculating the travel time reliability measure over the entire origin-destination path, the highway links cannot be considered independent.

Reliability is closely intertwined with VOT. In RP models, if variability is not measured explicitly and included as a variable, this omission will tend to inflate the estimated value of average time savings. In reality, variability in travel time tends to be correlated with the mean travel time. When choosing a toll road, people are paying for changes in both variables – a reduction of the average travel time, and increased reliability, so omitting one variable will tend to attribute the total effect to the included variable.

The principal conceptual drawback of the reliability approaches based on travel time variability is that they do not explicitly consider the nature of the underlying activities and mechanisms that create the travel disutility. Needless to say, the largest part of the disutility associated with unreliable travel time is due to being late (or too early) at the activity location and consequently losing a part (or all) of the planned activity participation. The practical advantage of the time variability approaches is however, in its relative simplicity and exclusive reliance on the data supplied by the transportation networks.

3.3 Schedule Delay Cost

This approach has been widely accepted by the research community since it was first proposed in 1982 by Small. According to this approach, the impact of travel time (un)reliability is measured by the explicit cost associated with the delayed or early arrival at the activity location. This approach considers a single trip at a time and assumes that the preferred arrival time that corresponds to zero schedule cost is known. The essence of the approach is that the trip cost (i.e. disutility) can be calculated as a combination of the following three components:

α = value of travel time and cost,
β = cost of arriving earlier than the preferred schedule,
γ = cost of arriving later than the preferred schedule.

By definition, only one of the schedule cost can have a non-zero value in each particular case depending on the actual arrival time versus the preferred one. There can be many analytical forms for the schedule cost as a function of the actual time difference (delay or early arrival). Both functions should be monotonically increasing with respect to the time difference. It is also expected in most cases that the schedule delay function should be steeper than the early arrival function for most activities, because being late is more onerous than being earlier.

The most frequently used forms, shown in **Figure 2**, include a simple linear function (i.e. constant schedule delay cost per minute), non-linear convex function (assuming that large delays are associated with growing cost per minute), and various piece-wise functions accounting for fixed cost associated with any delay along with a variable cost per minute.

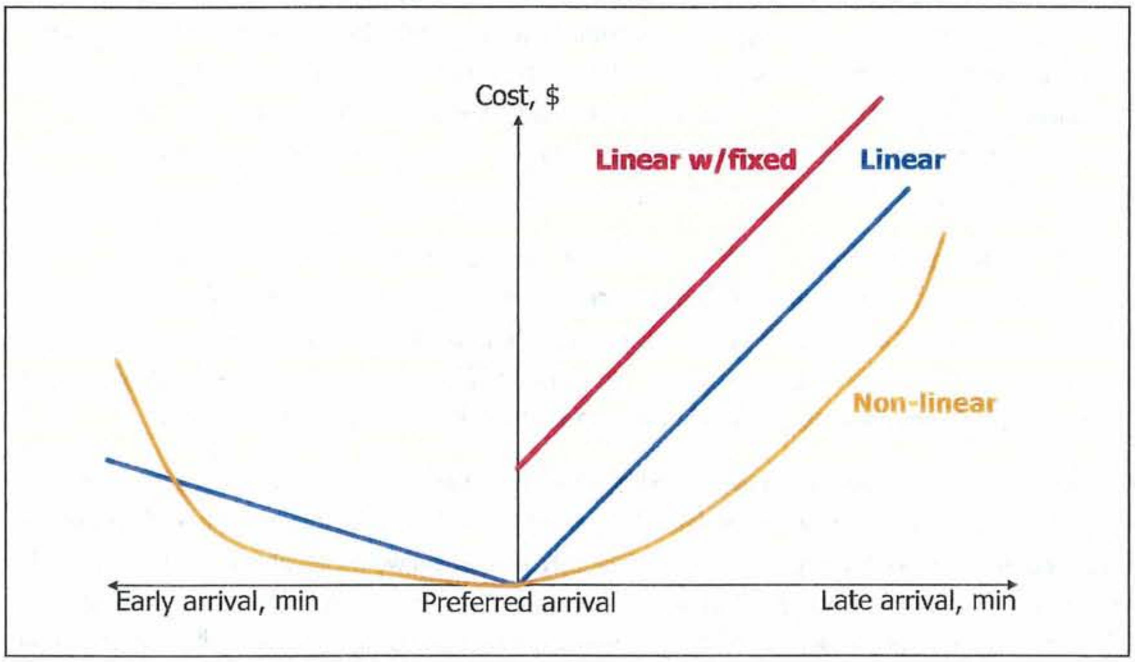

Figure 2 Schedule Delay Cost Functions

An example of a schedule delay model estimated in a highway route choice context with a specially designed SP survey is given in NCHRP (1999). The utility function was specified in the following way:

$$U = a \times T + b \times C + c \times SD(T) + \beta(\Delta t) + \gamma(\Delta t) \qquad (15)$$

where:

Δt = time difference between the actual and preferred arrival time,

$\beta(\Delta t)$ = early arrival cost specified as a non-linear convex function,

$\gamma(\Delta t)$ = late arrival cost specified as a linear function with a fixed penalty for any delay and another fixed penalty for extra late arrival.

The schedule delay cost estimation results are summarized in **Table 7**, for one of the tested model specifications. Interestingly, as reported by the authors, in the presence of explicit schedule delay cost the travel time variability measure (standard deviation) lost its significance. The authors concluded that in models with a fully specified set of schedule cost, it is unnecessary to include the additional cost of unreliability of travel time.

Table 7: Schedule Delay Cost Estimation Results

Schedule Delay Component	Marginal Values
Early arrival (non-linear):	
- by 5 min	$0.028/min
- by 10 min	$0.078/min
- by 15 min	$0.128/min
Late arrival dummy:	
- work trips	$2.87
- non work trips	$1.80
Late arrival (linear)	$0.310/min
Extra late arrival dummy	$0.98

Schedule delay cost should be distinguished from TOD choice and the associated disutility of shifting the planned (preferred) trip departure time or trip arrival time. In practical estimation analysis the data might mix these two factors. To clearly distinguish between the planned schedule and schedule delay, the person should explicitly report actual and preferred arrival time for each trip. Schedule delay cost assumes that the person has planned a certain schedule, but in the implementation process on the given day the delay occurs to disturb this plan. TOD choice relates to the stage of schedule planning. The outcome of this process is the preferred arrival time.

The difference between these two measures become even less clear if the schedule adjustments are modeled pivoting off of the observed (preferred) arrival time; that is, the travelers are asked about their willingness to shift the arrival time if the preferred arrival time would be associated with an additional toll. An example of a model of this type that was recently estimated based on a SP survey of highway users traveling to the downtown area of San Francisco is shown in **Figure 3**.

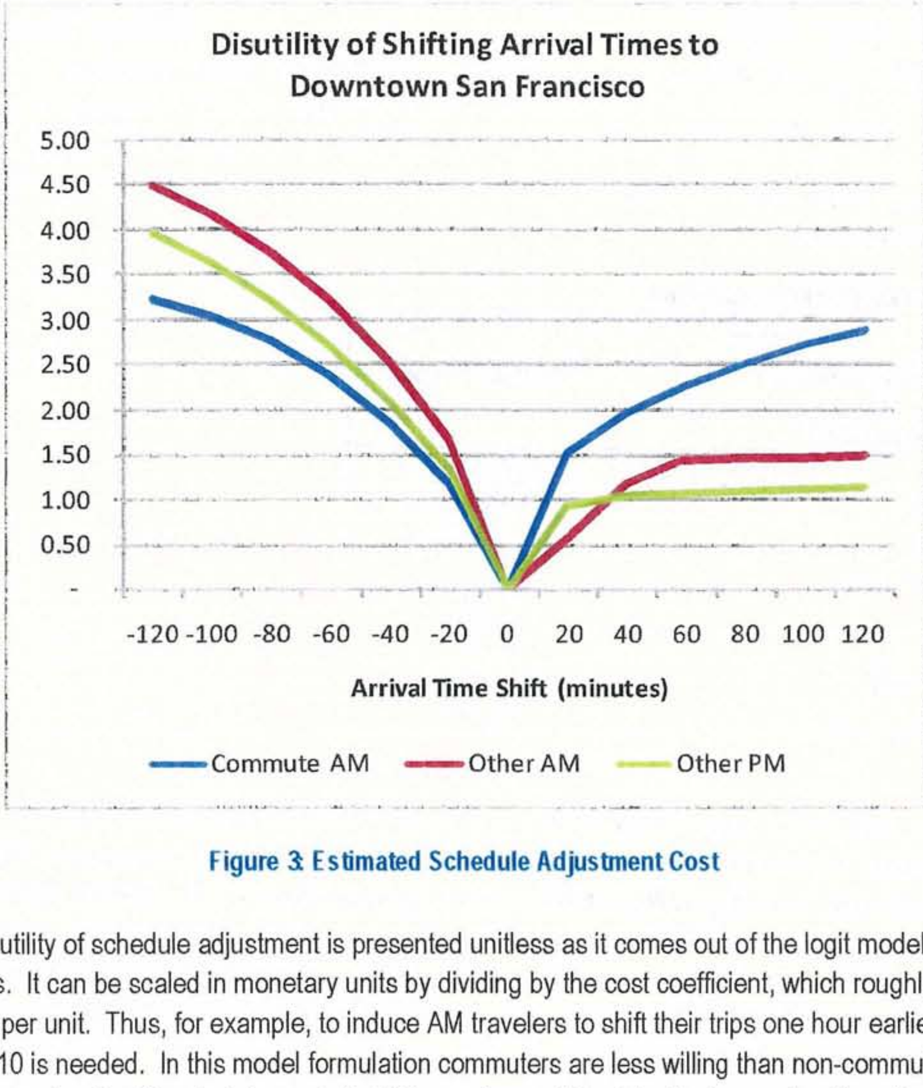

Figure 3: Estimated Schedule Adjustment Cost

The disutility of schedule adjustment is presented unitless as it comes out of the logit model estimation process. It can be scaled in monetary units by dividing by the cost coefficient, which roughly corresponds to $3.0 per unit. Thus, for example, to induce AM travelers to shift their trips one hour earlier, an incentive of $7-$10 is needed. In this model formulation commuters are less willing than non-commuters to switch their planned arrival time to later periods. This may be explained by the longer duration of work trips; later arrivals may imply less discretionary evening time. Interestingly and contrary to the schedule delay models, the associated disutility of making a trip earlier is larger than the disutility of making a trip later. This shows that the choice framework for planning/scheduling trips is different from the framework of schedule delays. In the model formulation and estimation, these frameworks should be clearly distinguished and separated.

Comparing schedule delay to time variability as two different measures of time reliability, it should be noted that the schedule delay approach provides a better behavioral insight than travel time variability. It explicitly states the reasons and attempts to quantify the factors of the disutility associated with unreliable travel time, specifically real or perceived penalties associated with not being at the activity location on time. The schedule delay approach, however, has its own theoretical limitations:

- The approach is applied separately for each trip made by a person during the day and it assumes that the schedule delay cost for each subsequent trip is independent of the previous trip. Technically this approach is based on a fixed departure time and a preferred arrival time for each trip. This is in general not a realistic assumption, since the activity duration requirements would create a dependence of the departure time for the next trip on the arrival time for the previous trip.

- This approach does not consider activity participation explicitly, though it makes a step towards such a consideration compared to the travel time variability approach.
- If applied for the evaluation of user benefits from travel time savings, this approach must incorporate TOD choice, i.e. travelers' reconsideration of departure time in response to the changed congestion. Otherwise, travel time savings can result in early arrival penalties out-weighting the value of saved travel time.

On the practical side, in order to be implementable, the schedule delay approach imposes several requirements that are not easy to meet, especially with conventional RP surveys:

- For each trip, in addition to the actual arrival time, the preferred arrival time should be identified. While it is generally known to the traveler (or perceived subconsciously), it is generally not observed in RP-type data. To explore this phenomenon and estimate models that address it, the SP framework has proven to be very effective, since the preferred arrival time and schedule delays can be stated in the design of alternatives. Simplified assumptions about the preferred arrival time have been adopted. For example in (Tseng & Verhoef, 2008), the preferred arrival time was calculated as a weighted average between the actual departure time and would-be arrival time under free-flow traffic conditions.
- Application of this model for forecasting would again require input in the form of preferred arrival times. This can be accomplished either by means of external specification of the usual schedules on the activity-supply side (that would probably be possible for work and fixed non-work activities), or by means of a planned schedule model on the demand side. The latter would generate individual schedule plans (departure times) based on the optimal activity durations conditional upon the average travel times. The subsequent simulation (plan implementation) model would incorporate schedule delay cost based on the simulated travel times.

3.4 Loss of Activity Participation Utility

This approach to incorporating travel time reliability in travel demand models is based on a concept of time-dependent utility profiles (Supernak, 1992; Kitamura & Supernak, 1997). Recently this approach was adopted for research into integrating DTA formulations with activity scheduling analysis (Kim at al., 2006; Lam & Yin, 2001). The essence of the of loss of activity participation utility approach is that each individual has a temporal utility profile for any given activity, characterized by function $U(t)$. This utility profile can be estimated either as parametric or non-parametric functions of time, and time itself can be modeled in either continuous or discrete form. The utility profile represents an instant utility of participation in the activity at any given point in time (or during the discrete time unit that starts at the given point in time). The total utility of participation in the activity can be calculated by integrating the utility profile from the arrival time (τ) to departure time (π):

$$U(\tau,\pi)=\int_{\tau}^{\pi}U(t)dt \qquad (16)$$

Simple utility profiles are independent of the activity duration. In this case, it is assumed that the marginal utility of each activity at each point of time is independent of the time already spent on this activity. This might be too simplifying an assumption, at least for certain activity types like household maintenance needs where the activity loses its value after the errands have been completed. More complicated utility profiles can be specified as two-dimensional functions $U(t,d)$ where d denotes the activity duration until moment t. In this case, the total utility of activity participation can be written as:

$$U(\tau,\pi)=\int_{\tau}^{\pi}U(t,t-\tau)dt \qquad (17)$$

Hypothetical, but typical temporal utility profiles specified in a discrete space with an hourly resolution are shown in **Figure 4**. The work activity profile is adjusted to reflect the fixed schedule requirements (higher utility to be present at 8.00 AM and 5:00 PM points). The shopping activity profile is much more uniform, with an additionally assumed convenience to undertake this activity after usual work hours.

Figure 5: Activity Participation Utility Profiles

The concept of utility profiles helps in understanding how individuals construct their daily activity schedules. According to this concept, each individual maximizes a total daily utility of activity participation. If we consider a predetermined sequence of activity episodes, it can be said that individuals switch from activity to activity when the utility derived from participating in the second activity exceeds the utility from continuing the previous activity. Travel episodes are placed between activity episodes in such a way that the whole individual daily schedule represents a continuous sequence of time intervals as shown in **Figure 5**.

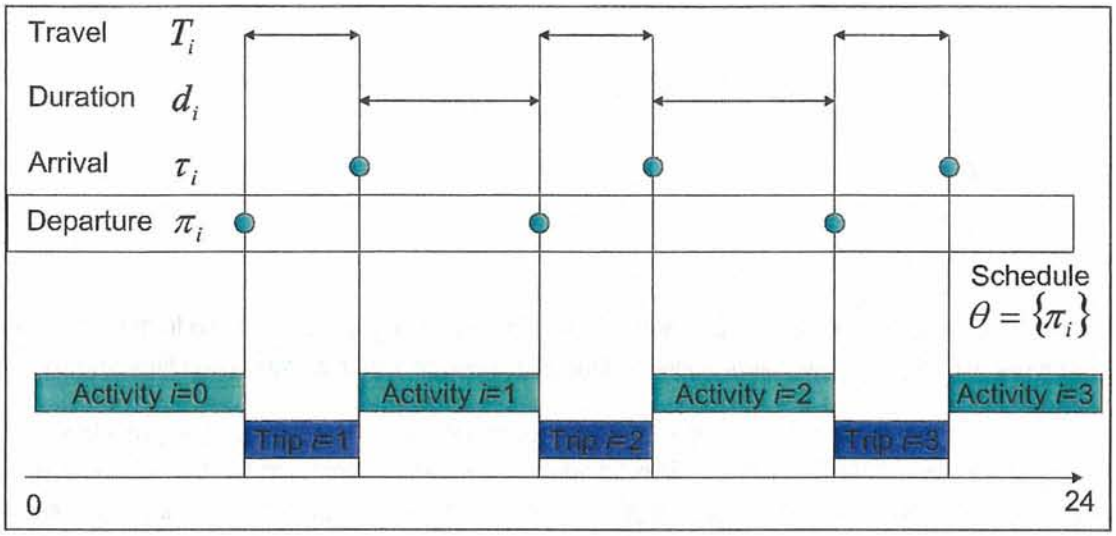

Figure 5: Individual Daily Schedule

The effect of unreliable travel times can be directly measured by comparing the planned and actual total daily activity and travel schedule utility. For simplicity, but without loss of generality, we assume that the sequence of activity episodes and trip departure times are fixed. We will also assume that a travel time delay never exceeds the planned duration of the subsequent activity, thus no activity is cancelled as a result of unreliable travel times. In other words, unreliability affects only travel times and arrival times. In this context, the reliability measure can be expressed as the loss of activity participation in the following way:

$$L = \sum_i \left(U_i^P - U_i^A\right) \qquad (18)$$

where:

L	=	total user loss (disutility) over the whole schedule,
U_i^P	=	utility of the trip and subsequent activity with planned (preferred) arrival time,
U_i^A	=	utility of the trip and subsequent activity with actual arrival time,

The planned and actual utilities can be expressed as:

$$U_i^P\left(\tau_i^P\right) = a \times T_i^P + b \times C_i^P + \int_{\tau_i^P}^{\pi_{i+1}} U_i(t)dt \qquad (19)$$

and

$$U_i^A\left(\tau_i^A\right) = a \times T_i^A + b \times C_i^A + \int_{\tau_i^A}^{\pi_{i+1}} U_i(t)dt \qquad (20)$$

where $T_i^P = \tau_i^P - \pi_i$ and $T_i^A = \tau_i^A - \pi_i$.

Substituting expressions *(19)* and *(20)* into **Equation 18** we obtain:

$$L = \sum_i \left[a \times \left(\tau_i^P - \tau_i^A\right) + b \times \left(C_i^P - C_i^A\right) + \int_{\tau_i^P}^{\tau_i^A} U_i(t)dt \right] \qquad (21)$$

The integral term of **Equation 21** represents activity participation utility loss resulting from the unreliable travel times, while the first two terms represent the loss resulting from the extra travel time and cost.

It can be shown that the activity participation utility loss and the schedule delay cost approaches are not independent (Tseng & Verhoef, 2008). The schedule delay cost functions can be derived from the temporal utility profiles. Thus the schedule delay approach can be thought of as a particular transformation of the temporal utility profile approach. The opposite is not true; that is, the temporal utility profiles could be fully restored from the schedule delay cost functions only under some specific assumptions.

To illustrate the relationship between temporal utility profile and schedule delay cost, consider two adjacent activities in the daily schedule with a trip between them as shown in **Figure 6**. In this fragment of the daily schedule, we assume that the temporal utility profile of the first activity is monotonically decreasing, while the utility of the second activity is monotonically increasing with time. We also number the trip between the two activities as T_2, to be consistent with the numbering shown in **Figure 5**. With an (ideal) zero trip time between the activities, the rational individual would switch from the first activity to the second activity at the intercept point of the two utility profiles, to ensure a maximum total utility. We can assume that the intercept point is the preferred arrival time, so that no schedule delay would be incurred when this point is realized as the activity start time. With a non-zero trip time, the optimal strategy would be to depart at such time that the departure time utility of the first activity would be equal to the arrival time utility of the second activity.

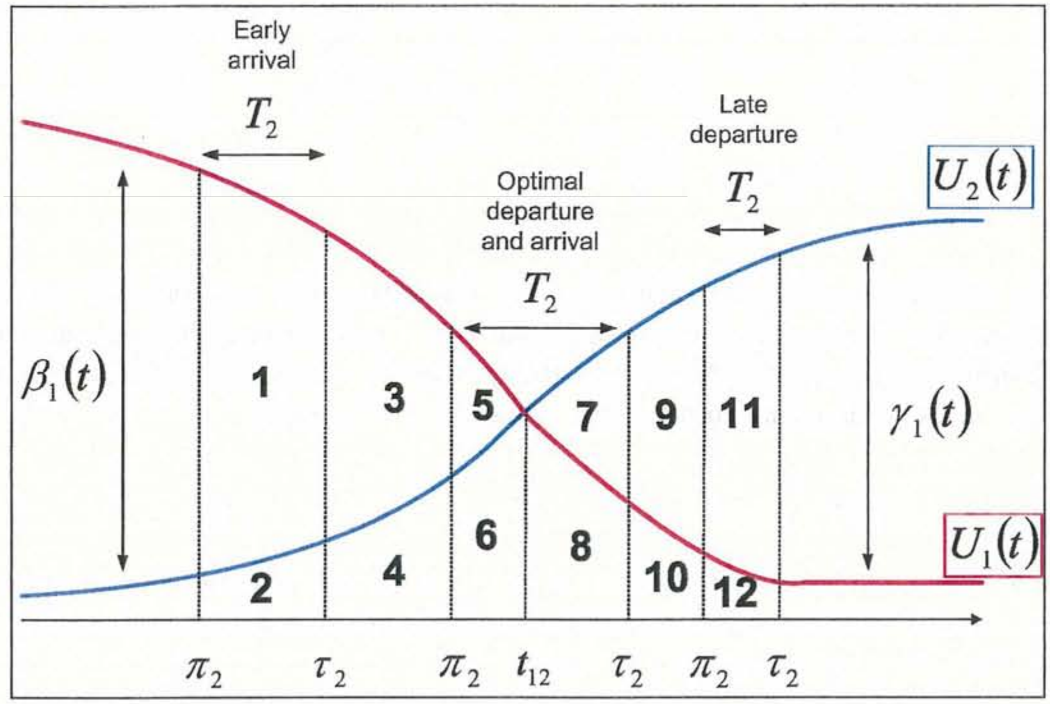

Figure 6: Temporal Utility Profiles for Two Adjacent Activities

Since the maximum utility would be realized when there is no trip between the activities, then the loss of utility associated with a trip can be calculated as the sum of the travel cost itself and the cost of the necessary schedule delay:

$$C_2(\pi_2,\tau_2)=\alpha_2(\pi_2,\tau_2)+\beta_2(\pi_2,\tau_2)+\gamma_2(\pi_2,\tau_2) \qquad (22)$$

where:

$\alpha_2(\pi_2,\tau_2)$	=	travel cost,
$\beta_2(\pi_2,\tau_2)$	=	cost of arriving early,
$\gamma_2(\pi_2,\tau_2)$	=	cost of departing/arriving late.

The travel cost can be understood as the lost utility that results from spending time on travel instead of in activity participation; this travel-related loss is incurred from the activity that would provide the most utility at the time of the trip:

$$\alpha_2(\pi_2,\tau_2)=\int_{\pi_2}^{\tau_2}\alpha_2(t)dt=\int_{\pi_2}^{\tau_2}\max[U_2(t),U_1(t)]dt \qquad (23)$$

The cost of arriving early ($\tau_2 < t_{12}$) or late ($\pi_2 > t_{12}$) is simply the utility lost from both activities due to their sub-optimal schedules:

$$\beta_2(\pi_2,\tau_2)=\int_{\tau_2}^{t_{12}}\beta_2(t)dt=\int_{\tau_2}^{t_{12}}[U_1(t)-U_2(t)]dt \qquad (24)$$

and

$$\gamma_2(\pi_2,\tau_2)=\int_{t_{12}}^{\pi_2}\gamma_2(t)dt=\int_{t_{12}}^{\pi_2}[U_2(t)-U_1(t)]dt \qquad (25)$$

While this derivation is intuitive, the resulting schedule delay expressions are a function of both departure and arrival times, which is rather inconvenient. An alternative way of deriving these cost components results in functions expressed solely in terms of activity arrival time. To do so, the travel cost is expressed as the loss of utility due to traveling instead of participating in the first activity:

$$\alpha_2(\pi_2,\tau_2)=\int_{\pi_2}^{\tau_2}\alpha_2(t)dt=\int_{\pi_2}^{\tau_2}U_1(t)dt \qquad (26)$$

The cost of early arrival remains equal to the cost due to sub-optimal activity scheduling, as in **Equation 24**. The cost of late arrival is also the cost due to sub-optimal activity scheduling, plus the opportunity cost of traveling instead of participating in the second activity:

$$\gamma_2(\pi_2,\tau_2)=\int_{t_{12}}^{\tau_2}\gamma_2(t)dt=\int_{t_{12}}^{\tau_2}[U_2(t)-U_1(t)]dt \qquad (27)$$

To verify that both cost derivation approaches produce the same total cost and also highlight the differences between them, all cost components are shown in **Table 8**, related to the areas 1-12 of integration under the temporal utility curves shown in **Figure 6**. It is clear that the only difference between the two derivation methods is in the formulation of the travel cost function and the area of integration for the schedule delay cost for a late arrival. In the second method the extra utility of the second activity over the first activity at the time of traveling (areas 7 and 11 in **Figure 6**) is transferred from the travel cost component to the late arrival schedule delay component.

Table 8. Trip Cost Components

Case	Component	Areas of Integration in Figure 6	
		First Derivation	Second Derivation
$\pi_2 \le t_{12} \le \tau_2$: departure earlier than the intercept and arrival later	$\alpha_2(\pi_2,\tau_2)$	5,6,7,8	5,6,8
	$\beta_2(\pi_2,\tau_2)$		

than the intercept	$\gamma_2(\pi_2,\tau_2)$		7
$\pi_2 < \tau_2 < t_{12}$: arrival earlier than the intercept	$\alpha_2(\pi_2,\tau_2)$	1,2	1,2
	$\beta_2(\pi_2,\tau_2)$	3,5	3,5
	$\gamma_2(\pi_2,\tau_2)$		
$t_{12} < \pi_2 < \tau_2$: departure later than the intercept	$\alpha_2(\pi_2,\tau_2)$	11,12	12
	$\beta_2(\pi_2,\tau_2)$		
	$\gamma_2(\pi_2,\tau_2)$	7,9	7,9,11

It is possible to restore the temporal utility profiles from estimated travel cost and schedule delay functions in the following way, as long as the intercept (preferred arrival time) is known and the temporal utility functions exhibit the monotonicity properties depicted in **Figure 6**:

$$U_1(t) = \alpha(t) \tag{28}$$

and

$$U_2(t) = \begin{cases} \alpha_2(t) - \beta_2(t), & \text{for } t < t_{12} \\ \alpha_2(t), & \text{for } t = t_{12} \\ \alpha_2(t) + \gamma_2(t) & \text{for } t > t_{12} \end{cases} \tag{29}$$

Thus, for a simple case under the assumptions explained above, there is no essential difference between the schedule delay cost approach and temporal utility profile approach. The direct analogy does not hold however, when more than two activities are considered (and not necessarily in a fixed order) or when the underlying utility profiles are more complicated and the preferred arrival times cannot be established for each trip (pair of adjacent activities) independently. In this case, utility profiles still provide a comprehensive framework for calculation of the loss of activity participation, while schedule delay cost components are bound to a particular order of activities and trips with predetermined preferred arrival time.

As long as the daily schedule can be understood as a sequence of fixed activities taking place in discrete time periods, with only two activities feasible at any given time period and preferred arrival times known, then the analogy described above between schedule delay cost and temporal utility profiles can be extended to multiple activities. The equations above can be applied recursively to any pair of activities to derive the schedule delay cost, and from it, restore the temporal utility profiles. This technique however is extremely "fragile" and fails if any of the simplifying assumptions does not hold.

The concept of temporal utility profiles, where travel time unreliability effects are considered as the loss of the activity participation utility, is the most holistic among the four possible approaches to incorporating travel time reliability outlined above. One important theoretical limitation of this concept is the assumption of independence among the temporal utility profiles, needed so that the daily schedule utility can be constructed as the sum of the individual activity utilities. In reality, the utility of one activity may be dependent on the participation and duration of the other activities. Effects related to substitution, saturation, satiation, and time-space budget constraints make the utility profiles interdependent across activity episodes. A microeconomic framework that distinguishes between direct and indirect utility functions holds promise; however, it has not yet resulted in operational structures for travel demand modeling.

For practical applications, this approach requires estimation of the temporal utility profiles on the demand side. This is a realistic task using econometric methods, although it might result in quite complicated structures and would require a large (household type) survey. Application of such a model would require explicit modeling of a planned daily schedule based on expected travel times for each individual. The network simulation would provide actual travel times, so that the calculation of the utility loss would result from the difference between the actual and expected travel times.

Appendix 3: Methods to Evaluate Uncertainty, Systematic Biases and Risk Associated with Pricing Projects

Considerable uncertainty exists in traffic forecasts for new highway projects. A review of forecasts using data from highway and transit projects across the globe found that the different between forecasted and actual traffic is more than 20% for about one half of the highway projects examined, and about 40% for approximately one-quarter of all highway projects (Flyvbjerg et al., 2005 and 2006). While such uncertainty is not unexpected, it is often largely ignored by designers and transportation planners. This appendix provides more detail on this discussion.

Even greater uncertainty characterizes forecasts of the demand for *tolled* roadways, compared to other roadways, because of the presence of additional unknown variables, such as the toll schedule and motorists' willingness to pay for using the road. Yet gaining a good understanding of this uncertainty can be critical, since private investment generally depends on cost recovery through toll collection, which in turn is a function of the realized roadway demand. In order to address this clear gap in the literature, Standard & Poor's (S&P's) produced a series of studies that examine the risk and uncertainty of tolled highway projects. This appendix summarizes key elements of these studies and investigates methods for accommodating (or at least recognizing) uncertainty in the traffic forecasting process. The first section of this appendix describes the observed frequency and magnitude of traffic volume mispredictions, while the second section explains the various sources of risk and uncertainty in traffic forecasts and how these relate to project financing. The third section describes methods for recognizing and incorporating uncertainty in models of travel demand.

3.1 Frequency and Magnitude of Traffic Demand Misprediction

S&P's study of traffic forecasts began in 2002 with data on 32 toll road projects from around the world. The sample was then increased to 68 and 87 projects in 2003 and 2004, respectively. However, in both updates the conclusions remained largely the same.

In the first study, Bain and Wilkins (2002) found that traffic forecasts for new toll roads suffer from substantial optimism bias, a finding that is supported by the subsequent studies. The average ratio of actual-to-forecast traffic volumes in the first year of operation was about 0.73 (versus 0.74, 0.76, and 0.77 in the 2003, 2004, and 2005 studies). **Figure 7** shows the distribution of forecasting errors in the 2005 update. Due to the nature of averaging ratios such as these, traffic forecasts for toll roads may be over-predicting actual volumes by even more than 33% (implied by an actual-to-forecast ratio of 0.75).[2] The 2002 study found that 78% of actual-to-forecast traffic volume ratios were less than 0.9 while only 12% were over 1.05; that is, the forecasts for approximately three-quarters of the tolled facilities overestimated demand by more than 10%. In the 2003 study, 63% of the facilities exhibited actual-to-forecast ratios less

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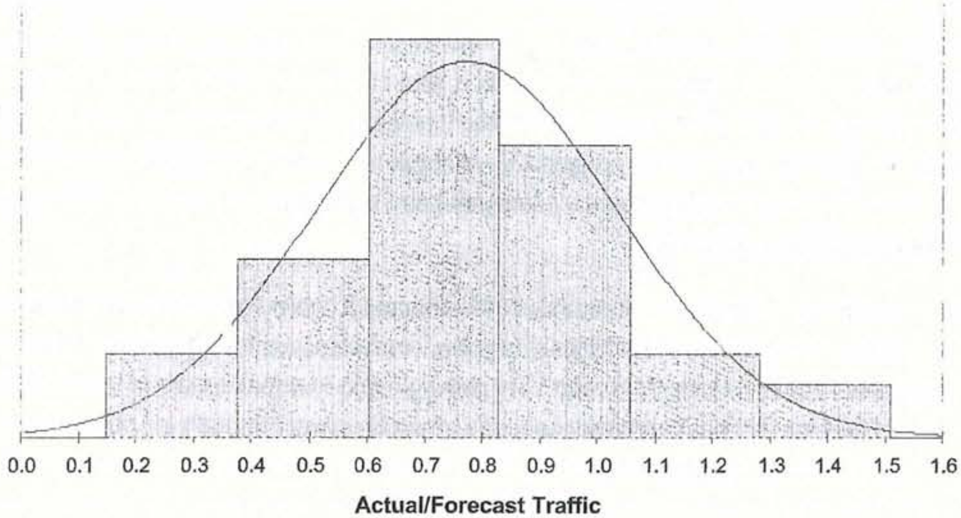
[2] A volume-weighted average of ratios (essentially the sum of predicted values over the sum of actual values) yields a much more robust indicator of the average percentage error, reflecting whether an investor will win (average >1) or lose (<1) – on average, across projects. Essentially, the issue is that the ratios are non-negative and bounded by zero, leaving a right-side skew that can tends to bias averages high.

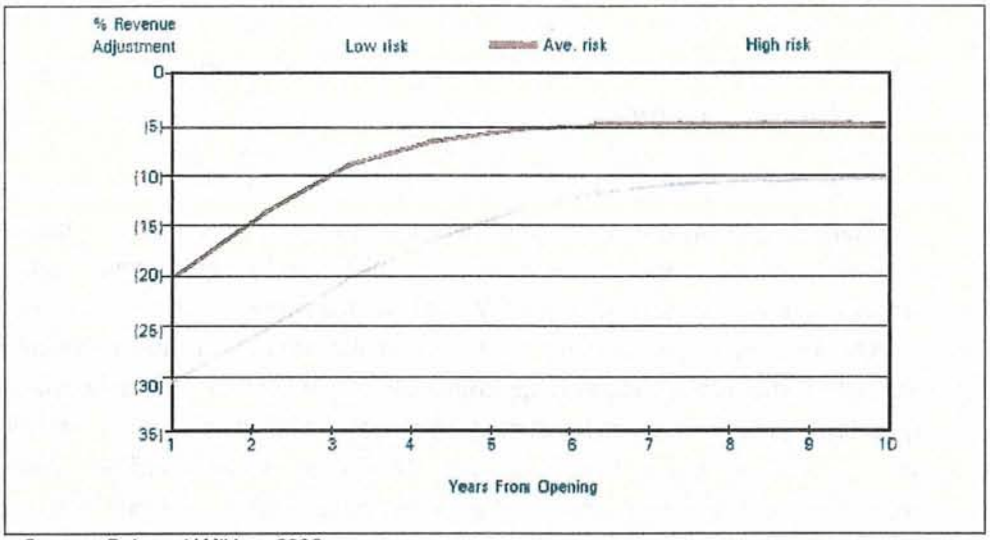
than 0.85, and 12% of the facilities had a ratio over 1.05. This evidence clearly suggests that travel demand modelers need to improve their forecasting methods.



Source: Bain and Polakovic, 2005

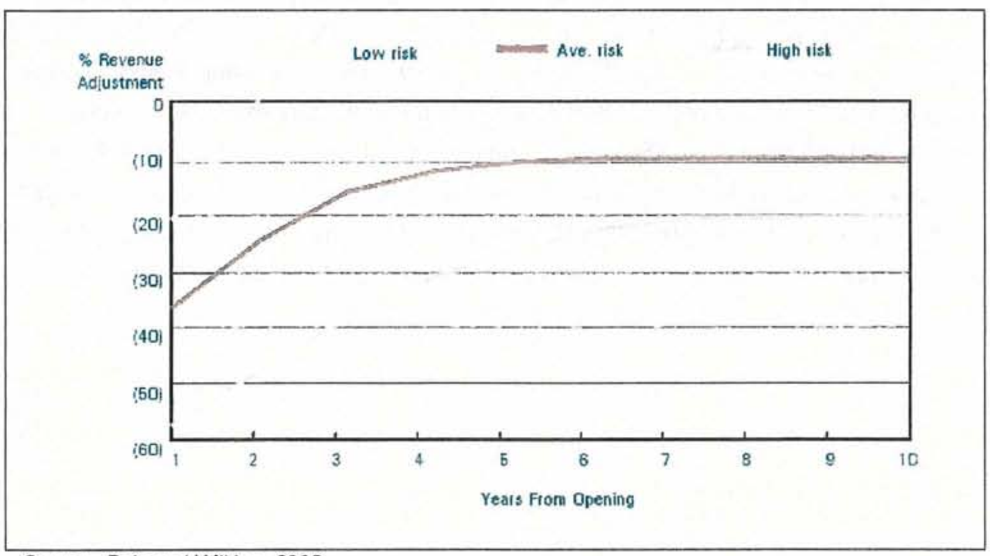
Figure 7: Actual-to-Forecast Traffic Volume Ratio Distribution

One of the main diagnostics to come out of the 2002 study was S&P's Traffic Risk Index (TRI). While the exact details for its estimation are proprietary in nature (and thus not provided), the index attempts to predict the amount of project risk based on many project attributes. Based on the TRI, Bain and Wilkins (2002) determined a risk level (low, average, or high) for each project, and divided its discussion by forecast source: those commissioned by banks versus those commissioned by others. Figure 8 and Figure 9 show the TRI profiles.



Source: Bain and Wilkins, 2002

Figure 8 Estimated Error in Tolled Highway Project Forecasts Commissioned by Banks



Source: Bain and Wilkins, 2002

Figure 9 Estimated Error in Tolled Highway Project Forecasts Commissioned by Others (Non-Banks)

These findings suggest that actual-to-forecast traffic volume ratios in the first year of operation average about 0.9 for low-risk bank-commissioned projects, and 0.8 for low-risk projects commissioned by others. Both types of low-risk projects had average ramp-up durations[3] of about 2 years (after which actual volumes closely matched forecasts). For average-risk projects, year one volume ratios were found to be 0.8 and 0.65 for bank- and non-bank-commissioned projects, respectively. The ramp-up duration was about 5 years in both cases. However, projects commissioned by banks ramped up to about 95% of forecast volumes over the first five years, while projects commissioned by others ramped up to only 90%. For high-risk projects, the volume ratios were just 0.7 and 0.45, respectively, and ramp-up durations were about 8 years. After the ramp-up period, bank-commissioned high-risk projects reached about 90% of forecast volumes while other projects reached approximately 80% of forecast. This suggests that projects with greater uncertainty (and thus risk) underestimate initial traffic volumes by a greater amount, on average, experience a longer ramp-up duration (to reach stable volumes), and stabilize at lower final traffic volumes (versus predictions). Moreover, the risk magnitude is greater for projects not commissioned by banks, suggesting that non-bank project commissioners (public agencies, interest groups, and bidders) may have interests that are better served when predicted traffic volumes are high, and are typically less accountable than banks for investors' monies (Bain & Wilkins, 2002).

The 2003 study provided sufficient observations to conduct several less aggregate analyses. It was found that projects developed in countries with a history of toll facilities exhibited significantly higher actual-to-forecast ratios than projects in countries unaccustomed to highway tolling. Actual-to-forecast volume ratios in the first year of operations averaged 0.81 in countries with a history of tolling, but just 0.58 in other countries (see **Figure 10** and **Figure 11**). Thus, forecast risks appear much higher in countries without a history of tolling. This is intuitive, given that user adoption will be much faster (thanks to existing toll tag and manual payment experiences), and that contractors and operators would be expected to be more familiar with tolling operations. In U.S. regions where flat-rate tolling is already well-established (e.g., Florida, Southern California, New York, and Houston), it may be reasonable to expect first-year ratios in the neighborhood of 0.8. However, most other U.S. regions are unfamiliar with tolling, and therefore forecasts may be overly optimistic if appropriate modeling assumptions are not used, particularly for the ramp-up period.

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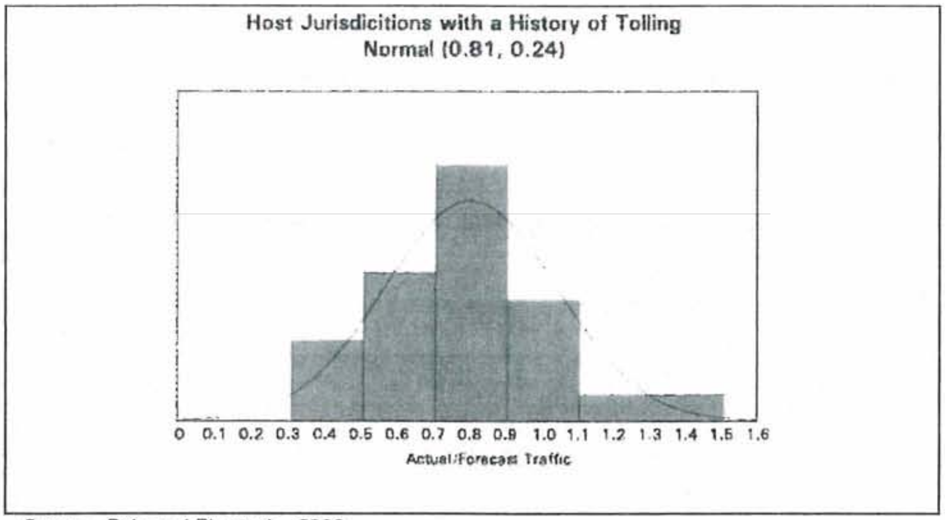
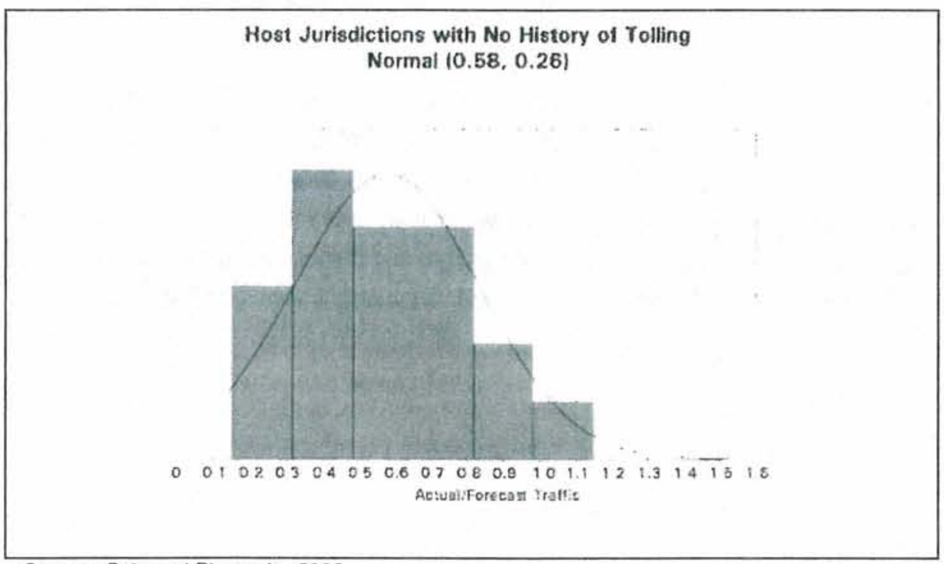
[3] The ramp-up period is the period in which traffic volumes rise to a relatively stable or equilibrium level. This period may require several years.



Source: Bain and Plantagie, 2003

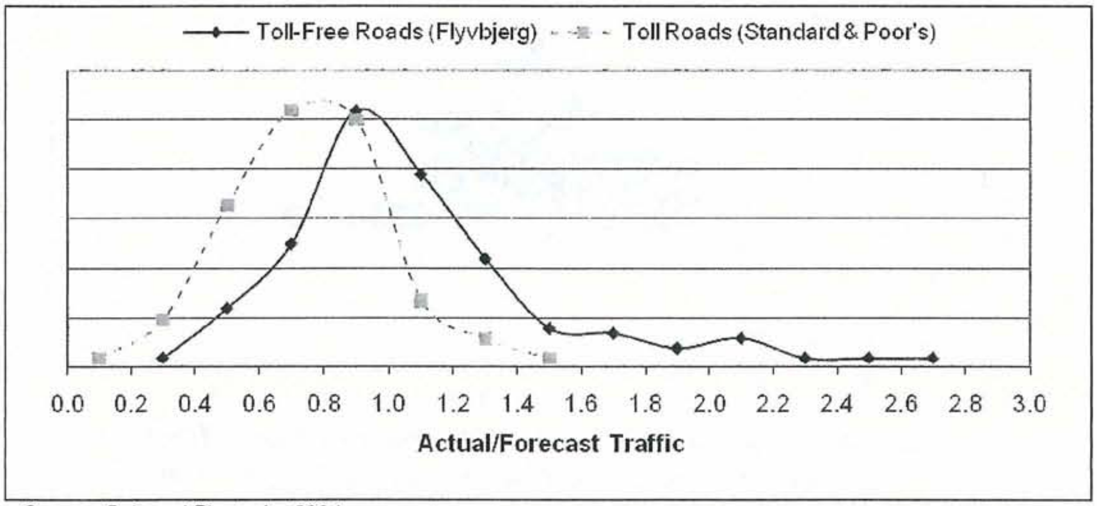
Figure 10
Distribution of Actual-to-Forecast Traffic Volume Ratios in Year One of Operation for Projects in Countries with a History of Tolling



Source: Bain and Plantagie, 2003

Figure 11:
Distribution of Actual-to-Forecast Traffic Volume Ratios in Year One of Operation for Projects in Countries with No History of Tolling

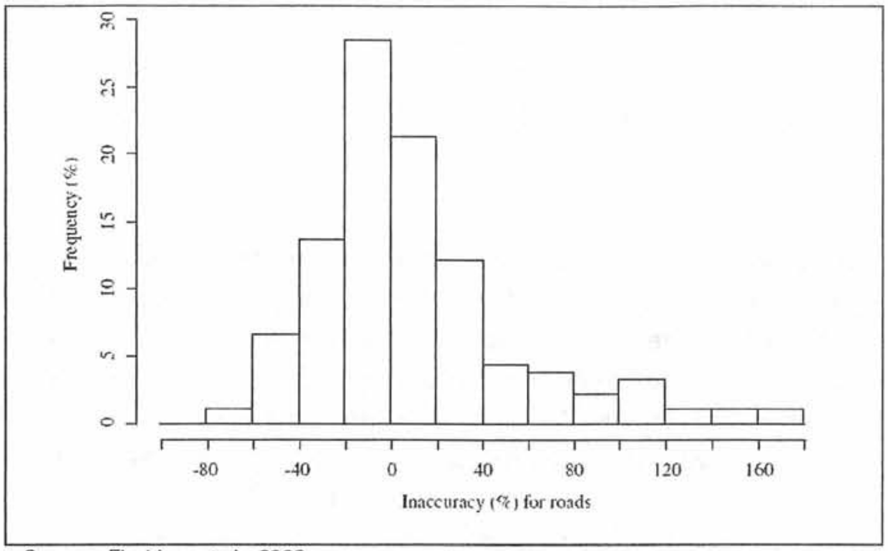
Traffic forecasts for new tolled highways were compared to forecasts for new non-tolled facilities (Bain & Plantagie, 2004). The comparison suggests that new non-tolled roadways exhibit little optimism bias, though the same amount of forecast uncertainty remains. **Figure 12** shows that the two actual-to-forecast ratio distributions exhibit approximately the same shape, but with an added -20% optimism bias shift in the distribution of tolled road ratios. This suggests that after controlling for the added optimism bias of tolled projects, there may be little difference in the accuracy of traffic forecasts for tolled and non-tolled projects.



Source: Bain and Plantagie, 2004

Figure 12 Distribution of Actual-to-Forecast Traffic Volume Ratios for Tolled and Non-Tolled Projects

Independent studies of the forecast performance for non-toll roads have found that the average actual-to-forecast ratio for these roads is 1.09, with 95% confidence that this value lies between 1.03 and 1.16 (Flyvbjerg et al., 2005 and 2006). As discussed previously, this average ratio is higher than if a weighted average were taken. A weighted average ratio would likely be very close to zero since there appears to be approximately the same number of projects falling above and below the break even ratio of 1.0. This situation corresponds to the 0% difference in forecast inaccuracy shown in **Figure 13**.



Source: Flyvbjerg et al., 2006

Figure 13: Distribution of Actual-to-Forecast Traffic Volume Ratios for Non-Tolled Road Projects

In Standard & Poor's 2005 update the uncertainty in project ramp-up years was investigated in greater depth. The expectation was that uncertainty would fall slightly from opening year forecasts, because traffic demand would have an opportunity to stabilize, as drivers learn of route alternatives and obtain toll accounts, for example. The sample size was just 25 projects for years one through five, and the hypothesis was not supported (Bain & Polakovic, 2005). The mean ratio of actual-to-forecast traffic volumes was 0.77 in year one, and 0.79 (negligibly higher) in year five. **Table 9** shows the average uncertainty ratios for each of the first five years of traffic operation. The difference in ratios is just 0.02, and thus, not significant. These results suggest that traffic demand generally remains well below the forecast, even into the fifth year of operation. Conversely, while a much smaller sample of Spanish toll roads identified similar optimism biases, it also showed that forecast ratios generally improved following year one (Vassallo & Baeza, 2007).

Table 9: Average Ratio of Actual-to-Forecast Traffic Volumes

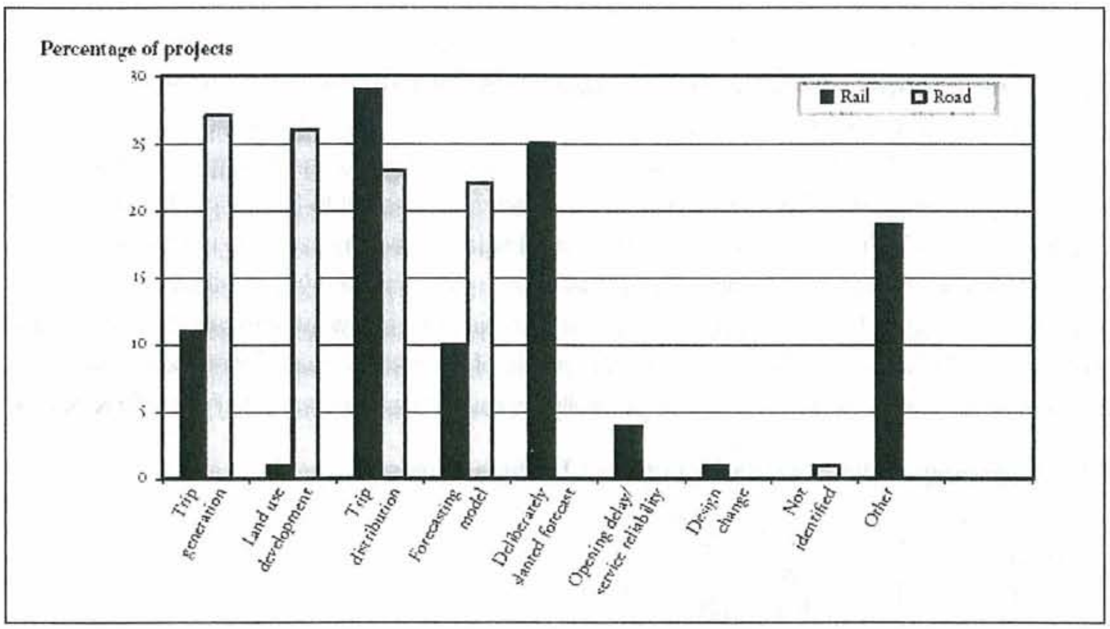
Years from Opening	Average Actual-to-Forecast Traffic Volume Ratio
1	0.77
2	0.78
3	0.79
4	0.80
5	0.79

Source: S&P's, 2005

4.2 Sources of Risk and Uncertainty in Traffic Forecasts

While significant uncertainty in traffic forecasts clearly exists, the causes of such uncertainty vary. Numerous studies have identified and examined several sources of forecast error (see for example Flyvbjerg et al., 2005 and 2006; Bain & Wilkins, 2002; George et al., 2003 and 2007). These studies indicate that there are differences between tolled and non-tolled highways in terms of the sources of forecast error.

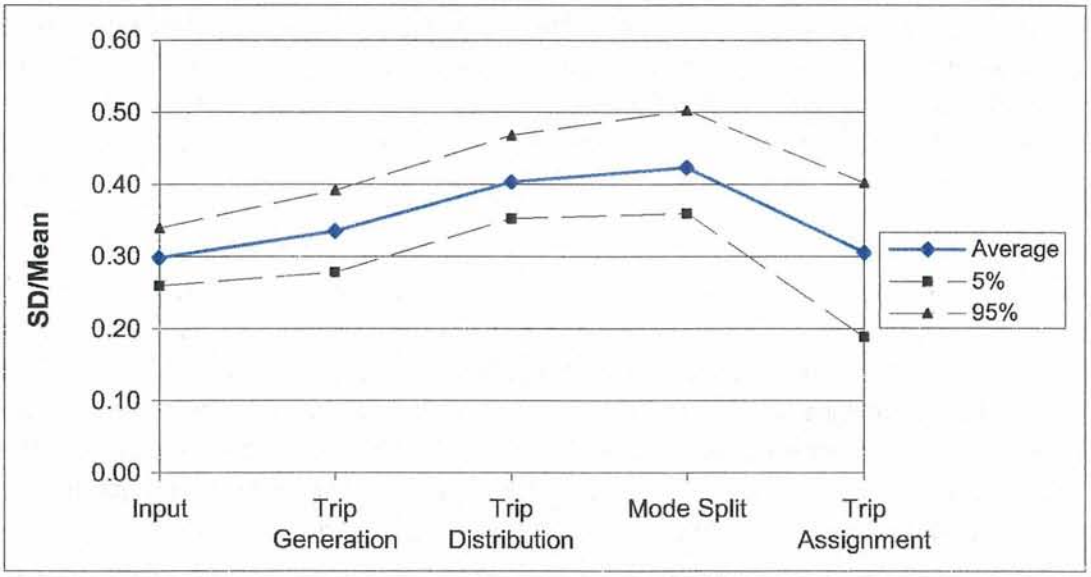
Figure 14 provides the percentage of projects with stated sources of traffic forecasting error, as reported by project managers, for both passenger rail and road projects (Flyvbjerg et al., 2005 and 2006). The two top-stated sources of error for toll-free road projects are estimates of trip generation and land development, though trip distribution and the forecasting model are close runners-up. The authors attribute much of the modeling uncertainty to dated data used in model calibration. Land Transport New Zealand (2006) also notes the importance of quality and relevance of data used in the forecasting model. This is a common problem with travel survey data. However, with forecasts at 10 years out, more of the error may stem from uncertainty in how land will develop (Flyvbjerg et al., 2005 and 2006). Such forecasts are based on development plans, which emerge and evolve over time.



Source: Flyvbjerg et al., 2005

Figure 14: Project Manager-Stated Sources of Forecast Error for Non-Tolled Facilities

Zhao and Kockelman (2002) tracked the propagation of uncertainty through a four-step travel demand model. They controlled the uncertainty of model inputs and parameters, and performed 100 simulations of the model. **Figure 15** illustrates the range of coefficients of variation (CoVs) in intermediate and final model outputs (across the 100 simulations), given CoVs of 0.3 for all model inputs. These results suggests that modeling error in effect "grows" through the application of trip generation, trip distribution, and mode choice models (as one's scale of resolution gets finer, essentially – to the number of trips by mode between each origin-destination pair). However, the final step of traffic assignment enjoys a drop in uncertainty (at the link-flow level), thanks to overlap in different trips' routings and mode and trip distribution choices across all travelers, along with congestion feedbacks (which moderate the presence of high link-demand values). Overall, Zhao and Kockelman's (2002) work suggests that link-flow estimates enjoy the same level of uncertainty as inputs and parameters. Consequently, simple regressions of outputs on inputs (and aggregations of inputs) should offer very high predictive power, suggesting that prime sources of forecast uncertainties can be rather quickly deduced – and exploited, for better prediction.



Source: Zhao and Kockelman, 2002

Figure 15: Uncertainty Propagation Through a Four-Step Travel Demand Model

Zhao and Kockelman (2002) also point out that models are abstractions of reality and the entire modeling paradigm is a source of error in traffic forecasts. While their study did not consider tolled roads, one can imagine that output variability may rise, as toll-technology adoption rates and heterogeneity in value of travel time savings introduce more uncertainty. In fact, for tolled roads, Bain and Wilkins (2002) noted the importance of data used to calibrate travel demand models, both in terms of currency (more recent is better) and the ease with which data were collected (affecting data quality and quantity).

Network attributes can also play a key role in forecast reliability. Analysts do not know the actual future network, and coded networks are significant simplifications of actual networks (generally ignoring local streets, signal timing plans, turning lane presence and lengths, etc.). Forecasts that depend on future network changes (such as nearby highway extensions) tend to be less reliable (Bain & Wilkins, 2002). The level of traffic congestion is also a key source of forecast error. As noted by Bain and Wilkins (2002) and Zhao and Kockelman (2002), it is more difficult to predict traffic flows on uncongested than congested networks, because congestion feedbacks distribute traffic more evenly over space and time while establishing something like a volume upper bound on all links, associated with a link capacity.

Another key source of error in traffic forecasts comes from uncertainty in land development patterns (Rodier, 2003; Flyvbjerg et al., 2005 and 2006; Land Transport New Zealand 2006). Rodier's (2003) application of the Sacramento, California travel demand model for year 2000 conditions found that about half of the 11-percent overestimation of VMT was due to demographic and employment projections, which serve as inputs to the demand models. The other half was due to the model itself. With forecasts anticipating demand ten or more years out, Flyvbjerg et al. (2005 and 2006) suggest that more of the error may stem from uncertainty in future land development patterns. For tolled roads, Bain and Wilkins (2002) argue convincingly that land development forecasts are regularly critical, and that the more stable a region's economy, the better its land use (and, thus, its travel demand) forecasts. Such forecasts are generally based on land use plans and expert judgment, which are simply educated guesses and tend to evolve over time. Another option is land use modeling, which, of course, is also fraught with a variety of uncertainties (see for example Pradhan & Kockelman, 2002; Rodier & Johnston, 2002; Krishnamurthy & Kockelman, 2003; Rodier, 2005; Clay & Johnston, 2006; Sevcikova et al., 2007; and Duthie et al., 2008).

While the sources of error described above apply for projects of any type, there are many other error sources that are specific to tolled roads. One such source identified by Bain and Wilkins (2002) and George et al. (2007) is tolling design – that is, whether shadow tolls or user-paid tolls[4] are used. With shadow tolls, the government pays the concessionaire an amount based on toll road use. So from the user perspective, it is very similar to a toll-free road. With user-paid tolls, the toll charge is quite obvious to the user. Since driver willingness to pay is complex and varies with observed and unobserved driver attributes, projects with user-paid tolls carry more forecasting risk than free roads or shadow-priced roads. Moreover, George et al. (2007) suggest that user fees make a tolled road more susceptible to changes in demand caused by economic downturns and recessions, toll rate increases, and escalating fuel costs. Other special or relatively rare events, such as natural disasters or acts of terrorism, are often key sources of uncertainty as well (George et al., 2007). While such events are difficult to predict, HLB Decision Economics (2004) suggests that the number and duration of recessions in the forecast period should be considered in investment grade studies.

Another important consideration in understanding project risk is the "tolling culture" of a region (Bain & Wilkins, 2002). This is essentially the degree to which tolls have been used in the past. In nations and regions where tolling has not previously been used, there is greater uncertainty surrounding traffic forecasts. If travelers are accustomed to paying tolls for other road facilities, forecasts tend to be much more reliable. As noted earlier, the absence of a "tolling culture" appears to result in 20% greater average optimism bias (Bain & Plantagie, 2003).

Of course, over-simplifications embedded in the travel demand model are also sources of error in traffic forecasts. For instance, the robustness and heterogeneity (across travelers and trip types) of value of travel time (VOT) estimates are generally ignored, but may be crucial in producing accurate forecasts. The

[4] Only 4 of the 32 projects investigated in the 2002, Bain and Wilkins study had shadow tolls.

use of imported parameters (calibrated for other regions or even other countries) can also cause much error (Bain & Wilkins, 2002). Another important modeling issue is related to the actual representation of tolls. Models that recognize the full complexity of certain tolling regimes (such as variable tolls or HOT lanes that are free at certain hours) can be quite difficult to specify and calibrate (Bain & Wilkins, 2002), introducing further uncertainty.

Facilities enjoying a competitive advantage of some sort also tend to offer more reliable forecasts (Bain & Wilkins, 2002; George et al., 2007). For instance, forecasts for projects in dense, urban networks (with many alternative routes) generally will be less certain than those for projects with a clear competitive advantage over alternatives (for example a corridor with the only river crossing in a region). Moreover, many privately financed projects rely on protection against competition in the future. If protection is provided (via non-compete clauses, for example), long-run traffic forecasts tend to be more reliable (Bain & Wilkins, 2002). Of course, such clauses may be contentious, as discussed in Perez and Sciara (2003), Poole (2007), and Ortiz et al. (2008). However, non-compete clauses generally do not ban planned improvements (Ortiz et al. 2008) and typically do not prohibit new free roads. But they may allow for compensation when toll revenues fall due to improvements on nearby non-tolled facilities (Poole 2007).

Meaningful distinctions can also arise in the context of user attributes. Bain and Wilkins (2002) assert that toll facilities serving mostly a small market segment of travelers allow for more reliable traffic forecasts. This is because smaller markets are easier to model than more heterogeneous populations. For example, beltways (orbital style facilities) are likely to carry more forecasting risk than radial facilities (which typically carry a high share of commuters into and out of the city center, for work purposes). In addition, if there is a single origin-destination pair that constitutes the majority of trips made on the facility, forecasts errors fall, as a result of the relatively homogeneous makeup of such travelers. However, George et al. (2007) warn that when only a small market segment constitutes the majority of toll road users, road traffic and revenues will be more susceptible to any form of downturn affecting that small segment.

Of course, road location and configuration also affect levels of forecast error. When the preferred alignment of a new toll road is constrained by external factors (for example land use patterns, nature and location of existing development, land/right-of-way availability, topography, geological sensitivities, engineering limitations, and/or politics), traffic forecasts become more uncertain (Bain & Wilkins, 2002). Bain and Wilkins (2002) also assert that facilities with proper connectors to the rest of the network have more reliable estimates. If the toll road terminates in the downtown area and long queues await travelers joining the local network and/or if travelers must take circuitous routes to enter the toll road, the competitive advantage of the toll road can be compromised, and greater forecast errors can emerge. Demand variations over times of day and days of the year also affect forecast reliability. If a road serves a stable demand profile, forecasts tend to be more reliable (Bain & Wilkins 2002). Commercial users of the tolled facility also can play an important role. In particular, if most commercial vehicles are independent truckers, there is added risk in traffic forecasts since their behavior is less well understood. However, if most commercial truckers work for fleet owners, the opposite is true. (Bain & Wilkins, 2002) Moreover, dependence on commercial travel carries more risk since commercial travel is more susceptible to economic downturns (George et al., 2007)

Overall, Bain and Wilkins (2002) indicate seven top drivers of forecast failure: poorly estimated VOTTs, economic downturns, mis-prediction of future land use conditions, lower-than-predicted time savings, added competition (e.g., improvements to competing roads or the addition of new roads), lower than anticipated truck usage, and high variability in traffic volumes (by time-of-day or day of the year). Bain and Plantagie (2003) added several other top drivers: complexity of the tolling regime, underestimation of the duration and severity of the ramp-up period, and reliance on a single VOT (as opposed to segmenting user groups). Another rating agency, Fitch Ratings, also suggested several of these same drivers, but added that the use of a regional travel demand model developed for other planning purposes also can cause great error in traffic forecasts (George et al., 2003). This suggests, to some extent, that a comprehensive, regional model may not perform as well as simpler estimation techniques (e.g., OD pair trend analysis), if the regional model lacks appropriate specification for the toll road scenario. Clearly, there is a great deal of uncertainty in traffic and revenue forecasts of tolled roads stemming from various sources. The next section discusses methods that can be used to measure and evaluate this uncertainty in forecasting models.

3.2 Methods for Accommodating Risk in Travel Demand Modeling and Revenue Estimation Analyses.

Accommodating risk and uncertainty in demand and revenue forecasts is an important component of any toll road study. While a single "best" statistical forecast is useful, it lacks the information needed for making long-term financial decisions. Given the great number of assumptions, inputs, and estimated parameters entering travel demand models, model outputs can be highly uncertain and inaccurate. Neglecting this uncertainty (or equivalently, assuming determinism) can invite scrutiny from stakeholders, since not all will agree with assumed inputs and parameter values (Duthie, 2008). As noted in the previous sections, the magnitude of error in demand forecasts (and, thus, revenue forecasts) can be substantial, and tends to be biased in favor of toll road projects. Even with advances in model designs over the past couple decades, a review of the data suggests that forecast accuracy has not improved and may have worsened (Flyvbjerg et al., 2006). Most analysts, policy-makers, and investors agree that it is imperative that modelers quantify forecasting risk in a meaningful way (Rodier, 2007), and while the financial community has understood the need to address risk in toll road studies, Kriger et al. (2006) believe that very few practitioners conduct any sort of risk assessment. Some simply verify results by use of "reality checks" (for example comparing to older forecasts and using simple intuition to verify whether results seem reasonable) while others use no verification methods at all.

One key component of risk assessment in model outputs lies in explicitly stating all modeling assumptions (Kriger et al., 2006), making the model specification as transparent as possible. If modelers and users understand the implications of alternative assumptions, the uncertainty in the forecasting process will be better understood. Of course, other options for understanding and communicating forecast uncertainty also exist, as discussed here now.

A relatively common and reasonably effective method for accommodating risk in demand and revenue forecasts is the use of sensitivity analyses or "stress tests" (Kriger et al., 2006). Most sensitivity analyses rely on the exploration of a very limited set of different values for key variables, such as a region's or neighborhood's population growth rate, values of travel time, and planned tolls (Kriger et al., 2006).

Though such analyses can provide key insights, many practitioners and financial analysts feel that they do not adequately reveal the range of possible outcomes (see for example HLB Decision Economics, 2003 and Kriger et al., 2006). As their name implies, stress tests seek to understand the outcomes of relatively extreme conditions – generally to anticipate worst- (and best-) case investment scenarios. In this way they help analysts anticipate lower (and upper) bounds on project outcomes, but certainly not a distribution of outcomes, or probability of financial loss.

Model validation studies offer another method for quantifying uncertainty, by examining how well model forecasts match observed data not used in model calibration (Rodier, 2007). Such studies measure forecast uncertainty directly from observed data, and thus require data from two points in time: the older data set is used for model estimation and calibration while the newer one is used for validation. It can be impossible to conduct such tests of models developed from recent data, but at least one obtains a sense of the magnitudes of errors that can emerge from transferring behavioral parameters calibrated on old data to current-year contexts. Such validation tests are a valuable complement to sensitivity tests. And such results assist analysts in communicating the size and relevance of uncertainty to decision makers and the public (Rodier, 2007).

Of course, sensitivity testing and model validation studies have their limitations. For example, sensitivity tests are constrained to typically three or four scenarios. In contrast, Monte Carlo simulation techniques more fully explore the range of possible outcomes, by defining and drawing from probability distributions for key inputs. Such techniques also exhibit limitations: they require assumptions of input distributions (and their covariances) when these are often unknown, and generally more sophisticated programming techniques (to ensure rapid run times for testing a high number of scenarios).

Monte Carlo techniques are at the heart of the four-step risk analysis process (RAP) used by HLB Decision Economics (2003). In step 1, HLB defines a "structure and logic" model, in order to forecast traffic and revenue on the basis of an array of inputs and parameters. In step 2, central estimates and probability ranges are assigned to each relevant input and parameter. In step 3, expert opinions regarding the results of step 2 are obtained, and probability ranges and central estimates are revised. In the final step, Monte Carlo simulation techniques are employed, drawing inputs and parameters from their respective probability distributions, and traffic and revenue probability ranges are derived based on the simulation outcomes. This approach allows firms like HLB to determine the likelihood that revenue cannot cover the debt service, an important criteria for issuance of debt.

As discussed earlier, Zhao and Kockelman (2002) performed a similar analysis (for a non-tolled case), using a four-step travel demand model for a sub-network of the extensive Dallas-Fort Worth region with 118 variable input and parameter values. Although only 100 runs were performed, the analysis by Zhao and Kockelman provides useful insights into the degree of uncertainty in link- and region-level traffic forecasts. They assigned density functions to 18 random model parameters (13 in trip generation, 1 in trip distribution, 2 in mode choice, and 2 in assignment) and four major model inputs for each of 25 zones (forecasts of households and jobs per zone). Each of the uncertain parameters and inputs were assumed to follow lognormal distributions with coefficients of variation[5] (CoVs) of 0.3, 0.1, and 0.5. After performing 100 simulation runs (for each of the 3 CoVs), two network links were examined in detail for the case of CoVs equal to 0.3. On both links, flows ranged from around 400 vehicles per hour to over 2000, with CoVs of 0.31 and 0.32. Zhao and Kockelman (2002) also performed a regression analysis of standardized input and parameter values on system-level VMT results. This analysis indicated that inputs and trip generation parameter values were the most important factors in forecasts of total VMT. It seems evident that traffic forecasts can exhibit a great deal of variation and depend greatly on parameter and input assumptions used in model calibration and application. When tolls are present, results could exhibit even greater variation. However, Zhao and Kockelman (2002) observed similar uncertainty levels in model inputs and outputs suggesting that opportunities for errors in one part of the model to offset errors in another can have a dampening effect on overall uncertainty. Thus, adding more uncertain inputs and/or parameters may not amplify forecast uncertainty.

Lam and Tam (1998) also performed a study of uncertainty using Monte Carlo draws in traffic and revenue forecasts for a toll road project connecting Hong Kong to an adjacent region separated by a body of water. No actual travel demand model was used, however, since only one other reasonable route existed between the two regions and a detailed travel study was deemed unnecessary. Instead, trip generation and routing shares were assigned distributions, and allowed to vary across simulation runs in order to quantify forecast uncertainty. A total of 10,000 simulations were performed, and overall revenues were found to hit or exceed the base forecast approximately 52% of the time. This is not so surprising, since the base forecast represents a simulation based on the mean values for all 12 unknowns input parameters. They also estimated that the standard deviation of forecast revenues rose from just 17% of the mean in the first forecast year to 28% of the mean after 20 years (Lam & Tam, 1998). It is useful to note the smaller coefficients of variation found here, in comparison to Zhao and Kockelman's (2002) study. For instance, the total population and trip generation rates were both assumed to have CoVs of 0.05. Lam and Tam investigated a particular scenario with arguably much less risk. Since their bridge facility enjoyed a clear advantage over competing routes, there was a specific traveler group being serviced, and a single origin-destination pair making up the majority of travel.

More recently, Sevcikova et al. (2007) compared Bayesian melding techniques and standard sampling approaches to analyze uncertainty in projections of household counts using UrbanSim, a land use simulation model. They found that Bayesian melding techniques produced wider ranges in output values than standard approaches, and the ranges suggested by the standard approaches were too narrow. Duthie et al. (2008) used an antithetic sampling technique to analyze uncertainty in an integrated land use-transportation setting. Methods like these, for sampling thoughtfully and performing estimation rapidly, can be invaluable in obtaining output distributions from complex models relatively quickly.

Consistent with such analyses, the National Federation of Municipal Analysts (NFMA 2005) formally recommends that a range of possible road project and policy outcomes should be explored based on different scenarios (or assumptions), and that varying variables or parameters one at a time is insufficient. By assigning realistic probability distributions to parameter values and inputs, the probability of a given

[5] The coefficient of variation is defined as the ratio of the standard deviation to the mean.

scenario can be understood. The NFMA's (2005) guidelines for traffic and revenue studies include several highlights: a no-build traffic forecast should be produced, a baseline traffic and revenue forecast should be produced, sensitivity analyses should be performed on inputs (including population, employment, and income growth, toll elasticity by consumers, and acceleration of the planned transportation network), and debt service analysis should be performed.

Of course, just as neglecting uncertainty is equivalent to assuming determinism, neglecting covariance in inputs is equivalent to presuming their independence. Thus, it is important to recognize the co-dependence of input distributions due to correlated response under various conditions and as introduced in parameter distributions via the estimation process. For example, economic boom/bust cycles can affect land development and thus population and job growth across zones similarly, along with trip generation rates, vehicle ownership, and income levels. This can result in wider uncertainty bounds than univariate input and parameter distributions would indicate. For example, Zhao and Kockelman (2002) used multivariate distributions for their population and employment input values with +0.30 correlations, but relied on independent distributions for all model parameters.

Another approach is "reference class forecasting," as described by Flyvbjerg et al. (2005). This method essentially relies on past experiences with a sample of similar projects in order to estimate outcome distributions and thus the probability of various events occurring. By comparing the forecasts with past experience, judgments can be made regarding the validity of results. Of course, this is difficult to do without good data on a variety of reasonably comparable projects. But it is a useful strategy when such data exist.

To determine an investment's credit rating, credit agencies and financial analysts use varied approaches to account for revenue forecast risk. For example, Fitch Ratings (George et al., 2003, George et al., 2007) claims to study the key assumptions and inputs of the travel demand model used in creating future forecasts, and then considers a range of possible outcomes associated with each factor in order to develop a "stress" scenario alongside a base scenario (essentially sensitivity testing, but with relatively extreme scenarios). The base case is generally more conservative than the base case developed by the project sponsor, eliminating any evident forecast optimism. The stress case is developed to determine the project's ability to withstand rather severe (but not unreasonable) circumstances in which the ability to pay debt service is stressed. Based on the results of the stress scenario, an investment rating is assigned to the project. For credit analysis of longer-term traffic forecasts, Bain et al. (2006) suggest taking a conservative approach, reducing growth rate expectations and carefully examining future toll schedule increases. They also suggest that long-term growth rates exceeding 1% and toll increases beyond those suggested by reasonable correction for inflation should be viewed with caution. While these techniques simplify uncertainty testing dramatically and help investors understand the real possibility of loss, they do not illuminate the variety (and likelihood) of futures that truly exist, and associated investment risk cannot be fully understood using such methods.

3.3 Summary and Recommendations

As discussed in this appendix, a great deal of uncertainty exists in traffic forecasts. Flyvbjerg's analyses (2005 and 2006) suggest that traffic forecast errors exceed 20% roughly half the time across all roadway projects and more than 40% of the time for a quarter of projects. This situation is compounded when traffic forecasts of *tolled* projects are considered, since more unknowns exist. S&P's analysts (Bain & Wilkins, 2002; Bain & Plantagie, 2003 and 2004) found that, on average, tolled traffic volumes are well below forecasts (on the order of 25% or more) in their first year of operation, suggesting considerable optimism bias, and that this bias does not fade over time. As transportation agencies look more closely at tolling options as a way to fund highway capacity expansion and manage demand, it becomes even more important that models provide reliable traffic forecasts.

Traditionally, travel demand models have been used to provide a single projection of future conditions. Though the models become more sophisticated, the future remains unknown, and model forecasts should be presented as such. It is critical that the uncertainty implicit in travel demand models be communicated to planners and policy makers. Of course, quantifying such uncertainty is not a trivial task. While the sources of misprediction vary, designers and transportation planners have found a number of methods to accommodate forecast uncertainty (or at least quantify it).

Sensitivity testing allows for greater understanding of the magnitudes of uncertainty in the model. By allowing key model inputs and parameters to vary simultaneously, creating multiple possible scenarios, uncertainty in traffic and revenue forecasts can be better bounded. Indeed, this appears to be the most common method for dealing with uncertainty by credit agencies. However, sensitivity testing generally does not provide a probability of particular outcomes occurring. Therefore, it can be difficult for policy makers to truly understand inherent risks. When feasible, comparisons with similar, past projects is a meaningful tool for anticipating potential outcomes.

Monte Carlo simulation may be most appropriate to identify a more comprehensive set of possible futures. By drawing parameters and inputs from reasonable sets of distributions, the probability of particular outcomes can be understood. Of particular importance for projects where financial backing is dependent on toll revenues is the probability that toll revenues will cover debt service, and whether additional revenues will remain (over and above debt service). Moreover, since most toll road studies use rather streamlined model systems, computing time is typically not an issue. Thus, the recommended best practice for dealing with uncertainty in toll road projects is the use of Monte Carlo simulation. Sensitivity testing is valuable in some cases where simulation may be too computationally expensive, though more thoughtful sampling methods, such as Bayesian melding and antithetic sampling, can reduce such computational burden in many cases.

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• *Glossary of Tolling Terms*

Amortization – A financial term referring to terms of a loan where the provision is made in advance for the gradual reduction of an amount owed over time.

Area pricing – A tolling approach where vehicles are charged a fee to travel within a high activity center, such as a downtown or business district. Prices may vary by time of day to encourage motorists to enter the zone during less busy times or to use transit. An example is Fareless Square in Portland, where transit is available for free to discourage short-term and short-distance auto travel within the business district.

Bus rapid transit (BRT) – High-frequency bus service on dedicated lanes that are separate from general travel. BRT combines the advantages of rail transit – exclusive right-of-way to improve punctuality and frequency – with the advantages of a bus system – low implementation costs and flexibility to serve lower density areas.

Congestion pricing – An overarching term used to describe measures that reduce congestion by charging drivers tolls that vary by time of day or traffic volumes.

Consumer surplus – In economics, the difference between the price a consumer pays for an item and the price she would be willing to pay rather than do without it.

Cordon pricing – A pricing scheme where vehicles entering a high activity area are charged a fee when they cross the boundary line into the activity center. Motorists are charged each time they cross the cordon line. Prices could vary by time of day, to encourage motorists to enter the cordon zone during non-peak periods or to make peak trips using transit. This is similar to area pricing, distinguished by the toll being charged for crossing the cordon rather than for driving within the cordon zone.

Cost-benefit analysis (CBA) – An analytic technique used in determining the economic value of a project or plan. Costs and benefits are typically denominated in dollars and include the money, time, resources, and consequences associated with a project or activity.

Distance-based tolls – Fixed toll rates based on distance traveled and vehicle type.

Diversion – The result of people making different travel choices, in this case as a result of a toll. Diversion can refer to taking different routes, or changing modes, travel time or destination.

Dynamic congestion pricing – Tolls that change based on real-time travel conditions. For example, when traffic volumes go up, so do the tolls. Rates are lowered as demand eases.

Elasticity – The price elasticity of demand measures the nature and degree of the relationship between changes in quantity demanded of a good and changes in its price. High elasticity implies high sensitivity to changes in price while low elasticity, often referred to as inelasticity, means low sensitivity to price changes.

Electronic toll collection (ETC) – Using technology to collect tolls from drivers without requiring them to stop and make cash payments.

Equity – The idea that all travelers are of equal standing, and should be considered in the development of toll policy. Social, geographic and income equity are examples of equity issues that arise in toll policy development and implementation.

Express toll lanes – Limited access, normally barrier-separated highway lanes requiring drivers of all vehicles to pay tolls in order to use the facility. All tolls are collected electronically.

Fixed tolls – Toll rates that don't change. They are typically used to pay for the bridge or road on which they are charged. Trucks pay more than cars.

Fixed-schedule congestion pricing – Tolls charged at predetermined rates reflective of demand levels at different times of day; rates can be based on hour of the day, day of the week, direction of travel and vehicle type.

Gas tax – A state levied tax on the consumption of gasoline. The primary means currently of financing highways in Oregon.

Greenhouse gas emissions – The generation and emission of gases, such as carbon dioxide, methane, nitrous oxide and halocarbons, which accumulate in the atmosphere and have a long residence time, leading to a surface warming of the land and oceans.

High occupancy vehicle (HOV) – A vehicle containing more than one person.

High occupancy vehicle (HOV) lane - A travel lane restricted to transit and carpool vehicles meeting occupancy requirements of two or three people per car. HOV lanes are meant to carry more people in less space than general purpose lanes.

High occupancy toll (HOT) lanes – Travel lanes restricted to either qualifying HOVs or solo drivers willing to pay a toll. The toll typically varies by time of day or traffic levels and is collected electronically.

Investment grade – The top four rating categories for bonds. Important to tolling as special, independent analysis of the revenue generating capacity of a particular toll project may be required for bond issuance.

Managed toll lanes – Any toll lane that uses variably priced tolls to maintain superior, less congested travel conditions.

Mileage-based fee or mileage tax – A tax on vehicle use based upon miles driven rather than fuel consumption.

Non-recurrent delay – A type of travel delay that occurs because of incidents, and is therefore not as predictable as recurrent delay caused by traffic exceeding capacity, bottlenecks, other infrastructure problems.

Open road tolling – Use of electronic toll collection methods to keep traffic moving, as opposed to making people stop at toll booths to pay the toll.

Opportunity cost – In economics, the value of the next-highest-valued alternative use of a given resource.

Parking policies –Adopted means of managing access to a particular locale by changes in the price of parking.

Peak period – The busiest travel times of the day, also known as commute time or rush hour. There are typical two peak periods each weekday – the morning and afternoon commute times.

Public-Private Partnerships (PPPs) – Contractual agreements formed between a public agency and private sector entity, which expand on the traditional private sector role in the delivery of transportation projects. PPPs are particularly prevalent for tolling projects.

Pricing – A tolling concept where the level of toll (price) is used to change travel behavior.

Public good – In economics, a good that is non-rival and non-excludable. This means consumption of the good by one individual does not reduce the amount of the good available for consumption by others and no one can be effectively excluded. A non-congested public highway can be considered a public good.

Recurrent delay – A type of highway delay that occurs regularly due to too much traffic and/or geometric constraints.

Single occupancy vehicle (SOV) – A vehicle containing only one occupant.

State Infrastructure Bank (SIB) – An ODOT-managed revolving loan fund available for transportation projects.

System-wide tolling – Implementing tolls on highways and major arterials to reduce congestion, minimize route diversion and increase transportation revenues.

Theory of the Second Best – In economics, a theory of what happens when one or more optimality conditions are not satisfied in an economic model. It implies the need to study the details of a situation prior to assuming theory based conclusions because improvements in market performance in one area may not mean an overall improvement. This is significant in congestion pricing schemes where theoretically optimal conditions are likely to be unachievable.

Time-of-day pricing – A tolling approach that varies by the time of day in order reduce congestion at peak hours; rates are higher at peak hours then at off-peak.

Tolling – Charging a price to use a road, bridge or tunnel.

Toll Revenue Bonds – A type of municipal bond where the principal and interest are secured by tolls paid by the users of the facility that is built with the proceeds of the bond issue.

Travel-demand forecasting – The analytical estimation of future travel volumes and patterns, typically performed with computer models. There are four basic components: (1) trip generation – predicting the number of trips that will be made; (2) trip distribution – determining where the trips will go; (3) Mode usage – how the trips will be divided among available modes of travel; and (4) Trip assignment – predicting which routes the trips will take, resulting in highway system and transit ridership forecasts.

Travel demand management – The application of techniques that affect when, how, where, and how much we travel done in a purposeful manner by government or other organizations. The techniques include education, policies, regulations or other combinations of incentives and disincentives.

Truck only toll (TOT) lanes – Limited access, normally barrier-separated toll lanes available only to trucks for a variably priced toll. All tolls are collected electronically.

Value of time – One of the most important benefits of road pricing, as well as other transportation projects, is travel time savings. What these savings are worth to motorists can vary by income, gender, age, trip purpose, mode used, length of trip, uncertainty of travel time and other factors. This in turn implies analytical difficulties in applying values to given situations.

Value pricing – Toll rates that vary in direct proportion to travel demand or congestion on alternative free routes.

Variable toll – A toll that changes by time of day, traffic volumes or other factor.

Columbia River Crossing Project

Amendments to the 1998 South/North Land Use Final Order for the Expo Center/Hayden Island Segments

LUFO Steering Committee Recommendation Concerning the 2011 South/North Land Use Final Order

June 23, 2011

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1. Introduction

This document constitutes the South/North Land Use Final Order (LUFO) Steering Committee's recommendation to TriMet regarding TriMet's application to the Metro Council (Council) for amendments to the original South/North Corridor Project LUFO, which the Council adopted on July 23, 1998 (the 1998 LUFO). As initially approved, the 1998 LUFO covered an area extending from the Clackamas Town Center in the south through the cities of Milwaukie and Portland to the Oregon/Washington border in the north.

Since 1998, the Council has amended the 1998 LUFO three times. These include South/North LUFO amendments for Interstate Avenue (1999), Interstate 205 and Downtown Portland (2004) and Portland-Milwaukie (2008). The modifications included in this recommendation for a fourth LUFO amendment are part of a larger, two-state integrated light rail and highway project commonly known as the Columbia River Crossing (CRC) Project. Because Oregon Laws 1996, Chapter 12 (House Bill 3478), which is the law governing Council adoption of South/North Land Use Final Orders, applies only within the jurisdictional boundaries of the State of Oregon, this LUFO amendment addresses only that portion of the CRC Project within the State of Oregon.

This 2011 LUFO Steering Committee recommendation involves an area contained within the North Portland and Hayden Island segments as identified in the 1998 LUFO.[1] When the Council adopted its 1999 LUFO amendments for Interstate Avenue (the 1999 LUFO amendment), it renamed that portion of the 1998 LUFO North Portland segment extending from N. Denver Avenue to the Portland Metropolitan Exposition Center (Expo Center) the "Expo Center Segment." This 2011 LUFO amendment retains the name "Expo Center Segment" and extends the area it encompasses northward to N. Marine Drive.

This recommendation is provided pursuant to Section 6(1) of House Bill 3478, which directs TriMet to apply to the Metro Council for a Land Use Final Order approving the light rail route, stations, lots and maintenance facilities, and the highway improvements for the Project, including their locations, "following receipt of recommendations from the Department of Transportation and the Steering Committee", and Section 6(2), which provides:

> "(2) Any siting of the light rail route, a station, lot or maintenance facility, or a highway improvement outside the locations established in a land use final order, and any new station, lot, maintenance facility or highway improvement, shall require a land use final order amendment or a new land use final order which shall be adopted in accordance with the process provided for in

[1] The 1998 LUFO divided the South/North Project into nine segments. Those segments included the North Portland Segment, which extended from the Edgar Kaiser Medical Facility to N. Marine Drive, and the Hayden Island Segment, which extended from N. Marine Drive to the Oregon/Washington state line at the Columbia River.

subsection (1) of this section."

In May 1998, in accordance with Section 1(21) of House Bill 3478, the South/North LUFO Steering Committee was established through intergovernmental agreement between Metro, TriMet, ODOT, Clackamas County, Multnomah County, the City of Portland, and the City of Milwaukie. In 2008, the Intergovernmental Agreement was amended to add the City of Gresham as a LUFO Steering Committee member. The City of Gresham was added because the project required expansion of the Ruby Junction Maintenance Facility in Gresham. The City of Oregon City is an ex officio member of the Committee.

This recommendation from the LUFO Steering Committee addresses the light rail route, light rail stations and highway improvements in the portion of the Expo Center and Hayden Island segments of the South/North Project located between approximately N. Victory Boulevard and the Oregon/Washington state line. The CRC Project also will expand the use of the Ruby Junction Maintenance Facility in Gresham. However, all activity associated with that facility would occur within the maintenance facility boundaries that the Council previously approved in its 2008 LUFO amendment. For that reason, there is no need to approve a new boundary map for that facility.

2. Requirements of House Bill 3478.

House Bill 3478, Section 6(1) authorizes the Council, upon application by TriMet and following recommendations from the Steering Committee and Department of Transportation, to adopt a Land Use Final Order for the South/North Project. A LUFO is a written order or orders of the Council deciding the light rail route, the stations, lots and maintenance facilities, and the highway improvements for the South/North Project, including their locations. The LUFO identifies the light rail route, stations, lots, maintenance facilities and highway improvements that comprise the South/North project, and it further specifies the locations within which these facilities and improvements may be located. As explained in Section 6(1)(a) of House Bill 3478,

> "The applied for locations shall be in the form of boundaries within which the light rail route, stations, lots and maintenance facilities, and the highway improvements shall be located. These boundaries shall be sufficient to accommodate adjustments to the specific placements of the light rail route, stations, lots and maintenance facilities, and the highway improvements for which need commonly arises upon the development of more detailed environmental or engineering data following approval of a Full Funding Grant Agreement."

3. Recommended South/North Project LUFO Amendments

The LUFO Steering Committee recommends that TriMet apply for, and that the Council adopt, a LUFO amending the 1998 South/North LUFO to approve the light rail route, stations, maintenance facilities and highway improvements identified textually below and in the attached maps, which illustrate the location "boundaries" as required by Section 6(1)(a) of HB 3478. The modified route and station and the highway improvements all are located within the Expo Center and Hayden Island segments of the South/North Project as identified in the 1998 LUFO and the 1999 LUFO amendment. The maintenance facility improvements involve expanded use of improvements at the existing Ruby Junction Maintenance Facility in Gresham, within location boundaries that the Council approved in 2008.

The area affected by these amendments extends from south of N. Victory Boulevard to the Oregon/Washington border. The original light rail alignment within the area subject to this 2011 LUFO amendment is identified in Figures 1.8b on page A-11 of the 1998 LUFO and Figure 1.8 of the 1999 LUFO amendment. The 1999 LUFO amendment extended only as far north as the Expo Center. Because this 2011 LUFO amendment affects a relatively small portion of the Expo Center segment, the LUFO Steering Committee recommends that the analysis of the Expo Center and Hayden Island segments be combined and addressed as a single segment (Expo Center/Hayden Island).

For light rail, the CRC Project begins at the Expo Center and continues northward to the Oregon/Washington state line on the Columbia River along an alignment located west of the alignment boundary that the Council approved in the 1998 LUFO. From the Expo Center station, the light rail alignment proceeds northward under N. Marine Drive and onto a new, integrated multi-modal rail/vehicular/bicycle/pedestrian bridge crossing over the North Portland Harbor onto Hayden Island west of Interstate 5. The alignment then continues northward, crossing over N. Hayden Island Drive onto the lower deck of the new southbound Interstate 5 bridge, where it continues to and beyond the Oregon/Washington state line.

A single light rail station is located at the east end of the Jantzen Beach Center west of Interstate 5. No park-and-ride lots or maintenance facilities are proposed for this segment. However, maintenance facility improvements will be provided at the Ruby Junction Maintenance Facility in Gresham within the boundaries of this facility that the Council approved in the 2008 LUFO amendments for the Portland-Milwaukie Project.

For highway improvements, the CRC Project begins just south of N. Victory Boulevard and extends northward to the Oregon/Washington border. These highway improvements were not part of the South/North Project initially approved in 1998. However, HB 3478 authorizes amendments to the South/North project from time to time, and it authorizes the inclusion of highway improvements if they are described in a Draft or Final Environmental Impact Statement for the Project. Highway improvements were added to the 2008 amendments for the Portland-Milwaukie Project, and they are recommended here as well. Much like the Westside Corridor Project, which extended light rail to Hillsboro, widened and improved US 26 and Oregon 217 and connecting roadways, and was approved under a

LUFO process pursuant to Oregon Laws 1991, Chapter 3 (Senate Bill 573)[2], the CRC Project is an integrated light rail and highway project, with many improvements serving dual rail and highway purposes.

The highway improvements for the Expo Center/Hayden Island segments include the following[3]:

- New northbound and southbound Interstate 5 Columbia River bridges and removal of existing Interstate 5 bridges. The new southbound bridge is a two-tier bridge with highway on the upper deck and light rail on the lower deck. The new northbound bridge is a two-tier bridge with highway on the upper deck and bicycle and pedestrian facilities on the lower deck. Each bridge will include three travel lanes and two auxiliary lanes.
- Widening of Interstate 5 in both the northbound and southbound directions from approximately N. Victory Boulevard to the Oregon/Washington state line. Northbound, Interstate 5 will widen from three travel lanes at N. Victory Boulevard to three travel lanes and two auxiliary lanes on the new northbound Interstate 5 Columbia River bridge. Southbound, Interstate 5 will narrow from three travel lanes and two auxiliary lanes on the new southbound Interstate 5 Columbia River bridge to three travel lanes south of N. Victory Boulevard.
- Newly designed interchanges at Marine Drive and Hayden Island and improvements to the Victory Boulevard Interchange.
- A new integrated light rail/vehicular/bicycle/pedestrian bridge west of Interstate 5 connecting Hayden Island with the Expo Center and N. Expo Road and the N. Vancouver Way extension.
- Realignment, widening and/or modification of N. Marine Drive, N.E. Martin Luther King Boulevard, N. Vancouver Way, N.E. Union Court, N. Jantzen Avenue, N. Jantzen Drive, N. Hayden Island Drive and N. Tomahawk Island Drive.
- New roadway connections between N.E. Martin Luther King Jr. Boulevard and N. Vancouver Way, N.E. Martin Luther King Jr. Boulevard and NE Union Court, N. Jantzen Avenue and N. Hayden Island Drive, and N. Expo Road and N. Force Avenue.

The proposed boundaries within which the above-described light rail facilities and highway improvements would be located are as illustrated on the boundary maps for the Expo Center/Hayden Island segments attached to this recommendation (**Figures 1.1 to 1.3**)

The Ruby Junction Maintenance Facility in Gresham includes light rail tracks, vehicle storage spaces, maintenance bays, an operation center, and related facilities necessary to maintain light rail vehicles. The 2008 South/North LUFO findings for the Portland-Milwaukie Project anticipated use of this facility to serve light rail vehicles needed for

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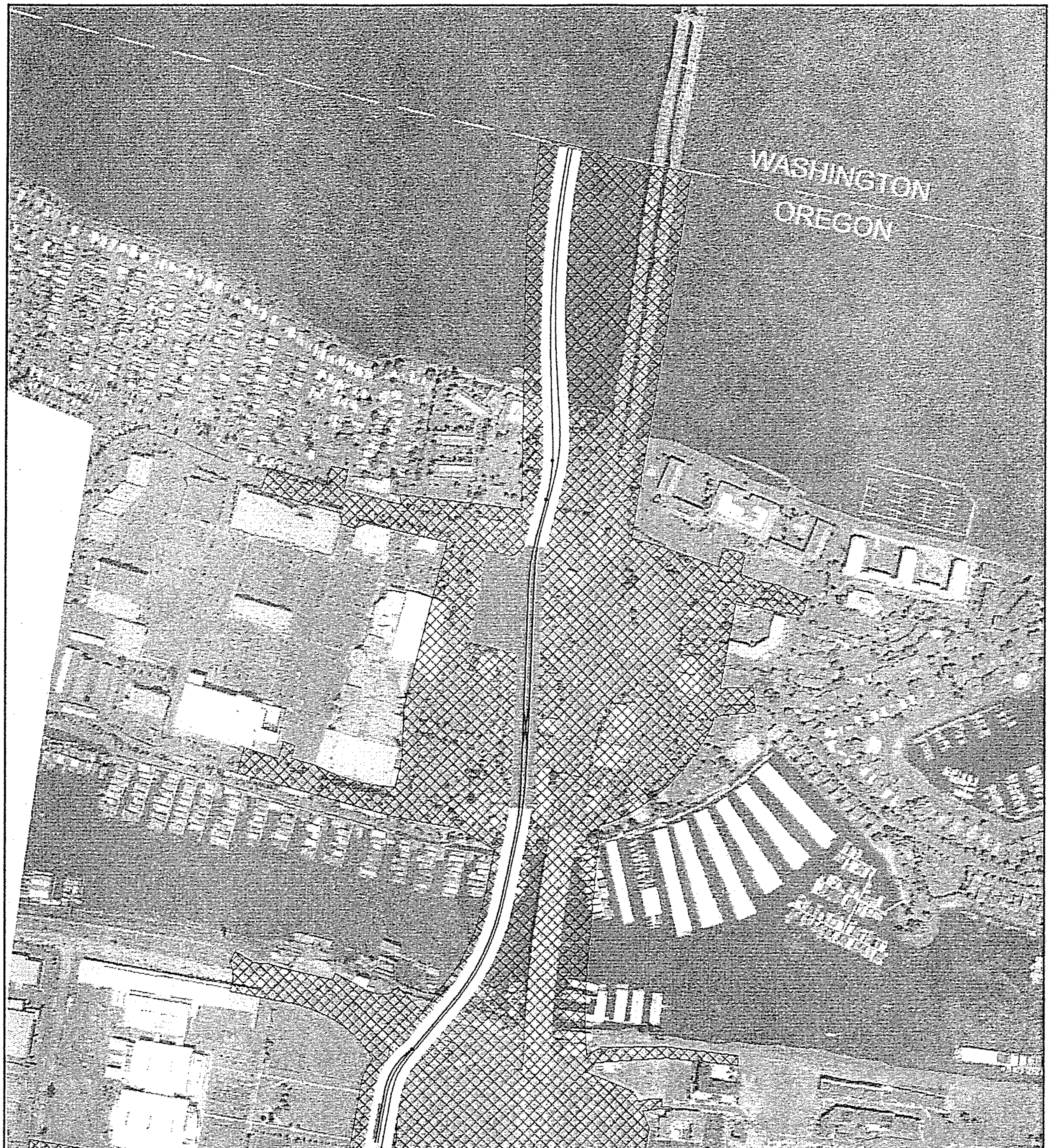
[2] Senate Bill 573 for the Westside Corridor Project served as the model for House Bill 3478 for the South/North Project.

[3] Many of these roadway improvements include associated bicycle and pedestrian improvements.

future light rail transit expansion to Vancouver, Washington. With the CRC project, that expectation becomes a reality. Because all improvements associated with the CRC Project will be located within the locational boundary of the Ruby Junction facility that the Metro Council approved in 2008, there is no need to amend the boundary map to accommodate the expanded use of the facility associated with the CRC project. For informational purposes, the 2008 boundary map that the Council approved is attached to this recommendation as **Figure 2.1.**



South/North Land Use Final Order Amendment Boundary Map

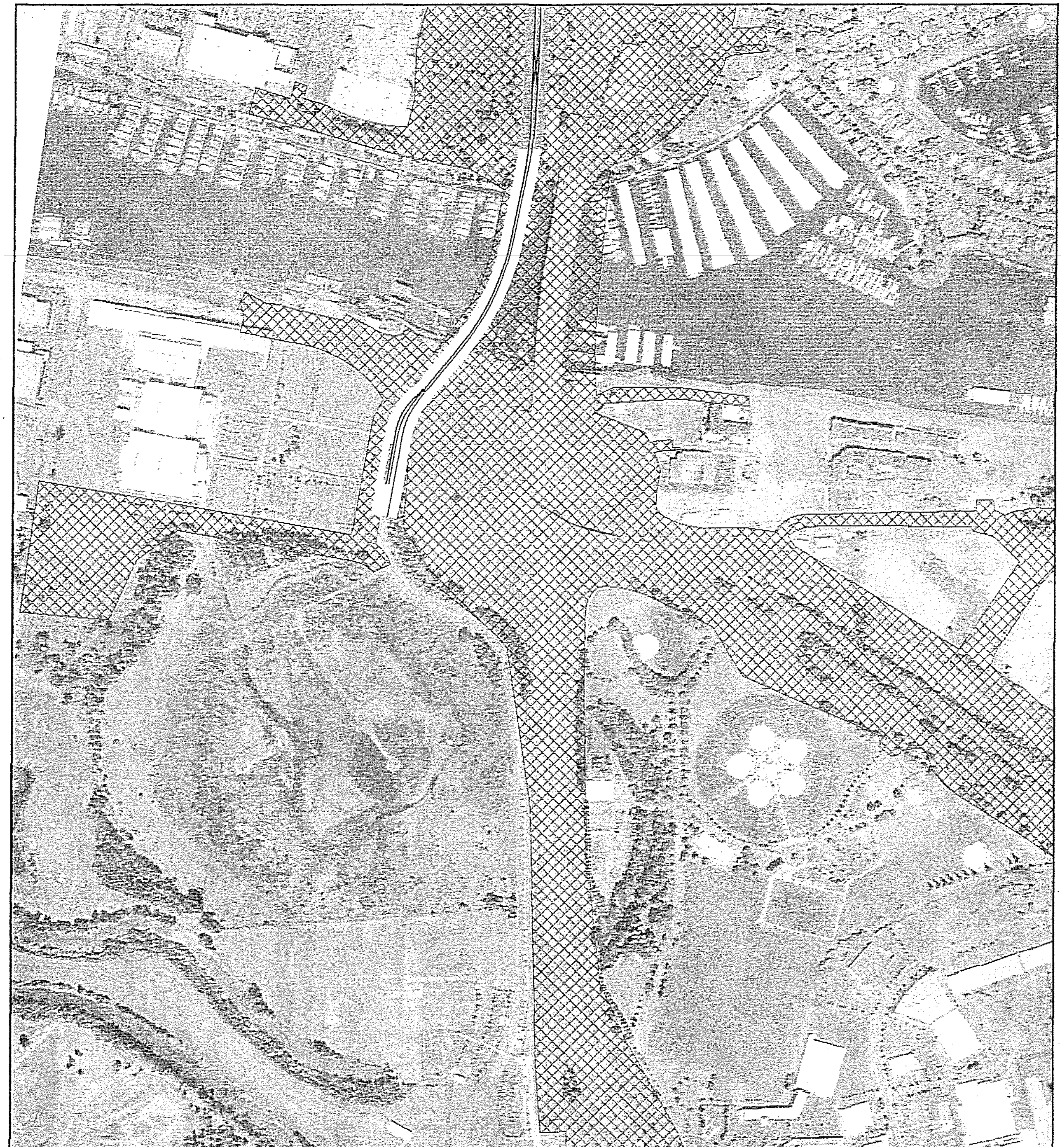
Figure 1.1 — **Columbia River Crossing Project**

Light Rail Route
Light Rail Stations
Highway improvements
Potential Alignment
Potential Station Platform

METRO

0 200 400 Feet
1 inch equals 400 feet

LUFO Steering Committee Recommendations
Concerning the 2011 South/North Land Use Final Order – Columbia River Crossing Project June 23, 2011



South/North Land Use Final Order Amendment Boundary Map

Figure 1.2

Columbia River Crossing Project

South/North Land Use Final Order Amendment Boundary Map

Figure 1.3

Columbia River Crossing Project

Light Rail Route	Potential Alignment
Light Rail Stations	Potential Station Platform
Highway improvements	

METRO

0 200 400 Feet

1 inch equals 400 feet

South/North Land Use Final Order Amendment Boundary Map

Figure 2.1 Ruby Junction Operations and Maintenance Facility

Existing O&M
Potential O&M expansion
Potential Alignment
Potential Station Platform
Existing Light Rail

METRO

0 250 500 Feet
1 inch equals 500 feet

June 2008

4. Interpretation of Terms

For the purposes of South/North Land Use Final Orders, including the 1998 LUFO and each amendment thereto, the Council has interpreted the terms "light rail route", "stations", "lots", "maintenance facilities" and "highway improvements" to have the following meanings:

- "***Light rail route***" means the alignment upon which the light rail tracks will be located. The light rail route will be located on land to be owned by or under the operating control of TriMet.
- "***Stations***" means those facilities to be located along the light rail route for purposes of accessing or serving the light rail system. Stations include light rail station platforms; kiss-and-ride areas; bus transfer platforms and transit centers; vendor facilities; and transit operations rooms.
- "***Lots***" means those parking structures or surface parking lots that are associated with a station, owned by or under the operating control of either TriMet or another entity with the concurrence of TriMet, and intended primarily for use by persons riding transit or carpooling. Parking structures may include some retail or office spaces in association with the primary use.
- "***Maintenance facilities***" means those facilities to be located on land to be owned or controlled by TriMet for purposes of operating, servicing, repairing or maintaining the light rail transit system, including but not limited to light rail vehicles, the light rail tracks, stations, lots, and ancillary facilities and improvements. Maintenance facilities include maintenance facility access trackways; storage tracks for light rail vehicles; service, repair and maintenance shops and equipment; office facilities; locker rooms; control and communications rooms; transit district employee and visitor parking lots; and storage areas for materials and equipment and non-revenue vehicles.
- "***Highway improvements***" include new roads, road extensions or road widenings outside existing rights-of-ways that have independent utility in themselves and are not needed to mitigate adverse traffic impacts associated with the light rail route, stations, lots or maintenance facilities.

Additionally, for the 1998 LUFO and the amendments thereto, the Metro Council determined that implementation of the South/North LUFO under sections 8(1)(a) and (b) of Chapter 12 of the 1996 Oregon Laws (HB 3478), including the construction, operation and maintenance of the light rail route, stations, lots and maintenance facilities and the highway improvements for the Project, necessitates and requires development approval of certain associated actions and the permitting of certain associated or ancillary facilities or improvements. These associated actions or ancillary facilities or improvements generally are required: (1) to ensure the safe and proper functioning and operation of the light rail system; (2) to provide project access; (3) to improve traffic flow, circulation or safety in the vicinity of the Project; or (4) to mitigate adverse impacts to the adjoining roadway network resulting from the alignment, stations, lots or maintenance facilities. For these reasons, the Metro Council determined that these actions, facilities or improvements are integral and necessary parts of the Project.

The Metro Council has further determined that the associated actions and ancillary facilities or improvements for the South/North Project include, but are not limited to: ties, ballast, and other track support materials such as tunnels and bridges; modifications to existing tracks; retaining walls and noise walls, culverts and other drainage systems; traction electrification equipment including maintenance facility accesses, including road accesses, pedestrian bridges and pedestrian and bicycle stops, bus pullouts, shelters, bicycle storage facilities and similar facilities. They also include temporary construction-related roadways, staging areas and road or lane closures; roadway reconstruction, realignment, repair, widening, channelization, signalization or signal modification, lane reconfiguration or reduction, addition or modification of turning lanes or refuges, modification of traffic circulation patterns, or other modifications or improvements that provide or improve project access, improve traffic flow, circulation or safety in the vicinity of the Project, facilitate or are necessary for the safe or proper functioning and operation of the Project, or are necessary to mitigate adverse traffic impacts created by the Project; modifications of private roadways adjoining the Project; permanent road, lane or access closures associated with and necessitated by the Project; and other associated actions or associated or ancillary facilities or improvements related to the Project.

Columbia River Crossing Project

Amendments to the 1998 South/North Land Use Final Order for the Expo Center/Hayden Island Segments

Proposed LUFO Steering Committee Recommendation Concerning the 2011 South/North Land Use Final Order

June 23, 2011

South/North Land Use Final Order Steering Committee Members

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TriMet
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The area affected by these amendments extends from south of N. Victory Boulevard to the Oregon/Washington border. The original light rail alignment within the area subject to this 2011 LUFO amendment is identified in Figures 1.8b on page A-11 of the 1998 LUFO and Figure 1.8 of the 1999 LUFO amendment. The 1999 LUFO amendment extended only as far north as the Expo Center. Because this 2011 LUFO amendment affects a relatively small portion of the Expo Center segment, the LUFO Steering Committee recommends that the analysis of the Expo Center and Hayden Island segments be combined and addressed as a single segment (Expo Center/Hayden Island).

For light rail, the CRC Project begins at the Expo Center and continues northward to the Oregon/Washington state line on the Columbia River along an alignment located west of the alignment boundary that the Council approved in the 1998 LUFO. From the Expo Center station, the light rail alignment proceeds northward under N. Marine Drive and onto a new, integrated multi-modal rail/vehicular/bicycle/pedestrian bridge crossing over the North Portland Harbor onto Hayden Island west of Interstate 5. The alignment then continues northward, crossing over N. Hayden Island Drive onto the lower deck of the new southbound Interstate 5 bridge, where it continues to and beyond the Oregon/Washington state line.

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LUFO process pursuant to Oregon Laws 1991, Chapter 3 (Senate Bill 573)[2], the CRC Project is an integrated light rail and highway project, with many improvements serving dual rail and highway purposes.

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The proposed boundaries within which the above-described light rail facilities and highway improvements would be located are as illustrated on the boundary maps for the Expo Center/Hayden Island segments attached to this recommendation (**Figures 1.1** *to* **1.3**)

The Ruby Junction Maintenance Facility in Gresham includes light rail tracks, vehicle storage spaces, maintenance bays, an operation center, and related facilities necessary to maintain light rail vehicles. The 2008 South/North LUFO findings for the Portland-Milwaukie Project anticipated use of this facility to serve light rail vehicles needed for future light rail transit expansion to Vancouver, Washington. With the CRC project, that

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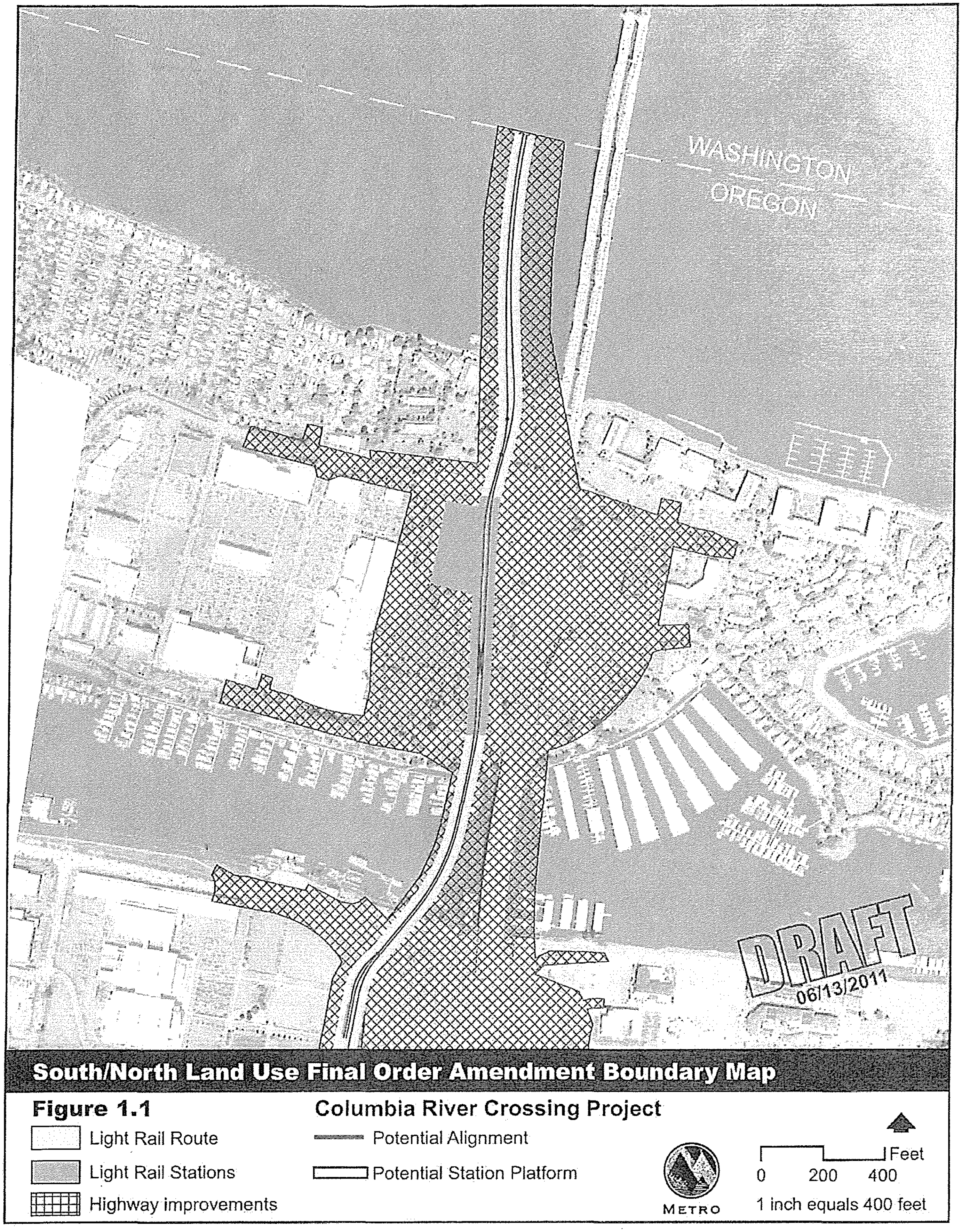

WASHINGTON
OREGON
DRAFT
06/13/2011
South/North Land Use Final Order Amendment Boundary Map
Figure 1.1
Columbia River Crossing Project
Light Rail Route
Light Rail Stations
Highway improvements
Potential Alignment
Potential Station Platform
METRO
Feet
0
200
400
1 inch equals 400 feet

South/North Land Use Final Order Amendment Boundary Map

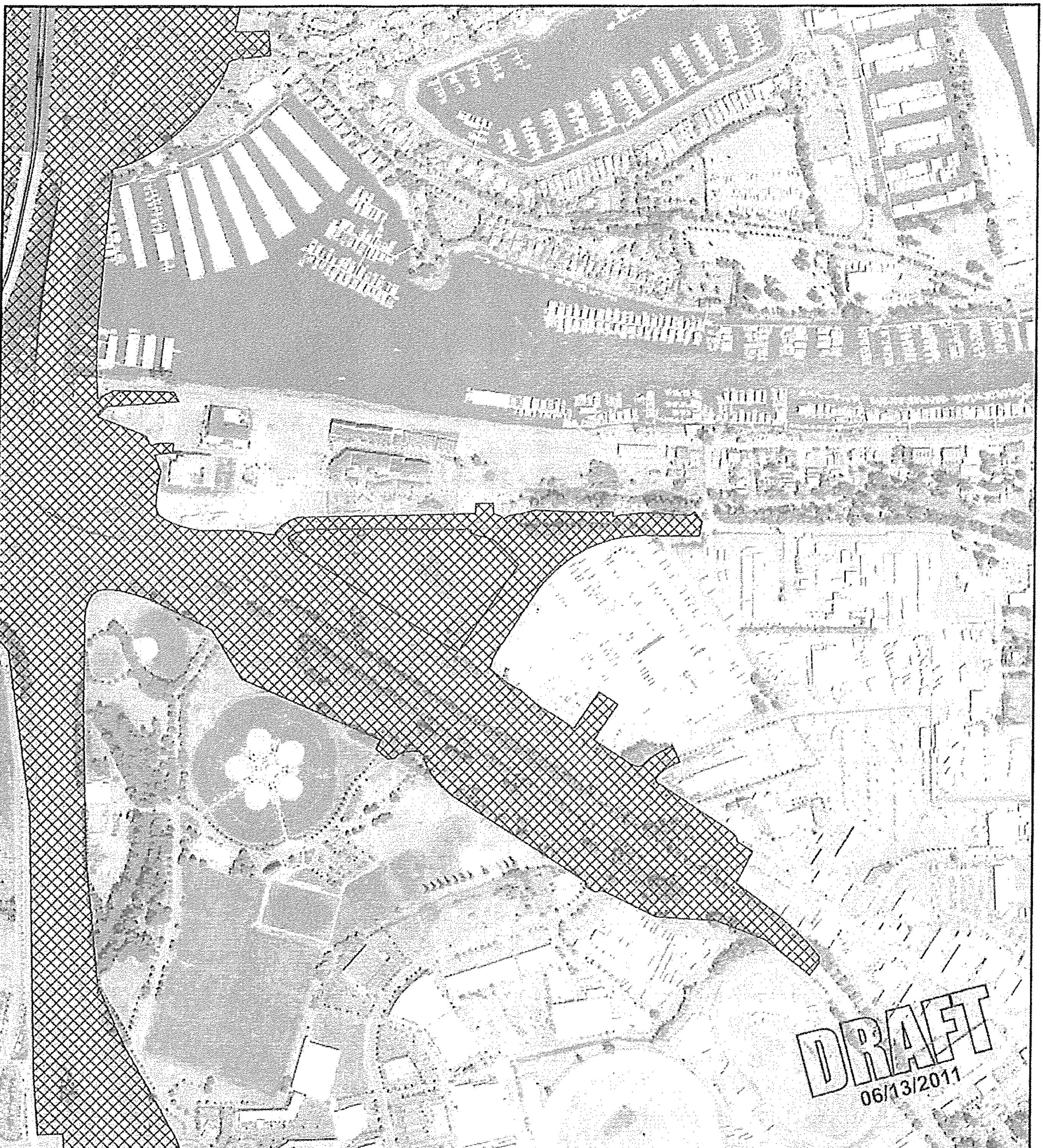
Figure 1.2

Columbia River Crossing Project

- Light Rail Route
- Light Rail Stations
- Highway improvements
- Potential Alignment
- Potential Station Platform

METRO

Feet
0 200 400
1 inch equals 400 feet



South/North Land Use Final Order Amendment Boundary Map

Figure 1.3

Columbia River Crossing Project

Light Rail Route

Light Rail Stations

Highway improvements

Potential Alignment

Potential Station Platform

METRO

Feet
0 200 400

1 inch equals 400 feet

South/North Land Use Final Order Amendment Boundary Map

Figure 2.1

Ruby Junction Operations and Maintenance Facility

Existing O&M

Potential O&M expansion

Potential Alignment

Potential Station Platform

Existing Light Rail

METRO

Feet
0 250 500
1 inch equals 500 feet

June 2008

4. Interpretation of Terms

For the purposes of South/North Land Use Final Orders, including the 1998 LUFO and each amendment thereto, the Council has interpreted the terms "light rail route", "stations", "lots", "maintenance facilities" and "highway improvements" to have the following meanings:

- "***Light rail route***" means the alignment upon which the light rail tracks will be located. The light rail route will be located on land to be owned by or under the operating control of TriMet.
- "***Stations***" means those facilities to be located along the light rail route for purposes of accessing or serving the light rail system. Stations include light rail station platforms; kiss-and-ride areas; bus transfer platforms and transit centers; vendor facilities; and transit operations rooms.
- "***Lots***" means those parking structures or surface parking lots that are associated with a station, owned by or under the operating control of either TriMet or another entity with the concurrence of TriMet, and intended primarily for use by persons riding transit or carpooling. Parking structures may include some retail or office spaces in association with the primary use.
- "***Maintenance facilities***" means those facilities to be located on land to be owned or controlled by TriMet for purposes of operating, servicing, repairing or maintaining the light rail transit system, including but not limited to light rail vehicles, the light rail tracks, stations, lots, and ancillary facilities and improvements. Maintenance facilities include maintenance facility access trackways; storage tracks for light rail vehicles; service, repair and maintenance shops and equipment; office facilities; locker rooms; control and communications rooms; transit district employee and visitor parking lots; and storage areas for materials and equipment and non-revenue vehicles.
- "***Highway improvements***" include new roads, road extensions or road widenings outside existing rights-of-ways that have independent utility in themselves and are not needed to mitigate adverse traffic impacts associated with the light rail route, stations, lots or maintenance facilities.

Additionally, for the 1998 LUFO and the amendments thereto, the Metro Council determined that implementation of the South/North LUFO under sections 8(1)(a) and (b) of Chapter 12 of the 1996 Oregon Laws (HB 3478), including the construction, operation and maintenance of the light rail route, stations, lots and maintenance facilities and the highway improvements for the Project, necessitates and requires development approval of certain associated actions and the permitting of certain associated or ancillary facilities or improvements. These associated actions or ancillary facilities or improvements generally are required: (1) to ensure the safe and proper functioning and operation of the light rail system; (2) to provide project access; (3) to improve traffic flow, circulation or safety in the vicinity of the Project; or (4) to mitigate adverse impacts to the adjoining roadway network resulting from the alignment, stations, lots or maintenance facilities. For these reasons, the Metro Council determined that these actions, facilities or improvements are integral and necessary parts of the Project.

The Metro Council has further determined that the associated actions and ancillary facilities or improvements for the South/North Project include, but are not limited to: ties, ballast, and other track support materials such as tunnels and bridges; modifications to existing tracks; retaining walls and noise walls, culverts and other drainage systems; traction electrification equipment including maintenance facility accesses, including road accesses, pedestrian bridges and pedestrian and bicycle stops, bus pullouts, shelters, bicycle storage facilities and similar facilities. They also include temporary construction-related roadways, staging areas and road or lane closures; roadway reconstruction, realignment, repair, widening, channelization, signalization or signal modification, lane reconfiguration or reduction, addition or modification of turning lanes or refuges, modification of traffic circulation patterns, or other modifications or improvements that provide or improve project access, improve traffic flow, circulation or safety in the vicinity of the Project, facilitate or are necessary for the safe or proper functioning and operation of the Project, or are necessary to mitigate adverse traffic impacts created by the Project; modifications of private roadways adjoining the Project; permanent road, lane or access closures associated with and necessitated by the Project; and other associated actions or associated or ancillary facilities or improvements related to the Project.

Columbia River Crossing Project

Amendments to the 1998 South/North Land Use Final Order for the Expo Center/Hayden Island Segments

LUFO Steering Committee Recommendation Concerning the 2011 South/North Land Use Final Order

June 23, 2011

South/North Land Use Final Order Steering Committee Members

Metro
Rex Burkholder, Metro Councilor

TriMet
Neil McFarlane, General Manager

Oregon Department of Transportation
Matthew Garrett, Director

City of Portland
Sam Adams, Mayor

City of Milwaukie
Greg Chaimov, Councilor

City of Gresham
Shane Bemis, Mayor

Multnomah County
Loretta Smith, Commissioner

Clackamas County
Ann Lininger, Commissioner

City of Oregon City
Doug Neely, Mayor, Ex Officio

TABLE OF CONTENTS

1. Introduction

This document constitutes the South/North Land Use Final Order (LUFO) Steering Committee's recommendation to TriMet regarding TriMet's application to the Metro Council (Council) for amendments to the original South/North Corridor Project LUFO, which the Council adopted on July 23, 1998 (the 1998 LUFO). As initially approved, the 1998 LUFO covered an area extending from the Clackamas Town Center in the south through the cities of Milwaukie and Portland to the Oregon/Washington border in the north.

Since 1998, the Council has amended the 1998 LUFO three times. These include South/North LUFO amendments for Interstate Avenue (1999), Interstate 205 and Downtown Portland (2004) and Portland-Milwaukie (2008). The modifications included in this recommendation for a fourth LUFO amendment are part of a larger, two-state integrated light rail and highway project commonly known as the Columbia River Crossing (CRC) Project. Because Oregon Laws 1996, Chapter 12 (House Bill 3478), which is the law governing Council adoption of South/North Land Use Final Orders, applies only within the jurisdictional boundaries of the State of Oregon, this LUFO amendment addresses only that portion of the CRC Project within the State of Oregon.

This 2011 LUFO Steering Committee recommendation involves an area contained within the North Portland and Hayden Island segments as identified in the 1998 LUFO.[1] When the Council adopted its 1999 LUFO amendments for Interstate Avenue (the 1999 LUFO amendment), it renamed that portion of the 1998 LUFO North Portland segment extending from N. Denver Avenue to the Portland Metropolitan Exposition Center (Expo Center) the "Expo Center Segment." This 2011 LUFO amendment retains the name "Expo Center Segment" and extends the area it encompasses northward to N. Marine Drive.

This recommendation is provided pursuant to Section 6(1) of House Bill 3478, which directs TriMet to apply to the Metro Council for a Land Use Final Order approving the light rail route, stations, lots and maintenance facilities, and the highway improvements for the Project, including their locations, "following receipt of recommendations from the Department of Transportation and the Steering Committee", and Section 6(2), which provides:

> "(2) Any siting of the light rail route, a station, lot or maintenance facility, or a highway improvement outside the locations established in a land use final order, and any new station, lot, maintenance facility or highway improvement, shall require a land use final order amendment or a new land use final order which shall be adopted in accordance with the process provided for in

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[1] The 1998 LUFO divided the South/North Project into nine segments. Those segments included the North Portland Segment, which extended from the Edgar Kaiser Medical Facility to N. Marine Drive, and the Hayden Island Segment, which extended from N. Marine Drive to the Oregon/Washington state line at the Columbia River.

subsection (1) of this section."

In May 1998, in accordance with Section 1(21) of House Bill 3478, the South/North LUFO Steering Committee was established through intergovernmental agreement between Metro, TriMet, ODOT, Clackamas County, Multnomah County, the City of Portland, and the City of Milwaukie. In 2008, the Intergovernmental Agreement was amended to add the City of Gresham as a LUFO Steering Committee member. The City of Gresham was added because the project required expansion of the Ruby Junction Maintenance Facility in Gresham. The City of Oregon City is an ex officio member of the Committee.

This recommendation from the LUFO Steering Committee addresses the light rail route, light rail stations and highway improvements in the portion of the Expo Center and Hayden Island segments of the South/North Project located between approximately N. Victory Boulevard and the Oregon/Washington state line. The CRC Project also will expand the use of the Ruby Junction Maintenance Facility in Gresham. However, all activity associated with that facility would occur within the maintenance facility boundaries that the Council previously approved in its 2008 LUFO amendment. For that reason, there is no need to approve a new boundary map for that facility.

2. Requirements of House Bill 3478.

House Bill 3478, Section 6(1) authorizes the Council, upon application by TriMet and following recommendations from the Steering Committee and Department of Transportation, to adopt a Land Use Final Order for the South/North Project. A LUFO is a written order or orders of the Council deciding the light rail route, the stations, lots and maintenance facilities, and the highway improvements for the South/North Project, including their locations. The LUFO identifies the light rail route, stations, lots, maintenance facilities and highway improvements that comprise the South/North project, and it further specifies the locations within which these facilities and improvements may be located. As explained in Section 6(1)(a) of House Bill 3478,

> "The applied for locations shall be in the form of boundaries within which the light rail route, stations, lots and maintenance facilities, and the highway improvements shall be located. These boundaries shall be sufficient to accommodate adjustments to the specific placements of the light rail route, stations, lots and maintenance facilities, and the highway improvements for which need commonly arises upon the development of more detailed environmental or engineering data following approval of a Full Funding Grant Agreement."

3. Recommended South/North Project LUFO Amendments

The LUFO Steering Committee recommends that TriMet apply for, and that the Council adopt, a LUFO amending the 1998 South/North LUFO to approve the light rail route, stations, maintenance facilities and highway improvements identified textually below and in the attached maps, which illustrate the location "boundaries" as required by Section 6(1)(a) of HB 3478. The modified route and station and the highway improvements all are located within the Expo Center and Hayden Island segments of the South/North Project as identified in the 1998 LUFO and the 1999 LUFO amendment. The maintenance facility improvements involve expanded use of improvements at the existing Ruby Junction Maintenance Facility in Gresham, within location boundaries that the Council approved in 2008.

The area affected by these amendments extends from south of N. Victory Boulevard to the Oregon/Washington border. The original light rail alignment within the area subject to this 2011 LUFO amendment is identified in Figures 1.8b on page A-11 of the 1998 LUFO and Figure 1.8 of the 1999 LUFO amendment. The 1999 LUFO amendment extended only as far north as the Expo Center. Because this 2011 LUFO amendment affects a relatively small portion of the Expo Center segment, the LUFO Steering Committee recommends that the analysis of the Expo Center and Hayden Island segments be combined and addressed as a single segment (Expo Center/Hayden Island).

For light rail, the CRC Project begins at the Expo Center and continues northward to the Oregon/Washington state line on the Columbia River along an alignment located west of the alignment boundary that the Council approved in the 1998 LUFO. From the Expo Center station, the light rail alignment proceeds northward under N. Marine Drive and onto a new, integrated multi-modal rail/vehicular/bicycle/pedestrian bridge crossing over the North Portland Harbor onto Hayden Island west of Interstate 5. The alignment then continues northward, crossing over N. Hayden Island Drive onto the lower deck of the new southbound Interstate 5 bridge, where it continues to and beyond the Oregon/Washington state line.

A single light rail station is located at the east end of the Jantzen Beach Center west of Interstate 5. No park-and-ride lots or maintenance facilities are proposed for this segment. However, maintenance facility improvements will be provided at the Ruby Junction Maintenance Facility in Gresham within the boundaries of this facility that the Council approved in the 2008 LUFO amendments for the Portland-Milwaukie Project.

For highway improvements, the CRC Project begins just south of N. Victory Boulevard and extends northward to the Oregon/Washington border. These highway improvements were not part of the South/North Project initially approved in 1998. However, HB 3478 authorizes amendments to the South/North project from time to time, and it authorizes the inclusion of highway improvements if they are described in a Draft or Final Environmental Impact Statement for the Project. Highway improvements were added to the 2008 amendments for the Portland-Milwaukie Project, and they are recommended here as well. Much like the Westside Corridor Project, which extended light rail to Hillsboro, widened and improved US 26 and Oregon 217 and connecting roadways, and was approved under a

LUFO process pursuant to Oregon Laws 1991, Chapter 3 (Senate Bill 573)[2], the CRC Project is an integrated light rail and highway project, with many improvements serving dual rail and highway purposes.

The highway improvements for the Expo Center/Hayden Island segments include the following[3]:

- New northbound and southbound Interstate 5 Columbia River bridges and removal of existing Interstate 5 bridges. The new southbound bridge is a two-tier bridge with highway on the upper deck and light rail on the lower deck. The new northbound bridge is a two-tier bridge with highway on the upper deck and bicycle and pedestrian facilities on the lower deck. Each bridge will include three travel lanes and two auxiliary lanes.
- Widening of Interstate 5 in both the northbound and southbound directions from approximately N. Victory Boulevard to the Oregon/Washington state line. Northbound, Interstate 5 will widen from three travel lanes at N. Victory Boulevard to three travel lanes and two auxiliary lanes on the new northbound Interstate 5 Columbia River bridge. Southbound, Interstate 5 will narrow from three travel lanes and two auxiliary lanes on the new southbound Interstate 5 Columbia River bridge to three travel lanes south of N. Victory Boulevard.
- Newly designed interchanges at Marine Drive and Hayden Island and improvements to the Victory Boulevard Interchange.
- A new integrated light rail/vehicular/bicycle/pedestrian bridge west of Interstate 5 connecting Hayden Island with the Expo Center and N. Expo Road and the N. Vancouver Way extension.
- Realignment, widening and/or modification of N. Marine Drive, N.E. Martin Luther King Boulevard, N. Vancouver Way, N.E. Union Court, N. Jantzen Avenue, N. Jantzen Drive, N. Hayden Island Drive and N. Tomahawk Island Drive.
- New roadway connections between N.E. Martin Luther King Jr. Boulevard and N. Vancouver Way, N.E. Martin Luther King Jr. Boulevard and NE Union Court, N. Jantzen Avenue and N. Hayden Island Drive, and N. Expo Road and N. Force Avenue.

The proposed boundaries within which the above-described light rail facilities and highway improvements would be located are as illustrated on the boundary maps for the Expo Center/Hayden Island segments attached to this recommendation (**Figures 1.1 to 1.3**)

The Ruby Junction Maintenance Facility in Gresham includes light rail tracks, vehicle storage spaces, maintenance bays, an operation center, and related facilities necessary to maintain light rail vehicles. The 2008 South/North LUFO findings for the Portland-Milwaukie Project anticipated use of this facility to serve light rail vehicles needed for

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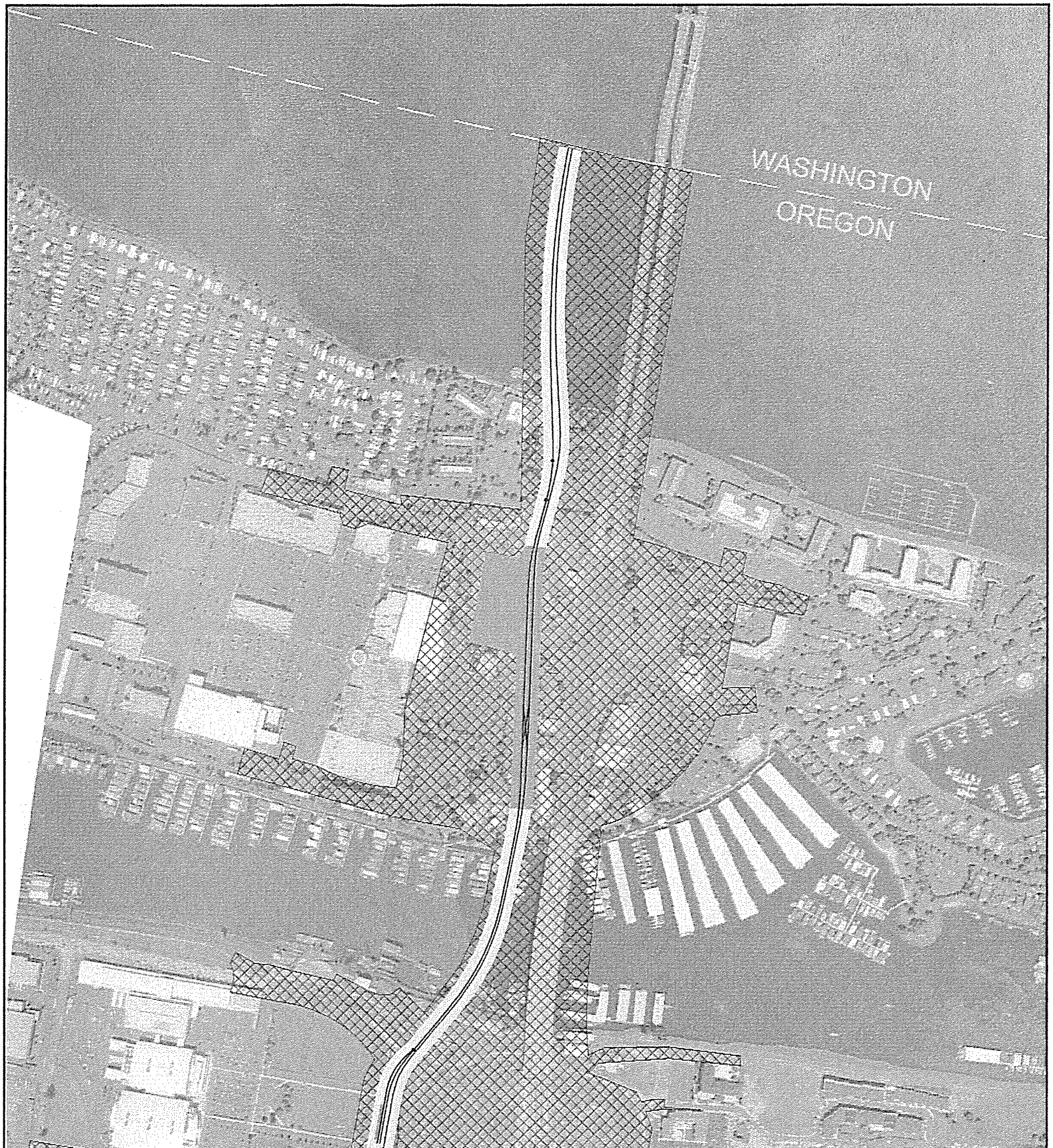
[2] Senate Bill 573 for the Westside Corridor Project served as the model for House Bill 3478 for the South/North Project.

[3] Many of these roadway improvements include associated bicycle and pedestrian improvements.

future light rail transit expansion to Vancouver, Washington. With the CRC project, that expectation becomes a reality. Because all improvements associated with the CRC Project will be located within the locational boundary of the Ruby Junction facility that the Metro Council approved in 2008, there is no need to amend the boundary map to accommodate the expanded use of the facility associated with the CRC project. For informational purposes, the 2008 boundary map that the Council approved is attached to this recommendation as **Figure 2.1.**



South/North Land Use Final Order Amendment Boundary Map

Figure 1.1

Columbia River Crossing Project

Light Rail Route

Light Rail Stations

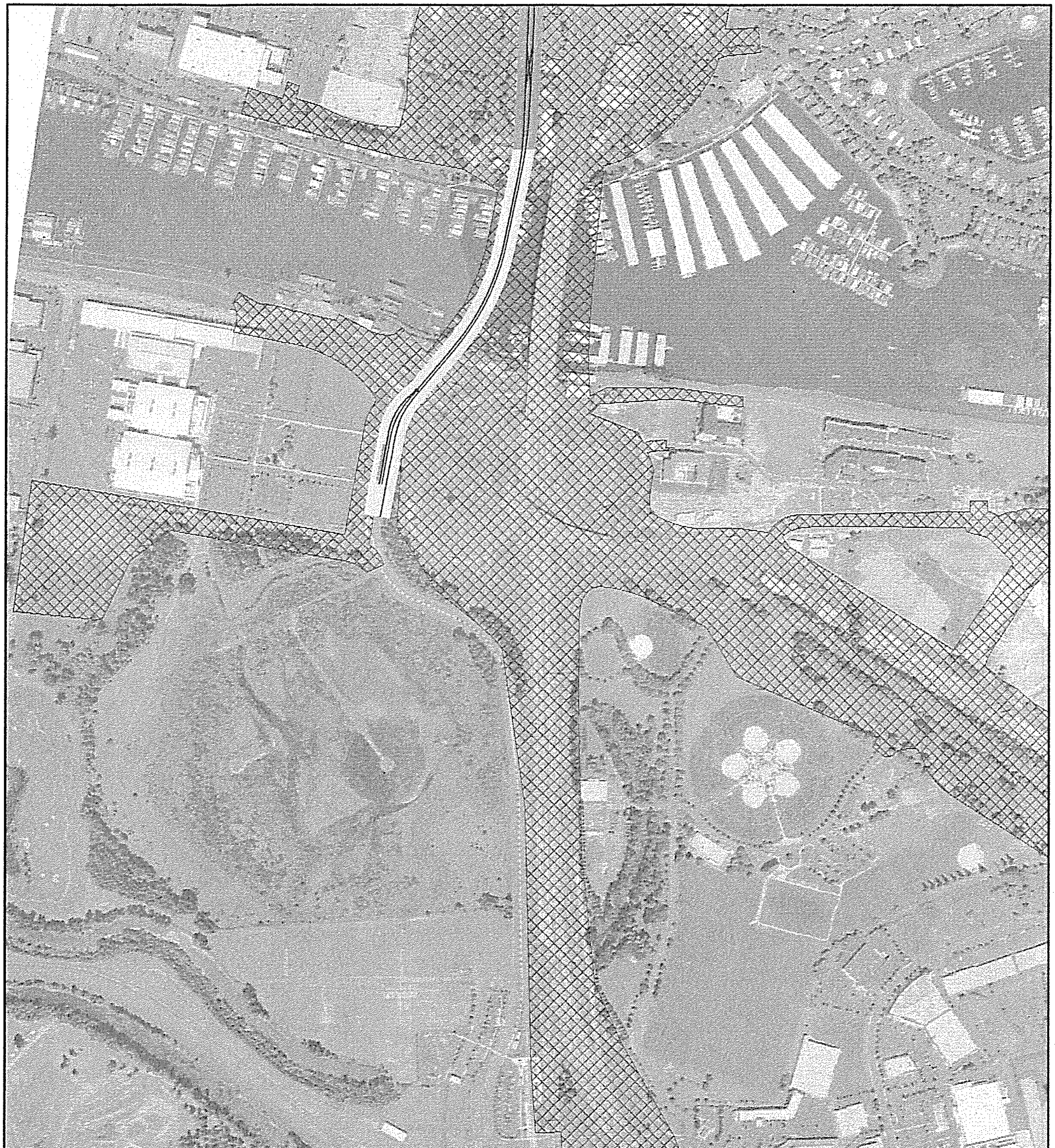
Highway improvements

Potential Alignment

Potential Station Platform

METRO

Feet
0 200 400
1 inch equals 400 feet



South/North Land Use Final Order Amendment Boundary Map

Figure 1.2

Columbia River Crossing Project

Light Rail Route

Light Rail Stations

Highway improvements

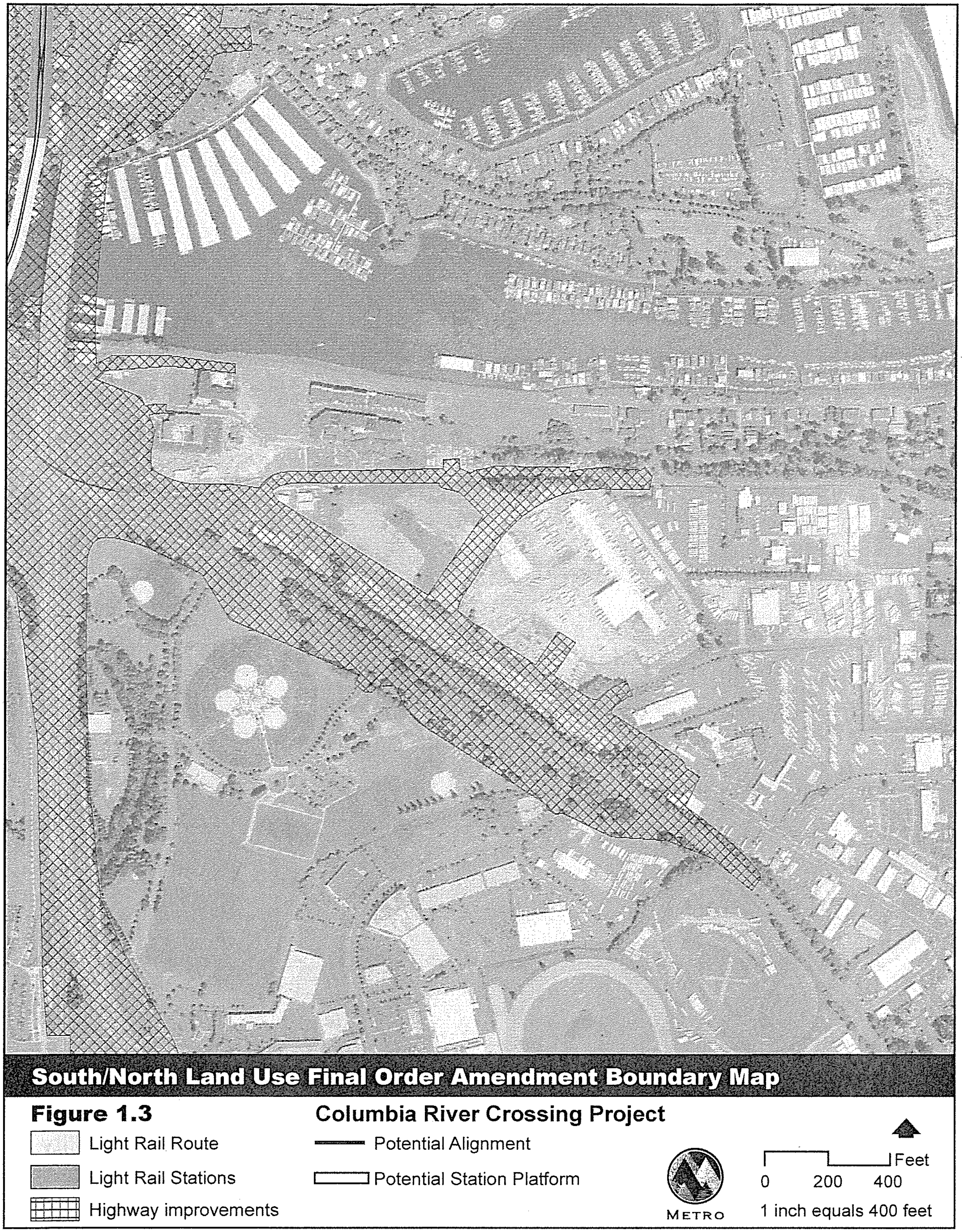
Potential Alignment

Potential Station Platform

METRO

Feet
0 200 400

1 inch equals 400 feet



South/North Land Use Final Order Amendment Boundary Map
Figure 1.3
Columbia River Crossing Project
Light Rail Route
Potential Alignment
Light Rail Stations
Potential Station Platform
Highway improvements
METRO
Feet
0
200
400
1 inch equals 400 feet

South/North Land Use Final Order Amendment Boundary Map

Figure 2.1

Ruby Junction Operations and Maintenance Facility

Existing O&M

Potential O&M expansion

Potential Alignment

Potential Station Platform

Existing Light Rail

METRO

0 250 500 Feet

1 inch equals 500 feet

June 2008

4. Interpretation of Terms

For the purposes of South/North Land Use Final Orders, including the 1998 LUFO and each amendment thereto, the Council has interpreted the terms "light rail route", "stations", "lots", "maintenance facilities" and "highway improvements" to have the following meanings:

- "***Light rail route***" means the alignment upon which the light rail tracks will be located. The light rail route will be located on land to be owned by or under the operating control of TriMet.
- "***Stations***" means those facilities to be located along the light rail route for purposes of accessing or serving the light rail system. Stations include light rail station platforms; kiss-and-ride areas; bus transfer platforms and transit centers; vendor facilities; and transit operations rooms.
- "***Lots***" means those parking structures or surface parking lots that are associated with a station, owned by or under the operating control of either TriMet or another entity with the concurrence of TriMet, and intended primarily for use by persons riding transit or carpooling. Parking structures may include some retail or office spaces in association with the primary use.
- "***Maintenance facilities***" means those facilities to be located on land to be owned or controlled by TriMet for purposes of operating, servicing, repairing or maintaining the light rail transit system, including but not limited to light rail vehicles, the light rail tracks, stations, lots, and ancillary facilities and improvements. Maintenance facilities include maintenance facility access trackways; storage tracks for light rail vehicles; service, repair and maintenance shops and equipment; office facilities; locker rooms; control and communications rooms; transit district employee and visitor parking lots; and storage areas for materials and equipment and non-revenue vehicles.
- "***Highway improvements***" include new roads, road extensions or road widenings outside existing rights-of-ways that have independent utility in themselves and are not needed to mitigate adverse traffic impacts associated with the light rail route, stations, lots or maintenance facilities.

Additionally, for the 1998 LUFO and the amendments thereto, the Metro Council determined that implementation of the South/North LUFO under sections 8(1)(a) and (b) of Chapter 12 of the 1996 Oregon Laws (HB 3478), including the construction, operation and maintenance of the light rail route, stations, lots and maintenance facilities and the highway improvements for the Project, necessitates and requires development approval of certain associated actions and the permitting of certain associated or ancillary facilities or improvements. These associated actions or ancillary facilities or improvements generally are required: (1) to ensure the safe and proper functioning and operation of the light rail system; (2) to provide project access; (3) to improve traffic flow, circulation or safety in the vicinity of the Project; or (4) to mitigate adverse impacts to the adjoining roadway network resulting from the alignment, stations, lots or maintenance facilities. For these reasons, the Metro Council determined that these actions, facilities or improvements are integral and necessary parts of the Project.

The Metro Council has further determined that the associated actions and ancillary facilities or improvements for the South/North Project include, but are not limited to: ties, ballast, and other track support materials such as tunnels and bridges; modifications to existing tracks; retaining walls and noise walls, culverts and other drainage systems; traction electrification equipment including maintenance facility accesses, including road accesses, pedestrian bridges and pedestrian and bicycle stops, bus pullouts, shelters, bicycle storage facilities and similar facilities. They also include temporary construction-related roadways, staging areas and road or lane closures; roadway reconstruction, realignment, repair, widening, channelization, signalization or signal modification, lane reconfiguration or reduction, addition or modification of turning lanes or refuges, modification of traffic circulation patterns, or other modifications or improvements that provide or improve project access, improve traffic flow, circulation or safety in the vicinity of the Project, facilitate or are necessary for the safe or proper functioning and operation of the Project, or are necessary to mitigate adverse traffic impacts created by the Project; modifications of private roadways adjoining the Project; permanent road, lane or access closures associated with and necessitated by the Project; and other associated actions or associated or ancillary facilities or improvements related to the Project.

Laura Dawson-Bodner

From: Sharonnasset [sharonnasset@aol.com]
Sent: Thursday, June 23, 2011 6:20 PM
To: Tom Hughes; Shirley Craddick; Carlotta Collette; Carl Hosticka; Barbara Roberts; Kathryn Harrington; Rex Burkholder
Subject: Support Civil Rights demand that the NEPA requirements are followed, don't just go along.
Attachments: Budget note ODOT.pdf; Benton_and_Congressman(3).pdf; CRC_Questions_Letter-March-2011.pdf

Good Day Council Members,

The Note that the Oregon Joint Ways and Means attached to the Oregon Department of Transportation budget list several areas of concern. It established legislative oversight, requires updates, including updates on alternatives.

For a project as important as Columbia River Crossing to be completed it must have a wide range of support; currently it does not. Adherence to the National Environmental Policy Act is essential for promoting consensus among various stakeholders and for demonstrating transparency. The Columbia River Crossing project needs to follow the National Environmental Policy Act (NEPA) requirements, that all reasonable alternatives are thoroughly studied. NEPA is part of the 1969 Civil Rights Act!

Concerns that reasonable alternatives were removed without being subject to a complete NEPA analysis leaves the project vulnerable to legal challenges that may result in crippling delays and enormous legal cost. This valuable step in the NEPA process brings the best options to the forefront and creates cooperation between the sponsoring agencies, stakeholders, taxpayers, and the ability to receive Federal funding for this project.

The Third Bridge was not studied!
Elected officials representing thousands in a letter from Senator Benton.
The Chair of SW WA Regional Transportation Council.
The Board of Clark County, member of CTRAN and RTC both CRC Signatory Agencies ALL agree the Third Bridge was not studied!

Who benefits from violating our Civil Rights? Not the citizen, not the tax payers, not just and honest people. Metro is siding with Anti-Civil Rights activities. Why? Hopefully because you have been kept in the dark!

Honest, verifiable, creditable data on a range of alternative thoroughly studied A thorough study of a range of alternatives benefits everyone. Citizens have a chance to see the pro's and con's of different alternatives to determined which scenario is best for their communities. Creating a transparent process is important to attract the stakeholders needed to complete mega projects. When an honest, fair, and just process produces a project, funding is easier to acquire.

A Supplemental Environmental Impact Statement, on a range of reasonable alternatives thoroughly studied including cost and benefit analysis must be completed immediately.

Support Civil Rights demand that the NEPA requirements are followed, don't just go along.

"Once you know the truth you can never go back to not knowing" "If your not part of the solution you're the problem"   Rev. Martin Luther King Jr.

Stand up for others rights, or when they come for you, you will stand-alone.

Peace,
Sharon

	General Fund	Lottery Funds	Other Funds	Federal Funds	Nonlimited Other Funds	Nonlimited Federal Funds	Total Funds	Positions	Full-Time Equivalent (FTE)

Package 502 Columbia River Crossing Investment

Package Description This package is provided for the purpose of approving a budget note relating to the Columbia River Crossing project.

LFO Recommendation Approve the budget note.

Budget Notes The Columbia River Crossing (CRC) bridge project is a major initiative to address congestion problems on I-5 between Portland, Oregon and Vancouver, Washington that requires support by not only the Governors of both states but the Legislatures as well. The Oregon Department of Transportation (ODOT) budget includes resources to continue work on solutions that advances the CRC to completion of the required Environmental Impact Statement.

ODOT is directed to provide reports to the Senate and House Transportation Committees on the progress made on the CRC project whenever these committees or their interim equivalents meet. Such ODOT reports shall include updated information on cost estimates, proposed alternatives, right-of-way procurement schedule, financing plans for the CRC project including initial and updated information regarding projected traffic volumes, fuel/gas rate assumptions, toll rates, cost of toll collections, as well as potential impacts on other Oregon transportation funding, needs and priorities.

ODOT is directed to secure and provide an independent investment grade analysis of the project with oversight of the consultant provided by the State Treasurer.

Finally, ODOT shall provide a clear and concise feasibility study, and develop a phased master plan for the CRC that allows for legislative oversight and approval at key decision points and report to the Legislature by February 2012, with the first iteration of CRC reports.

LFO Recommended	-	-	-	-	-	-	-	-	-

HOUSE OF REPRESENTATIVES
900 COURT ST NE
SALEM, OR 97301

MEMORANDUM

TO: House Committee on Transportation and Economic Development

FROM:
Rep. Jules Bailey
Rep. Phil Barnhart
Rep. Katie Eyre Brewer
Rep. Ben Cannon
Rep. Brian Clem
Rep. Jason Conger
Rep. Michael Dembrow
Rep. Margaret Doherty
Rep. Lew Frederick
Rep. Tim Freeman
Rep. Chris Garrett
Rep. Mitch Greenlick
Rep. Chris Harker
Rep. Mark Johnson
Rep. Shawn Lindsay
Rep. Mike McLane
Rep. Mary Nolan
Rep. Julie Parrish
Rep. Patrick Sheehan
Rep. Carolyn Tomei

DATE: March 28, 2011

RE: CRC Questions

Thank you for scheduling this important hearing on HJM 22. Having reviewed recent correspondence regarding the Columbia River Crossing[1], we believe that there are important unresolved questions that demand further scrutiny before the commitment of additional public dollars to this project.

Raising questions should not be construed as opposition to a new bridge. We are well acquainted with the congestion issues in the I-5 corridor; we recognize the need for major improvements at the Columbia River; and we fully support the effort to secure federal funds. These arguments in favor of a major project, however, are not necessarily arguments for any specific proposal. With respect to the current CRC proposal, at least the following questions deserve further attention.

1. What is the "true cost" of the CRC?

The cost of the CRC is represented to be between $3.2 and $3.6 billion. Impresa argues that the true cost, in year-of-expenditure dollars, is closer to $10 billion over the life of the project after accounting for debt service and the need for improvements to the Rose

[1] We refer to the Oct. 4, 2010 memo from Impresa Consulting; the Jan. 21, 2011 response from ODOT; and the Feb. 7, 2011 reply from Impresa Consulting.

Quarter. CRC responds that the Rose Quarter is a "different" issue. But it appears to be very much in question whether the CRC, absent Rose Quarter improvements, accomplishes much more than shifting the I-5 bottleneck to the south. If Rose Quarter improvements are an essential part of a complete solution to I-5 congestion in the Portland area, then those expenses should be considered in evaluating the true cost, and in presenting the cost to the public.

2. Traffic projections and tolling revenue

The CRC financing plan depends heavily on tolling revenue. The projected revenue from tolling depends, in turn, on projected traffic over the new bridge. The Impresa analysis contends that based on ODOT's own data and assumptions of 1% annual growth, traffic over the CRC will be 30,000 vehicles per day **lower** in 2030 than the DEIS forecast. If this is correct, the less-than-projected tolling revenue results (according to Impresa's analysis) in a debt service **shortfall of $1 billion.**

In the few years since CRC's projections were issued, traffic over the bridge has not only failed to increase as forecast, it has actually declined. Based on the exchange between Impresa and ODOT, there appears to be an empirical dispute about whether the current decline in traffic levels merely reflects the recession or, instead, reflects a longer term "sea change" in how people commute. Impresa points out that the decline in traffic preceded the recession by two full years. We are not aware of a refutation of this point.

CRC/ODOT assert that their projections are based on commonly accepted models; Impresa responds that these models are themselves flawed, and cites examples. We are not aware of a refutation of this point, either.

Finally, ODOT says that there will be an independent, investment-grade study at a future time, before bonding. **If there is an undisputed need for an independent, investment-grade financial analysis,** it should be undertaken before any major commitment of additional public dollars.

3. Cost overruns

Critics assert that CRC's cost estimate of $3.2-3.6 billion is low by at least hundreds of millions of dollars, given the likelihood of cost overruns in a project such as this.

Cost overruns are a fact of life and should not be taken by themselves as a reason to oppose the project. However, the magnitude of possible overruns should be considered in conjunction with the significant questions about the CRC's traffic and tolling projections. If we are materially off-target on *both* projected costs and projected revenues, this could create enormous downside exposure for Oregon taxpayers. We are not satisfied that this downside risk has been fully digested.

Thank you for your consideration of these issues.

Washington State Senate

109B Irv Newhouse Building
P.O. Box 40417
Olympia, WA 98504-0417

Senator Don Benton
17th Legislative District

Olympia Ph: (360) 786-7632
District Ph: (360) 576-6059
E-mail: benton.don@leg.wa.gov

February 11, 2009

Dear Governors' Christine Gregoire and Ted Kulongoski, Sponsor Agencies; Southwest Washington Regional Transportation Council and CTRAN,

Attached please find correspondence from Congressman Earl Blumenauer to the Director of the Oregon Department of Transportation, dated January 7, 2009

We would like to thank Congressman Earl Blumenauer for his leadership on the Columbia River Crossing project's need to follow the National Environmental Policy Act (NEPA) requirements, that all alternatives are thoroughly studied. A thorough study of all options to include data is a necessary requirement in the NEPA process. This valuable step in the NEPA process brings the best options to the forefront and creates cooperation between the sponsoring agencies, stakeholders, and taxpayers, and the ability to receive Federal funding for the project.

We are asking that the CRC project immediately commence a Supplemental EIS to fully study the "port-to-port connector" option RC-14.

The foci of the Columbia River Crossing are the economy, safety, and the environment. A thorough NEPA process will create comparable data that will answer questions of cost, land use, environmental justice, mobility, congestion relief, regional freight, the distribution of benefits, and impacts.

In summary, adherence to the National Environmental Policy Act is essential for promoting consensus among various stakeholders and for demonstrating transparency. The I-5 international highway system's importance is internationally known. An open and transparent process is needed to build stakeholders consensus that will propel and help develop this project to completion. A project as important and enormous as the Columbia River Crossing must have transparency and must provide credible comparable data on the "port to port connector."

We the undersigned, as elected officials, and with our constituents' best interests at the forefront of our actions, urge Southwest Regional Transportation Council, CTRAN and the Governors of Oregon and Washington, to direct CRC Project to proceed with a full Supplemental EIS on the "port to port connector" RC-14, starting in March 2009.

Thank you for your immediate attention to this very urgent matter.

Respectfully submitted,

Senator Don Benton,
17th District
Member of the
Senator's Joint CRC Oversight Committee

Senator Pam Roach
WA State Senator 31st District

Councilor Pat Campbell
Vancouver City Councilmen #6

Senator Bob Morton
WA State Senator 7th District
Environment, Water & Energy Committee

Commissioner Marc Bolt
Clark County Commissioner
SW WA Regional Transportation Council

Commissioner Jerry Oliver
Port of Vancouver

Commissioner Tom Mielke
Clark County Commissioner
SW WA Regional Transportation Council
CTRAN Board Member

Senator Jim Honeyford
WA State Senator 15th District
Environment, Water & Energy Committee
Ways and Means Committee

Senator Bob Mc Caslin
WA State Senator 4th District
Economic Development Trade and Innovation

In support of Senator Benton's letter to Governors Christine Gregoire and Ted Kulongoski, Sponsor Agencies; Southwest Washington Regional Transportation Council and CTRAN.

Bruce Chandler

Representative Bruce Chandler
WA State Representative 15th District
Commerce and Labor Committee
Ways and Means Committee

Senator Larry George
OR State Senator 13th District
Senator's Joint CRC Oversight Committee

EARL BLUMENAUER
THIRD DISTRICT, OREGON

COMMITTEE ON WAYS AND MEANS
SUBCOMMITTEES:
TRADE
SELECT REVENUE MEASURES

COMMITTEE ON BUDGET

Congress of the United States
House of Representatives
Washington, DC 20515-3703

WASHINGTON OFFICE:
2267 RAYBURN BUILDING
WASHINGTON, DC 20515
(202) 225-4811
FAX: (202) 225-8941

DISTRICT OFFICE:
729 N.E. OREGON STREET
SUITE 115
PORTLAND, OR 97232
(503) 231-2300
FAX: (503) 230-5413

website: blumenauer.house.gov

January 7, 2009

Matthew Garrett, Director
Oregon Department of Transportation
355 Capitol Street NE Rm 135
Salem, OR 97301

Dear Director Garrett:

Attached please find correspondence from my constituent, Ms. Sharon Nasset regarding the process for the proposed Columbia River Crossing project. Ms. Nasset is concerned that one option—known as the "port-to-port connector"—was removed from consideration without being subject to a complete NEPA analysis, and leaves the project vulnerable to legal challenges that may result in crippling delays.

Ms. Nasset believes that the CRC project should immediately commence with a supplemental EIS to fully study the "port-to-port connector" option.

As ODOT is one of the agencies leading the efforts on this project, I'm sharing her concerns with you. I would appreciate a response from ODOT or the CRC project addressing how the "port-to-port connector" option was removed from consideration as it relates to the NEPA process.

Thank you for your time and consideration.

Sincerely,

Earl Blumenauer

Earl Blumenauer
Member of Congress

Cc: Sharon Nasset

PRINTED ON RECYCLED PAPER

Dear Congressman Earl Blumenauer,

Thank you for this opportunity to bring our concerns to you. It also has been recommended by locally elected officials that federal elected officials take the lead on this because NEPA is a requirement for federal funding and the NEPA process has not been followed. The National Environmental Policy Act was established to guarantee everyone would have a valued part in construction projects within our United States. It is our understanding that all parties should have an equal part in the decision making of a project. We also understand that all data and information used in the decision making process is to be publicly transparent and available. The NEPA process was established to avoid problems with the few with power subjecting their will over the citizens. The hard work that made justice part of the public works project process will only be followed when our elected officials insist the NEPA process be followed. Therefore, I come before you today asking you to use the power the citizens have given you to work on their behalf to impose justice and insure we, are a land ruled by law.

We see two possible outcomes the way this project is being managed:

1. Connect with CRC and have them follow the NEPA laws or
2. Wait until the Environmental Impact Statement is complete and then deal with Law suits.

If we wait we could face the issues that the "Bridge to Nowhere "faced. Our credibility at the Federal level will be lost and we will have to start over.

We are providing a list of those on record who have stated that the Replacement Bridge is the wrong project, the NEPA process has not been followed, Open Meetings Laws have been violated and the process needs to be opened to options that were arbitrarily remove by CRC:
Clark County Commissioners, Bike Transportation Alliance, Coalition for a Livable Future, Oregonians In Action, 1000 Friends of Oregon, Cascade Policy Institute, Evergreen Freedom Foundation, Board of Sustainable Future, Osprey, Audubon Society, EPA, Lars Larson, Onward Oregon, Sensible Transportation Solutions, Economic Transportation Alliance, Local Economists, Environmentalist, Metro Councilors, Port Vancouver Commissioner Jerry Oliver, Senator Benton, Representative Jim Dunn, Representative Chip Shields, Senator Larry George, Senator Gary George, Pearson Airport board members, US Fish & Wildlife hatchery division, Clark College Law Department, Professor Will Macht, CRC Sponsor Agencies and 800 taxpayer signatures. This group of tax payers rarely has the opportunity to speak with one voice.

In conclusion we are asking you to require the Columbia River Crossing Project to immediately perform a Supplemental Environmental Impact Study to thoroughly study the Port-to-Port connection RC-14.

Sincerely,

Sharon Nasset

Economic Transportation Alliance

Columbia River CROSSING

0 200 400 600 800 1000
SCALE IN FEET

LPA PHASE I

DISCLAIMER:
THIS DRAWING IS FOR INFORMATION PURPOSES AND MAY NOT HAVE BEEN PREPARED FOR LEGAL, ENGINEERING OR SURVEYING PURPOSES. USERS OF THIS INFORMATION SHOULD REVIEW OR CONSULT THE PRIMARY DATA AND INFORMATION SOURCE TO ASCERTAIN THE USABILITY OF THIS INFORMATION.

City of Gresham

Mayor Shane T. Bemis

1333 N.W. Eastman Parkway
Gresham, Oregon 97030-3813
(503) 618-2306
Fax (503) 665-7692

June 22, 2011

Mr. Neil McFarlane, Chair
South/North LUFO Steering Committee
c/o TriMet
4012 SE 17th Avenue
Portland, OR 97202

Dear Chair McFarlane,

Gresham has had a long involvement with the South/North Land Use Final Order (LUFO) process as a regional partner with an interest in the project. In fact, this latest portion of the project includes maintenance facility expansion at the Ruby Junction Yard in Gresham.

I am sorry that I am not able to personally attend the Steering Committee meeting. Please accept this letter as the City of Gresham's affirmative support for a Steering Committee to recommendation to approve this Amendment to the 1998 LUFO (subsequently amended in 1999, 2004, and 2008).

In my absence, I have asked Ron Papsdorf to present this letter to the Committee and express the City's support for the LUFO amendment.

It is imperative to the region's continued economic viability that I-5, a major interstate and international trade corridor provide efficient freight mobility through the Portland-Vancouver Metropolitan Area. Gresham remains a supporter of the Columbia River Crossing project and associated light rail system extension. The project provides important additional multi-modal transportation service for the region as well as job creation, economic development and freight mobility.

Best wishes,

Shane T. Bemis
Mayor

c: LUFO Steering Committee

Laura Dawson-Bodner

From: Barbara Roberts
Sent: Friday, June 24, 2011 4:17 PM
To: Laura Dawson-Bodner
Subject: One more for the record

From: Mark Childs [mailto:markc@capacitycommercial.com]
Sent: Sunday, June 19, 2011 1:56 PM
To: Tom Hughes; Shirley Craddick; Kathryn Harrington; Rex Burkholder; Barbara Roberts
Subject: Important step forward in Columbia River Crossing

Councilors:

I want to thank you for your approving the Columbia River Crossing. Resolution No 11-4264. The Columbia River bridge construction is extremely important to the Portland economy. It is not just the fact that commerce will be able to move much better around the region, but the communication to businesses in the Portland area that local government cares about them. Every day every business makes decisions that influences if and where they will grow. Let's keep letting them know that if they'll keep reinvesting their profits, local government will keep reinvesting their tax dollars.

Again, thank you for standing up for business in what has got to be a tough local environment.

Mark

Mark Childs, SIOR | Senior Vice President
CAPACITY COMMERCIAL GROUP, LLC
Direct: 503.542.4350 | Cell: 503.504.3298
markc@capacitycommercial.com

805 SW Broadway, Suite 700 | Portland, OR 97205
Main: 503.326.9000 | Fax: 503.425.1006
www.capacitycommercial.com

CORFAC International Member

Laura Dawson-Bodner

From: Ina Zucker on behalf of Carl Hosticka
Sent: Friday, July 08, 2011 3:32 PM
To: Laura Dawson-Bodner
Subject: FW: Letter to Nancy Boyd, CRC Project Director
Attachments: Nancy Boyd, CRC Project Director.pdf

CRC record

From: Tom Hughes
Sent: Thursday, June 16, 2011 9:20 AM
To: Metro Councilors; 'blocherd@trimet.org'; 'peter.capell@clark.wa.gov'; 'clarko@trimet.org'; 'jdalin@ci.cornelius.or.us'; 'ficcod@wsdot.wa.gov'; 'nick@portlandoregon.gov'; 'davecherie@aol.com'; 'ginsburg.andy@deq.state.or.us'; 'tom.imeson@portofportland.com'; 'knapp@ci.wilsonville.or.us'; 'susie.lahsene@portofportland.com'; 'alininger@co.clackamas.or.us'; 'dean.lookingbill@rtc.wa.gov'; 'rian.m.windsheimer@odot.state.or.us'; 'sam.adams@portlandoregon.gov'; 'eric.chambers@greshamoregon.gov'; Rex Burkholder; 'jack.burkman@ci.vancouver.wa.us'; Carlotta Collette; 'deconcini.nina@deq.state.or.us'; 'craigd@tigard-or.gov'; 'andy_duyck@co.washington.or.us'; Kathryn Harrington; 'djordan@ci.oswego.or.us'; 'district1@multco.us'; 'mcfarlan@trimet.org'; 'district4@multco.us'; 'royr@rascpas.com'; 'boardcom@clark.wa.gov'; 'jason.a.tell@odot.state.or.us'; 'wagnerd@wsdot.wa.gov'; 'pam.thompson@portofportland.com'
Cc: 'joanne@tigard-or.gov'; 'karenb@co.clackamas.or.us'; 'eric.chambers@greshamoregon.gov'; 'dianne.m.eaton@odot.state.or.us'; 'cevero.gonzalez@portlandoregon.gov'; 'mila.greisen@portlandoregon.gov'; 'emilykle@co.clackamas.or.us'; 'lowe.lesley@deq.state.or.us'; 'runnionk@trimet.org'; Kathryn Sofich; 'swensed@wsdot.wa.gov'; 'pam.thompson@portofportland.com'; 'kelly.tannock@portofportland.com'; 'thornberg.carol@deq.state.or.us'; Nikolai Ursin; Ina Zucker
Subject: Letter to Nancy Boyd, CRC Project Director

Attached please find the letter sent to Nancy Boyd, Columbia River Crossing project director.

Please let me know if you have any questions.

Tom Hughes
Metro Council President

Metro
600 NE Grand Avenue
Portland, OR 97232-2736
503-797- 1560
www.oregonmetro.gov

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600 NE Grand Ave.
Portland, OR 97232-2736 www.oregonmetro.gov

Metro | *Making a great place*

Nancy Boyd, Director
Columbia River Crossing
700 Washington Street, Suite 300
Vancouver, WA 98660

Dear Ms. Boyd:

Attached is a signed copy of Resolution No. 11.4264 (Attachment A) adopted by the Metro Council on June 9, 2011. Approval of this resolution is in acknowledgement of a significant amount of hard work by the Columbia River Crossing (CRC) project staff, the Project Sponsors Council and the jurisdictional partners. Together, we have made some important improvements to the project and addressed some difficult challenges.

However, as we note in our resolution, there remains some important unresolved issues and refinement of details that need prompt and careful attention. As you know, there are strong feelings in the community about this project and while the Metro Council is fundamentally supportive of this project, it is important that we bolster their support by aggressively and deliberately working together to address these outstanding issues and refinements. I am particularly concerned that before the Land Use Final Order is brought before the Metro Council for approval that there be substantial progress in addressing the Community Enhancement Fund, setting a direction on governance and establish an approach to phasing in the event required by the availability of resources. In addition, before I am expected to sign the Final Environmental Impact Statement document, I will be looking to ensuring that the many agreements reached over the past three years as a result of addressing these and other conditions are accurately reflected in the document.

Attachment B to this letter provides a summary of the various issues that require some level of follow-up. In some cases, there is a need for immediate attention. In other cases, we understand that decisions will not be made for some time but we would appreciate an acknowledgement of when and how these issues will be resolved. Finally, there are some issues that were raised through public testimony that merit a response and we would appreciate being apprised of that response.

Metro fully recognizes the importance of completing the CRC project and the significant economic contribution it will make to this region. Metro looks forward to continuing to partner with ODOT, WsDOT and the CRC Project on this undertaking.

Thank you for your support and cooperation.

Sincerely,

Tom Hughes
Metro Council President

Enclosures: 2

Cc: Metro Council
Joint Policy Advisory Committee on Transportation (JPACT)

BEFORE THE METRO COUNCIL

FOR THE PURPOSE OF CONCLUDING THAT THE CONCERNS AND CONSIDERATIONS RAISED ABOUT THE COLUMBIA RIVER CROSSING PROJECT IN EXHIBIT A TO RESOLUTION NO. 08-3960B HAVE BEEN ADDRESSED SATISFACTORILY	))))))	RESOLUTION NO. 11-4264 Introduced by Councilor Rex Burkholder

WHEREAS, the Joint Policy Advisory Committee on Transportation (JPACT) recommended and the Metro Council endorsed the Locally Preferred Alternative (LPA) for the Columbia River Crossing Project by Resolution No. 08-3960B (For the Purposes of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions); and

WHEREAS, Resolution No. 08-3960B supported a Columbia River Crossing Project that includes a replacement bridge with three northbound and three southbound through lanes plus auxiliary lanes for merging and weaving using tolls for both finance and for demand management and selecting light rail transit to Vancouver as the preferred transit mode; and

WHEREAS, among the conditions of Council endorsement of the LPA was a list of concerns and considerations, contained in Exhibit A to Resolution No. 08-3960B as reflected in Exhibit A to this resolution, to be addressed before the Council would approve a land use final order (LUFO) for the project; and

WHEREAS, Resolution No. 08-3960B indicated that the Metro Council will invite public review and discussion on the issues raised in Exhibit A; and

WHEREAS, the Columbia River Crossing Project Team in cooperation with the Integrated Project Staff and Project Sponsors Council responded to the concerns and considerations adopted by the Metro Council as well as by the governing bodies of the other partner jurisdictions and agencies; and

WHEREAS, the Governors of Oregon and Washington commissioned an Independent Review Panel and a Bridge Review Panel to provide independent expert evaluation and recommendation; and

WHEREAS, the Project Team presented its assessment to JPACT on June 9, 2011, and JPACT voted to recommend that the Metro Council accept the responses as satisfactory; now, therefore,

BE IT RESOLVED THAT the Metro Council:

1. Accepts the responses to the concerns and considerations set forth in Exhibit A to Resolution No. 08-3960B and attached to this resolution as Exhibit A, also, as satisfactory, based upon the assessment contained in the documentation attached to this Resolution as Exhibit B and supports completion of a Final Environmental Impact Statement for the project consistent with changes documented in this Exhibit.

2. Acknowledges further refinements and decisions will be made and will include effective engagement with the Metro Council

3. Directs the Chief Operating Officer to send a copy of this resolution to the Columbia River Crossing Project.

ADOPTED by the Metro Council this 9th day of June, 2011.

Tom Hughes, Council President

Approved as to form:

Alison Kean Campbell, Acting Metro Attorney

RESOLUTION 08-3960B
Exhibit A

Metro Council Concerns and Considerations
Columbia River Crossing "Locally Preferred Alternative"

The Metro Council recognizes that endorsement of a "Locally Preferred Alternative" is one important narrowing step that enables the project management team to proceed with further analysis of a reduced range of alternatives. The Council is cognizant that many important issues are generally still unresolved at the time of endorsement of an LPA, but that clear articulation of concerns is required to make sure that such unresolved issues are appropriately resolved during the next phase of design, engineering, and financial planning, with proper participation by the local community and its elected representatives. If those sorts of outstanding issues are not satisfactorily resolved during that post-LPA selection phase, then the project risks failing to win the approval of necessary governing bodies at subsequent steps of the process.

While the Metro Council endorses the LPA, Replacement Bridge with Light Rail and Tolls, as described in Resolution 08-3960A, the Metro Council simultaneously finds that the following issues will need to be satisfactorily addressed in the upcoming refinement of design, engineering and financial planning:

FORMATION OF A LOCAL OVERSIGHT COMMITTEE TO SUCCEED THE TASK FORCE

The Metro Council concluded on June 5, 2008 through Resolution 08-3938B that further oversight of the project is needed once the Task Force's work is concluded. The Council suggested that the Governors of Oregon and Washington convene such a local oversight group. On June 19, 2008, the Governors issued a joint letter that concluded there is a need to reconvene the CRC Project Sponsor's Council as the oversight committee to succeed the Task Force, including representatives from Washington State Department of Transportation, the Oregon Department of Transportation, cities of Portland and Vancouver, Metro, the Southwest Washington RTC, TriMet and CTRAN. The Governors charged the committee with advising the two departments of transportation and two transit agencies on a consensus basis to the greatest extent possible regarding the major issues requiring further oversight and resolution.

PROJECT ISSUES REQUIRING LOCAL OVERSIGHT DURING PLANNING, DESIGN, ENGINEERING, FINANCE AND CONSTRUCTION

The Governors have charged the Project Sponsors Council with project oversight on the following issues, milestones and decision points:

1) Completion of the Environmental Impact Statement (EIS),
2) Project design, including, but not limited to: examining ways to provide an efficient solution that meets safety, transportation and environmental goals,
3) Timelines associated with project development,
4) Development and use of sustainable construction methods,
5) Ensuring the project is consistent with Oregon and Washington's statutory reduction goals for green house gas emissions, and
6) A finance plan that balances revenue generation and demand management, including the project capital and operating costs, the sources of revenue, impact to the funds required for other potential expenditures in the region.

The Metro Council has identified additional areas of concern that need to be addressed by the Project Sponsors Council as the project moves forward:

A. TOLLING
Implementation of tolls on the existing I-5 Bridge should be undertaken as soon as legally and practically permissible. Consideration should be given to potential diversion of traffic to I-205 and potential tolling I-5 and I-205 with those revenues potentially used for projects on these two facilities in the Portland-Vancouver metropolitan area.

B. NUMBER OF AUXILIARY LANES
Determine the number of auxiliary lanes in addition to the three through lanes in each direction on the replacement bridge across the Columbia River and throughout the bridge influence area.

C. IMPACT MITIGATION AND COMMUNITY ENHANCEMENT
Identify proposed mitigation for any potential adverse human health impacts related to the project and existing human health impacts in the project area, including community enhancement projects that address environmental justice.

D. DEMAND MANAGEMENT
Develop of state-of-the-art demand management techniques in addition to tolls that would influence travel behavior and reduce greenhouse gas emissions.

E. FINANCING PLAN
A detailed financing plan showing costs and sources of revenue must be proposed and presented to the partner agencies and to the public. The proposed financing plan should indicate how the federal, state and local (if any) sources of revenue proposed to be dedicated to this project would impact, or could be compared to, the funds required for other potential expenditures in the region.

F. CAPACITY CONSIDERATIONS, INDUCED DEMAND AND GREENHOUSE GASES
Further analysis is required of the greenhouse gas and induced automobile demand forecasts for this project. The results of the analysis must be prominently displayed in the Final Environmental Impact Statement. The analysis should include comparisons related to the purpose and function of the so-called "'auxiliary" lanes. A reduction in vehicle miles traveled should be pursued to support stated greenhouse gas reduction targets as expressed by legislation in Oregon and Washington and by the Governors.

G. PRESERVATION OF FREIGHT ACCESS
The design and finance phase of the CRC project will need to describe specifically what physical and fiscal (tolling) methods will be employed to ensure that trucks are granted a priority which is commensurate with their contributions to the project and their important role in the economy relative to single-occupancy automobile commuting. Ensure that freight capacity at interchanges is not diminished by industrial land use conversion.

H. LIGHT RAIL
As indicated in the Item 2 "resolved" in the body of the resolution, the Metro Council's endorsement of the LPA categorically stipulates that light rail must be included in any phasing package that may move forward for construction.

I. DESIGN OF BICYCLE AND PEDESTRIAN FACILITIES

More detailed design of bicycle and pedestrian facilities is required to inform the decisions of the local oversight panel described above. The project should design "world class" bicycle and pedestrian facilities on the replacement bridge, bridge approaches and throughout the bridge influence area that meet or exceed standards and are adequate to meet the demand generated by tolls or other demand management techniques.

J. URBAN DEVELOPMENT IMPACTS AT RE-DESIGNED INTERCHANGES

More design of the interchanges related to the CRC is required to fully evaluate their community impact. The design of interchanges within the bridge influence area must take into account their impact on urban development potential. The Metro Council is also concerned that the Marine Drive access points preserve and improve the functionality of the Expo Center.

K. BRIDGE DESIGN

The bridge type and aesthetics of the final design should be an important consideration in the phase of study that follows approval of the LPA and precedes consideration of the final decision.

Metro Conditions from Exhibit A to Resolution No. 08-3960B

Overall Status Classification:

- Issue is settled or on track to be settled with the conclusion of the FEIS and ROD
- Issue is settled or on track to be settled with the conclusion of the FEIS and ROD but further refinement and decision-making after the FEIS/ROD will be required
- Conflict or inconsistency between jurisdictions; or issue is unresolved; or issue needs additional work

OVERALL STATUS CATEGORY	NUMBER	ISSUE	EXPLANATION OF STATUS
	A	Tolling – Implement tolling on I-5 as soon as legally and practically permissible; consider diversion to I-205 and tolling of that facility with revenues used for projects in the region.	The project has undertaken various analyses of tolls and the impact of tolling, though additional studies and analysis will need to be undertaken as the project advances. At the direction of the governors of Oregon and Washington, the project is working with the treasurers and legislators of both states to review and refine the financing plan and toll assumptions to minimize financial risk and provide accountability and oversight as the project moves toward construction. At this point, tolling of I-5 is an essential element of the project, both to manage congestion and as part of the funding package for the CRC project along with federal and state funding. Tolling of interstate facilities must be consistent with the provisions of Title 23 U.S.C. Section 129, the federal law that specifies the circumstances under which interstate facilities may be tolled. The CRC project qualifies, though tolling of I-205 does not because federal regulations allow tolling of existing facilities only if a project involves reconstruction or replacement of that facility. Reconstruction or replacement of I-205 is not being proposed as part of the CRC project nor is tolling being proposed for I-205 in connection with the CRC project. At this time, tolling is not being considered to fund other projects in the region. Further information on federal requirements can be found at: http://www.ops.fhwa.dot.gov/tolling_pricing/toll_agreements.htm Tolling of I-5 during construction of a new facility is permissible under federal statutes, but no recommendations or decisions about tolling during construction have been made. Tolling during construction could serve as a demand reduction measure to reduce traffic during the construction phase. An aggressive construction phase Transportation Demand Management (TDM) program has been developed and tolling during construction is still a possibility. Specific decisions on tolling, including the possibility of advance tolling as well as toll rates and toll structure, will be made by the appropriate bodies after consultation with the project's local partners (including the Metro Council) and a public outreach and education process. Under current statutory authority, the Washington Transportation Commission and the Oregon Transportation Commission have tolling authority in their respective states. In Washington, the legislature reserves the authority to impose tolls on any state route or facility. The issues of tolling and tolling authority may also be explored in the forthcoming discussions on governance related to the project. If the decision is made to implement tolling during construction, this condition will be satisfied. If the project is considering not implement tolling during construction, the project will engage the Metro Council prior to the tolling decision.

			Analyses conducted for the CRC project included using the regional traffic forecasting model to assess the impact of various tolls on total traffic and diversion to I-205. The Tolling Study Report, released in January 2010, included analyses of a no-build scenario, a no-toll build scenario, and ten other scenarios with varying toll structures and some with tolling of the I-205 and I-5 bridges. Key findings from the analysis undertaken for the CRC project included: • The regional travel forecasting models project that under the base tolling scenario, the CRC project will reduce auto travel on I-5 across the Columbia River, as compared to the No Build. The CRC project will also reduce overall person trips on I-5, as compared to the No Build due to the effect tolls have on shifting some cross river trip origins and destinations. • When looking at the tolled vs. no toll scenarios, tolling and transit improvements reduce auto travel across the river on I-5 by approximately 40,000 trips per day for the base tolling scenario (the numbers of trips vary by tolling scenario). • At the Columbia River, there is an approximate 4.5% shift of auto trips on an all day basis from I-5 to I-205 as compared to the Build No-Toll scenario. More diversion to I-205 is predicted in the off-peak hours when capacity is available than during peak hours. On I-205 south of I-84, the models estimate that diversion will be approximately 1% on an all day basis as compared to the no build. The Tolling Study Report had three principal conclusions about diversion: • For most of the I-5 only toll scenarios, the majority of drivers would not change their travel patterns. Some would choose a new destination or a non-tolled route. Additional diversion to transit is minimal due to the already significantly increased ridership associated with project improvements. • Higher tolls on I-5 would cause more route diversion; however, the percentage of diversion tends to be lower during peak periods when travelers' willingness to pay tolls may be higher and/or alternative routes are congested, and thus, time-consuming and diversion during off-peak periods occurs when available capacity can accommodate the diversion. • For scenarios that toll both the I-5 and I-205 bridges, traffic levels would be higher on I-5 and lower on I-205 compared to tolling only the I-5 bridge. However, compared to the No Toll "No Build" project scenario, total cross-river traffic demand would be less on both the I-5 and I-205 bridges as many trips would divert to transit or not be made across the Columbia River. The No Toll "No Build" scenario would result in the most significant congestion in the I-205 corridor due to diversion from the I-5 corridor due to the severe congestion bottleneck in that corridor. Additional information about the impact of tolling and diversion to I-205 can be found in The Tolling Study report at: http://www.columbiarivercrossing.org/FileLibrary/Tolling/CRC_TollingStudyCommitteeReport.pdf
	B	Number of Auxiliary Lanes – Determine the number of auxiliary lanes across the Columbia River.	During summer 2010, additional study was undertaken through the Integrated Project Staff (IPS) and the Project Sponsors Council (PSC). Developing performance measures and a more robust Transportation Demand Management Plan were among the actions considered to reduce the need for auxiliary lanes. The IPS recommendation forwarded to the PSC on August 5, 2010 was for a configuration with three through lanes and two auxiliary lanes in each direction and with standard 12-foot shoulders. The new recommendation results in narrower bridges as a result of reducing the project from 12 to 10 lanes. PSC concurred and forwarded its recommendation to the Governors on August 13, 2010.

			The decision on the number of lanes will be confirmed and finalized with the publication of the Final EIS and the issuance of the Record of Decision. Both are expected in 2011.
	C	Impact Mitigation and Community Enhancement – Mitigate for adverse human health impact of the project or existing health impacts in the project area; implement community enhancement projects that address environmental justice.	The project is committed to providing users and the surrounding neighborhoods with a safe and reliable transportation facility. The project is working with and within the surrounding communities to help build upon and support their community goals. The CRC project has been working with and will continue to work with the community to blend the transportation system enhancements and improvements into the fabric of the community. The project's goals include designing and constructing the project with as little disruption to the community as possible and developing the project such that it enhances the transportation and livability of the community and preserves the environmental, scenic, aesthetic, historic, natural and social resources of the area. The philosophy of the project is to leave the area better off and to provide enhancements within the community as part of the overall project design rather than providing an enhancement fund for future enhancements separate and disjointed from the rest of the project. Many enhancements are included in the project, such as improved local street connections in downtown Vancouver and Hayden Island, the provision of light rail transit in the corridor, replacement of substandard facilities for bicyclists and pedestrians with new "world class" facilities, local auto access from North Portland to Hayden Island on a separate arterial bridge and a safer highway network for all users and inclusion of public art in the transit element of the project. In addition to these features that are part of the project's responsibility, there is agreement to continue to explore creation of a community enhancement fund as an on-going responsibility of the Departments of Transportation. This will require consideration of alternative funding mechanisms, establishment of criteria for administration and decision-making and definition of the conditions that support creation of such a fund. Human health issues are embedded in the National Environmental Policy Act's intent and in its implementation. The analyses conducted for the Columbia River Crossing DEIS, and further updates for the FEIS, address all potentially significant human health impacts that could reasonably result from the proposed action. The project, with planned mitigation, would not have adverse health impacts. Key findings leading to the conclusion that the project would not have adverse health impacts include analyses related to air quality, noise and vibration, climate change and greenhouse gases, and water quality. These four areas are highlighted below: • All criteria air pollutants and mobile source air toxins will be lower, in some cases significantly lower, in 2030 than they are today. Some pollutants will be slightly higher in some areas with the project than with the no-build, but emissions will be substantially below today's levels and will be well within relevant standards established to promote public health and welfare. Long-term mitigation for air quality impacts is not proposed. The FEIS will describe measures to reduce impacts from construction emissions. • Noise impacts from highway traffic will be lower with the project than without due to proposed mitigation, primarily sound walls. All light rail noise can be mitigated. • The project will reduce greenhouse gas (GHG) emissions compared to the no-build. The project will implement recommendations from the Governor's Climate Change Integration Group regarding how transportation in Oregon can reduce GHG emissions.

			• Currently, all runoff from the river crossing and most runoff from I-5 in the project area discharges untreated into the Columbia River and other surface waters. The project will provide water quality treatment for 115 percent of the new impervious surface, including the entire river crossing and most of I-5 in the project area that is currently untreated. These changes are beneficial to the health of aquatic species and people. The Draft EIS included and the Final EIS will include more detailed information, including analysis, applicable standards, conclusions, and mitigation where appropriate on the following topics related to human health: · Air Quality · Noise and Vibration · Land Use and Economics · Neighborhoods · Pedestrians and bicycles · Traffic and Transit · Visual and Aesthetics · Parks and recreation · Public services · Environmental justice · Hazardous materials · Water Quality The major steps to the impact analysis that followed or occurred simultaneously with data collection were: neighborhood resource mapping, the completion of displacement surveys, review of potential impacts and benefits from other disciplines (such as air quality), evaluation of potential impacts to low-income housing developments, and a robust outreach and communication program. In response to questions raised by various parties commenting on the DEIS, including the Multnomah County Health Department, the project team did undertake additional analyses including assessing greenhouse gases, additional air quality and noise studies. The Final EIS will include substantially more documentation than the DEIS related to health impacts. The CRC website will provide access to the FEIS and technical reports upon their publication.

	D	Demand Management – Develop state-of-the-art demand management techniques in addition to tolls to influence travel behavior and reduce greenhouse gas emissions.	The TDM Working Group developed both a Construction Phase and a Post-Construction Phase TDM program. The recommended Construction Phase program is a bi-state, multi-pronged approach that seeks to maximize use of alternative modes of travel through targeted marketing and additional services. The IPS has also endorsed a Post-Construction TDM Program with the goal of shifting as much as an additional 11 percent of peak person trips to non-SOV modes above the level assumed in the travel forecasts generated for the project, resulting in a non-SOV mode share that could exceed 50 percent. The Construction Phase TDM Plan was endorsed by the PSC. Additional follow-on work has been recommended to move toward implementation. To facilitate the active management of the corridor, the PSC adopted the concept of a Mobility Council on March 6, 2009. The Mobility Council would regularly assess all aspects of the corridor and the direct and indirect impacts. The PSC vision of the Mobility Council would include active management in four areas: the toll rate structure, the use of through and auxiliary lanes; transit policies; and transportation demand management strategies. During 2009 and 2010, the PSC oversaw the development and endorsed the TDM plans. TDM Plans were presented to and endorsed by the PSC on January 22, 2010 and on August 9, 2010. The PSC also established a Performance Measures Advisory Group to help establish performance measures, targets and strategies to help inform the design of the CRC project and to manage the system after construction. Key performance measures focused on the following goal areas: 1) System Access, Mobility and Reliability, 2) Financial Responsibility and Asset Management, 3) Climate, Energy Security and Health, 4) Safety and Security, 5) Economic Vitality, and 6) Land Use. The Performance Measures Advisory Group recommendations were presented to and endorsed by the PSC on January 22, 2010 and August 9, 2010. The Governance Committee of the IPS is developing recommendations for consideration by the PSC on governance structures to implement the Mobility Council and establish its charge and authority. Further consultation will be required with the Metro Council on coordination of roles and responsibilities of the Mobility Council with Metro transportation and land use policy direction.
	E	Financing Plan – Develop a financing plan for presentation to the project partners and the public that indicates federal, state and local funding and how the project could impact other expenditures in the region.	A Conceptual Finance Plan was developed and shared with the PSC on January 22, 2010. The plan illustrates how the project could be funded using a combination of federal and state funds and toll revenues. On May 14, 2010, the PSC received additional presentations related to tolling and federal funding priorities. The funding plan in the FEIS is based on these concepts and will be updated as appropriate. At the direction of the governors of Oregon and Washington, the project is working with the treasurers and legislators of both states to review and refine the financing plan and toll assumptions to minimize financial risk and provide accountability and oversight as the project moves toward construction. The funding plan will be continually reviewed with the PSC as it evolves and will be finalized prior to the Federal Transit Administration (FTA) approval of entry into final design, which is anticipated in 2012. The federal funding sources being sought for the project are principally those for which no other projects in the region are eligible. The funding contribution from each state is intended as a state contribution in recognition of the statewide significance of the project and is not intended to be the region's share of a broader state funding package. The region's continued support for the project finance plan is predicated on the federal and state funding contributions accordingly. Financing issues will continue to evolve with consultation among the project partners. Additional work remains on the financing plan with each additional step requiring more detailed analyses in accordance with requirements of the Federal Transit Administration and Federal Highway Administration. After the approval of the Final EIS, additional financial analysis and

			commitment will be required before federal agencies authorize entering into final design. An even more detailed financial analysis and a higher level of commitment will be required before federal agencies enter into a full funding grant agreement. Since issuance of bonds for the construction of the project is envisioned, a formal investment grade bond revenue analysis and a determination of bonding capacity will be required in the future. The Tolling Study can be found at: http://www.columbiarivercrossing.org/FileLibrary/Tolling/CRC_TollingStudyCommitteeReport.pdf Information presented to the PSC about funding from federal sources can be found at: http://www.columbiarivercrossing.org/FileLibrary/MeetingMaterials/PSC/PSC_WorkshopMaterials_051410_1of2.pdf
	F	Capacity Considerations, Induced Demand and Greenhouse Gases – Conduct additional analysis of GHG and induced automobile demand; prominently display the results in the FEIS; include comparisons of the auxiliary lanes; pursue reductions in VMT in support of targets established by the states.	In November 2008, the Greenhouse Gas Emissions Expert Review Panel was convened to review the GHG and climate change methodology used in the project's Draft EIS. In its report issued on January 8, 2009, the panel validated the methodology and confirmed the findings in the Draft EIS - that the CRC project would be expected to reduce GHG emissions relative to the No-Build. They made suggestions for future analyses that will be incorporated into the FEIS. This updated analysis has been completed including use of the latest EPA MOVES model, taking into account mode shift to transit, bike and pedestrian, the effect of speeds on emission rates and the reduction of emissions due to crashes and bridge lifts. This analysis shows similar results to the DEIS analysis but with even greater GHG reductions than previously estimated. Additionally, the GHG and Climate Change analysis in the CRC Draft EIS received the 2009 NEPA Excellence Award from the National Association of Environmental Professionals. The Greenhouse Gas Expert Review Panel's report can be found at: http://www.columbiarivercrossing.org/FileLibrary/TechnicalReports/GHG_PanelReport_010809.pdf Since release of the DEIS, several groups, including the Transportation Demand Working Group, the Performance Measures Advisory Group, and the IPS, have worked on strategies designed to enhance mobility, especially through promotion of alternative modes of travel that reduce both GHG emissions and VMT. The strategies and plans of each of these groups have been endorsed by PSC. Additional work relating to implementation of these strategies and plans will be needed as the project advances. Further discussion relating to the recommendations and implementation of transportation demand management strategies can be found in Issue D, above. A qualitative analysis of the potential for induced travel demand was conducted by the Travel Demand Expert Review Panel. In its report dated November 25, 2008, the panel concluded that "the CRC project finding that the project would have a low impact to induce growth is reasonable for this corridor because the project is located in a mature urban area." The report can be found at: http://www.columbiarivercrossing.org/FileLibrary/TechnicalReports/TravelDemandModelReview_PanelReport.pdf An additional study of induced growth was conducted by Metro during summer 2010 using its Metroscope model. This quantitative study also concluded "that the proposal would have negligible impact on population and employment growth in Clark County, when comparing the projected growth that would occur with the project with the projected growth that would occur even with no change to the existing bridge." According to Metro, the three main conclusions from its summer 2010 analysis using Metroscope were: • The CRC project produces a minor difference in regional growth relative to the no-build alternative and almost no change compared to the No-Build if tolls are imposed on I-5.

			• The results using Metroscope reinforce the previous qualitative analysis with its quantitative approach. • The no-build and build scenarios result in basically the same growth patterns for population and employment and confirm the validity of the approach used for forecasting traffic volumes in the Draft and Final EIS involving holding population and employment forecasts constant between the Build and No-Build scenarios. Results of the Metroscope analysis were summarized by Metro in its news release that can be found at: http://news.oregonmetro.gov/1/post.cfm/metro-finds-columbia-river-crossing-toll-bridge-with-light-rail-would-have-negligible-impact-on-growth
	G	Preservation of Freight Access – Describe the physical improvements and tolling methods that will be used to ensure trucks are granted priority due to their importance relative to single-occupant autos; ensure that freight capacity at interchanges is not diminished by industrial land use conversion.	The importance of freight has been recognized throughout the project. The Freight Working Group provided key input to the design process, including the design of key interchanges such as the Marine Drive interchange. The design standards used for the project seek to accommodate trucks used in commerce. The ramp terminals, ramps, and interchanges have been sized to provide needed capacity for trucks. Freight-only lanes and ramps were considered, but were not recommended by the Freight Working Group. The project's plan for the Marine Drive interchange includes a flyover ramp from eastbound Marine Drive to northbound I-5 and braided ramps on southbound I-5 between the Marine Drive and Interstate/Victory Boulevard interchanges. Analyses conducted for the project indicate that neither of these is required short-term and can be delayed until after year 2030. Both projects, however, are considered part of a long-term solution because of the importance of accommodating freight movements, particularly those associated with the Port of Portland and other industrial uses along Marine Drive. The revised plan for the Hayden Island Interchange includes provision of an arterial bridge across the Portland Harbor, connecting Hayden Island to North Interstate Avenue and Martin Luther King Blvd in lieu of ramp connections through the I-5/Hayden Island interchange complex to the Marine Drive interchange. This has a beneficial impact for freight by removing this auto traffic from the key freight access interchange, the Marine Drive interchange. Electronic tolling is planned for the project. It is currently assumed that trucks will pay more based on number of axles or weight. Both DOTs share the concern about capacity being used up by unplanned non-industrial development, but must rely upon the partners with land use authority to prevent industrial lands from being converted to other uses with unacceptable transportation impacts. One of the relatively new methods of protecting the capacity of interchanges being used in Oregon is an Interchange Area Management Plan (IAMP). An IAMP identifies long-range improvements, access management strategies, and land use tools that are used to protect the interchange. IAMPs are adopted by the local jurisdiction and by the Oregon Department of Transportation. Development of IAMPs is underway for both the Hayden Island and Marine Drive interchanges and will include provisions dealing with limits on conversion of industrially zoned land to commercial. In addition, changes to industrially zoned land is controlled by Metro's Urban Growth Management Functional Plan (Title 4) which limits non-industrial uses in areas designated Regionally Significant Industrial area which applies to significant areas near the interchanges in the CRC bridge influence area. Adoption by the City of Portland and the Oregon Transportation Commission are expected sometime during 2011.

	H	Light Rail Transit – Implement light rail transit as a required element in any plan that moves forward.	Light rail transit was selected as the high capacity transit mode and is being advanced as a key element of the project. Confirmation of the selection of light rail transit as a project element will be with the publication of the Final EIS and the issuance of the Record of Decision. Both actions are expected in 2011. The project will pursue FTA authorization to proceed to final design in 2012 contingent on the FTA's approval of a capital and operating financing plan. In addition, C-TRAN is considering referral of a measure to the voters for operating support for LRT.
	I	Design of Bicycle and Pedestrian Facilities – Undertake additional design to include "world class" bicycle and pedestrian facilities on the bridge, approaches and throughout the bridge influence area; meet or exceed standards; be adequate to meet the demand considering tolls and other transportation demand measures.	A "world class" facility for pedestrians and bicyclists is being advanced. It will feature a facility for bicyclists and pedestrians on the main span with more width than other facilities in the Portland-Vancouver region and far exceeds minimum standards. The capacity of the facility is calculated to be more than adequate for the predicted use. The Pedestrian and Bicycle Advisory Committee (PBAC) spent considerable effort helping develop a complete system that features a river crossing using one of the lower-level sections of the bridge for the main river crossing. PBAC helped develop appropriate connections at both ends of the project and for Hayden Island. PBAC also recommended development of a future maintenance and security plan that has been endorsed by PSC and committed to by the Oregon and Washington DOTs to include reliable funding for maintenance and security, programming of activity space to create "eyes on the pathway," visible and regular monitoring by security personnel with cameras and call boxes, appropriate lighting and posting of laws and ordinances. Connections for bicyclists and pedestrians to the local network in downtown Vancouver, Hayden Island, and streets and multi-use paths in the vicinity of Marine Drive and Delta Park are still undergoing refinement. The project is committed to providing good connections that meet or exceed all applicable standards, such as width and grade, that avoid or minimize conflicts among modes of travel, and that seeks to improve the existing circuitous routing patterns in the area. Many features needed to implement this vision for a world class facility in the corridor, such as the precise locations, widths, grades, etc will be determined in the final design phase including consultation with local agencies and stakeholders.
	J	Urban Development Impacts at Re-designed Interchanges – Undertake additional evaluation of the impact of redesigned interchanges and urban development potential; preserve and improve access to the Expo Center.	Several of the interchanges, especially the Marine Drive and Hayden Island interchanges, have undergone considerable additional analyses. Key participants in these evaluations have been the Marine Drive Stakeholder Group and the Portland Working Group. Several options for the Marine Drive interchange were explored. Key issues considered in the designs for the Marine Drive interchange included the impact on freight movements, access to existing industrial uses in the area, access to the Expo Center, and the creation of parcels that could be put to beneficial uses. The Hayden Island interchange also underwent additional study designed to further the Hayden Island Plan and implement features that are supportive of transit, seek to implement a "main street" for Tomahawk Island Drive, and minimize the footprint of the project on Hayden Island. Additional analyses led to a new concept (known as Concept D) utilizing an arterial bridge to provide access between Hayden Island and N. Expo Road with a corresponding elimination of direct freeway ramps within the project design between Hayden Island and the Marine Drive interchange. Efforts are currently underway to incorporate this into a design that will be included as the preferred option in the Final EIS. Additional refinement work addressing urban design characteristics will continue as the project advances toward construction. The Portland Working Group and other stakeholders will be consulted as the project seeks to advance the design and final design details for the local streets, trails, sidewalks and crosswalks are subject to approval by the City of Portland. Overall, the combination of improvements at and around the Marine Drive and Hayden Island interchanges substantially improves local connectivity and access apart from the freeway improvements and the resulting removal of the congestion bottleneck.

			Access to/from Expo is substantially improved and representatives from Expo have been involved in the process.
	K	Bridge Design – Consider bridge type and aesthetics before the final design.	In seeking to achieve a quality design meeting aesthetic values, the project has made extensive use of advisory groups including the Urban Design Advisory Committee (UDAG), a Sustainability Working Group, the Independent Review Panel (IRP), the Hayden Island Design Group, and a constructability working group. The Urban Design Advisory Committee (UDAG) developed design guidelines and recommended a two-level, two-bridge concept that is being advanced. Overall guidance has been provided by the IPS and PSC to meet these objectives. UDAG's recommended guidelines are currently being developed into "architectural standards" to be adopted by WSDOT and CRC staff to use as the project moves into final design. These standards will be shared with UDAG, the cities of Portland and Vancouver, Metro, and other stakeholders and will be used for the bridge and other elements of the project. Beginning on November 3, 2010, the Bridge Expert Review Panel began reassessing bridge types, and constraints. In its final report on February 3, 2011, the Panel offered three more feasible bridge type alternatives for consideration, a tied arch, cable-stayed and deck truss. The panel found all three options less expensive and more suitable for the crossing over the Columbia River than the open web box bridge type that had been advanced. At the direction of the governors of Oregon and Washington, the two state DOTs reviewed the Panel's recommendation and reported back to the governors with project findings on February 25, 2011. On April 25, 2011, the governors of Oregon and Washington announced the selection of the deck truss bridge type for the replacement bridge. The governors cited several reasons for the selection including reducing and eliminating risks to schedule and budget; affordability; and the ability to secure funding. The Bridge Panel's final report can be found at: http://www.columbiarivercrossing.com/FileLlbrary/GeneralProjectDocs/BRP_Report.pdf The Washington and Oregon DOT's findings can be found at: http://www.columbiarivercrossing.org/FileLibrary/GeneralProjectDocs/DOTs_Draft%20Recommendation.pdf The Governors' announcement can be found at: http://www.columbiarivercrossing.com/FileLibrary/GeneralProjectDocs/DeliverCRC_GovPR.pdf The governors recognized the importance of design and aesthetic considerations and committed to specific actions. They committed to engaging the design community and stakeholders in the design process. They directed the project to add an architect to the project team and establish architectural specifications for the contractor to follow. Details of these actions are being developed and will be announced and advertised by the project. The Governors' April 25, 2011 announcement of the "Next Steps" can be found at: http://www.columbiarivercrossing.org/FileLibrary/GeneralProjectDocs/Gov_BridgeRecommend.pdf

Errata Sheet:
Resolution No. 11-4264, Exhibit B
Revisions adopted by JPACT on 6/9/11

	E	Financing Plan – Develop a financing plan for presentation to the project partners and the public that indicates federal, state and local funding and how the project could impact other expenditures in the region.	A Conceptual Finance Plan was developed and shared with the PSC on January 22, 2010. The plan illustrates how the project could be funded using a combination of federal and state funds and toll revenues. On May 14, 2010, the PSC received additional presentations related to tolling and federal funding priorities. The funding plan in the FEIS is based on these concepts and will be updated as appropriate. At the direction of the governors of Oregon and Washington, the project is working with the treasurers and legislators of both states to review and refine the financing plan and toll assumptions to minimize financial risk and provide accountability and oversight as the project moves toward construction. The funding plan will be continually reviewed with the PSC as it evolves and will be finalized prior to the Federal Transit Administration (FTA) approval of entry into final design, which is anticipated in 2012. The federal funding sources being sought for the project are principally those for which no other projects in the region are eligible. The funding contribution from each state is intended as a state contribution in recognition of the statewide significance of the project and is not intended to be the region's share of a broader state funding package. The region's continued support for the project finance plan is predicated on the federal and state funding contributions accordingly. Financing issues will continue to evolve with consultation among the project partners. Additional work remains on the financing plan with each additional step requiring more detailed analyses in accordance with requirements of the Federal Transit Administration and Federal Highway Administration. After the approval of the Final EIS, additional financial analysis and commitment will be required before federal agencies authorize entering into final design. An even more detailed financial analysis and a higher level of commitment will be required before federal agencies enter into a full funding grant agreement. Since issuance of bonds for the construction of the project is envisioned, a formal investment grade bond revenue analysis and a determination of bonding capacity will be required in the future. As the finance plan is finalized, it will take into account the impact on phasing. The Tolling Study can be found at: http://www.columbiarivercrossing.org/FileLibrary/Tolling/CRC_TollingStudyCommitteeReport.pdf Information presented to the PSC about funding from federal sources can be found at: http://www.columbiarivercrossing.org/FileLibrary/MeetingMaterials/PSC/PSC_WorkshopMaterials_051410_1of2.pdf

STAFF REPORT

IN CONSIDERATION OF RESOLUTION NO. 11-4264, for the purpose of CONCLUDING THAT THE CONCERNS AND CONSIDERATIONS RAISED ABOUT THE COLUMBIA RIVER CROSSING PROJECT IN EXHIBIT A TO RESOLUTION NO. 08-3960b HAVE BEEN ADDRESSED SATISFACTORILY

Date: May 23, 2011

Prepared by: Andy Cotugno
503-797-1763

BACKGROUND

Overview

The Columbia River Crossing (CRC) is a proposed multimodal bridge, transit, highway, bicycle and pedestrian improvement project sponsored by the Oregon and Washington transportation departments in coordination with Metro, TriMet and the City of Portland as well as the Regional Transportation Council of Southwest Washington, CTRAN and the City of Vancouver, Washington. (More detailed project information may be found at: http://www.columbiarivercrossing.org/).

The CRC project is designed to improve mobility and address safety problems along a five-mile corridor between State Route 500 in Vancouver, Washington, to approximately Columbia Boulevard in Portland, Oregon, including the Interstate Bridge across the Columbia River.

The project would be funded by a combination of Federal Transit Administration (FTA) New Starts funding for the transit component, Federal Highway Administration (FHWA) funding for highway, freight, bicycle and pedestrian improvements, with local match being provided by the states of Oregon and Washington through toll credits and other funding. Tolls are also proposed for a new I-5 bridge to pay for a portion of the capital project and manage transportation demand.

Locally Preferred Alternative Approval

In July, 2008 the Metro Council adopted Resolution No. 09-3960B endorsing the Locally Preferred Alternative (LPA) consisting of replacement of the I-5 Interstate Bridge with three through lanes each direction plus auxiliary merging and weaving lanes, extension of light rail transit to Vancouver, Washington, provision of bike and pedestrian facilities on the bridge and connecting to the regional network and implementation of congestion pricing as both a demand management and revenue tool.

However, that resolution also raised a number of concerns and considerations needing to be addressed prior to finalizing the project through publication of a Final Environmental Impact Statement. Some of the concerns and considerations dealt with issues that could potentially change specific aspects of the project design (such as the number of lanes or the design of the Hayden Island Interchange) while other concerns dealt with development of further information about the potential impacts of the project (such as the impact on traffic on I-205).

This staff report and Exhibit B to this resolution provide information relating to those concerns and considerations and analyses and conclusions reached since that action. The overall purpose of this resolution is to provide sufficient information to demonstrate that all of the concerns and considerations have been adequately addressed, thereby allowing the project development to be completed.

The underlying policy direction calling for the project in the first place is laid out in the Regional Transportation Plan adopted and periodically updated by Metro. In addition the staff report for Resolution No. 08-3960B approving the Locally Preferred Alternative provides considerable background on the alternatives considered, impacts evaluated and process followed to arrive at that decision, much of which is also published in the Draft Environmental impact Statement for the project.

Adoption of concerns and considerations to be addressed further

While the Metro Council expressed their support for this LPA, they also expressed concern about a number of issues they felt needed to be addressed before the project development is completed. As such the resolution also identified those concerns and considerations, calling for them to be addressed by the CRC project. Of particular concern were the following:

1. Assessment of tolling including timing of implementation and whether to extend tolls to I-205 and the traffic impacts if tolls are not extended to I-205;
2. Evaluation of the number of auxiliary lanes in addition to the three through lanes each direction;
3. Consideration of mitigation for any potential adverse human health impacts including community enhancements that address environmental justice;
4. Development of state of the art demand management techniques in addition to tolls;
5. Development of a financing plan with particular attention to how the revenue sources impact other projects in the region;
6. Assessment of greenhouse gases and the potential for induced growth and travel demand;
7. Preservation of the priority for freight access including ensuring that interchange capacity is not diminished by industrial land conversion;
8. Inclusion of light rail as part of any phasing plan that is developed;
9. Development of the bike/pedestrian facilities throughout the bridge influence area as "world-class" facilities;
10. Re-examination of interchange designs to minimize community impacts and maximize LRT station-area development opportunities. Particular attention should be paid to revisiting the Hayden Island Interchange and ensuring adequate access to the Expo Center;
11. Consideration of the bridge type and design to ensure aesthetic considerations are reflected in the final design.

CRC Response to concerns and conditions

In response to the conditions adopted by the Metro Council, as well as numerous other concerns raised by the other participating jurisdictions, the CRC Project responded through a multi-pronged approach:

1. The Project Sponsors Council (PSC) met on a much more frequent basis to review analyses and develop agreements on changes to incorporate into the project or reasons with better support documentation if changes were not warranted.
2. An Integrated Project Staff (IPS) working group was created co-chaired by the PSC co-chairs to carry-out the analyses commissioned to respond to the conditions.
3. Subcommittees of the IPS with participation by multiple partners were convened to focus on the following topics:
    a. Hayden Island Interchange re-design or removal;
    b. Vancouver City Center Interchange removal;
    c. Number of auxiliary lanes;
    d. Induced growth;
    e. Application of performance measures to the project scope decisions;
    f. Definition of construction mitigation travel demand management program;
    g. Definition of post-construction travel demand management program;

h. Post-construction governance and the role of a Mobility Council;
i. Phasing strategies.

4. The Governors of Oregon and Washington commissioned an Independent Review Panel which met from April to July of 2010. It was comprised of eight nationally recognized experts in developing, financing and implementing large complex multi-modal projects to do a thorough independent review of the project. They made recommendations for changes, and actions to be taken to reduce risk. The full recommendation report can be accessed at: http://crcreview.columbiarivercrossing.org/documents/IRP_report.pdf
5. In response to one of the recommendations of the Independent Review Panel, the Governors of Oregon and Washington commissioned a Bridge Review Panel which met from September 2010 to February 2011. It was comprised of 11 internationally recognized bridge experts plus the state bridge engineers for the states of Oregon and Washington and representatives from TriMet and C-TRAN. They were charged with evaluating the viability of the bridge type being pursued and recommend whether to proceed with the current bridge type proposal or an alternate bridge type, including consideration of whether some of the constraints that have controlled key aspects of the bridge design could be altered. The full report from the Bridge Panel can be accessed at: http://www.columbiarivercrossing.com/FileLibrary/GeneralProjectDocs/BRP_Report.pdf
The decision of the Governors on the recommendation of the bridge panel can be accessed at: http://www.columbiarivercrossing.com/FileLibrary/GeneralProjectDocs/DeliverCRC_GovPR.pdf
6. The City of Portland contracted with the engineering consulting firm URS to provide independent expertise in examining design options to remove or revise the Hayden Island Interchange and traffic operations and engineering analysis of 8, 10 and 12 lane bridge options.

Satisfaction of Concerns and Considerations

Exhibit B to this resolution provides documentation on how each condition has been satisfied. Presented in the table is a brief restatement of the condition being addressed and a synopsis of the conclusions and recommendations about each condition. In addition, in most cases there is an electronic link to the CRC web-site providing direct access to the full report on that subject. In this manner, the reader can review the overall conclusion but also access greater detail if desired. Also presented as part of Exhibit B is an assessment by the Project Sponsors Council and the Independent Project Staff of whether the concern is fully and finally decided and will be reflected as such in the Final Environmental Impact Statement or whether there is agreement in principle with further decisions still pending later in the process. For example, there is agreement in principle about the parameters for tolling although the specific toll rates will not be made until much closer to opening day. In each case where a future decision will be necessary, the character of that future process is provided.

The conditions and conclusions presented in Exhibit B are as follows:

A. Tolling
B. Number of Auxiliary lanes
C. Impact Mitigation and Community Enhancement
D. Demand Management
E. Financing Plan
F. Greenhouse Gases and Induced Demand
G. Preservation of Freight Access
H. Light Rail Transit
I. Bike/Pedestrian Facilities
J. Interchange redesign and urban development impacts
K. Bridge Design

Next Steps

The effect of adoption of this resolution is to concur that the concerns and considerations are sufficiently addressed to proceed with finalizing the Final Environmental Impact Statement (FEIS). Certain aspects are direct changes to the design, such as the number of lanes and the configuration of the Hayden Island and Marine Drive interchanges accompanied with a local access bridge across North Portland Harbor that will be reflected accordingly in the FEIS document itself. Other concerns and considerations represent an agreement in principle with a recognition that Metro will be engaged in future decision-making on project details as they develop, including the setting of toll rates, the timing of toll implementation, the specific design of demand management programs and the Mobility Council, implementation of the finance plan, development of a community enhancement fund, bike, pedestrian and local street design details, station area development and aesthetic treatment of the bridge itself. Of particular concern to the Metro Council are certain issues that require further attention as the project proceeds:

- Finalizing whether to implement tolls during construction to serve as a demand management tool to mitigate traffic impacts during construction and provide an important contribution to the financing plan.
- Further consideration of establishment of a community enhancement fund, including purpose, amount, administrative and selection criteria and source of funding.
- Ensuring the state contribution to the project recognizes the statewide significance of the project and is not at the expense of other regional priorities.

ANALYSIS/INFORMATION

1. **Known Opposition**

   The CRC is a very large and complex transportation project. There are strong feelings – pro and con – associated with the project. Opposition to the project includes concerns raised regarding the need for the project, greenhouse gas emissions that could be generated by the project, costs, tolls, the light rail extension to Vancouver, Washington and the aesthetic qualities of the bridge type. Opposition to tolls and light rail in Clark County has been well organized and aggressive. Opposition on the Oregon side has included concern that the project will simply worsen the bottleneck on I-5 in the vicinity of the Fremont Bridge and I-84 interchange. While it does not worsen that bottleneck, there remains criticism that the project shouldn't be built if it doesn't address an equally severe bottleneck just downstream.

   Support for the project includes addressing the severe bottleneck and safety issues, the impact on freight movement and the opportunity to significantly improve transit service to Vancouver.

2. **Legal Antecedents**

   Federal
   - National Environmental Policy Act
   - Clean Air Act
   - SAFETEA-LU
   - FTA New Starts Process

   State
   - Statewide Planning Goals
   - State Transportation Planning Rule
   - Oregon Transportation Plan
   - Oregon Highway Plan
   - Oregon Public Transportation Plan

• Oregon Bicycle and Pedestrian Plan

Metro

- Resolution No. 02-3237A, "For the Purpose of Endorsing the I-5 Transportation and Trade Study Recommendations," adopted on November 14, 2002.
- Resolution No. 07-3782B, "For the Purpose of Establishing Metro Council Recommendations Concerning the Range of Alternatives to Be Advanced to a Draft Environmental Impact Statement For the Columbia River Crossing Project," adopted on February 22, 2007.
- Resolution No. 07-3831B, "For the Purpose of Approving the Federal Component of the 2035 Regional Transportation Plan (RTP) Update, Pending Air Quality Conformity Analysis," adopted on December 13, 2007.
- Resolution No. 08-3911, "For the Purpose of Approving the Air Quality Conformity Determination for the Federal Component of the 2035 Regional Transportation Plan and Reconforming the 2008-2011 Metropolitan Transportation Improvement Program," adopted on February 28, 2008.
- Resolution No. 08-3938B, "For the Purpose of Providing Metro Council Direction to its Delegate Concerning Key Preliminary Decisions Leading to a Future Locally Preferred Alternative Decision for the Proposed Columbia River Crossing Project," adopted on June 5, 2008.
- Resolution No. 08-3960B "For the Purpose of Endorsing the Locally Preferred Alternative for the Columbia River Crossing Project and Amending the Metro 2035 Regional Transportation Plan with Conditions." adopted July 17, 2008.
- Ordinance 10-1241B "For the Purpose of Amending the 2035 Regional Transportation Plan (Federal Component) and the 2004 Regional Transportation Plan to Comply With Federal and State Law; to Add the Regional Transportation Systems Management and Operations Action Plan, the Regional Freight Plan and the High Capacity Transit System Plan; to Amend the Regional Transportation Functional Plan and Add it to the Metro Code; to Amend the Regional Framework Plan; and to Amend the Urban Growth Management Functional Plan." Adopted on June 10, 2010.

3. **Anticipated Effects**

The approval of this resolution would be to "perfect" the endorsement of the Locally Preferred Alternative and remove the conditions imposed by Resolution No. 08-3960B. This would allow the project scope to be finalized through the Final Environmental Impact Statement, would allow Metro to consider approval of the Land Use Final Order and allow the Federal Highway Administration and Federal Transit Administration to issue a Record of Decision. With these actions in place, the project can proceed from the current development stage into final design.

4. **Budget Impacts**

If there is a role for Metro to play, the CRC project would reimburse Metro for any costs incurred for such work (this could be additional updated travel forecasting and updated rating information for the New Starts submission, for example).

RECOMMENDED ACTION

Adopt Resolution No. 11-4264 For the Purpose of Concluding that the Concerns and Considerations Raised About the Columbia River Crossing Project in Exhibit A to Resolution No. 08-3960B have been Addressed Satisfactorily.

Attachment B

Metro Resolution No. 11-4264 – issues requiring follow-up:

- **Pre-construction Tolling:** The Council continues to be interested in tolling during construction. There needs to be a clear definition of when and how this will be resolved.
- **Toll rate setting:** It is understood that actual rates will be set by the two Transportation Commissions at a later date and that there will be an investment grade toll revenue analysis that helps inform that decision. But there is a need for better clarification of when this will occur and under what criteria or guiding principles rates will be set.
- **Community Enhancement Fund:** A clear work program and schedule for development of a Community Enhancement Fund needs to be established. Clear progress is important to accomplish before adoption of the LUFO.
- **Construction phase TDM:** The PSC approved a detailed and aggressive construction phase TDM program to mitigate construction phase traffic congestion. The FEIS needs to reflect this.
- **Post construction TDM:** The PSC reviewed an aggressive post-construction TDM strategy that needs to be reflected in the FEIS. In addition, implementation is tied to the concept of the Mobility Council and the recommendations of the Performance Measures Advisory Group (PMAG). These need to be finalized and reflected in the FEIS and a clear work program and schedule for implementing the Mobility Council and the performance measures need to be established, especially aspects relating to governance.
- **Finance Plan:** The funding strategy for the project is intentionally crafted to not pursue state and federal funding sources that jeopardize other regional priorities. The Finance Plan and FEIS finance chapter need to better reflect this.
- **Phasing Plan:** The finance plan needs to be finalized taking into account the impact on phasing. Completion of the Phasing Plan should ensure it doesn't build the bridge at the expense of local bridge, local streets and bike/ped. connections.
- **Interchange Area Management Plan (IAMP):** The IAMP should include recognition of Metro's Title 4 requirements regarding limitation on non-industrial uses in Regionally Significant Industrial Areas.
- **Local street, bike, pedestrian final design:** Metro needs to be involved as final design details are developed for the local street network and bike/ped. facilities.
- **Aesthetic Considerations:** Metro needs to be involved as final architectural details of the bridge and throughout the project are defined.
- **Governance:** There needs to be agreement on the governance that will be in place after issuance of the Record of Decision by the federal agencies. In addition, there needs to be a clear work program and schedule for concluding the governance structure for post-construction operations by the time the ROD is issued. Several of our Metro Council and JPACT members are interested in further consideration of a Bi-State Compact.

Based upon public testimony received at the Metro Council meeting, several issues were raised that need to be addressed. We would appreciate being apprised of how they are addressed.

Hayden Island Livability Project (HILP):

- Recognition of the status of the Manufactured Home community as an Environmental Justice (EJ) community
- Early construction of the Hayden Island local bridge as mitigation measure during construction
- Development of a strategy for replacement of the Safeway
- On-site air quality monitoring during construction
- Dust control on Hayden Island during construction
- Use of low-sulfur diesel fuel in construction equipment

HiNoon Neighborhood Association:

- There is some merit to the request by HiNoon for a park-and-ride facility on the island in light of the lack of connecting bus service on the island and the planned termination of park-and-ride service at the Expo Center.
- There is a need to reconcile the east of I-5 neighborhood commercial zone in the Hayden Island Concept Plan with the CRC proposal for stormwater facilities with the prospect of a park-and-ride lot.
- A question has been raised about the appropriateness of the planned stormwater treatment in an urban environment.
- The Hayden Island Plan calls for a significant "Gateway Park" as a post-construction re-use of the of Thunderbird Hotel site. What is the status of this proposal.
- Consideration should be given to the proposal for a multi-use path on the east side of I-5.
- The overall layout for the local street, bike and pedestrian facilities are terrific but there is a need for continued engagement of the community in the design details as they develop.

Pacific Environmental Advocacy Center:

- This testimony included a very strong assertion that there is a need for a Supplemental DEIS to provide an opportunity for public comment on a substantial amount of new information and change to the project design. Please provide an explanation why this is not required.