INTERSTATE 5 COLUMBIA RIVER CROSSING

Transit Technical Report

January 2008

Columbia River CROSSING

TO: Readers of the CRC Technical Reports

FROM: CRC Project Team

SUBJECT: Differences between CRC DEIS and Technical Reports

The I-5 Columbia River Crossing (CRC) Draft Environmental Impact Statement (DEIS) presents information summarized from numerous technical documents. Most of these documents are discipline-specific technical reports (e.g., archeology, noise and vibration, navigation, etc.). These reports include a detailed explanation of the data gathering and analytical methods used by each discipline team. The methodologies were reviewed by federal, state and local agencies before analysis began. The technical reports are longer and more detailed than the DEIS and should be referred to for information beyond that which is presented in the DEIS. For example, findings summarized in the DEIS are supported by analysis in the technical reports and their appendices.

The DEIS organizes the range of alternatives differently than the technical reports. Although the information contained in the DEIS was derived from the analyses documented in the technical reports, this information is organized differently in the DEIS than in the reports. The following explains these differences. The following details the significant differences between how alternatives are described, terminology, and how impacts are organized in the DEIS and in most technical reports so that readers of the DEIS can understand where to look for information in the technical reports. Some technical reports do not exhibit all these differences from the DEIS.

Difference #1: Description of Alternatives

The first difference readers of the technical reports are likely to discover is that the full alternatives are packaged differently than in the DEIS. The primary difference is that the DEIS includes all four transit terminus options (Kiggins Bowl, Lincoln, Clark College Minimum Operable Segment (MOS), and Mill Plain MOS) with each build alternative. In contrast, the alternatives in the technical reports assume a single transit terminus:

- Alternatives 2 and 3 both include the Kiggins Bowl terminus
- Alternatives 4 and 5 both include the Lincoln terminus

In the technical reports, the Clark College MOS and Mill Plain MOS are evaluated and discussed from the standpoint of how they would differ from the full-length Kiggins Bowl and Lincoln terminus options.

Difference #2: Terminology

Several elements of the project alternatives are described using different terms in the DEIS than in the technical reports. The following table shows the major differences in terminology.

DEIS terms	Technical report terms
Kiggins Bowl terminus	I-5 alignment
Lincoln terminus	Vancouver alignment
Efficient transit operations	Standard transit operations
Increased transit operations	Enhanced transit operations

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Difference #3: Analysis of Alternatives

The most significant difference between most of the technical reports and the DEIS is how each structures its discussion of impacts of the alternatives. Both the reports and the DEIS introduce long-term effects of the full alternatives first. However, the technical reports then discuss “segment-level options,” “other project elements,” and “system-level choices.” The technical reports used segment-level analyses to focus on specific and consistent geographic regions. This enabled a robust analysis of the choices on Hayden Island, in downtown Vancouver, etc. The system-level analysis allowed for a comparative evaluation of major project components (replacement versus supplemental bridge, light rail versus bus rapid transit, etc). The key findings of these analyses are summarized in the DEIS; they are simply organized in only two general areas: impacts by each full alternative, and impacts of the individual “components” that comprise the alternatives (e.g. transit mode).

Difference #4: Updates

The draft technical reports were largely completed in late 2007. Some data in these reports have been updated since then and are reflected in the DEIS. However, not all changes have been incorporated into the technical reports. The DEIS reflects more recent public and agency input than is included in the technical reports. Some of the options and potential mitigation measures developed after the technical reports were drafted are included in the DEIS, but not in the technical reports. For example, Chapter 5 of the DEIS (Section 4(f) evaluation) includes a range of potential “minimization measures” that are being considered to reduce impacts to historic and public park and recreation resources. These are generally not included in the technical reports. Also, impacts related to the stacked transit/highway bridge (STHB) design for the replacement river crossing are not discussed in the individual technical reports, but are consolidated into a single technical memorandum.

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Cover Sheet

Interstate 5 Columbia River Crossing

Transit Technical Report:

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TABLE OF CONTENTS

List of Exhibits

Appendices

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ACRONYMS

Acronym	Description
ADA	Americans with Disabilities Act
AOM	C-TRAN Administration, Operations, and Maintenance
API	Area of Potential Impact
BPA	Bonneville Power Administration
BRT	Bus Rapid Transit
CEI	Cost Effectiveness Index
CEVP	Cost Estimate Validation Process
CRC	Columbia River Crossing
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
FTA	Federal Transit Administration
HCT	High-Capacity Transit
HOV	High-Occupancy Vehicle
IB	inbound
LOS	Level-of-service
LPA	Locally Preferred Alternative
LRT	Light Rail Transit
LRV	Light Rail Vehicle
MOS	Minimum Operable Segments
MPO	Metropolitan Planning Organization
Mph	Miles per hour
MTP	Metropolitan Transportation Plan
NEPA	National Environmental Policy Act
OB	outbound
ODOT	Oregon Department of Transportation
O&M	Operations and Maintenance
RTC	Regional Transportation Council
RTP	Regional Transportation Plan
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SOV	Single Occupancy Vehicle
TDM	Transportation Demand Management
TSM	Transportation System Management
TSP	Transportation System Plan
V/C	Volume to Capacity Ratio
VCCV	Vancouver City Center Vision
VHD	Vehicle Hours of Delay
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled
WSDOT	Washington State Department of Transportation
YOE	Year of Expenditure

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1. Executive Summary

1.1 Introduction

The Columbia River Crossing (CRC) Transit Technical Report provides technical detail and background about transit alternatives analyzed for the CRC project in support of developing the Draft Environmental Impact Statement (DEIS). Further, the Transit Technical Report provides a summary of the impact that the alternatives under consideration would have on transit operations in the project study area. The Transit Technical Report has the following organization: the Executive Summary (Chapter 1) is a holistic overview of the CRC project, Chapter 2, Methods, defines the project boundaries and the process of how the project guidelines were established and methods for gathering data. Chapter 3, Coordination, describes the project sponsors and the other local agencies and stakeholder groups who are involved in outreach efforts. Chapter 4 describes the affected environment; this includes the affected transit agencies and the existing bi-state transportation and transit conditions. Chapter 5 describes the long-term transit effects of the CRC project; this chapter presents the results of the forecast modeling and analysis performed for the DEIS. In detail, it describes how each project component would perform in the year 2030 transportation climate. Chapter 6 discusses the potential temporary effects to transit from project construction and Chapter 7 discusses potential mitigation measures that could be implemented to address the temporary construction effects.

1.2 Project Definition

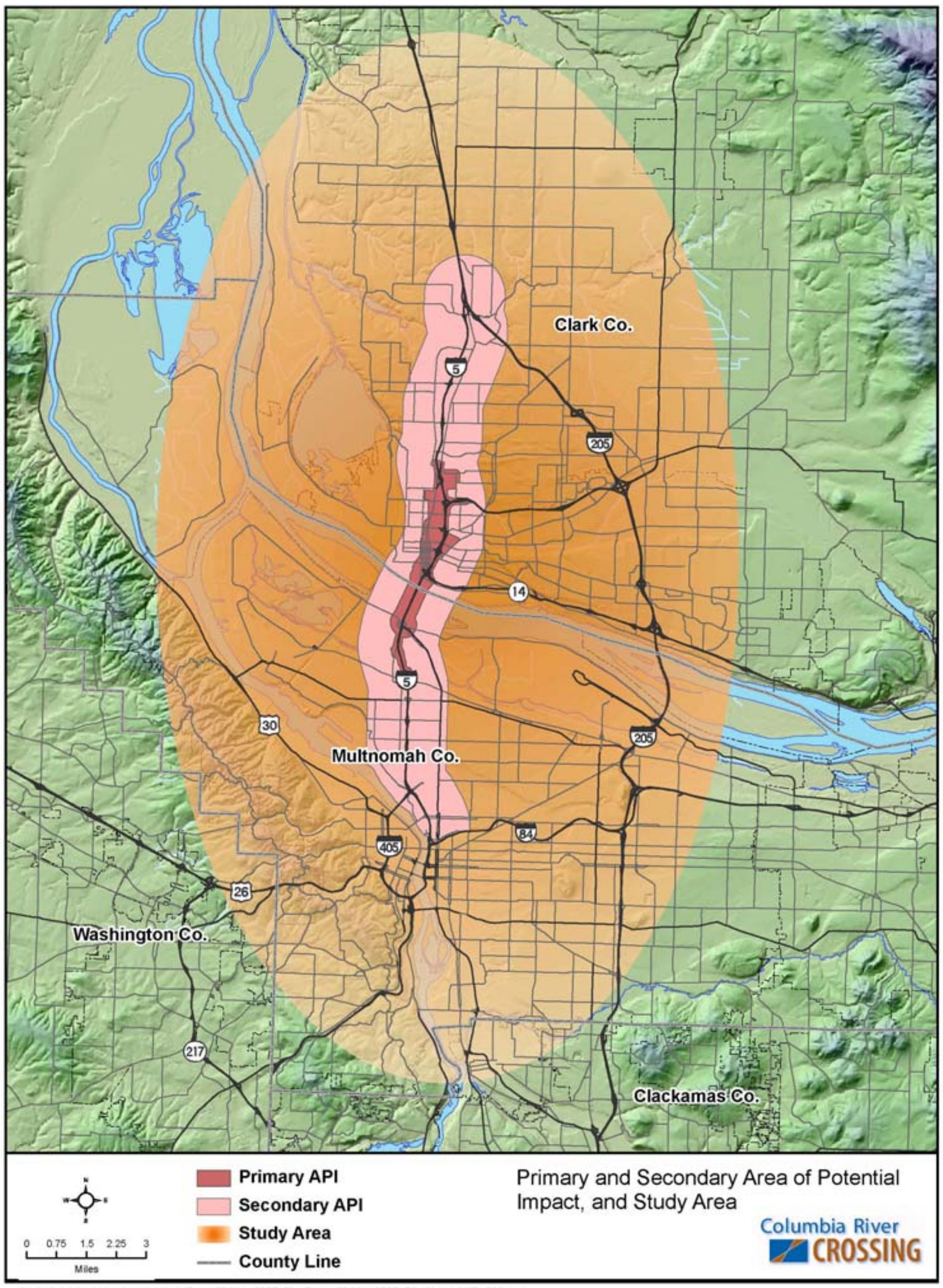
The CRC project seeks to identify solutions to the transportation problems, defined by the Washington and Oregon Departments of Transportation (WSDOT and ODOT), in the vicinity of the I-5 crossing of the Columbia River. In 1998, the state transportation departments formed a bi-state partnership to study transportation problems and possible solutions over a large stretch of the I-5 corridor from the Portland metropolitan area through southern Clark County, Washington. The studies showed that the highest congestion and the most unmet demand occur where I-5 crosses the Columbia River. The recommendations included adding more capacity of over the Columbia River with a replacement or supplemental bridge and considering high-capacity transit (HCT) improvements.

In January 2000, a 28-member bi-state committee appointed by the Governors of Oregon and Washington began the I-5 Transportation and Trade Partnership Task Force. The Task Force worked with the public and one another to determine what improvements to I-5 should be studied. The study resulted in a variety of corridor-wide improvement and traffic management recommendations, which were drafted in January 2002. The final strategic plan in June 2002 called for improvements including new transit and vehicle capacity across the Columbia River in the I-5 Trade Corridor, with more highway lanes at the crossing and with light rail transit across the river. These recommendations were subsequently handed over to the CRC project for intensive analysis. For more information about how the CRC project was defined, please refer to the *Final Definition of Transit Alternatives Report*.

1.2.1 Study Area

Based on the work completed by the I-5 Partnership, the CRC project focuses on the Bridge Influence Area, also known as the project area or area of potential impact. As shown in Exhibit 1, this is the area where improvements to transit operations may occur. As depicted, there is a primary and secondary Area of Potential Impact (API). These areas are defined to help measure the impact the project would have along the proposed transit guideway, the I-5 corridor and the four-county Portland-Vancouver metropolitan area.

Exhibit 1. Primary and Secondary Areas of Potential Impact, and Study Area



1.2.2 Public Transportation Providers

There are two local public transportation providers that currently run separate transit systems within the study area of the CRC project: C-TRAN, the Clark County Public Transportation Benefit Authority, serves Clark County; and TriMet serves the Oregon Tri-County service area. Exhibit 2 summarizes the existing transit operating characteristics of TriMet and C-TRAN. As detailed, TriMet operates a 44-mile regional light rail transit (LRT) system in addition to local and express buses. C-TRAN operates local and express buses within their service area. For more information about the systems provided by each transit agency, refer to Chapter 4.

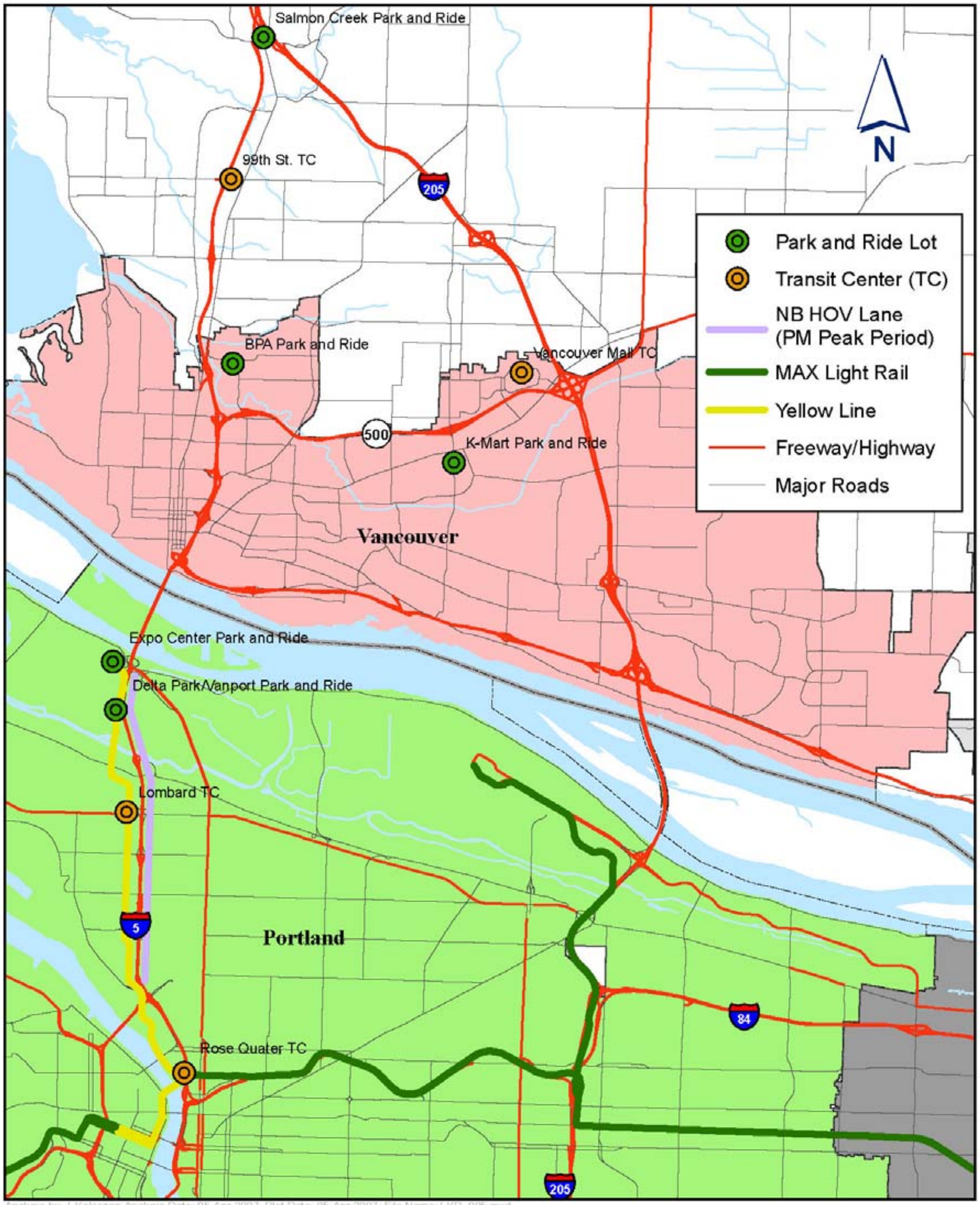
Exhibit 2. Summary of Existing Transit Operating Characteristics

Characteristic		TriMet	C-TRAN
Vehicles	**Fixed Route Buses**	645	130
	Light Rail Vehicles	105	N/A
Annual Revenue Hours	**Fixed Route Bus**	1,873,568*	231,191*
	LRT	415,713*	N/A
Maintenance Facilities	**Buses**	3	1
	LRT	2	N/A

*Source: 2005 National Transit Database.

Currently, between the two agencies, there are five park and ride lots and four transit centers within the API. In total, there are 1,972 parking spaces distributed throughout these facilities. Of the three park and ride lots and two transit centers in Washington, there are a total of 1,368 parking spaces and 14 bus bays. Of the two park and ride lots and two transit centers in Oregon, there are 604 parking spaces and 12 bus bays. Exhibit 3 illustrates the locations of existing transit centers and park and rides.

Exhibit 3. Existing Transit Passenger Facilities used for Bi-State Travel within the I-5 Corridor



Analysis by J. Koloszar; Analysis Date: 05-Apr-2007; Plot Date: 05-Apr-2007; File Name: LKR_005.mxd

1.2.3 Defining the Transit Markets

Defining the CRC transit markets provided contexts for defining the project alternatives to be studied. Defining the transit current markets allows the project alternatives to be created to reflect and respond to travel origins and destinations. To determine the current provision of bi-state multimodal transportation choices, the transit service provided to target markets in the study area was analyzed. As shown in Exhibit 4, two key transit markets, Inner Urban Market and the Suburban Commuter Market, have been identified for bi-state travel across the Columbia River (see the *CRC 2030 Transit Market Analysis*):

- **Inner Urban Market**: Local and intermediate distance trips between downtown Vancouver and downtown Portland, with destinations in those locations and in North Portland, Delta Park, Rivergate, Hayden Island, and the inner urban areas in and around downtown Vancouver.
- **Suburban Commuter Market**: Long distance trips from Salmon Creek, East Clark County, and Outer Clark County to destinations in the inner urban market as well as downtown Portland.

The existing bi-state transit travel market analysis was supported by field observations and passenger counts on the existing C-TRAN and TriMet service networks in both the I-5 and I-205 corridors.

In November of 2006 the *CRC On-Board Survey* reported that there are about 3,300 weekday daily transit passenger trips across the Columbia River in the I-5 corridor (in both directions). This total includes approximately 1,400 trips on C-TRAN's four express bus routes and 1,900 local bus trips. These daily trips result in about 928,000 annual trips on transit over the river.

Currently, the Inner Urban Market carries 64 percent of bi-state transit ridership and the Suburban Commuter Market constitutes the remaining 36 percent of the total transit travel market. The total of transit boardings on TriMet and C-TRAN transit systems is about 21 million annually for 2006 within the Bridge Influence Area.

Exhibit 4. CRC Transit Travel Markets

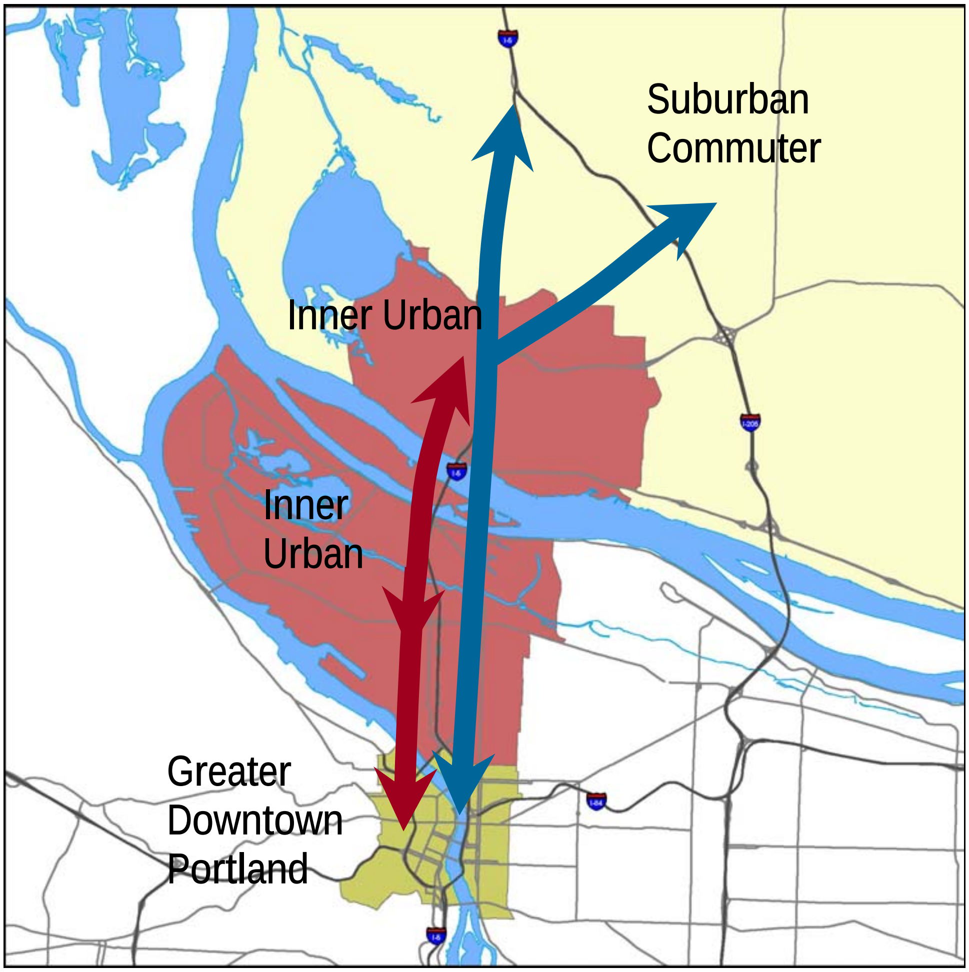
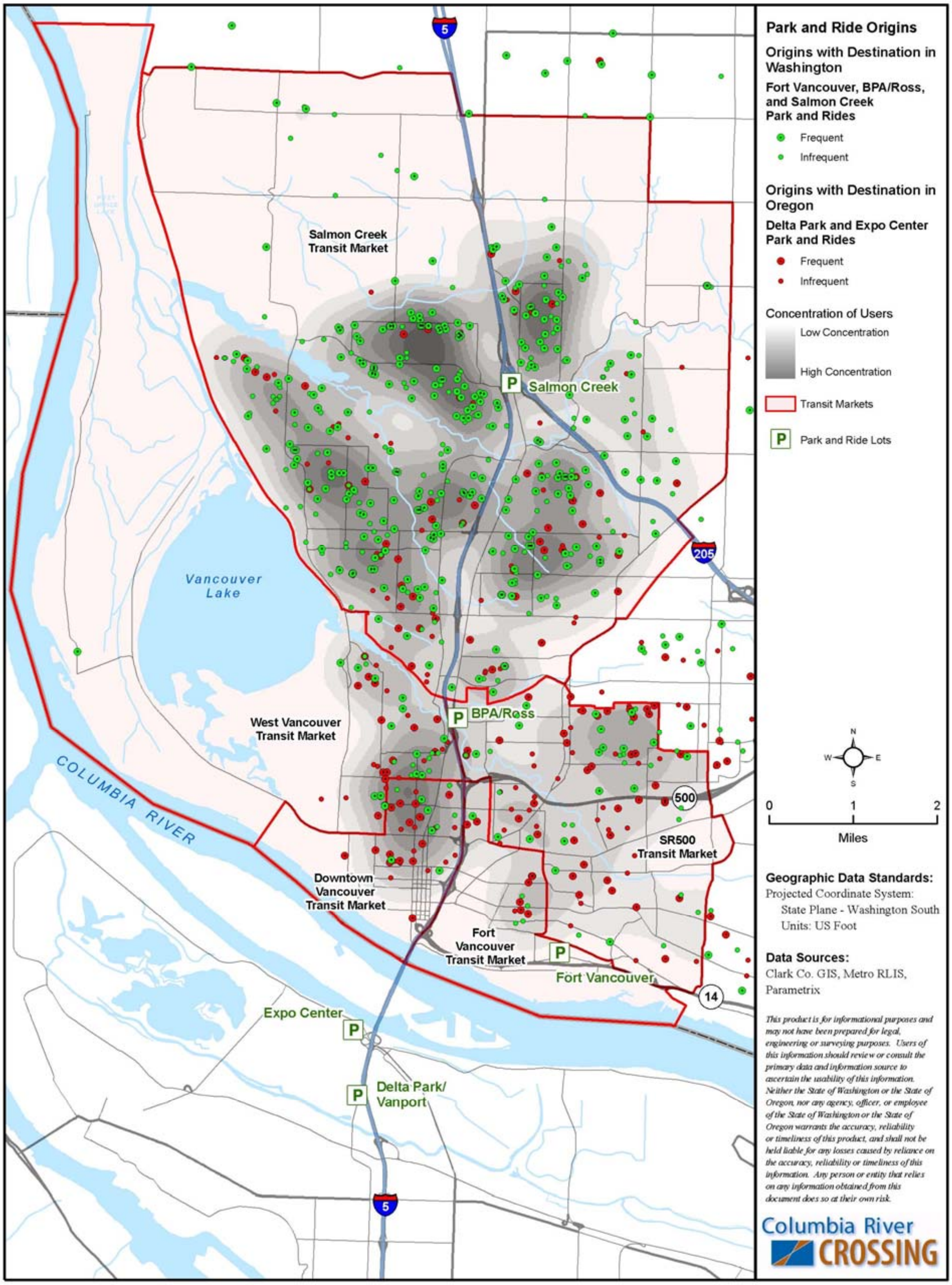


Exhibit 5 shows the points of origin of riders who frequently parked at Clark County park and ride lots and those who were infrequent transit users, based on the 2006 survey. For the Salmon Creek transit market, which is part of the Suburban Commuter Market, the majority of people who park in Clark County park and ride lots (such as Salmon Creek and BPA/Ross) travel across the river on C-TRAN's express bus routes. For residents of downtown Vancouver, and other areas within the Inner Urban Market, a greater number of people drive across the Columbia River, park at the Delta Park or Expo Center park and ride lots and use light rail for their transit trip. This geographic distribution of trip origins supports the division of the transit markets.

Modeling forecasts have been prepared and analyzed for the 2030 transit travel markets and the trip origin and destination patterns between 15 districts within the regional study area (seven districts in Washington and eight in Oregon). Generally, both today and in the 2030 land use forecasts, Clark County has more housing than employment, which results in a relatively large number of Clark County residents commuting across the Columbia River to employment in Portland.

Exhibit 5. 2006 Observed Clark County Park and Ride Origins for Transit Trips



1.2.4 CRC Project Values and Screening Criteria

The CRC Task Force adopted the CRC Project Vision and Values; the Values are detailed in Exhibit 6. The CRC Project Values were defined by seven screening criteria to provide comprehensive comparisons between system- and segment-level choices evaluated in this report. The CRC alternatives contain varying segment- and system-level choices, as defined in Section 1.3 below, to compare how the CRC Project Values would be met with the implementation of each alternative. Corresponding to the screening criteria, the following headings are carried throughout this report to allow comparison of the CRC Project Values by each system- and segment-level choice: Reliability & Travel Time; Accessibility; Ridership & River Crossings; Mode Split; Transit System Cost; and Local & Regional Support.

Exhibit 6. CRC Project Values, Screening Criteria and Screening Measures

Value	Screening Criteria	Screening Measure
Mobility, Reliability, Accessibility, Congestion Reduction and Efficiency	Reduce travel times and delay in the I-5 corridor and within the Bridge Influence Area for transit modes.	p.m. peak period transit vehicle travel speed in miles per hour (MPH) from selected corridor points along I-5. p.m. peak period transit VHD[1] from selected corridor points along I-5. Total transit vehicles per hour (p.m. peak direction) over the Columbia River within I-5 corridor.
	Improve person throughput of the I-5 Columbia River Crossing.	Total daily and annual transit trips over the Columbia River within I-5 corridor. Peak period/peak direction mode split between single-occupancy vehicles (SOV), high-occupancy vehicles (HOV) and transit for I-5.
Modal Choice	Provide for multimodal transportation choices in the I-5 corridor and within the Bridge Influence Area.	Percent of households and employment with access to transit within one quarter-mile of bus lines and one-half mile of HCT stations.
	Improve transit service to target markets in the I-5 corridor and within the Bridge Influence Area.	Transit travel times from the seven Clark County transit markets to the five major transit markets in Oregon.
Cost Effectiveness and Financial Resources[2]	Minimize the cost of construction.	Estimated transit capital costs. Estimated total capital, operations, and maintenance costs for each alternative package (National transit industry performance measures).
	Ensure transportation system maintenance and operation cost effectiveness.	Total HCT and transit system operating costs as defined by the Transit Performance Calculations (annual platform hours[3], operating cost per passenger mile).
Bi-State Cooperation	Support adopted transportation plans.	Transit system and service supports local and regional transportation plans.

1 Vehicle hours of delay (cumulative delay of all transit vehicles from traffic)

2 Refer to the CRC DEIS, Financial Analysis chapter, for more information.

3 Platform hours is the sum of revenue and deadhead transit service hours. Revenue hours are comprised of running time and layover/recovery time. Deadhead hours is the time that the vehicles travel when out of revenue service; this includes leaving or returning to the garage or yard facility, changing routes, and when there is no expectation of carrying revenue passengers.

1.3 Description of the Alternatives

The alternatives considered for the CRC Project consist of a diverse range of highway, transit and other transportation choices. Some of these choices – such as transit mode choice – could affect transportation performance throughout the bridge influence area or beyond; these are referred to as “system-level choices.” Segment design options, such as whether to build HCT on Washington Street versus Washington and Broadway Streets, would have differences that are focused only on the area immediately surrounding that proposed change and have no measurable effect on regional impacts or performance.

This report discusses the impacts from the build alternatives, both the system- and segment-level choices, as well as the impacts of other choices like maintenance facilities and the number of parking stalls at the park and ride lots. The build alternatives combine system-level and segment-level choices for highway, transit, pedestrian, and bicycle transportation. They are representative examples of how project elements may be combined and thus provide a reasonable range of alternatives for the project. Other combinations of specific elements are possible. Analyzing the full alternatives provides an understanding of the combined performance and impacts that would result from multimodal improvements spanning the bridge influence area. Engineering, design, and service details, such as precise station location, exact roadway widths and park and ride sizes, as well as transit routing and headways could vary from these descriptions, but the alignments, coverage, locations, and service concept would be similar. Justification for system- and segment-level choices that were not considered or were removed from consideration from the CRC project after preliminary analysis is discussed in the *Final Definition of Transit Alternatives*.

Following are brief descriptions of the information being evaluated in this report, which include:

- System-level choices
- Segment-level choices
- Full alternative choices

Exhibit 7 summarizes the structuring of the alternatives by system- and segment-level choices.

Exhibit 7. System and Segment Level Transit Choices by Alternative

Level	Choice[1]	Full-length Alternative Choices: Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
System	**HCT Mode**	None	BRT	LRT	BRT	LRT
System	**Level of Transit Service**	Existing	Efficient	Efficient	Increased	Increased
System	**Toll Rate[2]**	None	Standard Rate	Standard Rate[3]	Higher Rate	Higher Rate
System	**Location of Northern Terminus**	N/A	Kiggins Bowl/Lincoln Park-and-Ride/Mill Plain District Transit Center/Clark College Park-and-Ride	Kiggins Bowl/Lincoln Park-and-Ride/Mill Plain District Transit Center/Clark College Park-and-Ride	Kiggins Bowl/Lincoln Park and Ride	Kiggins Bowl/Lincoln Park and Ride
Segment	**Segment A1** *River Crossing[4]*	Existing	Replacement or Stacked Transit/Highway Bridge	Replacement or Stacked Transit/Highway Bridge	Supplemental	Supplemental
Segment	**Segment A1** *Bridge Crossing Transit Alignment*	N/A	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset
Segment	**Segment A2** *Two-way or Couplet Transit Alignment*	N/A	Two-Way on Washington or Couplet on Broadway and Washington	Two-Way on Washington or Couplet on Broadway and Washington	Two-Way on Washington or Couplet on Broadway and Washington	Two-Way on Washington or Couplet on Broadway and Washington
Segment	**Segment B** *Northern Transit Alignment*	N/A	Vancouver/I-5	Vancouver/I-5	Vancouver	Vancouver

1 Modeling software used to assess each alternative's performance does not distinguish between smaller details, such as most segment-level transit choices.

2 In addition to standard and high toll rates, this report evaluates options that would toll only the I-5 river crossing and options that would toll both the I-5 and the I-205 crossings.

3 Alternative 3 was evaluated with the standard rate, but was also tested with three different tolling scenarios: non-tolling, standard toll I-5, high toll I-5, and standard toll I-5 and I-205. For more information on the tolling methodology see the Traffic Technical Report.

4 River Crossing is reported and analyzed within this Transit Technical Report as a segment-level choice because of the limited effect this choice has upon the transit performance.

1.3.1 System-Level Choices

System-level choices have a potentially broad influence on the magnitude and type of benefits and impacts produced by this project. These choices may affect transportation operations throughout the defined CRC project area; in addition they could affect regional transportation and other elements outside the project corridor. The system-level choices are defined below and include:

- High-capacity transit (HCT) mode (bus rapid transit or light rail transit);
- Levels of transit operation (Efficient or Increased);
- Toll rate (no toll, I-5 only, I-5 and I-205, standard toll, higher toll); and
- Location of northern terminus.

1.3.1.1 High-Capacity Transit

Two types of HCT are being considered: bus rapid transit (BRT) and light rail transit (LRT). Both BRT and LRT would operate in an exclusive right-of-way through the project area, and are being evaluated for the same alignments and station locations. Both HCT modes have multiple alignment options and station locations that are segment-level choices and are discussed within Section 1.3.2.

- **BRT (Alternatives 2 and 4).** In general, the BRT guideway would extend from the existing Expo Center Transit Station in North Portland into Vancouver, terminating at, depending on the Vancouver or I-5 alignment, Kiggins Bowl or a new Lincoln Park and Ride located at the existing WSDOT maintenance facility at 40th Street and Main Street. Forty-foot and 60-foot articulated buses, depending on alternative, would operate in exclusive lanes, called the guideway, separated from other traffic. Crossing the Columbia River on a new bridge, the BRT guideway right-of-way width would be about 35 feet to accommodate transit vehicles operating in both directions, as well as a lane for potential break-downs. The right-of-way width along the remainder of the guideway in each direction would be about 33 feet, the same as LRT.
- **LRT (Alternatives 3 and 5).** In general, the LRT guideway would extend the existing MAX LRT Yellow line that operates between downtown Portland and the Expo Center in North Portland across the Columbia River and into Vancouver, terminating at either Kiggins Bowl or Lincoln park and ride depending on the northern transit alignment. One and two car LRT trains would operate within an exclusive guideway (33 feet of right-of-way width along entire length) as a continuation of the TriMet MAX Light Rail Yellow Line between Vancouver and downtown Portland.

1.3.1.2 Level of Transit Service

This report analyzed Efficient and Increased levels of transit service for both HCT modes and for some of their supportive local bus lines. The level of transit service chosen may differ from either of these choices. The Increased level of transit service was created as a system-level choice to distinguish the effect that more transit capacity and operations would have on the CRC Project Values.

- **Efficient Level of Transit Service.** In general, Alternatives 2 and 3 have an equilibrated level of service that would accommodate the demand projected for 2030 while meeting policy-level headways and service levels are somewhat higher than in the No-Build.
- **Increased Level of Transit Service.** In general, under the Increased transit service operation associated with Alternatives 4 and 5, transit service levels would be substantially higher than the No-Build Alternative and would increase the number of BRT vehicles or the number of LRT trains operating during the peak periods to reduce transit passenger wait times and increase transit ridership

1.3.1.3 Tolling

Three toll rates were examined: no toll; a standard toll; and a higher toll, as detailed in Exhibit 8 (see the Traffic Technical Report for a more detailed explanation of these toll categories). To determine appropriate tolling levels for the alternatives, a sensitivity analysis was preformed with no toll, I-5 only toll, and tolls on both I-5 and I-205. State law in both Oregon and Washington allows the state to finance transportation improvements via tolls. The Federal Government imposes limits on tolling the Interstate Highway System, but a bridge project such as the Columbia River Crossing, which will entail replacing or significantly reconstructing the river crossing, can be financed by tolls. Washington has already embarked on using tolls to finance capital projects, employing toll-backed bonds as the primary resource to pay for the expansion of the Tacoma Narrows Bridge, for example. Tolling the Columbia River Crossing highway lanes would generate revenues that could help pay for the project, and would also have an impact on transit ridership and performance.

Exhibit 8. Tolling Rates

	Peak Period		Off-Peak Period	
	Transponder	**No Transponder**	**Transponder**	**No Transponder**
No Toll	None	None	None	None
Standard Toll	$2.00	$2.25	$1.00	$1.25
Higher Toll	$2.50	$2.75	$1.00	$1.25

1.3.1.4 Location of Northern Terminus

In addition to the two potential full-length alignments for the HCT alternatives, with termini at Kiggins Bowl or Lincoln Park and Ride depending on alignment, there are two options that would terminate the HCT guideway farther south (see Exhibit 9). They are referred to as minimum operable segments (MOS); the HCT line would terminate at either the Mill Plain District Park and Ride or Clark College Park and Ride. The MOS's would provide a lower cost alternative in the event that the full-length HCT line could not be funded in a single phase of construction and financing.

Exhibit 9. Northern Terminus Options

	I-5 Alignment	Vancouver Alignment
Full-length Alignment	Kiggins Bowl Park and Ride	Lincoln Park and Ride
MOS Alignment	Clark College Park and Ride or Mill Plain District Park and Ride	Mill Plain District Park and Ride

1.3.2 Transit Segment-Level Choices

Segment-level choices would have less significant impacts upon the project values than the system-level choices; for example, they would tend to have a relatively small effect on system wide transit ridership. (Segment-level transit alignment and routing maps can be found in the *Final Definition of Transit Alternatives*.)

1.3.2.1 Transit Alignment Choice

The transit alignment choices are organized into three segments of the corridor (see Exhibit 10). Within each segment the alignment choices (design options) can be selected relatively independently of the choices in the other segments. These alignment variations generally would not affect overall system performance but could have important differences in the impacts and benefits that would occur in each segment. The transit design options will allow decision makers to make decisions about how to package the components of the Locally Preferred Alternative independently of each other. Following is a description of the three segments and the design options under study within each segment.

- **Segment A1 – Delta Park to South Vancouver: River Crossing Type and Hayden Island Transit Alignment.**

  River Crossing Type. One segment-level choice is to retain and supplement the existing bridges; the other is to remove the existing bridges and replace them with three new bridges.

  Replacement Bridge. The replacement river crossing option would remove the existing highway bridges across the Columbia River and replace them with three new parallel structures – one for I-5 northbound traffic, another for I-5 southbound traffic, and a third for HCT, bicycles, and pedestrians. The replacement crossing would include three through-lanes and two auxiliary lanes for I-5 traffic in each direction. A second design option for the replacement bridge is called a Stacked Transit/Highway Bridge, as described below.

  Stacked Transit/Highway Bridge. One option for bringing transit across the Columbia River is to include it on one of the new highway bridge structures to avoid building a third bridge, allow sharing of the foundations and reduce total width of the structures. To represent this option, the CRC project team has developed a design that would place the HCT inside the structure supporting the highway lanes for the southbound replacement bridge. The multi-use path that would be alongside transit on the third bridge under the replacement and supplemental bridge scenarios would instead be placed under the deck of the northbound bridge on the east side and HCT would be placed under the deck of the southbound bridge.

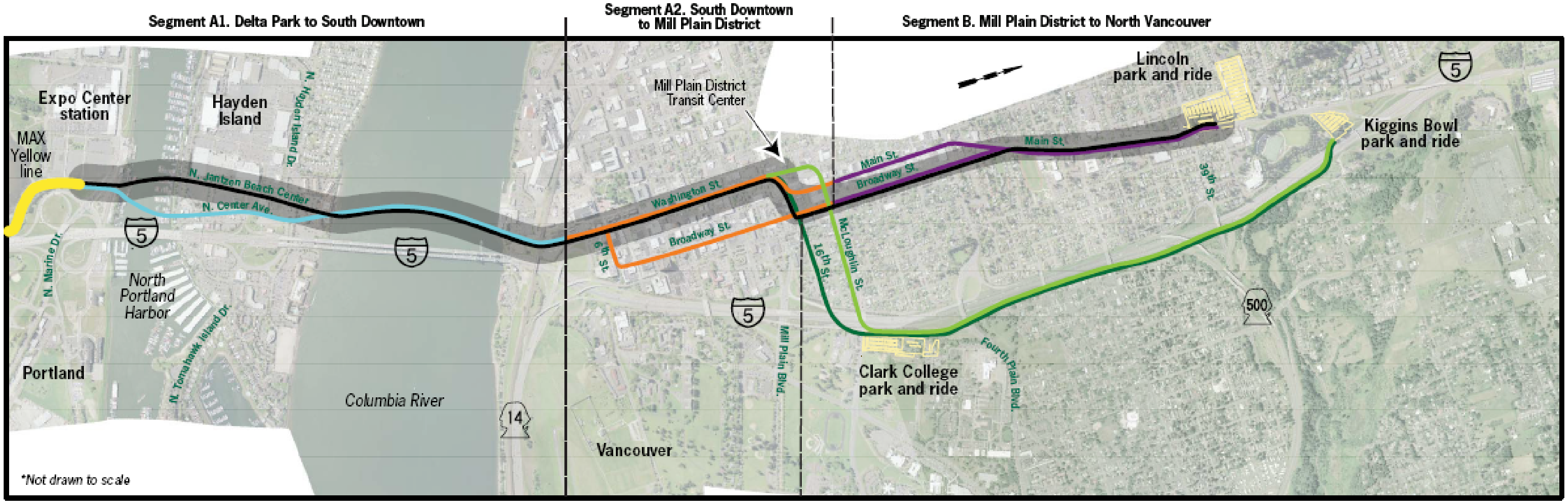
Supplemental Bridge. The supplemental river crossing option would retain the existing I-5 bridges and build a new bridge adjoining downstream of the existing I-5 crossing. The new supplemental bridge would carry southbound I-5 traffic and HCT, while the existing I-5 bridges would carry northbound I-5 traffic, bicycles, and pedestrians. The supplemental river crossing alternative would include three through-lanes and one auxiliary lane for I-5 traffic in each direction.

Hayden Island Transit Alignment. In Segment A1 there are two general transit alignment options under study: offset from or adjacent to I-5. An offset HCT guideway would place HCT approximately 450 feet west of I-5 on Hayden Island. An adjacent HCT guideway across Hayden Island would locate HCT immediately west of I-5. The final station design would be coordinated with the upcoming Hayden Island Master Plan to be conducted by the City of Portland.

- **Segment A2 – South Vancouver to Mill Plain District: Two-way on Washington or Couplet on Broadway and Washington Transit Alignment.** In Segment A2, with a replacement river crossing HCT would touch down in downtown Vancouver just south of the intersection at Sixth Street and Washington Street; with a Stacked Transit/Highway Bridge transit would touch down around Fifth Street. A supplemental crossing would push the touch down location north to Seventh Street. Once in downtown Vancouver, there are two alignment options for HCT – a two-way guideway on Washington Street or a couplet design that would place southbound HCT on Washington Street and northbound HCT on Broadway Street. Both options would have stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street.
- **Segment B – Mill Plain District to North Vancouver: Vancouver or I-5 Northern Transit Alignment.** In Segment B, from downtown Vancouver, the HCT alignment could either continue north on local streets or turn east and then north adjacent to I-5. Continuing north on local streets with the Vancouver alignment, HCT could either use a two-way guideway on Broadway Street or a couplet on Main Street and Broadway Street. At 29th Street, both of these options would merge to a two-way guideway on Main Street and end at the Lincoln Park and Ride located at the current WSDOT maintenance facility at 41st Street.

  The I-5 alignment has two routing options from downtown Vancouver's Mill Plain District station: head east on 16th Street and through a new tunnel under I-5, or head east on McLoughlin Boulevard and through the existing underpass beneath I-5. With either option, HCT would connect with the Clark College Park and Ride on the east side of I-5, then head north along I-5 to about SR 500 where it would cross back over I-5 to end at the Kiggins Bowl Park and Ride.

Exhibit 10. Transit Segments and Design Options



Representative Alignment — Transit Segments

DESIGN OPTIONS

HAYDEN ISLAND TO DOWNTOWN VANCOUVER

N. Jantzen Beach Center, Replacement Downstream Bridge (Representative Alignment)
Travel beside Jantzen Beach SuperCenter to connect with new bridge west of existing bridge.

Along I-5, Replacement Downstream Bridge
Travel along I-5 near N. Center Avenue to connect with new bridge west of existing bridge.

DOWNTOWN VANCOUVER TO 16TH STREET/MCLOUGHLIN

Washington Two-way (Representative Alignment)
Northbound and southbound transit on Washington Street.

Broadway-Washington
Northbound transit on Broadway and southbound transit on Washington.

NORTH OF DOWNTOWN VANCOUVER

Vancouver High Capacity Transit Alignment

Broadway Two-way North (Representative Alignment)
On Broadway Street from McLoughlin to Main Street. Continues on Main Street to park and ride at 39th Street.

Broadway-Main
Northbound transit on Broadway Street and southbound transit on Main Street from McLoughlin to 29th Street. Two-way on Main Street from 29th Street to park and ride at 39th Street.

I-5 High Capacity Transit Alignment

16th St., Along I-5
Two-way transit travels on 16th Street to east side of I-5. Travels from Clark College, along I-5, to park and ride near Kiggins Bowl.

McLoughlin, Along I-5
Two-way transit travels on McLoughlin to east side of I-5. Travels from Clark College along I-5 to park and ride near Kiggins Bowl.

1.3.3 Full Alternatives

The five full alternatives represent combinations of system-level and segment-level choices described above. These alternatives have been assembled to represent a range of possibilities and total impacts at the project and regional level. Packaging different configurations of highway, transit, river crossing, tolling and other improvements helps to show how the performance and impacts of the system- and segment-level choices may be affected by changes in policy. Defining the transit choices separately will provide an understanding how each component will impact the greater alternative and will provide decision makers the opportunity to fine-tune the Locally Preferred Alternative. For maps of the alternatives, please refer to the *Final Definition of the Transit Alternatives*.

Alternative 1: No-Build Alternative

Alternative 1 is the project's No-Build Alternative, providing the project with a model of what would happen without the construction of the I-5 CRC project. The National Environmental Policy Act (NEPA) requires the evaluation of a No-Build or "No Action" alternative for comparison with the build alternatives. Alternative 1 would include the same reasonably foreseeable roadway and transit components included in the region's financially-constrained transportation system of the adopted regional transportation plans (RTPs), except for any CRC related improvements (these components are listed in detail in the *Final Definition of Transit Alternatives Report*). Under Alternative 1, C-TRAN's annual service hours would grow at approximately one percent to the year 2011, after which service would remain constant in terms of revenue hours delivered. Alternative 1 provides a baseline for comparing the build alternatives (Alternatives 2, 3, 4, and 5), and for understanding what would happen without construction of the CRC project.

Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll

Alternative 2 would include a replacement I-5 crossing and BRT; it has been analyzed with both the I-5 and Vancouver full-length transit alignments. This alternative would replace the existing I-5 bridges with three new bridges downstream of the existing crossing. These new bridges would carry Interstate traffic, BRT, bicycles, and pedestrians. There would be three through-lanes and two auxiliary lanes for I-5 traffic in each direction. Transit would include a BRT system that would operate in an exclusive guideway from either Lincoln or Kiggins Bowl Park and Ride in Vancouver to the Expo Center station where riders could transfer to the existing light rail MAX Yellow Line. Some local buses would provide cross river service utilizing the exclusive guideway. Other local bus service would be similar to Alternative 1 routing and service levels. Express bus service in the I-5 corridor would be equilibrated for future demand. This alternative would include a standard rate toll collected from vehicles crossing the Columbia River on the new I-5 bridges.

Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll

Alternative 3 would include a replacement I-5 crossing and LRT; it has been analyzed with both the I-5 and Vancouver full-length transit alignments. This alternative is similar to Alternative 2 in that it would replace the existing I-5 bridges with three new bridges downstream. As in

Alternative 2, these new bridges would carry Interstate traffic, bicycles and pedestrians. The principal difference between the two alternatives is the HCT mode. Where Alternative 2 is packaged with BRT, Alternative 3 is packaged with LRT; the alignment and station locations are the same within both alternatives. Transit operations, such as headways, would differ between alternatives, and the LRT guideway would connect to the existing MAX Yellow Line at the Expo Center station, providing a no-transfer ride from Vancouver to downtown Portland. Express bus service in the I-5 corridor would be equilibrated for future demand. Local bus service would be slightly modified, and three feeder routes would be added, to feed the LRT trunk line. This alternative would include a standard rate toll collected from vehicles crossing the Columbia River on the new I-5 bridge. The differences between Alternative 2 and 3 are discussed within Section 1.4.1.

Alternative 4: Supplemental Crossing with BRT, Increase Level of Transit Service and I-5 Higher Toll

Alternative 4 would include a supplemental I-5 crossing, BRT, and the Vancouver full-length transit alignment. This alternative would use the existing I-5 bridges for northbound Interstate traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and BRT. The existing I-5 bridge would be re-striped to provide two lanes on each bridge structure and allow for an outside safety shoulder for disabled vehicles. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (eastern) bridge. Four southbound I-5 lanes (three through-lanes and one auxiliary lane) and BRT would be provided on a new downstream supplemental bridge. Operational details, such as headways, would be increased significantly over the transit headways of Alternative 2. Southbound BRT buses would turn around at the existing Expo Station in Portland at a new Transfer Facility where riders could transfer to TriMet's MAX LRT Yellow Line. BRT service would be more frequent compared to Alternative 2. Express bus service and local and feeder bus service would also be increased to meet demand. This alternative would include a higher toll rate than Alternatives 2 and 3.

Alternative 5: Supplemental Crossing with LRT, Increased Level of Transit Service and I-5 Higher Toll

Alternative 5 would include a supplemental I-5 crossing, LRT, and the Vancouver full-length transit alignment. This alternative, as with Alternative 4, would use the existing I-5 bridges for northbound traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and LRT. As in Alternative 4, the existing I-5 bridges would be re-striped to provide two lanes on each bridge and allow for an outside safety shoulder for disabled vehicles. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (eastern) bridge. Four southbound I-5 lanes (three through-lanes and one auxiliary lane) and LRT would be provided on a new downstream supplemental bridge. LRT would have the same alignment options, and the same station locations and requirements as BRT in Alternative 4. LRT service would be more frequent, approximately 6.5 minute headways during the peak period, compared to 7.5 minutes with Alternative 3. Express bus service and local and feeder bus service would be increased significantly to serve the added transit demand. This alternative would include a higher toll rate than Alternatives 2 and 3. The differences between Alternatives 4 and 5 compared to Alternatives 2 and 3 are discussed within Section 1.4.2.

1.3.4 Future Choices

Within each alternative, there are other components, like transit maintenance facilities, number of parking stalls included at each park and ride, and level of Transportation Demand Management (TDM) and Transportation System Management (TSM) within each alternative, that have some impact upon the measures like ridership and capital cost. These items are consistent across the full alternatives, (except when noted during the Clark College MOS discussion), so that direct comparisons can be drawn between the system- and segment-level choices.

1.4 How would transit change if the CRC project is not built?

The following is a brief summary of the existing bi-state transportation and transit performance and conditions within the I-5 corridor. For more information see the *CRC 2030 Transit Travel Markets Study*, the *CRC Draft Final Definition of Transit Alternatives Report*, and the *CRC Transportation Modeling Approach*. The existing conditions within the CRC project area discussed in more detail in Chapter 4.

1.4.1 Reliability and Travel Time

The 2007 transit vehicle and passenger delay within the project corridor is significant. As detailed in Exhibit 11, generally in the morning southbound peak all segments of I-5 north of the Columbia River function at a level of service (LOS) of F and the segments south of the crossing function at E or less; in the afternoon northbound peak all I-5 segments south of the Columbia River also function at a level of service F and the segments north function at E or less. This confirms that the bridge over the Columbia River is a bottleneck along the corridor.

Exhibit 11. 2006 Peak Period/Peak Direction I-5 Reliability LOS by Segment

Peak Period/ Peak Direction	I-5 Segment	Coefficient of Variability[1]	Transit LOS[2]
A.M. Southbound	39th Street to Fourth Plain Boulevard	1.06	F
	Fourth Plain Boulevard to the I-5 bridge	1.21	F
	I-5 bridge to Marine Drive	0.57	F
	Marine Drive to Lombard Street	0.42	E
	Lombard Street to Killingsworth Street	0.26	C
P.M. Northbound	Fourth Plain Boulevard to 39th Street	0.46	E
	I-5 bridge to Fourth Plain Boulevard	0.28	C
	Marine Drive to I-5 bridge	0.87	F
	Lombard Street to Marine Drive	1.71	F
	Killingsworth to Lombard Street	2.32	F

1 As defined by the Transit Cooperative Research Program (TCRP) in the “Transit Capacity and Quality of Service Manual,” the coefficient of variability, c_v, as the ratio of the standard deviation of observed headways to the scheduled headways.

2 As defined by TCRP in the “Transit Capacity and Quality of Service Manual,” LOS is defined as the ratio of the standard deviation of observed travel time to the average off-peak travel time. Therefore, a LOS “F” value shows that the variation of travel times is very great when compared to the average. A LOS of “C” value shows the travel time does not vary much from the average, and therefore is more predictable than the LOS “F” value.

Currently, there are nineteen 40-foot buses per hour (on local and express bus routes) in the afternoon peak period, northbound peak direction that use I-5 to cross the Columbia River. During an average weekday 4-hour northbound afternoon peak, transit vehicles experience over 11 vehicle hours of delay (VHD)[1] within the I-5 corridor (a distance of approximately 15 miles) and have an average travel speed of 8.3 mph when traveling through downtown Vancouver. About 20 percent of the existing delay occurs within the five-mile Bridge Influence Area, which has a transit VHD of two hours.

In 2030, if Alternative 1 – No-Build were implemented, Clark County and Portland would be connected by 24 40-foot buses crossing the Columbia River in the corridor during the peak hour in the peak direction. Bus service to Clark County would experience over 23 hours of VHD during the four-hour afternoon peak period, an increase of 12 VHD (nearly double the delay) above the 2007 conditions. (See Exhibit 12.) Ten VHD would occur within the Bridge Influence Area (five times the 2007 condition). Delay within the bridge influence area would account for approximately 43 percent of the total corridor delay and the average travel speed would slow from 8.3 mph to 7.5 mph through downtown Vancouver.

1.4.2 Accessibility

Currently, within the region (Clark County in Washington, and Multnomah, Clackamas, and Washington counties in Oregon), 83 percent of employment and 67 percent of households are within walking distance (one quarter-mile) of a bus route. Because development in suburban Clark County is anticipated to be less dense, a decrease in walking accessibility to bus would be expected in 2030: 78 percent of employment and 60 percent of households in the region are anticipated to be located within one quarter-mile of bus routes.

1.4.3 River Crossings and Ridership

In 2030, if the No-Build Alternative were implemented, the total passenger trips on transit over the I-5 crossing would be about 2,500,000 annually; nearly three times the 2007 number (see Exhibit 12).

The *2006 CRC On Board Survey* revealed that the Inner Urban Market is 64 percent of the bi-state transit ridership and the Suburban Commuter Market constitutes the remaining 36 percent of the total transit travel market. Transit boardings on all systems in 2007 are about 21 million persons annually; in 2030 the number would nearly double to about 42.6 million under Alternative 1. Generally, both today and in future land use forecasts, Clark County has more housing than jobs, which results in a relatively large number of Clark County residents commuting to employment across the Columbia River.

1.4.4 Mode Split

As detailed in Exhibit 12, in 2030 with the No-Build Alternative the daily transit mode split between the Clark County Urban Market and Oregon Market would be would be up from the current condition of six percent to 12 percent. In addition, the daily transit mode split between

[1] VHD is the cumulative delay that all transit vehicles traveling on links with a volume to capacity (v/c) ratio of greater than 85 percent would experience during the time period.

the Suburban Commuter Market and the Oregon Urban Market would be 12 percent with the No-Build Alternative, up from the current condition of three percent. The daily transit mode split from markets in Oregon to Clark County would be three percent up from the current condition of one percent. As detailed with Exhibit 15, transit mode-split would be 13 percent of the afternoon peak direction trips (up from seven percent with the 2007 conditions) within the I-5 corridor. This compares to 54 percent mode-split for single-occupancy vehicles (SOV) and 33 percent for high-occupancy vehicles (HOV).

1.4.5 Transit System Costs

Existing annual vehicle/mode operating costs are taken from C-TRAN's and TriMet's 2007 annual budgets. To provide the existing bi-state transit service, the transit system requires a total of 2,500 weekday platform hours, with 25,900 vehicle miles traveled. This weekday service results in a total of 754,000 platform hours annually (an annual VMT of 7,800,000), with an associated annual cost to operate of about $65.7 million.

Alternative 1 would have no transit capital cost associated with the CRC project, although it would include roadway and transit capital improvements as proposed in Metro's financially constrained 2004 RTP and Southwest Washington's Regional Transportation Council (RTC) *2030 Metropolitan Transportation Plan* (MTP). These are included in Appendix C of the *Final Definition of the Transit Alternatives Report*.

To provide the proposed bi-state transit service analyzed for the 2030 forecast year, the transit system which would not include BRT would require a total of about 2,600 weekday platform hours (with about 30,800 vehicle miles traveled). This represents a seven percent increase in platform hours over the existing conditions. The weekday service would result in a total of nearly 800,000 platform hours annually (an annual VMT of 9,200,000), with an associated total annual cost to operate of about $69.8 million (see Exhibit 12); an increase of $4.1 million over the 2007 conditions.

1.4.6 Local and Regional Support

The No-Build Alternative does not include high-capacity transit, which is called for in the City of Vancouver's *Vancouver City Center Vision* (VCCV), Metro's *2004 Regional Transportation Plan* (RTP), Southwest Washington's Regional Transportation Council (RTC) *2030 Metropolitan Transportation Plan* (MTP), and both the City of Portland's and City of Vancouver's Transportation System Plans (TSP). In addition, Metro's 2040 Growth Concept identifies Hayden Island as a station community; an area of urban activity centered on a transit station. The No-Build Alternative has been rated low for how it neglects to address the components of local and regional transportation plans.

1.5 How would transit be influenced by the CRC system-level choices?

This section provides a comparison of Alternatives that constitute the project's system-level choices.

- HCT mode choice;
- Level of transit service;
- Toll rate; and
- Location of northern terminus.

Exhibit 12 is a quick reference table for the key metrics analyzed within this report. Numerous other metrics were analyzed and are reported within the full discussion of the transit options within Chapter 5. There are several main points that can be drawn from this table. First, a strong demand for a HCT system exists in this location and BRT or LRT can serve the markets, but each mode has different efficiencies. Alternatives 2 through 5, the build alternatives, reduce corridor VHD by 90 percent or more when compared to No-Build Alternative 1. The cost to operate the transit system for the LRT Alternatives is lower than the costs to operate the BRT Alternatives but the capital cost of a BRT system is less than an LRT system. The CRC Cost Effectiveness Index reveals that LRT would be the most cost effective mode when measuring guideway river crossings; when measuring the incremental cost per incremental passenger over the No-Build Alternative, the Increased transit service with Alternatives 4 and 5 would be more beneficial for suburban Clark County. The next sections refer back to this table when discussing and analyzing the system-level choices; these discussions will explain the reasons for many of the key differences in the metric results reported and displayed in Exhibit 12.

Exhibit 12. Transit Quick Reference

Value	Screening Criteria	2007 Existing Conditions	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
Reliability	Corridor VHD for Local/Express Bus (hours)	11.23	23.28	11.17	13.07	12.11	13.15
Travel Time	HCT Travel Time in Minutes from Terminal Park and Ride to Pioneer Courthouse Square	Not Applicable	Not Applicable	43	40	48	40
River Crossings	Total annual transit passengers over the I-5 Crossing	930,000	2,500,000	4,800,000	6,700,000	5,700,000	7,400,000
Ridership	Total Annual Transit Boardings (All Systems) [1]	21,000,000	42,600,000	53,400,000	53,700,000	68,200,000	67,000,000
Daily Transit Mode Split	Clark County Urban Transit Market to 5 Markets in Oregon (All Trips)	6%	12%	15%	20%	18%	22%
	Clark County Suburban Commuter Market to 5 Markets in Oregon (All trips)	3%	12%	13%	15%	15%	16%
	5 Markets in Oregon to Clark County (All trips)	1%	3%	6%	8%	8%	10%
Capital Cost	In Millions, YOE CEVP Dollars[2]	$0	$0	$602.6 - $749.7	$783.1 - $940.8	$718.8 - $805.2	$879.1 - $975.7
Operation and Maintenance Cost	In Millions, Total Transit Annual Operating Costs (Current 2007 Dollars)	$65.9	$69.8	$75.1	$73.3	$114.4	$105.5
CRC Cost Effectiveness Index	Total Annualized[3] Cost per Guideway River Crossing	$0	$0	$15.09	$11.55	$23.67	$16.58
No-Build Comparison Cost Effectiveness Index	Incremental Cost[3] per Incremental Passenger Over No Build	Not Applicable	Not Applicable	$25.93	$14.23	$11.31	$8.93

Value	Screening Criteria	2007 Existing Conditions	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
Other Cost Effectiveness Index	Total Annual Incremental Place Miles	Not Available	Not Available	46,400,000	78,200,000	676,200,000	657,400,000
	Total Annual Incremental Operating Cost per Place Mile[4]	Not Available	Not Available	$0.11	$0.04	$0.07	$0.10
Local and Regional Support Level	Support of local and regional comprehensive transit and land use plans and policies	N/A	Low	Medium	High	Medium	High

1 All Systems include C-TRAN I-5 Express Bus, C-TRAN I-205 Express Bus, C-TRAN Local Bus, C-TRAN Limited Stop Bus, BRT, TriMet Yellow Line LRT, and TriMet North Portland Local Bus.

2 The Cost Estimate Validation Process (CEVP) estimate provides a dollar amount using a contingency that is more closely related to individual project activities, it is important to note that this estimated number is not designed to be used for project financing. CEVP dollars are reported in Year Of Expenditure (YOE) rather than in current dollars and therefore the estimate depends heavily on construction scheduling. Also, the CEVP process reports a range of dollar amounts based on the probability of occurrence of different factors.

3 Annualization factor is the number that is multiplied by average daily transit passenger trips/revenue/platform hours/etc. to obtain annual trips/revenue/platform hours. The factor varies according to the various service-types provided among the alternatives.

Both capital and O&M cost.

4 Incremental Place Mile is the annual amount of seat and standing capacity of vehicles in operation multiplied by the annual VMT over No Build,

1.5.1 How would HCT mode choices affect transit performance?

The following is a comparison of HCT mode choice: BRT and LRT. Alternative 2 is the representative BRT mode choice and Alternative 3 is the representative LRT mode choice. Mode choice is the only variable that is different between the alternatives compared below.

1.5.1.1 Reliability and Travel Times

BRT would have somewhat slower vehicle speeds and lower person throughput than LRT. In 2030, guideway speeds would be somewhat faster for LRT than BRT with total average speeds of 17.3 mph versus 14.5 mph, respectively, and average speeds in downtown Vancouver of 12.9 mph versus 9.6 mph, respectively. BRT would be slower than LRT in the exclusive guideway, because: BRT would not have signal priority in downtown Vancouver; there would be more variation in operator performance; dwell times would be slightly longer; and transit vehicle acceleration would be slower. Signal priority in downtown Vancouver would not be possible for BRT, because the high service frequencies of BRT vehicles, if given signal priority, would significantly disrupt cross traffic flow.

As detailed in Exhibit 12, during the afternoon peak, local and express buses within the I-5 corridor would experience 13 VHD with LRT Alternative 3 compared to 11 VHD with BRT Alternative 2. The corridor local and express bus VHD with BRT would be less than LRT because several local and all limited-stop bus routes in Alternative 2 would also benefit from the use of the exclusive guideway.

As detailed in Exhibit 13, within the HCT guideway, LRT would provide quicker transit travel times than BRT in every instance during the afternoon peak hour transit trip. With the replacement crossing with BRT, Alternative 2, transit travel times between major destinations would generally be faster than in the No-Build Alternative and slightly slower than the replacement crossing with LRT, Alternative 3. The only location where BRT would be quicker would be for the trip from Hayden Island to the 99th Street Transit Center. This would occur because the BRT transfer would occur at the Expo Center and the BRT passengers would have a one-seat ride from Hayden Island to the 99th Street Transit Center because the BRT and local buses would extend outside of the exclusive guideway along their routes. The LRT alternative would require a transfer at the Lincoln Park and Ride to local bus service for the remainder of the trip to the 99th Street Transit Center.

1.5.1.2 Accessibility

Transit access to household and employment within one-quarter mile of a bus line and one half mile of a HCT station is the same for Alternative 2 and 3. Household and employment transit accessibility does not change based on the HCT mode choice. Rather, HCT transit routing will affect accessibility as discussed in Section 1.6.

Exhibit 13. Comparison of Alternatives – Bi-State Transit Travel Times[1] to Target I-5 Corridor Markets

Alternative Screening Measure	Metric	Existing Conditions 2007	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
HCT Transit Travel Times Using the Guideway (p.m. Peak Hour)	Northern Terminus to Expo Center	N/A	N/A	13.0	12.0	19.0	12.0
	Northern Terminus to Pioneer Square	N/A	N/A	43.4	39.9	47.4	39.9
	Downtown Vancouver (7th St. and Washington St.) to Pioneer Square	N/A	N/A	35.4	31.6	34.4	31.6
	Lombard Transit Center to Northern Terminus	N/A	N/A	22.7	17.5	26.7	17.5
Transit Travel Times from the Seven Clark County Transit Markets to the Five Major Transit Markets in Oregon for a Few Representative Pairs in Minutes	**Two-Hour P.M. Peak Period/Peak Direction**						
	Pioneer Square to Salmon Creek (C-TRAN route 134)	44.3	48.0	32.0	32.0	33.0	33.0
	Lombard Transit Center to Vancouver Mall (via LRT & 4L or 4G BRT)	47.6	56.6	40.1	38.8	46.3	36.3
	Hayden Island to 99th St. Transit Center (via LRT & 71L or 71GL BRT)	34.5	39.5	24.0	32.4	30.0	30.9
	Two-Hour A.M. Peak Period/Peak Direction						
	Salmon Creek to Pioneer Square (C-TRAN route 134)	36.4	55.9	50.9	50.9	50.9	50.9
	Vancouver Mall to Lombard Transit Center (via LRT & 4L or 4G BRT)	30.7	30.7	36.6	34.0	44.6	33.3
	99th St. Transit Center to Hayden Island (via LRT & 71L or 71GL BRT)	39.5	40.5	24.0	19.1	30.0	20.4

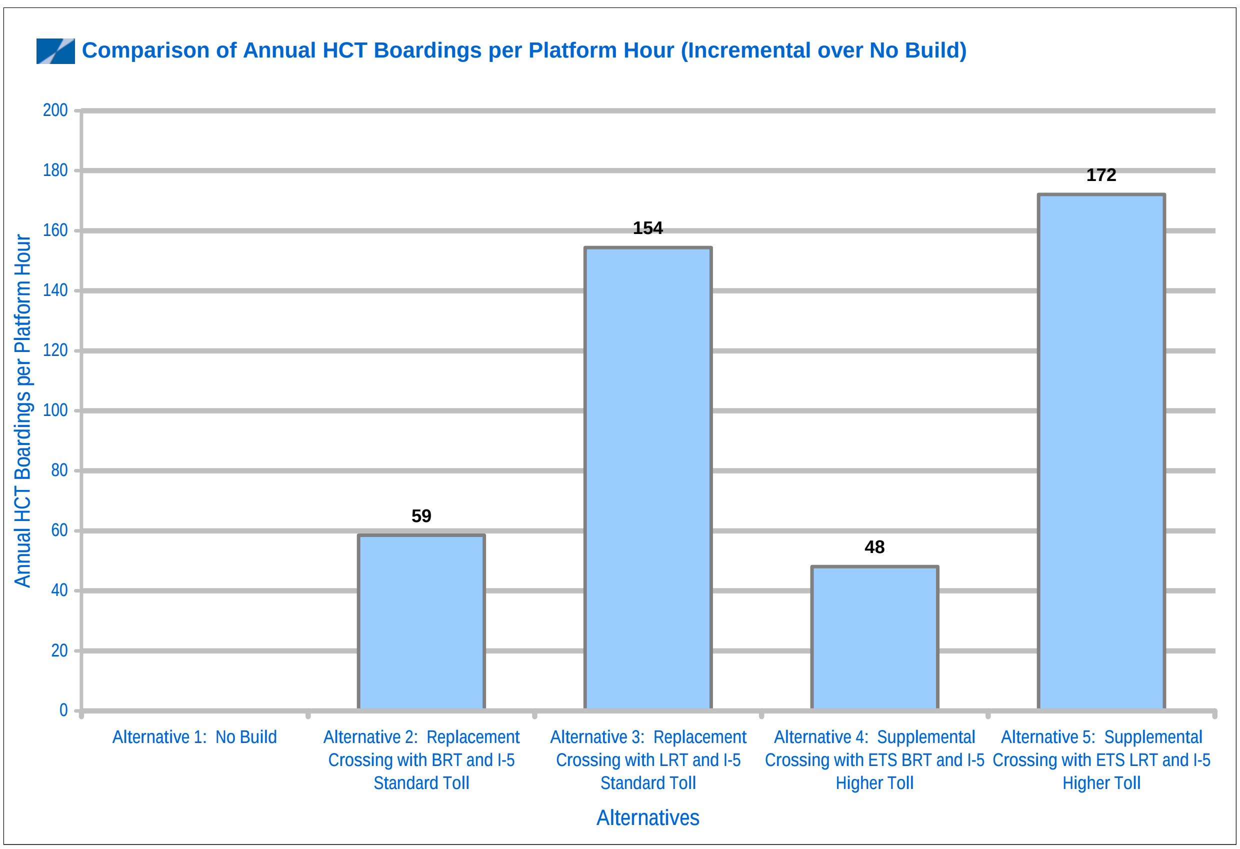
[1] The transit travel times reported in this table are non-weighted; therefore, they do not reflect the perceived wait time of transit users.

1.5.1.3 River Crossing and Ridership

As shown in Exhibit 14, LRT would increase annual passenger trips on transit across the Columbia River by approximately 4.2 million compared to the No-Build Alternative, while BRT would increase them by approximately 2.3 million trips over No-Build. About 90 percent of the Alternative 3 daily passenger transit trips across the Columbia River would be on light rail; in comparison, about 67 percent of the daily passenger transit trips across the river in Alternative 2 would be on BRT. In addition, every Alternative 2 HCT trip would be required to transfer from BRT to TriMet's MAX LRT Yellow Line or a TriMet local bus route, or vice versa depending on direction, at the Expo Center station. With Alternative 3, HCT would require a transfer at Expo Center station to continue a transit ride.

Compared to No-Build, the annual I-5 corridor transit river crossings would be slightly higher with LRT than BRT (see Exhibit 12). As shown in Exhibit 14, when looking at annual HCT passenger boardings per annual HCT platform hour, LRT would have 62 percent more boardings per platform hour than BRT compared to No-Build.

Exhibit 14. Comparison of Total Annual Incremental HCT Boardings per Annual Incremental HCT Platform Hour



1.5.1.4 Mode Split

Exhibit 15 details mode split over the I-5 Columbia River Crossing by each alternative. As detailed, all the build alternatives would reduce SOV mode split and increase transit mode split. LRT would perform better than the BRT Alternatives at reducing SOV reliance. Exhibit 16 details the total daily transit mode split by markets. As shown, Alternatives 2 and 3 would increase the transit mode split in the target markets compared to Alternative 1; these increases would be due to improved service and the addition of a bridge toll for general purpose vehicles. Generally, with an LRT system, the transit mode split from the Clark County Urban Market to the Oregon Urban Transit Market would be 33 percent more than with a BRT system (a 20 percent transit mode share compared to a 15 percent share, respectively). Between the Suburban Commuter Transit Market and the Oregon Urban Transit Market, with an LRT system, the daily transit mode split would be greater than with a BRT system. Finally, for the reverse commute from markets in Oregon to Clark County, with an LRT system the daily transit mode split would be 33 percent greater than with a BRT system.

Exhibit 15. Comparison of Alternatives – Mode Split Over the I-5 Columbia River Crossing

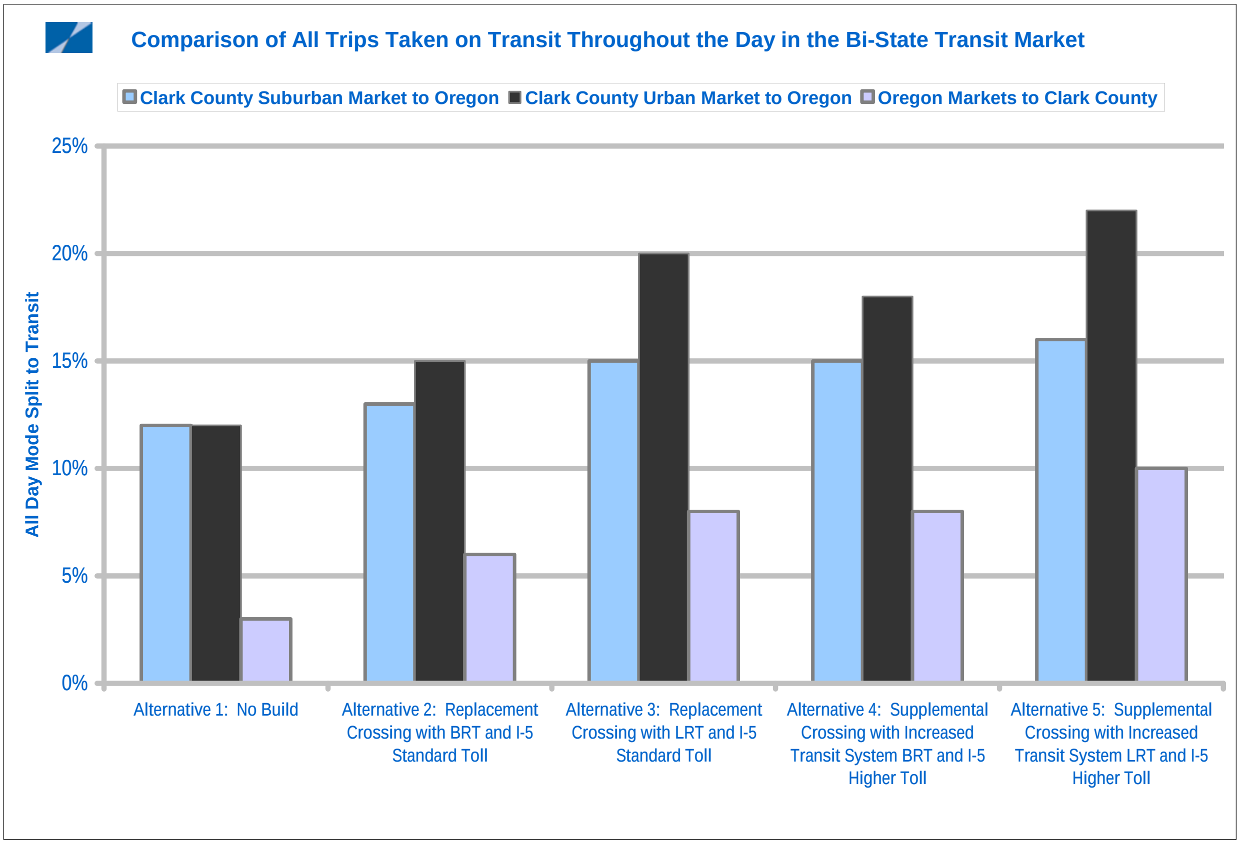
Alternative Screening Measure	Metric	Existing Conditions 2007	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
Peak Period/Peak Direction Mode Split Over the Columbia River via I-5 Between SOV, HOV and Transit	P.M. Peak Direction SOV	67 percent	54 percent	53 percent	50 percent	44 percent	41 percent
	P.M. Peak Direction HOV	27 percent	33 percent	28 percent	29 percent	23 percent	22 percent
	P.M. Peak Direction Transit	6 percent	13 percent	19 percent	21 percent	33 percent	37 percent

Source: 2030 Travel demand forecasting outputs

SOV – Single Occupancy Vehicle, HOV – High Occupancy Vehicle

[1] PM Peak Period: 3:00 PM to 7:00 PM weekdays; PM peak direction: Northbound

Exhibit 16. Comparison of Daily Transit Mode Split by Transit Market



1.5.1.5 Transit System Cost

Exhibit 12 shows that the estimated transit capital cost for BRT would be approximately 20 percent lower than for LRT. Both capital cost estimates include the construction of the exclusive guideway and the replacement bridge structures; the primary difference between the capital costs is the transit vehicles that would need to be purchased. For BRT, 24 60-foot articulated buses would need to be purchased. For LRT, 14 light rail vehicles (LRVs) would need to be purchased and no additional buses would be needed.

The lower number of vehicles that would be required for LRT Alternative 3 would contribute to lower annual operating and maintenance costs. The annual cost to operate Alternative 3 would be approximately $5.3 million less than BRT Alternative 2 as detailed in Exhibit 12. The lower projected annual operating costs contribute to the better cost effectiveness that would be seen with LRT Alternative 3. The total annualized cost per guideway river crossing would be about $11.55 for LRT Alternative 3 and about $15.09 for BRT Alternative 2. The lower cost of Alternative 3 is attributed to the increased number of river crossings associated with LRT versus BRT. This calculation does not include the express bus transit river crossings provided with the BRT Alternative.

1.5.1.6 Local and Regional Support

LRT is the preferred mode called for in Vancouver's Transportation System Plan and identified in Metro's 2040 Growth Concept to serve Hayden Island. Therefore, Alternative 3 has been rated higher than Alternative 2 in terms of how it would support local and regional transportation plans.

1.5.2 How would the level of transit service affect transit performance?

The following section compares Alternative 2 and 3 to Alternatives 4 and 5. This is a direct comparison of the combined effects of the "Efficient" level of transit service combined with the standard I-5 only toll, compared to the "Increased" level of transit service and the I-5 higher toll. The higher toll is increased 18 percent over the standard toll. For ease of comparison in the following discussion, Alternatives 2 and 3 are referred to as the Efficient transit service alternatives and Alternatives 4 and 5 are referred to as the Increased transit service alternatives unless otherwise stated. As detailed in the *Final Definition of Transit Alternatives Report*, the Increased transit service alternatives would have transit service increased to meet passenger demand without considering operational cost implications.

1.5.2.1 Reliability and Travel Times

Vehicle hours of delay (VHD) in the corridor for local and express bus service would increase by an hour with the BRT Increased transit service alternative and stay the same for both LRT Efficient and Increased transit service alternatives, 13 VHD. The VHD in the Bridge Influence Area for local and express bus would decrease by a half hour with both of the Increased alternatives. In either the Efficient or Increased alternatives, HCT would not experience any VHD within the guideway. Therefore, no significant benefit would be realized with the Increased transit service operations when comparing the reliability measures between Alternatives 2 and 4 and Alternatives 3 and 5.

As shown in Exhibit 12, when comparing HCT only, the LRT Efficient and Increased transit service alternatives have the same transit travel times along the same segment of each ride during the morning peak direction. Exhibit 13 details the travel times between select locations. When comparing the BRT Efficient to Increased transit service alternatives, the two hour afternoon peak direction transit travel time would increase in every instance in the Increased transit service alternative. When comparing transit travel times including local and express buses, the general trend is that BRT Efficient transit service would be quicker than BRT Increased transit service in most trip segments, during both two hour peak afternoon northbound and two hour peak morning southbound trips. An exception is the morning transit trip from Salmon Creek to Pioneer Square, where the travel time would remain the same in both the Efficient and Increased transit service alternatives. Alternative 4 would be slower in most cases because more congestion would be seen in the guideway from the increased number of transit vehicles.

This same comparison between LRT Efficient and Increased transit service alternatives reveals the opposite effect. The LRT Increased transit service alternative would be about one to two minutes quicker than the LRT Efficient transit service alternative along each trip segment (see Exhibit 13). An exception is on one morning southbound segment trip from the 99th Street

Transit Center to Hayden Island where LRT Efficient transit service alternative would be about 1 minute quicker than the Increased transit service alternative.

The primary difference between the Efficient and Increased alternatives is the transit headway decrease associated with the Increased transit service alternatives (refer to the *Final Definition of Transit Alternatives Report* for the specific details on headway increases). The decreased headways provide greater reliability and access to transit passengers because the bus or light rail would be running more frequently.

1.5.2.2 Accessibility

Since with either Efficient or Increased transit service alternatives the HCT alignment and stations would be the same, there would be no difference in accessibility to households and employers.

1.5.2.3 River Crossings and Ridership

The Increased transit service alternatives would increase the total number of transit vehicles per hour in the afternoon peak period/peak direction over the river; this would increase the transit capacity over the Columbia River by 600 to 1,100 seats and standing area compared to the Efficient transit service alternatives. The methodology for calculating the capacity of transit vehicles is described in the *Final Definition of Transit Alternatives Report.*

Annually, the Increased transit service alternatives would attract more transit passenger trips over the I-5 crossing than Efficient transit service alternatives (see Exhibit 12). Alternative 4 would see about 5,700,000 annual transit passenger trips compared to 4,800,000 with Alternative 2, a difference of 870,000 trips annually or 16 percent more. Alternative 5 would see 7,400,000 annual transit passenger trips over the I-5 river crossing compared to 6,700,000 with Alternative 3, a difference of 740,000 trips annually or nine percent. The annual boardings on the transit system for Increased BRT or LRT are comparable; both would increase the number of boardings on transit by about 13 to 14 million boardings annually, or 20 to 22 percent, over the Efficient transit service alternatives. Still, adding transit capacity across the bridge would not significantly affect ridership on transit and, therefore, the operational costs would be higher but would not result in a proportionate increase in transit ridership.

1.5.2.4 Mode Split

The transit systems associated with the Efficient and Increased transit service options would have the same alignment and station locations (Vancouver alignment was modeled); therefore, each option would have the same accessibility to employment and households within one-quarter mile from bus routes and one-half mile of HCT stations. In general, Increased transit service would increase trips from the Clark County Urban and Suburban Transit Markets to the Oregon Urban Transit Markets compared to Efficient transit service; this same relationship would be seen when comparing the daily transit mode split from the Oregon Urban Transit Markets to Clark County Urban and Suburban Commuter Transit Markets. In each instance the increase is about 1 to 2 percent (see Exhibit 16).

As detailed in Exhibit 15, Increased transit service would significantly increase the afternoon peak direction mode split for transit to 33 percent, from 19 percent with the BRT Efficient transit service alternatives. The BRT Increased transit service SOV mode split would decrease to 44 percent from 53 percent with Efficient transit service. This same effect would be apparent between the LRT Efficient and Increased transit service. The afternoon peak direction transit mode split would be 21 percent with Efficient LRT transit service and would increase to 37 percent with the LRT Increased transit service.

1.5.2.5 Transit System Cost

The capital cost associated with the Increased transit service alternatives would be about $110 million more than the Efficient transit service alternatives, as detailed in Exhibit 12. Alternative 4, the BRT Increased transit service, would have a capital cost about 6 to 16 percent more than BRT Efficient transit service alternative. Alternative 5 the LRT Increased transit service alternative, would have a capital cost about 4 to 11 percent more than LRT Efficient transit service.

The operating cost would be more for the Increased transit service alternatives when compared to Efficient level of transit service, as demonstrated in Exhibit 12. Alternative 4 would cost $39.4 million more to operate annually than Alternative 2, or about 1.5 times more costly; and Alternative 5 would cost $32.2 million more than Alternative 3, or about 1.4 times more costly. The impact of the increased transit service system of Alternatives 4 and 5 would reduce their cost effectiveness when compared to Alternatives 2 and 3 as detailed by the annualized cost per guideway river crossing.

As shown in Exhibit 12, there are three cost effectiveness indexes (CEI). The CRC CEI reveals the total annualized cost per guideway river crossing for the LRT Efficient transit service alternative is $73.3 million and the LRT Increased transit service alternative is $105.5 million; alternately, the BRT Efficient transit service alternative costs $75.1 million and the BRT Increased transit service alternative costs $114.4 million. The No-Build Comparison CEI reveals that the incremental cost per incremental passenger over the No-Build for the LRT Efficient transit service alternative is $14.23 and for LRT Increased transit service is $8.93; the BRT Efficient transit service alternative cost $25.93 and the BRT Increased transit service alternative costs $11.31. The Other CEI reveals the total annual incremental operating cost per place mile for the LRT Efficient transit service alternative is $0.04 and the LRT Increased transit service alternative is $0.10; the BRT Efficient alternative costs $0.11 and the BRT Increased alternative costs $0.07.

1.5.2.6 Local and Regional Support

The Increased and Efficient transit service options have the same bi-state support rating. LRT is rated more highly than BRT, because BRT is not the specific transit mode called for in Vancouver's TSP and identified in Metro's 2040 Growth Concept to serve Hayden Island, so Alternative 5 is rated high, whereas Alternative 4 is rated medium.

1.5.3 How does the toll rate affect transit performance?

To assess the impact of I-5 bridge tolls on transit ridership, in terms of the CRC project's stated values, a sensitivity analysis was completed for the LRT Vancouver alignment, with three different tolling scenarios. The tolling method does not impact Accessibility or the Transit System Cost measures.

As detailed in Exhibit 17, in the Standard Tolled scenarios, a peak period toll of $2.00 to $2.25 would be charged. This analysis assumes a 100 percent transponder use for work trips, thus these travelers would see a $2.00 toll in the peak period. Non-work trips assume a 75 percent/25 percent transponder/no transponder split, thus they see $2.25 in the peak period. Off-peak tolls contain the same transponder usage assumptions by trip purpose; tolls in the off-peak are $1.00 for transponders, and $1.25 for non-transponder trips. The Higher Tolled scenarios assume a $0.50 increase over the Standard Toll in the peak period. These rates assume the same transponder split by trip purpose, $2.50 and $2.75, and the non-peak tolls were identical in both scenarios.

Exhibit 17. Tolling Rates

	Peak Period		Off-Peak Period	
	Transponder	**No Transponder**	**Transponder**	**No Transponder**
No Toll	None	None	None	None
Standard Toll	$2.00	$2.25	$1.00	$1.25
Higher Toll	$2.50	$2.75	$1.00	$1.25

The higher toll would decrease the attractiveness of cross river travel and destinations, relative to the standard toll. Therefore, total cross river trips would increase at a lower rate with the higher toll scenario than with the standard toll scenario. The decrease of cross-river transit riders in the higher toll scenario may be because the total pool of cross-river trips (SOV, HOV, and transit) would be less. However, the higher toll would increase the transit mode split because those trips that do cross the river would then have an even higher incentive to use transit. In summary; within the regional travel-demand model, higher tolls equate to a decrease in cross-river trips, but there would be an increase in cross-river transit mode share.

1.5.3.1 Reliability

Tolls are not likely to significantly affect the reliability of transit service, particularly with LRT as the mode. Under a BRT scenario, a high toll for autos could potentially shift a number of people to the transit mode, adding more buses to the roadway network.

1.5.3.2 Ridership and Mode Split

A tolling sensitivity test was preformed on the Vancouver full-length alignment with the replacement crossing (Alternative 3). Comparing transit ridership over the Columbia River reveals some quantitative differences.

- No Toll on I-5 = 19,300 transit trips on I-5 across the Columbia River daily;
- Standard Toll on I-5 = 20,800 transit trips on I-5 across the Columbia River daily;
- Higher Toll on I-5 = 21,400 transit trips on I-5 across the Columbia River daily; and

- Standard Toll on I-5 and I-205 = 21,700 transit trips on I-5 across the Columbia River daily.

The higher toll would not only cause total cross-river transit trips to increase, it would also increase mode-share in transit's favor.

1.5.4 How would the location of the northern terminus affect transit performance?

Exhibit 18 provides information about the full-length Vancouver and I-5 transit alignments for comparison with the respective Minimum Operable Segments (MOS), using LRT as the representative HCT mode. If an MOS is chosen, it would have implications for any future extension to the full-length options defined in this document. All project development requirements, such as the environmental impact statement, FTA New Starts process, alternatives analysis, planning, engineering and design would likely need to be conducted as a separate new process. It would also change the potential for federal funding for any future extension, as well as adding costs for future inflation. Exhibit 18 summarizes these differences.

1.5.4.1 Vancouver Full-length Alignment vs. Mill Plain District MOS

Using LRT as the representative HCT mode, Exhibit 18 compares how transit operations would be affected under the full-length and MOS Northern Terminus Options. Shortening the HCT alignment would affect some of the CRC Project Values noted in Exhibit 28.

The LRT Mill Plain District MOS would have a guideway length (as measured from Expo Center) of about 2.07 miles, compared to the full length of the Vancouver alignment of 3.43 miles. With the MOS, no HCT stations would be constructed north of the Mill Plain District Transit Center. The park and ride lot at Kiggins Bowl would be a surface lot with approximately 150 parking spaces, the Lincoln Park and Ride would be a surface lot with 900 spaces and a surface lot would be constructed at the BNSF lot and the I-5 loop for a total of 1,148 spaces; therefore, a combined total of 3,218 park and ride spaces would be provided with the Mill Plain District MOS. The full-length Vancouver alignment would have 1,800 park and ride spaces directly on the guideway alignment and 610 spaces in satellite lots for a total of 2,410 spaces. Other operational aspects of the transit service, such as the HCT headways over the Columbia River, would be similar between the full-length and MOS Vancouver alignment.

Exhibit 18. Full-length and MOS Northern Terminus Option: LRT Representative HCT Mode

Characteristic		Vancouver Full-length LRT Alignment	Mill Plain District LRT MOS	I-5 Full-length LRT Alignment	Clark College LRT MOS
Total Guideway Length (Expo Center to Northern Terminus)		3.43 miles	2.07 miles	4.22 miles	2.65 miles
Park and Ride Spaces	**On Guideway**	1,800	1,100	2,500	1,100
	Satellite Lot	610	1,510	0	150
	Total	2,410	3,218	2,500	1,250
Daily Passenger Trips on Transit Over I-5 Crossing		20,800	19,100	21,100	18,200
Annual Passenger Trips on Transit Over I-5 Crossing		6,670,000	6,110,000	6,780,000	5,820,000
Total Transit System Daily Boardings		176,000	183,000	177,000	175,000
Peak Period/Peak Direction Mode Split over I-5 river crossing	**SOV**	50%	50%	50%	52%
	HOV	29%	27%	28%	29%
	Transit	21%	23%	22%	19%
Transit Accessibility	**Percentage of Clark County Households within ½ mile of HCT station**	5%	3%	4%	3%
	Percentage of Clark County Employment within ½ mile of HCT station	11%	9%	10%	9%
Estimated Capital Cost (YOE CEVP Dollars in Millions)		$879.3M	$615.8M	$1,068.8M	$674.9M
Total Annualized Cost per Guideway River Crossing		$11.55	$8.91	$13.67	$10.38
Total Annual Operating Cost (Increment over the No-Build)		$3.5M	$2.8M	$4.2M	$2.95M

Source: 2030 Travel demand forecasting outputs

LRT is the representative HCT mode

1.5.4.1.1 Accessibility

The shortened guideway with the Mill Plain District MOS, and the fewer number of HCT stations, would reduce the percentage of Clark County households and employment within one half-mile of an HCT station. For the MOS, three percent of Clark County households (a two percentage-point reduction, with the full-length Vancouver alignment) and nine percent of employment (a two percent reduction) would be within one half-mile of an HCT station.

1.5.4.1.2 River Crossings and Transit Ridership

Daily and annual passenger trips on transit over the Columbia River within the I-5 corridor for the Mill Plain District MOS would be approximately nine percent less than with the full-length Vancouver alignment—19,100 trips compared to 20,800. The reduction in trips on transit would result from the diminished accessibility of the HCT line to northern Vancouver and Clark County from shortening the length of the guideway, the reduced number of park and ride spaces, and the longer travel time and required transfer associated with the shuttle bus between Lincoln and Kiggins Park and Rides to the Mill Plain District Transit Center.

1.5.4.1.3 Mode Split

With the Mill Plain District MOS, the peak period/peak direction mode split would be 50 percent SOV, 27 percent HOV and 23 percent transit. With the full length of the Vancouver alignment the mode split would be 50 percent for SOV, 29 percent HOV, and 21 percent for transit. The transit mode split for the Mill Plain District MOS would increase two percent above the Vancouver full-length because of the number of park and ride spaces modeled with the alignment.

1.5.4.1.4 Transit System Costs

Because the length of the MOS guideway would be one-third less than the length of the Vancouver alignment, the cost to operate light rail from the Expo Station to the Mill Plain District terminus would be approximately 30 percent less than under the full-length alternative. However, with the Mill Plain District MOS the cost to operate the rest of the transit network (such as the limited stop buses and C-TRAN’s local buses) would be similar to the full-length Vancouver alignment. Therefore, the total cost to operate the LRT Mill Plain District MOS would only be slightly less than the full-length LRT Vancouver alignment. The full-length Vancouver alignment would have a total annual transit operating cost (as an increment over the No-Build Alternative) of $3.5 million, and the Mill Plain District MOS would be $2.8 million.

The total annualized cost per transit guideway river crossing for the Mill Plain District MOS would be $8.91, whereas the full-length Vancouver alignment would be $11.55, a savings of $2.64 per transit guideway river crossing.

1.5.4.1.5 MOS Effects on the BRT Vancouver Full-length Alternative Operating Costs

The BRT MOS exclusive guideway would terminate at Mill Plain District Park and Ride. The new BRT lines would follow the same route and at the same headways as with the full-length alignment, but the lines would extend outside of the exclusive guideway and would travel in mixed traffic for a greater distance. This would slightly increase the amount of congestion the BRT lines could be subjected to which would increase the total number of platform hours required. For this reason the BRT operating costs with the Mill Plain District MOS would be $5.1 million, nearly the same as the cost to operate the BRT full-length Vancouver alignment, at $5.3 million.

1.5.4.2 I-5 Full-length Alignment vs. Clark College MOS

The LRT Clark College MOS would have a guideway length (as measured from the Expo Center) of about 2.65 miles, compared to the full length of the LRT I-5 alignment which has a length of 4.22 miles. With the MOS terminus, there would be no HCT stations constructed north of the Clark College Park and Ride lot and the proposed park and ride at Kiggins Bowl would be reduced to a surface lot with approximately 150 parking spaces; due to the access constraints at the Clark College Park and Ride, the number of parking stalls would be limited along the MOS alignment to 1,100, for an MOS total of 1,250 parking stalls. With the full length of the I-5 alignment there would be 2,500 park and ride spaces directly on the guideway alignment. The other operational aspects of the transit service, such as the HCT frequencies over the Columbia River, would be similar to those associated with the I-5 alignment.

1.5.4.2.1 Accessibility

In total, the I-5 full-length option would have seven stations whereas the Clark College MOS would have five stations north of the Columbia River. The shortened guideway with the Clark College MOS, and the lower number of HCT stations, would reduce the percentage of Clark County households and employment that would be within one half-mile of an HCT station. For the MOS, three percent of Clark County households (compared to four percent with the full-length I-5 alignment) and nine percent of employment (10 percent with the full length of the I-5 alignment) would be within one half-mile of an HCT station.

1.5.4.2.2 River Crossings and Transit Ridership

Daily and annual passenger trips on transit over the Columbia River within the I-5 corridor would be approximately 13 percent less for the Clark College MOS as compared with the full-length I-5 alignment – 18,200 daily transit trips compared to 21,100. The reduction in trips on transit could be attributed to the diminished accessibility of the HCT line to northern Vancouver and Clark County from shortening the length of the guideway, the reduced number of park and ride spaces and the longer travel time and required transfer associated with the shuttle bus from the Kiggins Park and Ride to the Clark College transit station.

1.5.4.2.3 Mode Split

The Clark College MOS would have a comparable peak period/peak direction transportation mode split to the I-5 full-length alignment. With the MOS the peak period/peak direction traffic over the Columbia River would be made up of 52 percent single-occupancy vehicles (SOV), 29 percent high-occupancy vehicles (HOV) and 19 percent transit. With the full length of the I-5 alignment the mode split would be 50 percent for SOV, 28 percent HOV, and 22 percent for transit.

1.5.4.2.4 Transit System Costs

Although transit capital cost would be less with the Clark College MOS alignment, the annual operating costs would be similar to the full-length I-5 alignment. Because the length of the MOS guideway would be about 1.5 miles shorter than the full length of the I-5 alignment, the cost to operate light rail would be 36 percent less. However, the cost to operate the rest of the transit network (such as the limited stop buses and C-TRAN's local buses) would be similar to the full-length I-5 alignment. Therefore, the total annual cost to operate the LRT Clark College MOS would be approximately $1.3 million per year less than the full-length I-5 alignment. With the full-length I-5 alignment the total annual transit operating cost (as an increment over the No-Build Alternative) would be $4.24 million and with the Clark College MOS would be $2.95 million.

The Clark College MOS would have a total annualized cost per guideway river crossing of $10.38 whereas the full-length I-5 alignment would cost $13.67, a savings of $3.29 over the full-length alignment.

1.5.4.2.5 MOS Effects on the BRT I-5 Full-length Alternative Operating Costs

With the Clark College MOS, the new BRT lines would follow the same route and at the same headways as with the full-length alignments, but the lines would extend outside of the exclusive guideway and would travel in mixed traffic for a greater distance. This would slightly increase the amount of congestion the BRT lines could be subjected to which would increase the total number of platform hours required. For this reason the BRT annual operating costs with the Clark College MOS would be $5.154 million over the No-Build, approximately $6,000 more per year more than the cost to operate the full-length I-5 alignment, $5.149 million.

1.6 How would transit change with the CRC segment-level choices?

This section examines the segment-level transit effects that would vary by the options under examination for each segment described above in Section 1.3.2. The transit options under study in the three segments would generally not affect the metrics used to evaluate the long-term effects of alternatives at the system level, such as passenger trips on transit and VHD. However, the transit options at the segment level would affect the estimated transit capital costs. As a reminder, the segments are:

- **Segment A1**: Delta Park to South Vancouver
  - River Crossing Type (Replacement crossing with an option for Stacked Transit/Highway Bridge or Supplemental crossing)
  - Hayden Island Transit Alignment (Adjacent or Offset)
- **Segment A2**: South Vancouver to Mill Plain District
  - Two-way on Washington or Couplet on Broadway and Washington Transit Alignment
- **Segment B** – Mill Plain District to North Vancouver
  - Vancouver or I-5 Northern Transit Alignment.

1.6.1 Segment A1: How would the river crossing affect transit performance?

1.6.1.1 Replacement Crossing Compared to Supplemental Crossing

Whether the Columbia River Crossing structure were a replacement or supplemental bridge, the transit metrics, except for reliability and transit system costs, would not be impacted. With a supplemental bridge crossing, there would be impacts to the reliability of express bus service due to bridge lifts that would continue on the northbound crossing.

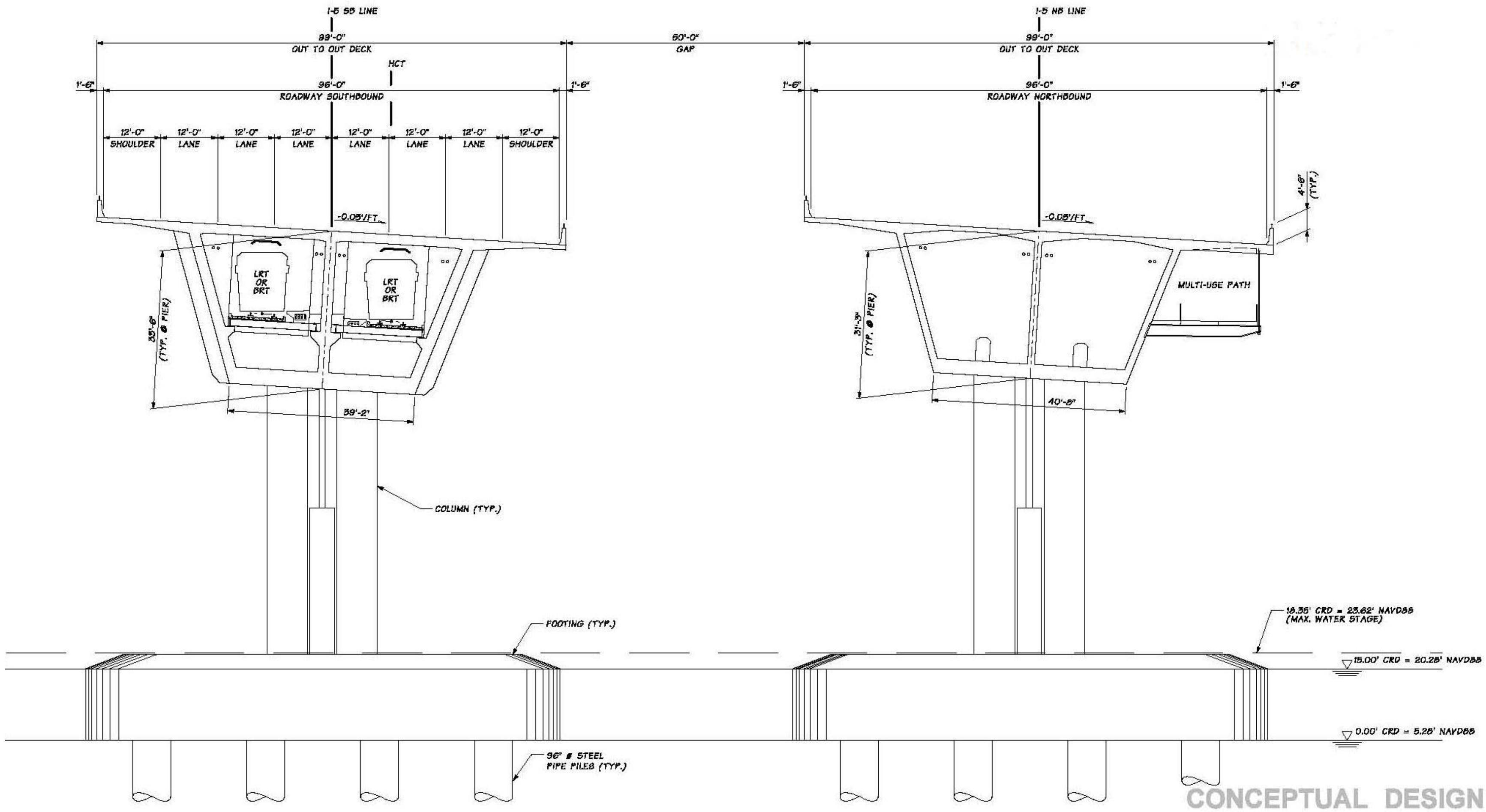
The capital cost of a replacement crossing with the Vancouver alignment and LRT mode, both transit and highway components, would range from $1.35 billion to $1.59 billion (calculations represented by Alternative 3). The capital costs of a supplemental bridge with the Vancouver alignment and LRT mode would range from $1.19 billion to $1.44 billion (calculations represented by Alternative 5). The annualized operating cost of the replacement bridge is $50,000, whereas the cost of the supplemental bridge, including construction of a third crossing for transit and the seismic retrofit, is $750,000. Although the capital costs for the supplemental bridge crossing are less, the cost to seismically upgrade and retrofit the existing Columbia River bridges is significantly more expensive than the maintenance and operation of a replacement crossing. Therefore, the replacement crossing option has lower operating and maintenance cost.

1.6.1.1.1 Stacked Transit/Highway Bridge

An option for bringing transit across the Columbia River is to place it inside the structure supporting the highway lanes for the southbound replacement bridge main river crossing. The CRC project team has named this the stacked transit/highway bridge design option. This option would remove the need for a third bridge and the accompanying piers and footings. The multi-use path that is alongside transit on the third bridge would instead be placed under the deck of the northbound bridge on the east side.

The stacked transit/highway bridge design has not been finalized but the concept is a concrete segmental bridge as shown in Exhibit 19. In effect, this would put transit in a pair of tunnels with the accompanying Fire, Life, and Safety considerations such as an air exchange system, fire suppression equipment and fire doors between the two box sections. The stacked transit/highway bridge would be more open to the air, so it would not require all of the Fire, Life, and Safety issues associated with transit in a tunnel. One concern associated with the stacked transit/highway bridge is, if an accident or incident that stopped or closed the transit system occurred within the stacked transit/highway bridge system, would it also stop general traffic on the I-5 lanes above or close the bridge span. With transit on a separate bridge, it would be located 50 feet west of the highway bridges and so would most likely not create a safety issue with the general purpose lanes of I-5.

Exhibit 19. Stacked Transit/Highway Bridge – Concrete Segmental Bridge Configuration – Looking Northward



1.6.1.1.1.1 Reliability and Travel Times

Transit reliability would not be affected with the stacked transit/highway bridge option because there is nothing to impede transit movement in the river crossing section. The guideway length and speed of curves is not significantly different from the three-bridge replacement option to make a difference in travel times.

1.6.1.1.1.2 Accessibility

Since the stacked transit/highway bridge would be under the general purpose traffic lanes, the approach grades on the north and south bridge touch-down would be less than if a separate bridge for transit were constructed. Increasing the grade to six percent for a short distance, within allowable parameters, allows the transit guideway to reach ground-level at Fifth Street in downtown Vancouver, rather than around Seventh Street, allowing both Fifth and Sixth Streets to have cross transit intersections. The Fifth Street station would provide better access to proposed development along the riverfront. With the three bridge option, Fifth Street would be closed at Washington Street. The multi-use bridge path would be located on the east side of the transit guideway between Expo Center and Hayden Island. It would separate to attach to the east side of the northbound I-5 bridge with the stacked transit/highway bridge option. The north bike access ramp to the island would not be as steep, since the guideway would be lower than the deck of the standard replacement design.

1.6.1.1.1.3 Transit System Costs

The CEVP estimate shows that the stacked transit/highway bridge would save approximately $37.5 million over the three bridge configuration. This number includes direct and schedule related costs. The structural components of the southbound highway bridge would need to be enhanced to include supporting transit on the pier bents but the fewer piers required allow for a cheaper bridge.

There would also be a construction schedule savings estimated to be approximately 10 months to build the stacked transit/highway bridge configuration compared to the three bridge option based on the *Stacked Transit/Highway Bridge Technical Memo* updated in December, 2007.

1.6.1.2 Hayden Island Adjacent Compared to Offset

Segment A1 extends from Delta Park to south Vancouver. In Segment A1, the segment level choices for both LRT and BRT are whether the Hayden Island station alignment is adjacent to or offset from the I-5 crossing and the main differences would depend on whether BRT or LRT is the HCT mode selected.

With BRT Alternatives 2 and 4, a new transfer facility would need to be constructed at Expo Center, while with LRT Alternatives 3 and 5 the alignment would be a northern extension of the existing light rail tracks and the existing station would be used. Across Hayden Island and the Columbia River, the BRT guideway would be 2 feet wider to allow for a median buffer to pass vehicles in the event one breaks down, as compared to the LRT guideway of 33 feet. In addition, the BRT station platforms would be 20 feet wider than the LRT station platforms to allow for a bypass lane because the BRT Alternatives would have several buses arriving and departing the platforms in a short period of time. As detailed in Exhibit 20, the adjacent to I-5 design option would increase the estimated capital cost by less than one percent over the offset design option.

Exhibit 20. Segment A1 Alternative 2 and 3 Transit Options

Characteristic		Alternative 2: Hayden Island Adjacent	Alternative 2: Hayden Island Offset	Alternative 3: Hayden Island Adjacent	Alternative 3: Hayden Island Offset
Expo Center Facility		Requires new BRT Transfer Center	Requires new BRT Transfer Center	Connects to existing Expo LRT station	Connects to existing Expo LRT station
Sharp Curves in Alignment		None	None	None	None
Average Travel Speed (Expo Center to 7th Street Station) [a]		21 mph	Not Available	27 mph	Not Available
Average Travel Time (Expo Center to 7th Street Station)[a]		4.6 min	Not Available	3.63 min	Not Available
Segment Length (Expo Center to North End of Segment A1)		7,661 feet	7,651 feet	7,725 feet	7,686 feet
Estimated Capital Cost		Less than 1 percent difference	Base Cost	Less than 1 percent difference	Base Cost
Width of Hayden Island Station Platform Width		75.5 feet	75.5 feet	55 feet	55 feet
Guideway Width Over Hayden Island and Columbia River		35 feet	35 feet	33 feet	33 feet
Touchdown in Downtown Vancouver	**Replacement Bridge Alternatives**	6th Street	6th Street	6th Street	6th Street
	Supplemental Bridge Alternatives	7th Street (6th Street closed)	7th Street (6th Street closed)	7th Street (6th Street closed)	7th Street (6th Street closed)

[a] The average travel speed and travel time have been calculated platform to platform from the Expo Center station to the 7th Street station, which is actually within Segment A2.

1.6.2 Segment A2: How would the transit alignment through downtown Vancouver affect transit performance?

Segment A2 extends from south Vancouver to the Mill Plain District. In Segment A2 the transit options include operating in a two-way HCT guideway on Washington Street or in a couplet on Washington/Broadway. With the transit alignment options, the main differences would be that with the two-way on Washington Street alignment, HCT would operate in the center of the street, with one station platform each for both travel directions, while with the couplet HCT would be side running with one platform for the northbound direction of travel on Broadway and the southbound direction of travel on Washington. The couplet on Washington/Broadway option would have an estimated capital cost 34 to 35 percent greater than the two-way on Washington Street option, because the couplet would require rebuilding two streets.

Within Segment A2 the transit alignments would have differences depending on whether BRT or LRT were the HCT mode. With the two-way on Washington Street option BRT would have to operate in contra-flow so that all transit vehicles in the guideway could access the center platforms while LRT (which has doors on both sides of the cars) would have normal circulation. In addition, LRT average travel speeds and average travel times would be somewhat faster than BRT due to differences in dwell times, driver variability and vehicle acceleration rates.

Construction in Segment A2 would incur 12 percent of the total transit cost whether LRT or BRT is the HCT mode. As detailed in Exhibit 21, the HCT couplet on Broadway/Washington, rather than HCT two-way on Washington Street, would increase the estimated capital cost by 35 percent over the base cost.

Exhibit 21. Segment A2 BRT & LRT Transit Options

	Alternative 2		Alternative 3	
Characteristic	**Two-Way on Washington Street**	**Couplet on Broadway/ Washington**	**Two-Way on Washington Street**	**Couplet on Broadway/ Washington**
Operations	Center Running Contra-Flow	Side Running Standard Circulation	Center Running	Side Running
Station Platforms	Center of street	Side of street	Center of street	Side of street
Stations	3	3	3	3 pairs (IB on Broadway, OB on Washington)
Segment Length*	3,438 route feet	3,445 route feet	3,184 route feet	3,216 route feet
Sharp Curves	No	No	No	Yes
Average Travel Speed (7th Street Station to Mill Plain District Transit Center)	9.6 mph	Not Available	12.9 mph	Not Available
Average Travel Time (7th Street Station to Mill Plain District Transit Center)	3 minutes	Not Available	2.32 minutes	Not Available
Capital Cost in Segment	Base cost	35 percent higher than base	Base cost	35 percent higher than base

* Lengths for couplets are averaged between directions. IB = Inbound direction, OB= Outbound direction

1.6.3 Segment B: How would the northern transit alignment affect transit performance?

Segment B extends from the Mill Plain District to North Vancouver. Segment B would include an alignment choice between constructing and operating HCT directly adjacent to the I-5 corridor or through Vancouver streets. Unlike Segments A1 and A2, the design options in Segment B would have significant differences to the long-term effects of the Alternatives, as detailed below. Exhibit 22 is a reference table for Segment B.

The reported comparison data are products of a sensitivity analysis preformed to analyze the impacts the Vancouver and I-5 transit alignments to the transit metrics. LRT is the representative HCT mode modeled for this analysis and the Efficient level of transit service was the transit system operation level. The sensitivity test was not conducted with the BRT mode. As revealed in Exhibit 22, there are numerous similarities in the outputs between the two northern alignments in terms of ridership, boardings, and mode split; most the transit metrics are within the models range of error of one to three percent. As discussed below, the primary differences between the alignments are in guideway length and capital and O&M costs. Therefore, similar comparisons could be drawn from a BRT mode choice discussion around the northern transit alignment choice, which would result in similar if not the same conclusions.

Exhibit 22. Transit Performance – Segment B LRT Transit Alignments

Characteristic		Vancouver Alignment	I-5 Alignment
Guideway Length (Expo Center to Northern Terminus)		3.44 miles	4.21 miles
Average Guideway Travel Speed		17.3 mph	21.5 mph
Average Travel Time	**Northern Terminus to Expo Center**	12 min	11.7 min
	Northern Terminus to Pioneer Square	39.9 min	39.6 min
Daily Passenger Trips on Transit Over I-5 Crossing		20,800	21,100
Annual Passenger Trips on Transit Over I-5 Crossing		6,673,000	6,779,000
Total Daily Transit System Boardings		175,700	177,100
Transit Accessibility	**Clark County Households within ½ mile of HCT station**	5 %	4 %
	Clark County Employment within ½ mile of HCT station	11 %	10 %
Estimated Capital Cost		$879.3M	$1,070.0M
Annual Operating Cost (Increment Over No-Build)		$3.5M	$4.2M
Annualized Cost per Transit Guideway River Crossing		$11.55	$13.67

LRT is the representative HCT mode for the data presented in this table.

1.6.3.1 Reliability and Travel Time

The vehicle hours of delay (VHD) within the corridor for local and express buses with LRT Vancouver alignment (Alternative 3) would be about 13 hours, and 12.5 hours with LRT I-5 alignment. HCT travel times during the afternoon peak direction would not be affected by whether the I-5 or Vancouver alignment were chosen, even though the I-5 full-length alternative is .77 miles longer than the Vancouver alignment (from Expo Center to the northern terminus). Due to differences in the operating environments, the I-5 alignment would have an average travel speed 3.5 mph faster than the Vancouver alignment but, because the Vancouver alignment would be shorter, the average travel times between the two alignments would be nearly the same. Most morning and afternoon two-hour peak direction trips from select locations within the region would have the same travel time for both Alignments, although there are several instances where the Vancouver alignment would produce a quicker trip between locations.

1.6.3.2 River Crossings and Ridership

The Vancouver and I-5 alignments would provide similar annual transit passengers over the I-5 crossing; with LRT the Vancouver alignment would see about 6.7 million and the

I-5 alignment would see about 6.8 million. The Vancouver alignment would see about 53.5 million annual transit boardings on all systems whether BRT or LRT and the I-5 alignment would see about 54 million (daily transit boardings would see a difference of less than two percent between the alignments). In both instances, the I-5 alignment would slightly outperform the Vancouver alignment.

1.6.3.3 Accessibility

Although the park and ride lots would allow either alignment to provide Clark County residents accessibility to HCT, the accessibility to the uses immediately surrounding the transit stations vary significantly along each alignment. From Mill Plain Boulevard to the alignment end points, the I-5 alignment would have about 29 percent of its length along a residential/commercial street, 20 percent in a below-grade section adjacent to non-residential uses, 19 percent at highway grade, and the remaining 22 percent would be on aerial structures adjacent to park and school property. The Vancouver alignment would be integrated into the arterial street system with at-grade crossings only, predominantly adjacent to residential and commercial land uses. As detailed in Exhibit 22, the Vancouver alignment, five percent of Clark County households and 11 percent of Clark County employment would be within one-half mile of an HCT station. The I-5 alignment would have four percent of Clark County Households and 10 percent of Clark County Employment within one-half mile of an HCT station. The difference between accessibility is more clearly illustrated when analyzing the 5-minute walking distance to transit stations along Segment B.

Exhibit 23 and Exhibit 24 illustrate a 5-minute walking distance to the proposed stations along Segment B of the I-5 and Vancouver full-length alignments. The 5-minute walking distance was measured along public right-of-way and existing public infrastructure like sidewalks and pedestrian paths; it was assumed that transit users would not cross private property or facilities to gain access to the transit stations. The City of Vancouver Comprehensive Plan Map was integrated with the map to illustrate the type of land uses within the 5-minute walking distance.

Analyzing the land uses and 5-minute walking distance along Segment B of the full-length alignments reveals that the Vancouver alignment would provide walking access to a larger area and higher density land uses than the I-5 alignment. There are 283 acres within a five-minute walk of the Vancouver alignment, whereas the I-5 alignment has 105 acres; a 63 percent smaller area within a 5-minute walking distance than the Vancouver alignment.

Within a five-minute walk of the Vancouver alignment, 87 acres are urban high-density residential zoning, compared to 10 acres along the I-5 alignment. Fifty-two acres of the Vancouver alignment are commercially zoned, compared to 9 acres along the I-5 alignment. Conversely, the I-5 alignment has 38 public facility acres within five-minutes walking distance, whereas the Vancouver alignment has 25 acres.

The difference between the acreages is because public right-of-way was used to measure the access routes. Using the Clark College station as an example, it is assumed that people would not cross through the private Clark College baseball field to gain access to the station; transit users would walk along a sidewalk. Southeast of the Kiggins Bowl station, there is a steep hillside that limits walking distance, but along the Vancouver alignment, all transit stations are at-grade and there are no terrain obstacles. Since the Vancouver alignment has more intense commercial and residential development surrounding the stations, more people would be within walking distance of the stations than the I-5 alignment.

Exhibit 23. I-5 Alignment: 5 Minute Walking Distance from Station Locations

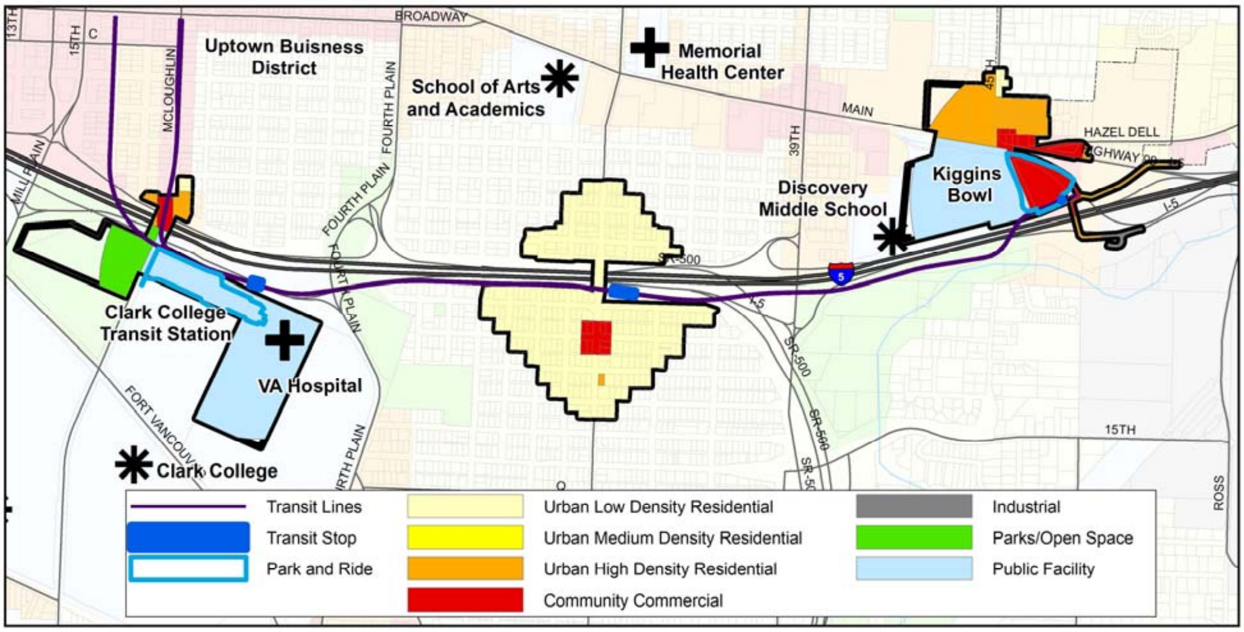
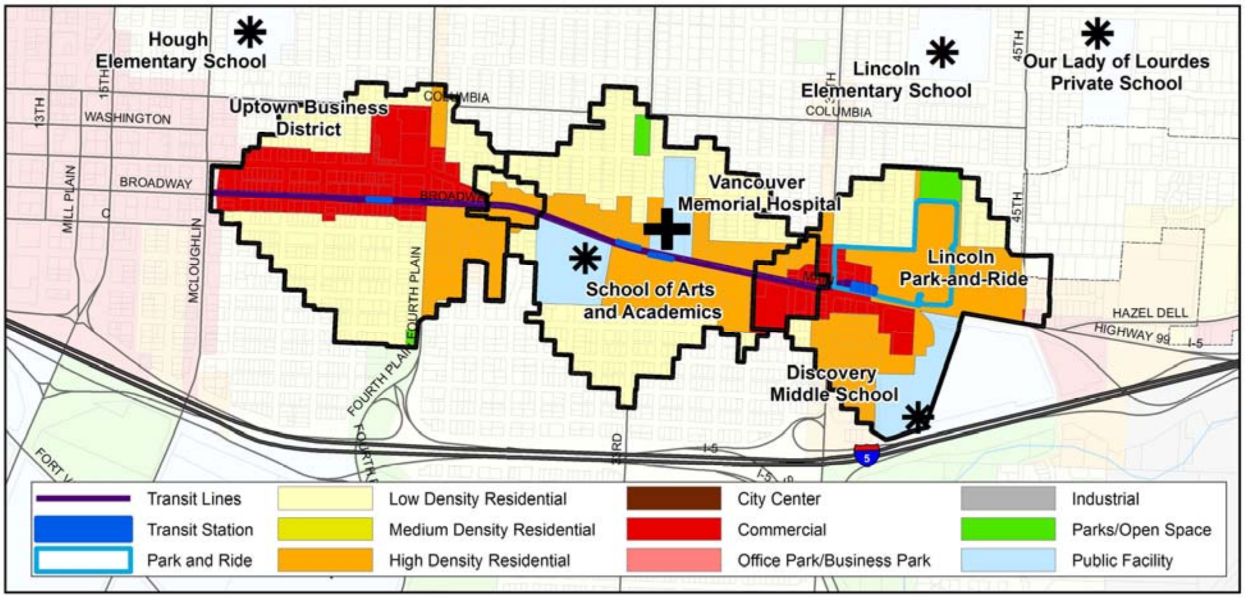


Exhibit 24. Vancouver Alignment: 5 Minute Walking Distance from Station Locations



1.6.3.4 Mode Split

The I-5 alignment would not have as significant impact upon the afternoon peak period transit mode split between the markets as the Vancouver alignment.

1.6.3.5 Transit System Costs

The capital cost of the I-5 alignment would be approximately $189.5 more than the Vancouver alignment because of design requirements along the alignment. The I-5 alignment would require shifting the crown of the highway 26 to 30 feet west, to accommodate the transit guideway within the existing highway right-of-way to the greatest extent possible. In addition, the I-5 alignment would require building an extensive retaining wall alongside I-5 and an aerial structure over SR 500 and I-5 to access the Kiggins Bowl Park and Ride lot. In contrast, the guideway with the Vancouver alignment would be integrated into the streetscape and would not require the construction of large, permanent structures. The estimated capital costs of the Vancouver alignment would be about 18 percent less than the I-5 alignment ($879.3M compared to $1.07B for LRT). As an increment over the No-Build Alternative, the annual cost to operate the Vancouver alignment with LRT would be about $3.5M and would be $4.2M with the I-5 alignment—an operating cost difference of about 17 percent.

1.7 Temporary Effects

Chapter 6 details how specific segments of the alignment would be temporarily impacted by construction of the CRC project. Temporary effects to transit buses during construction of the CRC project would consist mainly of an increase in travel time due to congestion on the I-5 highway during off-peak periods and on downtown Vancouver local city streets during all hours.

The main impact to transit during construction would be on travel times and speeds of the local and express bus system. The bus routes operating on the I-5 corridor would experience delays due to project construction and the resulting traffic congestion, lane closures, ramp closures, and detours. In turn, the delays experienced within the corridor would affect scheduled transfers at transit centers and park and rides to meet other routes, causing some passengers to miss their connection.

There are also anticipated impacts to businesses along segments of the alignments. With construction within the right-of-way along a business front, parking and access to businesses is restricted and, therefore, patronage may decrease during construction.

1.8 Mitigation

Chapter 7 details mitigation options for temporary effects. Bus routes would need to be rerouted during construction. Significant rerouting should be avoided; detours a few streets east or west of the existing route would be optimal.

To help citizens and business owners become aware of how to navigate within the construction areas, public meetings could be held, booths could be set up at public events, public notices could be posted, and information could be distributed by local newspapers and during local television news casts. In addition, the project sponsors could assist business owners in making the public aware that they are open during construction through additional signage and way-finding descriptions to available public parking.

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2. Methods

2.1 Introduction

This chapter is a summary of the methods that were used to collect data and evaluate effects to transit for the Interstate 5 (I-5) Columbia River Crossing (CRC) project, and that are documented in this technical report. Additional detail is provided in the *Transit Methods and Data Report*. The analysis was developed to comply with the National Environmental Policy Act (NEPA), with the Federal Transit Administration's (FTA) New Starts regulations, applicable state environmental policy legislation, and local and state transit policies, standards and regulations.

2.2 Analysis Areas

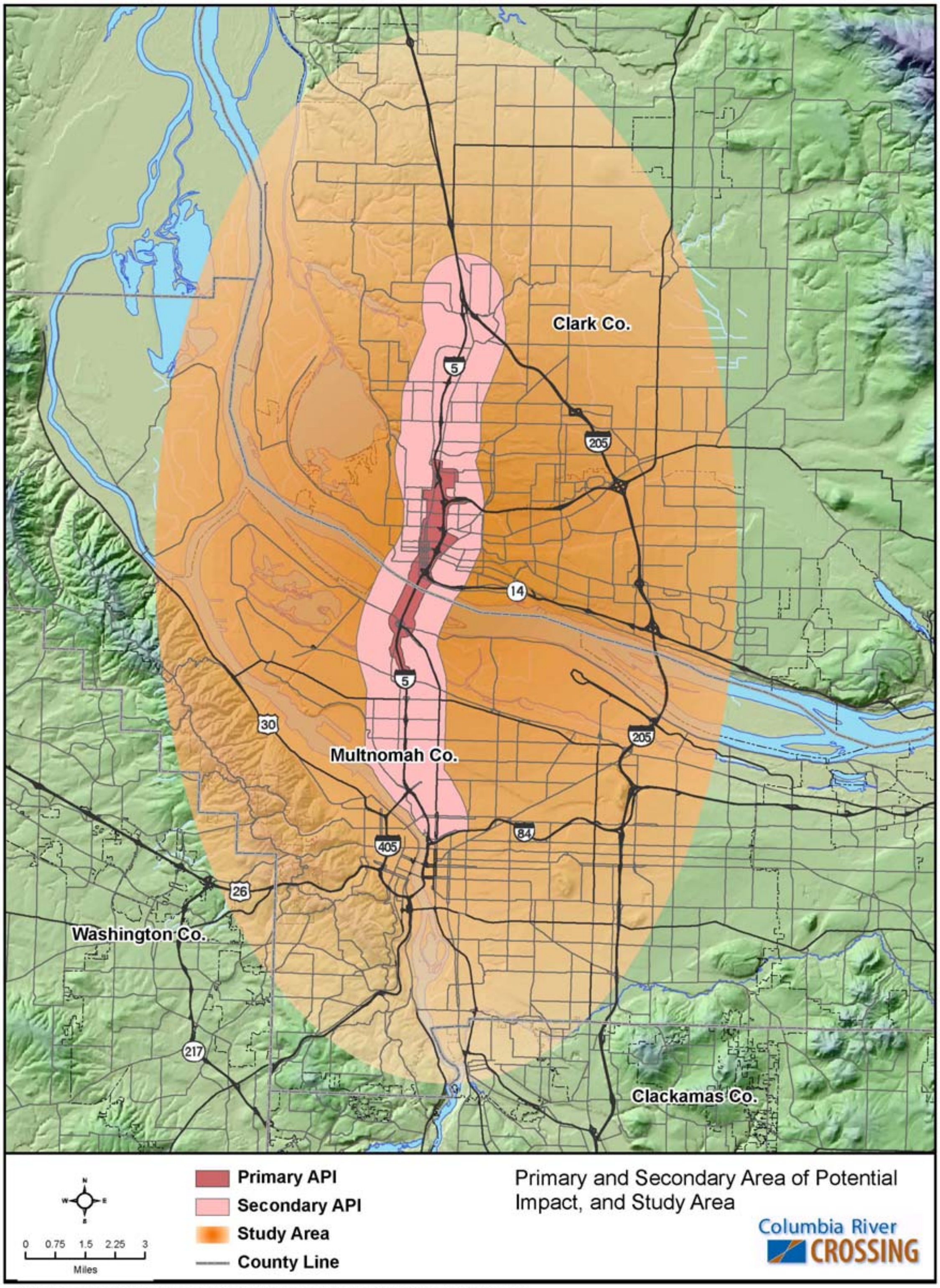
The evaluation of transit used three analysis areas to measure effects: the primary area of potential impact (API), the secondary API, and the study area. The primary API addresses the area where direct construction effects would occur and the secondary API is where indirect effects would occur. These two areas are similar across technical disciplines. The transit study area addresses areas where system-wide operational effects would occur. These three analysis areas are shown in Exhibit 25 and are described below.

2.2.1 Primary API

The primary API is the area that would experience direct impacts from construction and operation of the proposed project alternatives. Most physical project changes would occur in this area, although mitigation could still occur outside of it.

As defined, the primary API extends about five miles from north to south. It starts to the north of the I-5/Main Street interchange in Washington, and extends south to the I-5/Columbia Boulevard interchange in Oregon. North of the Columbia River, the primary API expands west into downtown Vancouver, and east near Clark College to include potential high-capacity transit (HCT) alignments and park and ride locations. Around the actual river crossing, the eastern and western sides each extend 0.25 mile from the I-5 right-of-way. South of the river crossing, the width narrows to 300 feet on each side.

Exhibit 25. Primary and Secondary Area of Potential Impact, and Study Area



Analysis by Analyst name; Analysis Date: 09-May-2007; Plot Date: 09-May-2007; File Name: LKR_034.mxd

2.2.2 Secondary API

The secondary API represents the area where indirect impacts (for example, traffic and development changes) would occur from the proposed project alternatives. For transit, some direct impacts could also occur in this area from the operations of the proposed project alternatives.

The secondary API, which is over 15 miles long, runs from a point approximately one mile north of the I-5/I-205 interchange all the way south to the I-5/I-84 interchange. It extends one mile on both the east and west sides of the I-5 right-of-way. These boundaries, and the geographic extent of the potential indirect impacts, may change as traffic projections become available.

2.2.3 Study Area

The study area includes a portion of the area currently served by the two transit service providers within the Portland-Vancouver region; TriMet and C-TRAN. This is the area in which system-wide effects to transit performance and service were evaluated.

The study area is a sub-area of the four-county region (Multnomah, Clackamas and Washington Counties in Oregon and Clark County in Washington). The study area includes the area up to, and extending east of, Interstate 205 (I-205). It also extends north of the secondary API to include existing, planned, and programmed transit facilities in northern Clark County and south to include downtown Portland.

2.3 Performance and Effects Guidelines

In February 2006 the CRC Task Force, composed of 39 leaders from both Washington and Oregon, adopted the CRC *Screening and Evaluation Framework* that established a six step formal process for screening a list of more than 75 transportation components and 12 multimodal alternative packages that would be combined to create the DEIS Alternatives. In general, the framework established screening criteria and performance measures to evaluate the effectiveness in addressing:

- The project’s Purpose and Need;
- Problems identified in the project’s Problem Definition; and
- Values identified in the Task Force’s Vision and Values Statement.

The evaluation of transit considered both long-term operational performance and effects and temporary construction effects.

2.4 Data Collection Methods

The following is a summary of the data sources and data collection methods that were used for this report. For more information see the CRC *Transit Methods and Data Report*. In general, the transit data collected was designed to comply with FTA’s New Starts program requirements. The data provides information on the benefits and effects of alternative transportation investments that were developed to address the project’s purpose and need. The alternatives have not yet been fully vetted with the FTA. Discussions and submittal will need to occur with FTA to be eligible for New Starts funding. This is normal for this stage of a project.

2.4.1 General Methods

For the CRC project, Exhibit 26 summarizes the types of data used to evaluate transit and the source and collection methods.

Exhibit 26. Data Sources and Collection Methods

Data	Source and Collection Method
Coordinated Modeling for the Bi-State Region	Coordination occurred with the two Metropolitan Planning Organizations in the bi-state Portland-Vancouver metropolitan area: Metro for Portland, Oregon and the Regional Transportation Council (RTC) for southwest Washington. For the purposes of CRC, Metro led the modeling effort, supported closely by the RTC. Metro's regional travel model was expanded to include approved population and employment forecasts for Clark County and its cities.
Analysis Years	The year 2005 served as the base year for existing conditions and the year 2030 served as the future forecast year for the No-Build Alternative and the build alternatives.
Transportation Analysis Zones	An integrated and expanded transportation analysis zone system was used that included all transportation analysis zones in Clark, Multnomah, Clackamas, and Washington counties. This extended well beyond the primary and secondary API, or study area shown in Exhibit 25.
Land Use Allocation	Transportation accessibility is an important determinant of future land use. The 2005 Base Year, used the household and employment allocation that RTC developed with Clark County was used and the MetroScope Integrated Land Use and Transportation Model. For the 2030 Forecast Year the interim 2030 land use allocation, recently developed by RTC and Metro and approved by the Bi-State Coordination Committee, was used.
Transportation System	Some of the data for the Transit analysis, such as the level-of-service (LOS) at intersections near proposed park and ride facilities, was collected from the CRC traffic analysis performed in accordance with the *Transportation Methods and Data Report*.
Operating Costs	For each transit alternative TriMet staff analyzed the LRT service and provided the estimated costs based on projected demand for service in the regional travel demand modeling results. For TriMet North Portland buses, the number of platform hours was determined by applying a factor to the vehicle hours traveled (VHT) from the 2030 travel demand forecasting outputs. For the BRT routes, guideway buses, and C-TRAN local bus service the CRC Transit Team worked with C-TRAN and used their scheduling program, The Master Scheduler (TMS), to create a detailed schedule for each transit alternative. With this schedule, TMS determined the number of buses needed in the peak and off-peak periods, which then provided the platform hours used to determine operating costs. In addition, an annual Operating and Maintenance (O&M) cost model was developed (following the procedures presented in FTA Guidance[a]) to estimate bus and bus-related costs. The methodology was composed of the following four steps: 1) develop O&M cost model for existing C-TRAN bus system, 2) create productivity ratios for the new vehicle type (e.g., articulated buses) and service characteristics, 3) add expense line item unit costs for costs that are not part of current operations (i.e. BRT Stations), and 4) run the O&M cost model for the different alternatives to calculate the total O&M costs for each alternative.

[a] Procedures and Technical Methods for Transit Project Planning, Federal Transit Administration, December, 2006, http://www.fta.dot.gov/planning/newstarts/planning_environment_2396.html

2.4.2 Modeling Tools

Data collection for the transit analysis used Metro's regional travel demand model. This model follows a traditional trip-based four-step model, which includes:

- Trip generation, based on land use and socioeconomic factors, to determine the location, magnitude, and purpose of trip-making;
- Trip distribution to identify origin and destination travel patterns by calculating trip lengths and travel times from transportation system attributes;
- Mode choice to sort trips into the various vehicle, transit, or pedestrian/bicycle modes; and
- Trip assignment to route paths for vehicle and transit trips, which are determined for several time periods throughout the day.

Metro's regional travel demand model uses EMME/2 software to assign trips to the auto and transit simulation networks. Limited auto assignment information was provided using VISUM for flow bundle analyses and traffic operations work. In addition to VISUM, the transit analysis used the VISSIM, Synchro/SimTraffic, and SUMMIT software packages to further derive transit performance measures.

2.4.3 Modeling

2.4.3.1 Inputs

The model inputs that were developed by the CRC project team and delivered to Metro and Regional Transportation Council (RTC) included:

- Traffic and Transit Data;
- Service Plans and Fare Policies;
- Draft Detailed Definition of Transit Alternatives;
- 2030 Base Year Land Use Allocation; and
- CRC Modeling Packages.

Over 20 modeling packages were prepared for the CRC transit alternatives. See *CRC Modeling Package T-1 (June 2006)* through *CRC Modeling Package T-21.2 (September 2007)*. Each of the transit service plans developed with respect to the alternatives for modeling purposes applied a consistent transit operating strategy composed of three types of transit service: 1) traditional local bus fixed-route service; 2) express bus with point-to-point service from Clark County park and ride lots to Portland; and 3) HCT service providing frequent and high-capacity bi-state service using an exclusive guideway (with the exception of the No-Build Alternative).

2.4.3.2 Processing and Outputs

For transit, 11 model outputs were provided as part of the initial travel and patronage forecasting. Exhibit 27 provides a list and description of these measures.

Exhibit 27. Transit Forecasting Model Outputs

Number	Model Output	Description
1	Transit Cutlines Ridership	Provides the person-trips on transit at specified critical points in the regional road network during the peak and off-peak periods.
2	Vehicle Hours of Delay (VHD) – Transit	The cumulative delay that all transit vehicles traveling on links with a volume to capacity (v/c) ratio of greater than 85 percent would experience during the time period.
3	Travel Times for Selected Origins and Destinations – Auto, Transit	Travel times between the 33 CRC districts identified in Washington and Oregon for auto and transit.
4	Transit Ridership	Provides the peak, off-peak, and daily ridership for the entire transit system and daily boardings on a route by route basis.
5	Job Accessibility based on Travel Times	Between selected origin and destination pairs, jobs that are accessible by vehicle category and by transit, for 15, 30, 45 and 60 minute travel time contours.
6	Household Accessibility based on Travel Times	Between selected origin and destination pairs, households that are accessible by vehicle category and by transit for 15, 30, 45 and 60 minute travel time contours.
7	Transit Peak Load Point (I-5 Premium Service Line)	Identifies the specific location of the transit peak load point on a route by route basis.
8	Park and Ride Lot Demand	Identifies the forecasted number of vehicles that would use a specific park and ride lot.
9	Transit Performance Calculations (TPC)	By route grouping, provides several measures including transit Vehicle Hours Traveled (VHT), VMT, passenger miles and vehicle requirements.

2.5 Analysis Methods

For the transit alternatives the analysis of the long-term operational performance and effects, both direct and indirect, have been based on a comparison of the modeling work and outputs described above. The long term operational performance and effects of the transit alternatives have also been evaluated on four CRC project values: 1) Mobility, Reliability, Accessibility, Congestion Reduction and Efficiency; 2) Modal Choice; 3) Cost Effectiveness and Financial Resources; and 4) Bi-State Cooperation. These values have been assessed using seven of the screening criteria adopted by the CRC Task Force, with 11 screening measures, for evaluating the DEIS alternatives. The values, screening criteria and measures are summarized in Exhibit 28. Justification for system- and segment-level choices that were not considered or were removed from consideration from the CRC project after preliminary analysis is discussed in the *Final Definition of Transit Alternatives.*

Exhibit 28. CRC Project Values, Screening Criteria and Screening Measures

Value	Screening Criteria	Screening Measure
Mobility, Reliability, Accessibility, Congestion Reduction and Efficiency	Reduce travel times and delay in the I-5 corridor and within the project area for transit modes.	P.M. peak period transit vehicle travel speed in miles per hour (mph) from selected corridor points along I-5. P.M. peak period transit VHD from selected corridor points along I-5. Total transit vehicles per hour (p.m. peak direction) over the Columbia River within I-5 corridor.
	Improve person throughput of the I-5 Columbia River Crossing.	Total daily and annual transit trips over the Columbia River within I-5 corridor. Peak period/peak direction mode split between single-occupancy vehicles (SOV), high-occupancy vehicles (HOV) and transit for I-5.
Modal Choice	Provide for multimodal transportation choices in the I-5 corridor and in the project area.	Percent of households and employment with access to transit within one quarter-mile of bus lines and one-half mile of HCT stations.
	Improve transit service to target markets in the I-5 corridor and in the project area.	Transit travel times from the seven Clark County transit markets to the five major transit markets in Oregon.
Cost Effectiveness and Financial Resources	Minimize the cost of construction.	Estimated transit capital costs. Estimated total capital, operations, and maintenance costs for each alternative package (National transit industry performance measures).
	Ensure transportation system maintenance and operation cost effectiveness.	Total HCT and Transit System operating costs as defined by the Transit Performance Calculation (annual service hours, operating cost per passenger mile).
Bi-State Cooperation	Support adopted transportation plans.	Transit system and service supports local and regional transportation plans.

2.5.1 Temporary Construction Effects Approach

Temporary construction effects have been estimated by evaluating the proposed construction methods and schedules and comparing the predicted detours, if any, and expected traffic delays with normal operation of transit services. Temporary displacements and relocations of facilities have also been evaluated to determine if transit service operations would be impacted.

2.5.2 Mitigation Measures Approach

Mitigation for temporary construction impacts was analyzed. The recommended mitigation measures are feasible within the goals and features of the proposed alternative. Chapter 7 describes the potential mitigation measures associated with the CRC project.

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3. Coordination

The CRC project is sponsored by the Washington State Department of Transportation (WSDOT), Oregon Department of Transportation (ODOT), Federal Highway Administration (FHWA) and Federal Transit Administration (FTA).

In addition to working with the project sponsors the CRC Transit Team (which is composed of agency and consultant staff) has coordinated with other local agencies and groups. The CRC Transit Team has also supported the CRC Communications Team in public outreach efforts. This coordination, which will continue throughout the project, has been vital to the development of the transit alternatives and in the transit system planning and analysis. The following is a brief summary of the Transit Team's ongoing coordination efforts with:

- The Transit & Modeling Working Group;
- The New Starts Working Group;
- Individual agency briefings;
- The Clark County High-Capacity Transit System Study; and
- Public Involvement.

3.1 Transit & Modeling Working Group

The Transit & Modeling Working Group is composed of members from CRC's Transit and Traffic Teams, project sponsors and representatives of the project's six local agency partners:

- City of Vancouver;
- City of Portland;
- Portland Metro;
- Southwest Washington RTC;
- C-TRAN; and
- TriMet.

Since the fall of 2005, this group has met bi-weekly to develop the CRC transit alternatives, discuss and resolve issues related to the modeling and assist in the analysis. An important function of this group is that the representing agency members serve as a resource to the CRC project and to share information, and build understanding of the project within their respective agencies and on the part of elected officials. The bi-weekly meetings of the Transit & Modeling Working Group, and the group's importance in building a consensus, will continue throughout the project's alternatives analysis and environmental review process.

3.2 New Starts Working Group

The New Starts Working Group, which began holding bi-weekly meetings at the start of 2007, is also composed of members from the CRC project's sponsors and six local agency partners, with active participation from the two transit agencies, the two Metropolitan Planning Organizations (MPO) and support from the two cities. The purpose of the New Starts Working Group is to provide technical and strategic advice to the CRC Transit Team on the preparation of products related to the FTA's New Starts reporting process. This includes reviewing and commenting on the travel demand modeling methods, and providing advice on draft and final New Starts guidance and regulations. This group will continue to meet and assist the development of the CRC transit alternatives through the selection of a Locally Preferred Alternative (LPA) and the submission of a Preliminary Engineering application to the FTA.

3.3 Individual Agency Briefings

The CRC Transit Team has provided individual agency briefings with the local agency partners and federal agencies (FTA and FHWA). These briefings have been either to provide a general update on the development of the project's transit alternatives, or to discuss a specific aspect of the transit alternatives that is of concern to the agency. These meetings will continue to be held as requested throughout the alternatives analysis/DEIS process.

3.4 Clark County High-capacity Transit System Study

In the fall of 2006, the Southwest Washington RTC began leading a partnership to study future options for a high-capacity transit (HCT) system in Clark County. The outcomes of the study include identifying possible combinations of HCT transit modes and travel corridors that would be needed to accommodate growth in Clark County. The CRC project and the CRC Transit Team have been and will continue to coordinate important analysis and decision milestones with this study.

3.5 Public Involvement

The CRC Transit Team has been supporting and working with the CRC Communications Team to develop and implement the Transit Communications Plan. This plan outlines the ways staff will inform and gather input from the public and stakeholders about transit issues and their trade-offs and describes the elements that public input may influence. The Transit Team has provided data and graphic images for outreach materials, such as fact sheets, displays and maps. Transit Team staff has attended neighborhood meetings, summer fairs, and festivals to talk with community members about the transit alternatives and to answer questions.

The goals of the Transit Communications Plan are to:

- Inform people about the transit issues regarding alignments, modes, station and park and ride location and design issues;
- Communicate trade-offs about the different options;

- Seek input from people in the project area about trade-offs and community preferences;
- Engage communities in the discussion of design issues; and
- Inform people outside of the project area about the transit issues and trade-offs.

Community input has guided and will continue to guide many HCT design elements, including the right-of-way width on streets in terms of an exclusive guideway, transit features and amenities, and locations of stations and other facilities. The current phase of outreach focuses on transit modes and alignments, and the locations of stations and park and ride lots. This report presents major findings on significant performance and cost differences between transit modes and alignment options at the end of 2007. A public comment period will follow in early 2008. Subsequent outreach efforts will focus on the design of the streetscape, stations, and park and ride lots. This public involvement effort will continue through the selection of the Locally Preferred Alternative (LPA) and the DEIS process in the spring of 2008.

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4. Affected Environment

4.1 Introduction

This section discusses the existing transit conditions in the project study area. For a discussion of the No-Build Alternative transit system with the 2030 forecast year, see Section 5.2.

I-5 is a critical bi-state link for transit service between Vancouver and Portland. The current I-5 crossing of the Columbia River, and its associated interchanges, experience heavy congestion and delays in the peak travel periods. Stop-and-go traffic conditions can last two to five hours in the peak direction in the mornings and afternoons, as well as whenever traffic accidents, vehicle breakdowns, or bridge-lifts occur. The congested crossing also affects peak-direction transit operations, reliability, and connectivity between Vancouver and Portland.

Transit service within the region is provided by two agencies: TriMet in the Portland Tri-County area and C-TRAN in Clark County. Existing bi-state transit service includes local fixed-route bus service between Vancouver and the Delta Park light rail (LRT) station in Portland (with light-rail service continuing on to downtown Portland) and commuter-oriented peak period express routes from Clark County park and ride lots and transit centers to central Portland or to light rail stations in Portland.

Exhibit 29 summarizes C-TRAN's existing transit network operating characteristics and Exhibit 30 provides a summary of C-TRAN's existing transit service within the primary and secondary API. Exhibit 31 summarizes the existing transit facilities that are used for bi-state travel, between Clark County and Portland, on I-5. The locations of these facilities are shown in Exhibit 32.

Exhibit 29. Summary of Existing Transit Operating Characteristics

Characteristic		TriMet	C-TRAN
Vehicles	**Fixed Route Buses**	645	130
	LRVs	105	N/A
Annual Revenue Hours	**Fixed Route Bus**	1,873,568*	231,191*
	LRT	415,713*	N/A
Maintenance Facilities	**Buses**	3	1
	LRT	2	N/A

*Source: 2005 National Transit Database

Exhibit 30. Existing Transit Service within the Primary and Secondary API

Route			Headway: Weekday Peak Period	Headway: Weekday Off-Peak Period	Headway: Weekend
TriMet	**Local Bus**	**Line 6**	15 minutes	15 minutes	15 minutes
		Line 8	15 minutes	15 minutes	15 minutes
		Line 16	30 minutes	N/A	N/A
	LRT	**Yellow Line**	10 minutes	15 minutes	15 minutes
C-TRAN	**Local Bus**	**Line 1**	30 minutes	30 minutes	45 minutes
		Line 2	40 minutes	40 minutes	40 minutes
		Line 3	40 minutes	40 minutes	40 minutes
		Line 4	15 minutes	15 minutes	15 minutes
		Line 6	30 minutes	30 minutes	30 minutes
		Line 25	30 minutes	30 minutes	45 minutes
		Line 30	25 minutes	25 minutes	30 minutes
		Line 32	30 minutes	30 minutes	30 minutes
		Line 37	15 minutes	15 minutes	15 minutes
		Line 71	15 minutes	15 minutes	30 minutes
	Limited Bus	**Line 44**	25 minutes	N/A	N/A
		Line 114	120 minutes	N/A	N/A
		Line 173	120 minutes	N/A	N/A
	Express Bus	**Line 105**	20 minutes	60 minutes	N/A
		Line 134	12 minutes	N/A	N/A
		Line 157	60 minutes	N/A	N/A
		Line 190	60 minutes	N/A	N/A
		Line 199	10 minutes	N/A	N/A

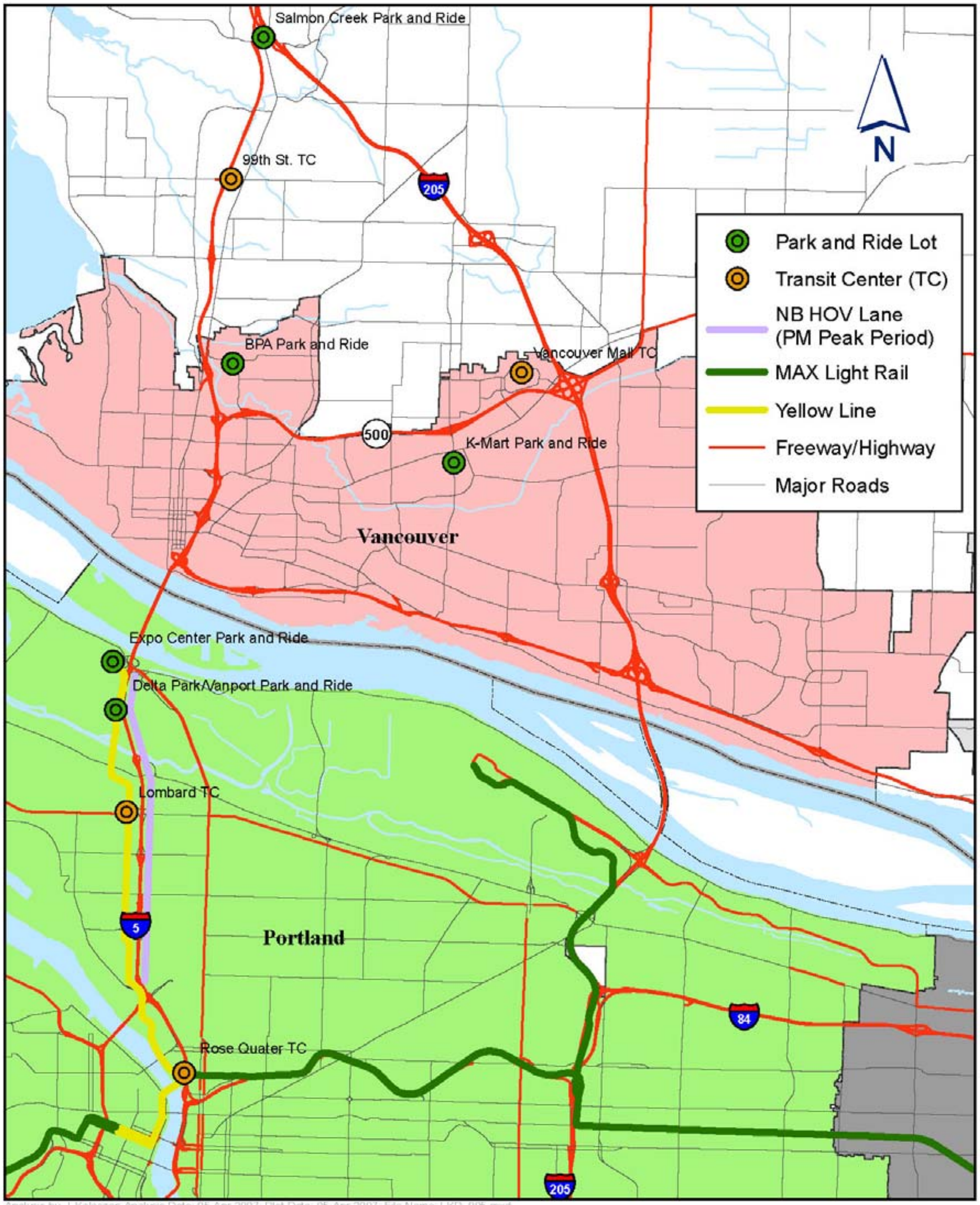
Source: TriMet's 2007 service schedule and C-TRAN's 2007 service redesign schedule

Exhibit 31. Existing Transit Passenger Facilities used for Bi-State Travel within I-5 Corridor

State	Transit Facility	Location	Parking Spaces	Bus Bays
Washington	Salmon Creek Park and Ride Lot	Adjacent to I-5 at NE 139th St.	493	N/A
	99th Street Transit Center	Adjacent to I-5 at NE 99th St.	600	9
	BPA Park and Ride Lot	NE Ross St. & NE 15th Ave	175	N/A
	Vancouver Mall Transit Center	NE Vancouver Mall Drive	N/A	5
	K-Mart Park and Ride Lot	Andresen and 25th St.	100	N/A
Oregon	Expo Center Park and Ride Lot	2060 N Marine Dr.	300	N/A
	Delta Park Park and Ride Lot	1904 N Victory Blvd.	304	4
	Lombard Transit Center	N Lombard & N Interstate Ave	N/A	4
	Rose Quarter Transit Center	N Interstate & N Holladay	N/A	4
		Total	**1,972**	**26**

Source: Physical inventory of 2007 existing conditions

Exhibit 32. Existing Transit Passenger Facilities used for Bi-State Travel within the I-5 Corridor



Analysis by J. Koloszar; Analysis Date: 05-Apr-2007; Plot Date: 05-Apr-2007; File Name: LKR_005.mxd

4.2 C-TRAN Transit Network

C-TRAN operates a fleet of 130 bus vehicles, with 26 routes (17 local routes and nine commuter/express routes). C-TRAN fleet maintenance occurs at the Administration, Operations and Maintenance (AOM) building in Vancouver. According to data from the National Transit Database, in 2005 C-TRAN logged approximately 303,195 annual revenue hours (231,191 for fixed route bus and 72,004 for paratransit services for seniors and people with disabilities).

The current C-TRAN transit network is the result of a service redesign that was adopted by C-TRAN in January of 2007 and fully implemented with minor modifications in November of 2007. In downtown Vancouver C-TRAN operates 10 local bus routes. Generally, these local bus routes operate at 15 to 60 minute headways in the peak and off-peak periods, on weekdays and weekends. See Exhibit 30 for a complete list of the local bus routes and their headways. Of these, local bus routes 4 – Fourth Plain, 37 – Mill Plain, and 71 – Highway 99 have the highest bi-state and local ridership. With C-TRAN's service redesign, Route 4 began extended service from Vancouver to the light rail station at Delta Park in north Portland. Route 4 also provides service to Hayden Island. While crossing the Columbia River, Route 4 currently operates in general purpose lanes in mixed traffic on I-5 in order to serve Hayden Island.

Within the project area, C-TRAN also operates three limited routes (44 – Fourth Plain Limited, 114 – Camas/Washougal Limited and 173 – Battle Ground Limited). These limited routes, which operate only during the peak period on weekdays, have a stop spacing of every one-half to one mile and therefore do not meet the CRC definition of a point-to-point express bus. The 4X is a limited stop version of the local bus route 4, with a peak period headway of 30 minutes. It crosses the Columbia River on I-5 general purpose lanes and facilitates a transfer opportunity to the light rail station at Delta Park, but does not stop on Hayden Island. The 114 and 173 also travel across the Columbia River and provide a transfer opportunity to light rail at Delta Park. These two routes both have peak period headways of 120 minutes.

4.2.1 C-TRAN I-5 Corridor

In the I-5 corridor C-TRAN's existing transit network also includes five express bus routes; the 105 – I-5 Express, 134 – Salmon Creek Express, 157 – Lloyd District Express, 190 – Marquam Hill Express, and the 199 – 99th Street Express. See Exhibit 30 for the headways of these existing express bus routes. Express bus service is defined as point-to-point service from Clark County park and ride lots (such as 99th Street and Salmon Creek) to central Portland with no intermediate stops. These express bus routes travel in general purpose lanes along I-5, except when operating in the afternoon peak northbound high-occupancy vehicle (HOV) lane on I-5 from Going Street to Marine Drive. Express buses operate on weekdays only and, except for the line 105, only during peak periods.

In Clark County two transit centers and three additional park and ride lots served by C-TRAN are used by people traveling within the I-5 corridor to central Portland. These are the Salmon Creek Park and Ride, the 99th Street Transit Center (which, with the service redesign, replaced the operational functions of the Seventh Street Transit Center downtown), the BPA Park and Ride, the Vancouver Mall Transit Center and the K-Mart Park and Ride. Together, these facilities provide a total of 1,368 park and ride spaces.

4.2.2 C-TRAN I-205 Corridor

In addition to express bus service over the Columbia River in the I-5 corridor C-TRAN's existing transit service includes limited and express bus service over the Columbia River in the I-205 corridor. These routes include the 65 – Parkrose Limited, 164 – Fisher's Landing Express, and the 177 – Evergreen Express. In the morning peak, routes 164 and 177 use I-205 to travel to downtown Portland; these routes return in the afternoon peak over I-5. Because these buses do not pick up or drop off passengers in the I-5 corridor they do not serve bi-state transit travel within the I-5 corridor and have therefore not been included in Exhibit 30. Route 65 provides a connection between east Vancouver and the Parkrose light rail station on the Blue Line into central Portland.

For transit service within the I-205 corridor, the existing transit facilities include the Fisher's Landing Transit Center (with 566 park and ride spaces) and the Evergreen Park and Ride lot (with 271 park and ride spaces).

4.3 TriMet Transit Network

Exhibit 29 above includes TriMet's existing transit operating characteristics and Exhibit 30 provides a summary of TriMet's existing transit service within the primary and secondary API. Exhibit 31 summarizes the existing transit facilities that are used for bi-state travel on I-5 between Clark County and Portland. The locations of these facilities are shown in Exhibit 32.

TriMet's transit network consists of a 44-mile, 64-station, light rail system shown in Exhibit 32 (including Interstate MAX, which extends from downtown Portland to the Expo Center, approximately two miles south of downtown Vancouver) with 103 light rail vehicles (LRVs). All LRV maintenance and repairs are carried out in two facilities – Ruby Junction on the east side of TriMet's service area and Elmonica on the west side. TriMet also currently operates 645 buses grouped into 18 fleets on 93 bus routes, paratransit service for seniors and people with disabilities, and facilities with advanced amenities and passenger information. TriMet's fixed route buses are assigned to one of three garages—Center Street or Powell Garage on the east side and Merlo Garage on the west side—where they are maintained and dispatched; a portion of the paratransit buses are maintained at a garage in the industrial district of Northwest Portland. According to data from the National Transit Database, in 2005 TriMet operated 2,727,571 annual revenue hours (1,873,568 hours for fixed route bus service; 438,290 hours for paratransit service; and 415,713 hours for light rail).

Within the primary API in North Portland, TriMet operates three local bus routes: line 6 – Martin Luther King Jr. Boulevard, line 8 – Northeast 15th Avenue and line 16 – Front Avenue/St. Johns. Route 6, which formerly provided bi-state service to the Seventh Street Transit Center in downtown Vancouver, travels along Martin Luther King Jr. Boulevard and across North Portland Harbor to Hayden Island. Route 8 provides service to

Middlefield east of I-5 and facilitates a transfer to Route 16 which travels along Marine Drive to the Rivergate area of Portland, stopping at the Expo Center light rail station. Routes 8 and 6 are frequent service lines and run at 15 minute peak and off-peak headways all day on weekdays and weekends. Route 16 operates at 30 minute headways in the morning and afternoon peaks only, and only on weekdays.

Within the primary API, TriMet also owns and operates the 5.8-mile Interstate MAX Yellow Line, which runs through North Portland and includes 10 stations between the Rose Quarter and its terminus at the Expo Center just south of North Portland Harbor. The Yellow Line runs at approximately 10 minute headways in the peak period and 15 minutes in the off-peak period on both weekdays and weekends.

Along the I-5 corridor in Portland there are currently two transit centers, and two additional park and ride lots that are served by TriMet and used by people traveling between Clark County and central Portland. These are the Expo Center park and ride, the Delta Park park and ride, and the Lombard and Rose Quarter Transit Centers. Together, these facilities provide a total of 604 park and ride spaces.

4.4 Existing Bi-State Transportation and Transit Conditions

4.4.1 Introduction

The following is a brief summary of the existing bi-state transportation and transit conditions within the I-5 corridor. For more information see the *CRC 2030 Transit Travel Markets Study (January 2007)* and the *CRC Draft Detailed Definition of Transit Alternatives Report (August 2007)*.

The I-5 crossing is utilized far beyond its designed vehicle throughput capacity and the highway and bridges fall short of current national design and safety standards. The two-bridge crossing, which served 30,000 vehicles per day in the 1960s, now carries more than 125,000 automobiles, buses, and trucks on an average weekday. While many of these trips are regionally-oriented (average trip length is 16 miles), it is estimated that approximately 70 to 80 percent of trips using the I-5 crossing enter or exit I-5 within a five-mile-long segment, creating intense congestion problems. This five-mile segment, known as the Bridge Influence Area (similar to the primary API) is between SR 500 in Washington and Columbia Boulevard in Oregon.

Within the Portland-Vancouver region, congestion in the Bridge Influence Area has an adverse affect on transit travel speed and service reliability. Between 1998 and 2005, local bus travel times between the Vancouver Transit Center and Hayden Island increased 50 percent during the peak period. Local buses crossing the I-5 bridge can take up to three times longer during parts of the morning peak compared to off-peak periods. On average, local bus travel times are between 10 and 60 percent longer when traveling in the peak direction.

Express buses, which also use I-5 to cross the Columbia River, experience congestion and incident-related delays. Express buses traveling southbound during the morning peak generally have travel times between 45 and 115 percent longer than express buses traveling during off-peak periods. Express buses traveling northbound during the afternoon peak have the advantage of using the northbound high-occupancy vehicle (HOV) lane; however, these buses still experience travel times between 35 and 60 percent longer than express buses traveling during the off-peak periods.

The following section describes the existing 2007 bi-state transit system using metrics that are similar to those used to compare the full alternatives in Section 5.2 and that are shown in Exhibit 28.[2]

4.4.2 Mobility, Reliability, Accessibility, Congestion and Efficiency

Exhibit 33 provides the existing transit vehicle average speeds in downtown Vancouver, and the travel delay in the I-5 corridor (defined here as from about Salmon Creek at 134th Street in Washington to downtown Portland) and the Bridge Influence Area. Exhibit 34 provides the existing person throughput of the I-5 crossing, with the combined vehicle capacity per peak hour and the total daily and annual passenger trips on transit.

In 2007, 19 standard 40-foot buses per hour (local and express bus routes) use I-5 to cross the Columbia River in the afternoon peak, in the northbound peak direction. This is the only type of transit vehicle that crosses the river on I-5 today. The local routes that travel in downtown Vancouver have an average travel speed of 8.3 mph. Over the afternoon peak (between 3:00 p.m. and 7:00 p.m. on weekdays) the buses that cross the Columbia River experience an average VHD of 11.2 hours in the I-5 corridor (over approximately 15 miles). VHD is the cumulative delay that all transit vehicles traveling on links with a volume to capacity (v/c) ratio of greater than 85 percent would experience during the time period. About 20 percent of the existing delay occurs within the five-mile Bridge Influence Area, which has a transit VHD of 2 hours. Due to congestion on I-5, the VHD that transit vehicles experience in the afternoon peak affects the overall reliability of transit, including the ability of the transit system to adhere to a published schedule.

[2] Some of *t*hese existing conditions are based on the 2005 transit networks, which are somewhat different from the 2007 Service Redesign. For example the 99th Street Express Bus (199) that would cross the Columbia River on I-5 was added with the Service Redesign. The number of buses over the river and the expected ridership on this route is not reflected in the 2005 data below.

Exhibit 33. Existing Transit Delay and Vehicles in the I-5 Corridor and Bridge Influence Area

Transit Characteristic	Metric	Existing Conditions
p.m. Peak Period Transit Vehicle Travel Speed in Miles Per Hour (MPH)	Downtown Vancouver	8.3 mph
Average Weekday p.m. Peak Period[1] Transit Vehicle Hours of Delay[2]	I-5 Corridor VHD	11.2 VHD
	Bridge Influence Area VHD	2 VHD
Total Transit Vehicles per Hour Over the Columbia River in I-5 Corridor (p.m. Peak Period/Peak Direction[3])	Standard 40-foot Buses	19
	Articulated 60-foot Buses	N/A
	LRT 90-foot Rail Cars	N/A
	Total	**19**

Source: 2006 CRC Transit Travel Time Survey, 2007 Travel demand forecasting outputs, C-TRAN and TriMet's 2007 published schedules

1 P.M. Peak Period: 3:00 p.m. to 7:00 p.m. weekdays

2 VHD is the cumulative delay experienced by transit vehicles on links with a v/c ratio greater than 85 percent during the time period.

3 P.M. Peak Direction: Northbound

As shown in Exhibit 34, the *2006 CRC On-Board Survey* observed that there are about 3,300 weekday daily transit passenger trips across the Columbia River in the I-5 corridor. This includes approximately 1,400 trips on C-TRAN's four express bus routes and 1,900 local bus trips. These daily trips result in about 928,000 annual trips on transit over the river. Currently, in the afternoon peak, 67 percent of persons crossing the river on I-5 northbound are in single-occupancy vehicles (SOV), 27 percent are in high-occupancy vehicles (two or more persons), and six percent are using transit.

Exhibit 34. Existing Person Throughput of the I-5 Columbia River Crossing

Transit Characteristic	Metric	Existing Conditions
Total Daily and Annual Transit Passenger Trips Over the Columbia River via I-5 (Bi-Directional)	Daily Express Bus and Local Bus	3,300
	Daily HCT	N/A
	Total Daily Transit Passenger Trips	**3,300**
	Annual Express Bus and Local Bus	928,000
	Annual HCT	N/A
	Total Annual Transit Passenger Trips	**928,000**
	Daily BRT/Bus Transfers from Clark County to TriMet Yellow Line	N/A
Peak Period/Peak Direction Mode Split Over the Columbia River via I-5 Between SOV, HOV and Transit	p.m. Peak Direction SOV	67 percent
	p.m. Peak Direction HOV	27 percent
	p.m. Peak Direction Transit	6 percent

Source: 2006 CRC On-Board Survey and 2007 travel demand forecasting outputs

1 P.M. peak period: 3:00 p.m. to 7:00 p.m. weekdays, p.m. peak direction is northbound

SOV – Single Occupancy Vehicle, HOV – High Occupancy Vehicle

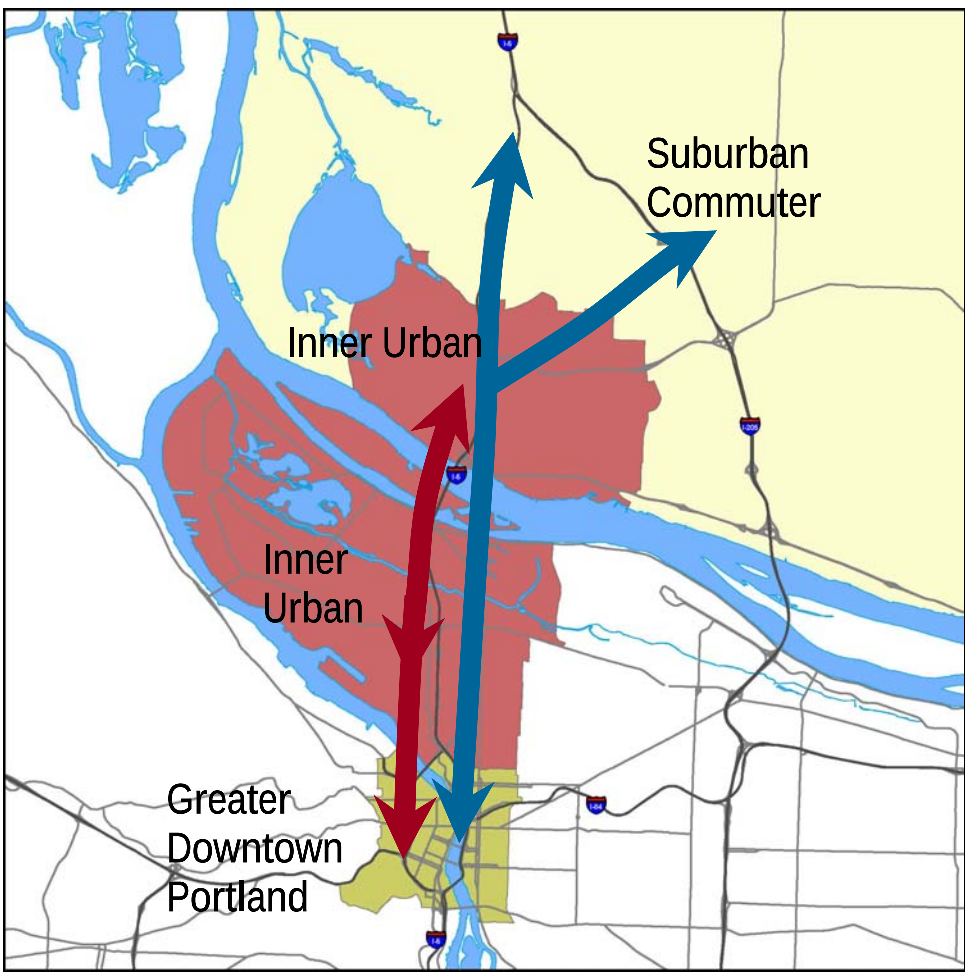
4.4.3 Existing Multimodal Transportation Choices

To determine the existing options for bi-state multimodal transportation choices the transit service provided in the study area was analyzed by target markets.

Two key transit markets, shown in Exhibit 35, have been identified for bi-state travel across the Columbia River (see the *CRC 2030 Transit Market Analysis*):

- **Inner Urban Market:** Local and intermediate distance trips between downtown Vancouver and downtown Portland, with destinations in those locations and in North Portland, Delta Park, Rivergate, Hayden Island and the inner urban areas in and around downtown Vancouver.
- **Suburban Commuter Market:** Long distance trips from Salmon Creek, east Clark County and outer Clark County to destinations in the inner urban market and downtown Portland.

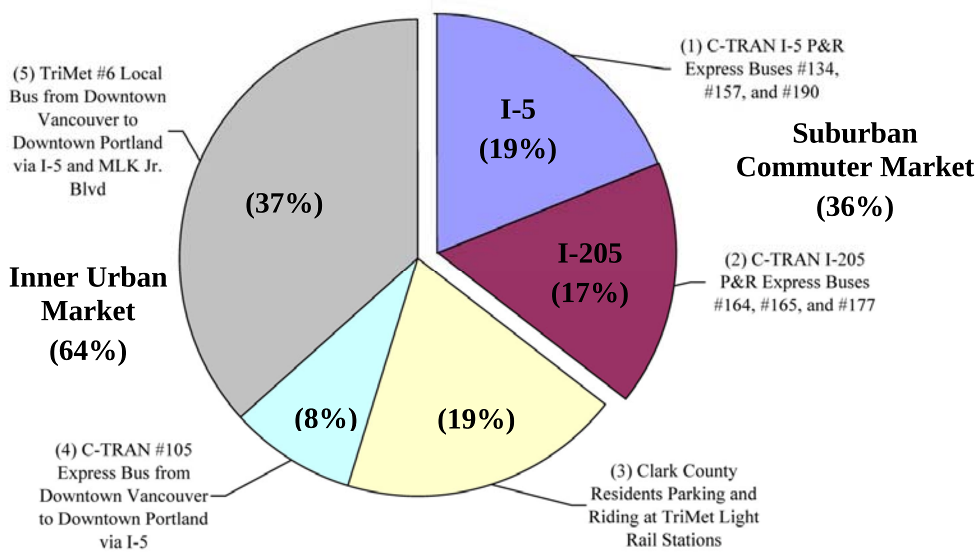
Exhibit 35. CRC Transit Travel Markets



The bi-state transit travel market analysis was supported by field observations and passenger counts on the C-TRAN and TriMet service networks in both the I-5 and I-205 corridors. Exhibit 36 shows the observed composition of the 2005-2006 daily bi-state transit trips from the *CRC On-Board Survey*. As shown, the inner urban transit market is 64 percent of today's bi-state transit patronage. It consists of 1,903 passengers riding on TriMet's route 6 (which has been replaced by C-TRAN's routes 4 and 4X with the 2007 Service Redesign), 438 passengers on C-TRAN's route 105, and 996 Clark County residents parking and riding at TriMet's MAX light rail stations.[3]

The suburban commuter transit market constitutes the remaining 36 percent of the total transit travel market in the corridor. It consists of 972 passengers riding C-TRAN's I-5 express bus routes 134, 157, and 190, and 866 passengers riding C-TRAN's I-205 express bus routes 164, 165, and 177.

Exhibit 36. 2005-06 Bi-State 24-hour Average Daily Transit Trips (Bi-Directional)

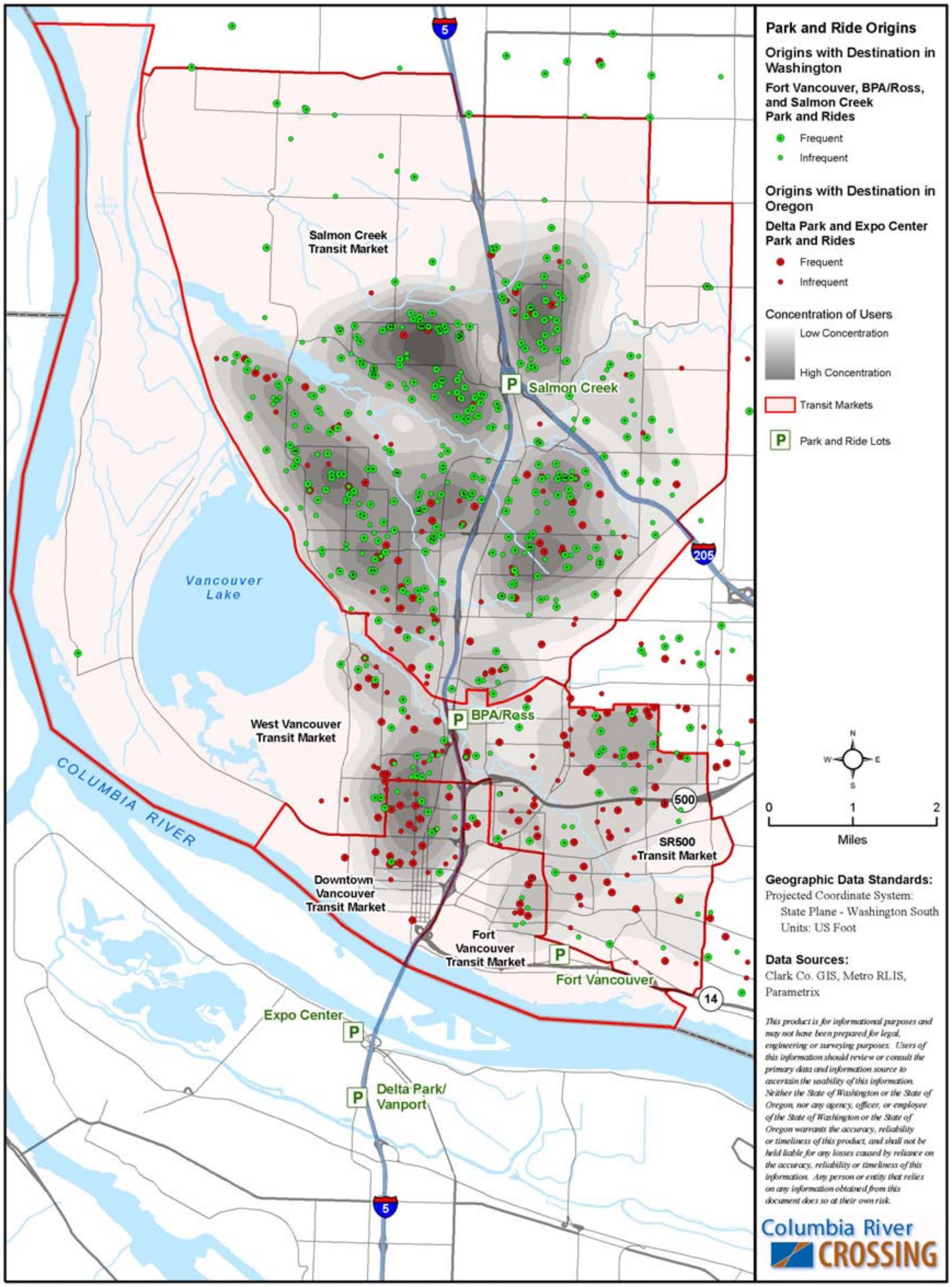


[3] This includes Clark County residents parking at the Delta Park and Expo Center park and ride lots in the I-5 corridor and the Parkrose and Gateway park and ride lots in the I-205 corridor and then riding MAX light rail.

Between March and June of 2006 the CRC project conducted a 12-week survey of license plates at Clark County and Oregon park and ride lots and collected 50,000 observations. From this survey, Exhibit 37 shows which Clark County park and ride lot is the origin of the existing bi-state transit trip in the I-5 corridor. Exhibit 37 also shows the points of origin of riders that frequently parked at the park and ride lot and those that were infrequent transit users. Within the Salmon Creek area, part of the suburban commuter market, the majority of people are parking in Clark County park and ride lots (such as Salmon Creek and BPA/Ross) and traveling across the river on C-TRAN's express bus routes. Within downtown Vancouver, and other areas within the inner urban market, a greater number of people drive across the Columbia River, park at the Delta Park or Expo Center lots, and use light rail for their transit trip. This geographic distribution of trip origins supports the division of the markets shown in Exhibit 36, where the 19 percent of bi-state transit trips of Clark County residents parking and riding at TriMet light rail stations is included as part of the inner urban market.

For the 2030 transit travel markets, modeling forecasts have been prepared and the trip origin and destination patterns between 15 districts within the regional study area (seven districts in Washington and eight in Oregon) have been analyzed. Generally, both today and in future land use forecasts, Clark County has more housing than jobs, which results in a relatively large number of Clark County residents commuting to employment in Portland across the Columbia River.

Exhibit 37. 2006 Observed Clark County Park and Ride Origins for Transit Trips



Analysis by: C.Hainey; Analysis Date: 12-June-2006; Plot Date: 11-July-2006 File Name: ParkandRideConcentrations-Combined.mxd

The existing bi-state transit service provided to target markets in the I-5 corridor is affected by the existing highway congestion. Exhibit 38 shows the average transit travel times on I-5 by segment and peak period direction (northbound for the afternoon peak and southbound for the morning peak). Average travel times are from observed travel times during the *2006 CRC Vehicle Survey on I-5*. This exhibit shows that southbound in the morning peak the total transit travel time between 39th Street in Clark County and Killingsworth in Portland is about 12 minutes, with the longest segment being between the I-5 bridge and Marine Drive. During the afternoon peak northbound the total transit travel time is over 14 minutes, with the longest segment travel time being between Marine Drive and Lombard Street – where the existing northbound HOV lane ends.

Exhibit 38. 2006 Average Peak Period/Peak Direction Transit Travel Times by I-5 Segment

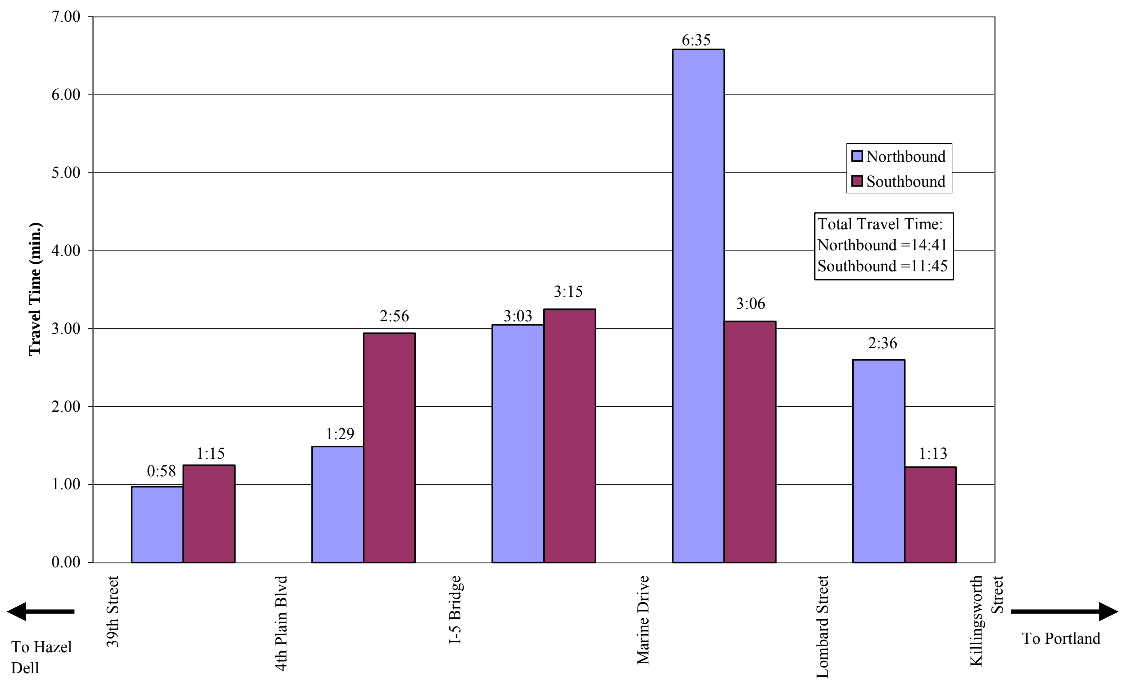


Exhibit 39 shows the transit level-of-service (LOS) values for each segment of I-5 in the study. The southbound highway segments north of the I-5 bridge all operate at LOS "F." Because the Delta Park bottleneck is in the middle of the segment from Marine Drive to Lombard Street there is less variability in the transit travel time, which is reflected with a LOS "E." All northbound highway segments south of the I-5 crossing operate at LOS "F." The segment from Fourth Plain Boulevard to 39th Street operates at LOS "E" due to the diverge bottleneck at SR 500 (near 39th Street). Otherwise, the travel times in the segment north of the I-5 crossing are not particularly variable, which confirms field observations that I-5 traffic generally travels at free-flow speeds north of the SR 14 interchange.

Exhibit 39. 2006 Peak Period/Peak Direction I-5 Reliability LOS by Segment

Peak Period[1]/ Peak Direction	I-5 Segment	Coefficient of Variability[2]	Transit LOS[3]
A.M. Southbound	39th Street to Fourth Plain Boulevard	1.06	F
	Fourth Plain Boulevard to the I-5 bridge	1.21	F
	I-5 bridge to Marine Drive	0.57	F
	Marine Drive to Lombard Street	0.42	E
	Lombard Street to Killingsworth Street	0.26	C
P.M. Northbound	Fourth Plain Boulevard to 39th Street	0.46	E
	I-5 bridge to Fourth Plain Boulevard	0.28	C
	Marine Drive to I-5 bridge	0.87	F
	Lombard Street to Marine Drive	1.71	F
	Killingsworth to Lombard Street	2.32	F

Source: 2006 CRC Vehicle Survey on I-5

1 a.m. peak period is defined as 6:00 a.m. to 10:00 a.m. and p.m. peak period is 3:00 p.m. to 7:00 p.m. weekdays.

2 As defined by the Transit Cooperative Research Program (TCRP) in the “Transit Capacity and Quality of Service Manual,” the coefficient of variability, c_v, as the ratio of the standard deviation of observed headways to the scheduled headways.

3 As defined by TCRP in the “Transit Capacity and Quality of Service Manual,” LOS is defined as the ratio of the standard deviation of observed travel time to the average off-peak travel time. Therefore, a LOS “F” value shows that the variation of travel times is very great when compared to the average. A LOS of “C” value shows the travel time does not vary much from the average, and therefore is more predictable than the LOS “F” value.

The existing transit service to the relevant transit markets is shown in Exhibit 40, which provides the existing transit travel times for a few representative pairs of the CRC transit markets, and Exhibit 41, which provides the existing daily transit mode split for the CRC transit markets.

The transit travel times include those for the northbound afternoon peak and the southbound morning peak. These transit travel times were provided by CRC’s VISSIM analysis of I-5 and Metro’s regional travel demand model for a specific transit route (as noted). On transit, to travel between Pioneer Square in downtown Portland and Salmon Creek on C-TRAN’s route 134 takes approximately 44 minutes in the two-hour afternoon peak and 36 minutes in the morning peak. Between the Lombard Transit Center and Vancouver Mall (via LRT and C-TRAN’s route 4L) the transit travel time is 48 minutes in the afternoon peak and 40 minutes in the morning peak. Finally, between Hayden Island and the 99th Street Transit Center (via LRT and C-TRAN’s route 71) the transit travel time is 35 minutes in the afternoon peak and 45 minutes in the morning peak.

As shown, the existing daily transit mode split between the Clark County Inner Urban Market and markets in Oregon is four percent. Between the Clark County Suburban Commuter Market and markets in Oregon the existing daily transit mode split is one percent, and the daily transit mode split from the markets in Oregon to Clark County (the reverse of the peak commute direction) is three percent.

Exhibit 40. Existing Average Weekday Total Transit Travel Times in the I-5 Corridor and Bridge Influence Area

Transit Characteristic	Metric		Existing Condition
Transit Travel Times from the Seven Clark County Transit Markets to the Five Major Transit Markets in Oregon for a Few Representative Pairs	Two-Hour P.M. Peak Period/Peak Direction[1]	Pioneer Square to Salmon Creek (via C-TRAN Route 134)	44.3 minutes
		Lombard Transit Center to Vancouver Mall (via LRT & Route 4L)	47.6 minutes
		Hayden Island to 99th Street Transit Center (via LRT & 71L)	34.5 minutes
	Two-Hour A.M. Peak Period/Peak Direction[2]	Salmon Creek to Pioneer Square (via C-TRAN Route 134)	36.4 minutes
		Vancouver Mall to Lombard Transit Center (via LRT & Route 4L)	30.7 minutes
		99th Street Transit Center to Hayden Island (via LRT & 71L)	39.5 minutes

Source: 2005 CRC VISUM analysis of I-5 and EMME/2

[1] P.M. Peak Direction: Northbound

[2] a.m. Peak Direction: Southbound

Exhibit 41. Existing CRC Transit Market Transit Mode Split

Transit Characteristic	Metric	Existing Conditions
Daily Transit Mode Split by Transit Market (Home Based Work Trips)	Clark County Inner Urban Transit Market to Markets in Oregon	4.5 %
	Clark County Suburban Commuter Market to Markets in Oregon	1.5 %
	Markets in Oregon to Clark County	5.6 %

Exhibit 42 shows the existing transit choices available in the I-5 corridor and the Bridge Influence Area. The metrics used to gauge opportunities to use transit are the percent of households and employment within one quarter-mile from a bus route or one half-mile from a high-capacity transit (HCT) station; these are the standard distances an individual will walk to access either a local bus route or HCT. The percent of households within walking distance of transit is the percent of residences (origins) within the walk distance radius. Equally important to determining whether a transit system provides the opportunity for people to choose transit is whether they can get to their intended destinations. This is reflected in the percent of employment within walking distance of transit.

Currently, 67 percent of households and 83 percent of employment within the four-county region (Clark County in Washington and Multnomah, Clackamas and Washington County in Oregon) are within one quarter-mile from a bus route.

Exhibit 42. Multimodal Transportation Choices in the Bridge Influence Area.

Transit Characteristic	Metric	Existing Conditions
Percent of Households and Employment with Access to Transit within 1/4 mile of Bus Lines and 1/2 mile of HCT Stations	Households in Region within 1/4 mile of bus route	67 percent
	Employment in Region within 1/4 mile of bus route	83 percent
	Clark County households within 1/2 mile of HCT station	0 percent
	Clark County employment within 1/2 mile of HCT station	0 percent

Source: 2005 Geographic Information System (GIS) analysis of regional households and employment and transit market mode split

4.4.4 Transit System Costs

Exhibit 43 shows the operating and maintenance costs of the existing transit system (that contributes to bi-state travel in the I-5 corridor), based on the existing weekday and annual platform hours and the weekday and annual vehicle miles traveled (VMT) for six categories of transit types. These transit types are: C-TRAN local buses, C-TRAN I-5 express buses, TriMet North Portland local buses, MAX LRT Yellow Line, C-TRAN's limited stop bus and BRT. (The transit system has been divided into these categories because they have different costs to operate.) The platform hours and VMT were estimated using the methodology described in Exhibit 26 and the existing annual operating costs are taken from C-TRAN's and TriMet's 2007 annual budgets.

To provide the existing bi-state transit service, the transit system requires a total of 2,483 weekday platform hours, with 25,883 vehicle miles traveled. This weekday service results in a total of 753,961 platform hours annually (an annual VMT of 7,804,685), with an associated annual cost to operate of just under $66,000,000.

Exhibit 43. Existing Transit System Operation and Maintenance Costs

Transit Characteristic	Metric		Existing Conditions
Weekday and Annual Platform Hours and Vehicle Miles Traveled and Annual Transit Operating Costs	**Weekday Platform Hours**		
	C-TRAN Local Bus		785
	C-TRAN I-5 Express Bus		291
	TriMet North Portland Local Bus		1,240
	LRT (Yellow Line)		135
	C-TRAN Limited Stop Bus		32
	BRT		N/A
		Total	**2,483**
	Annual Platform Hours		
	C-TRAN Local Bus		235,500
	C-TRAN I-5 Express Bus		73,623
	TriMet North Portland Local Bus		389,222
	LRT (Yellow Line)		47,520
	C-TRAN Limited Stop Bus		8,096
	BRT		N/A
		Total	**753,961**
	Weekday Vehicle Miles Traveled		
	C-TRAN Local Bus		10,281
	C-TRAN I-5 Express Bus		3,193
	TriMet North Portland Local Bus		10,833
	LRT (Yellow Line)		1,134
	C-TRAN Limited Stop Bus		442
	BRT		N/A
		Total	**25,883**
	Annual Vehicle Miles Traveled		
	C-TRAN Local Bus		3,084,300
	C-TRAN I-5 Express Bus		807,829
	TriMet North Portland Local Bus		3,401,562
	LRT (Yellow Line)		399,168
	C-TRAN Limited Stop Bus		111,826
	BRT		N/A
		Total	**7,804,685**
	Annual Operating Cost		
	C-TRAN Local Bus		$21,863,820
	C-TRAN I-5 Express Bus		$6,835,159
	TriMet North Portland Local Bus		$35,419,187
	LRT (Yellow Line)		$6,799,309
	C-TRAN Limited Stop Bus		$751,633
	BRT		N/A
		Total	**$65,719,349**

Source: 2007 C-TRAN TMS platform hour estimate and annual budget, and 2007 TriMet platform hour estimate and annual budget

4.4.5 Support of Local and Regional Transportation Plans

Six primary local and regional planning documents were reviewed to determine whether the existing transit system and service supports the transportation goals and policies in Oregon and Washington. Exhibit 44 rates how the existing transit system supports the goals and policies of these plans. The six local and regional plans that were reviewed are:

- The City of Vancouver's Vancouver City Center Vision (VCCV) Plan;
- Vancouver's Transportation System Plan (TSP);
- The Southwest Washington Regional Transportation Council's (RTC) Metropolitan Transportation Plan (MTP) for Clark County;
- The City of Portland's TSP;
- Metro's 2040 Growth Concept; and
- Metro's Regional Transportation Plan (RTP).

The VCCV Plan guides development in downtown Vancouver. The plan recommends implementing an HCT mode. Vancouver's TSP has a fundamental goal to support all travel modes and continue to build a walkable community. Vancouver's TSP identifies light rail as a strategic transportation option that should be considered during the development of a regional HCT system.

For Clark County, RTC has adopted the MTP which is the long-range transportation plan for the region. The MTP identifies future regional transportation system needs and outlines transportation plans and improvements necessary to maintain mobility and accessibility to land uses within and through the region.

In Portland, Metro's 2040 Growth Concept identifies Hayden Island as a Station Community, which is an area of development centered on a light rail or HCT station. Portland's TSP includes policies and objectives regarding the development of a public transportation system that conveniently serves city residents and provides travel to major destinations, such as station communities.

Metro's 2004 RTP sets a regional framework and identifies specific transportation projects and programs needed to improve choices for travel and create livable communities as envisioned in the 2040 Growth Concept. The RTP includes a regional public transportation system that would connect the existing light rail line at the Expo Center with a new light rail or rapid bus line.

Existing local and regional plans in Portland call for a light rail station on Hayden Island, which would connect Hayden Island to the rest of Portland, and an HCT system that would extend across the Columbia River to Vancouver. In Vancouver the existing local and regional plans look to implement an HCT system within downtown Vancouver and the I-5 corridor. Vancouver's TSP and Metro's 2040 Growth Concept, in particular, identify light rail as the HCT mode. Existing conditions, without HCT service to Hayden Island and Vancouver, do not support these plans and therefore rate low with this metric.

Exhibit 44. Supports Adopted Regional Transportation Plans

Transit Characteristic	Metric	Existing Conditions
Transit System and Service Supports Local and Regional Transportation Plans	Supports Vancouver’s TSP, the VCCV, RTC’s MTP, Metro’s 2004 RTP, Metro’s 2040 Growth Concept and Portland’s TSP	Low – Within the primary API there is no HCT mode that would support existing transportation plans.

MTP = Metropolitan Transportation Plan

RTP = Regional Transportation Plan

TSP = Transportation System Plan

VCCV = Vancouver City Center Vision

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5. Long-Term Transit Effects

This section addresses both direct and indirect long-term effects of the implementation of the project's segment and system-level choices upon transit in the CRC project study area for the design year 2030. For a discussion of the long-term effects associated with other elements of the physical environment, such as traffic impacts, land use, or air quality, please see those respective CRC technical reports. The information within this Chapter is supported by the *Final Definition of Transit Alternatives Report*.

5.1 Chapter Organization

This chapter describes the system- and segment-level choices that comprise the CRC project transit options. Compiled together, these options create the four full alternatives that include specific highway, transit, bicycle, pedestrian and other infrastructure improvements. This discussion focuses on how the specific system- and segment-level choices would affect corridor and regional transportation performance. First, Section 5.2 describes the system- and segment-level choices that comprise the No-Build and four build alternatives. Section 5.3 describes how the analysis in the subsequent sections will be presented, providing a framework for comparison of the system-and segment-level choices. Section 5.4 introduces the No-Build Alternative and discusses the impacts of "doing nothing;" the basis of this comparison is between the existing 2007 conditions and Alternative 1. Section 5.5 describes the impacts of the system-level choices, like HCT mode, upon transit. Section 5.6 presents the impacts on transit of the segment-level choices, like the type of crossing. This approach provides a comprehensive description and comparison of the long-term transit effects.

5.2 Description of System- and Segment-Level Choices and How They Are Structured Within the Project Alternatives

The four alternatives being considered for the CRC project consist of a diverse range of highway, transit and other transportation choices. Some of these choices, such as HCT mode choice, could affect transportation performance throughout the project area or beyond; these are referred to as "system-level choices." Options such as whether to build HCT on Washington Street or on a couplet on Washington and Broadway Streets, would have differences that are focused only on the area immediately surrounding that proposed change and have no measurable effect on regional impacts or performance; these are called "segment-level choices."

This report discusses the impacts from both the system- and segment-level choices, as well as the impacts of other choices like maintenance facilities. The full alternatives combine system-level and segment-level choices for highway, transit, pedestrian, and bicycle transportation. They are representative examples of how project elements may be combined; other combinations of specific elements are possible. Analyzing the full alternatives provides an understanding of the combined performance and impacts that would result from multimodal improvements spanning the bridge influence area. Exhibit 45 summarizes the structuring of the five full alternatives by system- and segment-level choices.

5.2.1 Transit System-Level Choices

System-level choices have a potentially broad influence on the magnitude and type of benefits and impacts produced by the CRC project. These choices may impact and influence transportation operations throughout the defined CRC project area; in addition they could affect regional transportation and other elements outside the project corridor. The system-level choices include:

- High-capacity transit (HCT) mode (bus rapid transit or light rail transit).
- Levels of transit operation (Efficient or Increased).
- Toll rate (no toll, standard toll I-5, high toll I-5, and standard toll I-5 and I-205).
- Location of northern terminus.

5.2.1.1 High-Capacity Transit Mode

Two types of HCT are being considered: bus rapid transit (BRT) and light rail transit (LRT). Both BRT and LRT would operate in an exclusive right-of-way through the project area, and are being evaluated for the same alignments and station locations. Both HCT modes have multiple alignment options and station locations that are segment-level choices and are discussed within Section 5.2.2.

- **BRT (Alternatives 2 and 4).** In general, the BRT guideway would extend from the existing Expo Center Station in North Portland into Vancouver terminating at either Kiggins Bowl or a new Lincoln Park and Ride located at the existing WSDOT maintenance facility (at 40th and Main Street), depending on the Vancouver or I-5 alignment. Forty-foot and 60-foot articulated buses, depending on the alternative, would operate in exclusive lanes, called the guideway, separated from other traffic. Crossing the Columbia River on a new bridge, the BRT guideway right-of-way width would be about 35 feet to accommodate transit vehicles operating in both directions, as well as a lane for potential break-downs. The right-of-way width along the remainder of the guideway in each direction would be about 33 feet, the same as LRT.
- **LRT (Alternatives 3 and 5).** In general, the LRT guideway would extend the existing MAX LRT Yellow Line that operates between downtown Portland and the Expo Center in North Portland across the Columbia River and into Vancouver, terminating at either Kiggins Bowl or Lincoln Park and Ride depending on the northern transit alignment. One and two car LRT trains would operate within an exclusive guideway (33 feet of right-of-way width along entire length) as a continuation of the TriMet MAX Light Rail Yellow Line between Vancouver and downtown Portland.

Exhibit 45. Transit System and Segment Level Choices

Level	Choice[1]	Full Alternative Choices: Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
System	**HCT Mode**	None	BRT	LRT	BRT	LRT
	Level of Transit Operation	Existing	Efficient	Efficient	Increased	Increased
	Toll Rate[2]	None	Standard Rate	Standard Rate[3]	Higher Rate	Higher Rate
	Location of Northern Terminus	N/A	Kiggins Bowl/Lincoln Park and Ride/Mill Plain Transit Center/Clark College Park and Ride	Kiggins Bowl/Lincoln Park and Ride/Mill Plain Transit Center/Clark College Park and Ride	Kiggins Bowl/Lincoln Park and Ride	Kiggins Bowl/ Lincoln Park and Ride
Segment	**Segment A1** ***River Crossing[4]***	Existing	Replacement or Stacked Transit-Highway Bridge	Replacement or Stacked Transit-Highway Bridge	Supplemental	Supplemental
	Segment A1 ***Bridge Crossing Transit Alignment***	N/A	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset
	Segment A2 ***Two-way or Couplet Transit Alignment***	N/A	Two-Way on Washington or Couplet on Broadway and Washington	Two-Way on Washington or Couplet on Broadway and Washington	Two-Way on Washington or Couplet on Broadway and Washington	Two-Way on Washington or Couplet on Broadway and Washington
	Segment B ***Northern Transit Alignment***	N/A	Vancouver/I-5	Vancouver/I-5	Vancouver	Vancouver

1 Modeling software used to assess each alternative's performance does not distinguish between smaller details, such as most segment-level transit choices.

2 In addition to standard and high toll rates, this report evaluates options that would toll only the I-5 river crossing and options that would toll both the I-5 and the I-205 crossings.

3 Alternative 3 was evaluated with the standard rate, but was also tested with three different tolling scenarios: non-tolling, standard toll I-5, high toll I-5, and standard toll I-5 and I-205. For more information on the tolling methodology see the Traffic Technical Report.

4 River Crossing is reported and analyzed within this Transit Technical Report as a segment-level choice because of the limited effect this choice has upon the transit performance.

5.2.1.2 Level of Transit Operation

The project analyzed Efficient and Increased levels of transit operation for both BRT and LRT and for some of their supportive local bus lines. The level of service chosen may differ from either of these choices. The Increased level of transit operation was created as a system-level choice to distinguish the effect that more transit capacity and operations would have upon the CRC Project Values.

- **Efficient Level of Transit Operation.** Alternatives 2 and 3 have an equilibrated level of service that would accommodate the demand projected for 2030 while meeting policy-level headways. Service levels are somewhat higher than in the No-Build.
- **Increased Level of Transit Operation.** Under the Increased level of service operation associated with Alternatives 4 and 5, transit service levels would be substantially higher than the No-Build Alternative and would increase the number of BRT vehicles or the number of LRT trains operating during the peak periods. This would reduce transit passenger wait times and increase transit ridership.

5.2.1.3 Tolling

Three toll rates were examined: no toll; a standard toll; and a higher toll, as detailed in Exhibit 46, (see the Traffic Technical Report for a more detailed explanation of these toll categories). To determine appropriate tolling levels for the alternatives, a sensitivity analysis was preformed with no toll, I-5 only toll, and tolls on both I-5 and I-205. State law in both Oregon and Washington allows the state to finance transportation improvements via tolls. The federal government imposes limits on tolling the Interstate Highway System, but a bridge project such as CRC, which will replace or significantly reconstruct the river crossing, can be financed by tolls. Washington has already embarked on using tolls to finance capital projects, employing toll-backed bonds as the primary resource to pay for the expansion of the Tacoma Narrows Bridge, for example. Tolling the bridge highway lanes would generate revenues that could help pay for the project, and would also have an impact on transit ridership and performance.

Exhibit 46. Tolling Rates used in Transit Modeling

	Peak Period		Off-Peak Period	
	Transponder	No Transponder	Transponder	No Transponder
No Toll	None	None	None	None
Standard Toll	$2.00	$2.25	$1.00	$1.25
Higher Toll	$2.50	$2.75	$1.00	$1.25

5.2.1.4 Location of Northern Terminus

In addition to the two full-length alignments for the HCT alternatives, with the terminus at Kiggins Bowl or Lincoln Park and Ride depending on alignment, there are two options that would terminate the HCT guideway further south than the full-length alignments (see

Exhibit 47). They are referred to as minimum operable segments (MOS); the HCT guideway would terminate either at the Mill Plain District Park and Ride or the Clark College Park and Ride. The MOS options would provide a lower cost alternative in the event that the full-length HCT guideway could not be funded in a single phase of construction and financing. Route maps are included in the *Final Definition of Transit Alternatives Report*.

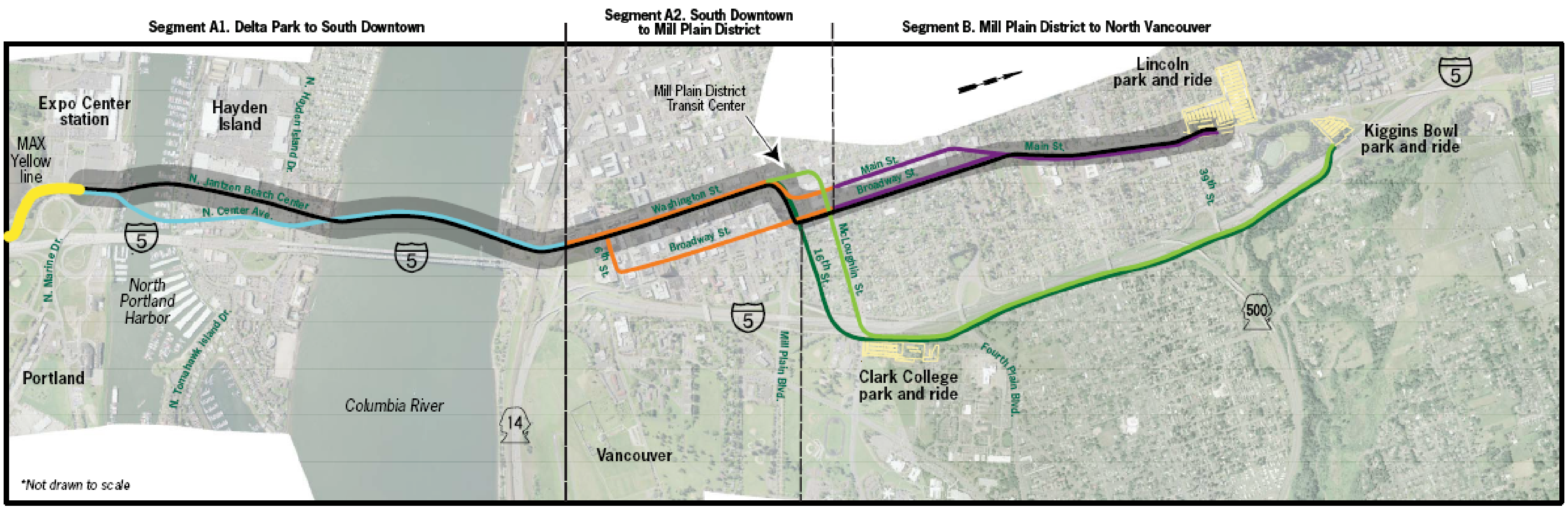
Exhibit 47. Northern Terminus Options

	I-5 Alignment	Vancouver Alignment
Full-length Alignment	Kiggins Bowl Park and Ride	Lincoln Park and Ride
MOS Alignment	Clark College Park and Ride or Mill Plain District Park and Ride	Mill Plain District Park and Ride

5.2.2 Transit Segment-Level Choices

Segment-level choices would have less significant impacts upon the project values than the system-level choices; for example, they would tend to only have a relatively small effect on system wide transit ridership. Exhibit 48 details how the transit and road segments are delineated. The segment-level choices typically accompany system-level choices; for instance, if the HCT mode system-level choice is made, the next decision could be a segment-level choice, like would HCT operate in both directions on Washington Street in downtown Vancouver or in a couplet along Broadway and Washington Streets. (Segment-level transit alignment and routing maps and can be found in the *Final Definition of Transit Alternatives*.)

Exhibit 48. Transit Segments and Design Options



Representative Alignment
Transit Segments

DESIGN OPTIONS

HAYDEN ISLAND TO DOWNTOWN VANCOUVER

N. Jantzen Beach Center, Replacement Downstream Bridge (Representative Alignment)
Travel beside Jantzen Beach SuperCenter to connect with new bridge west of existing bridge.

Along I-5, Replacement Downstream Bridge
Travel along I-5 near N. Center Avenue to connect with new bridge west of existing bridge.

DOWNTOWN VANCOUVER TO 16TH STREET/MCLOUGHLIN

Washington Two-way (Representative Alignment)
Northbound and southbound transit on Washington Street.

Broadway-Washington
Northbound transit on Broadway and southbound transit on Washington.

NORTH OF DOWNTOWN VANCOUVER

Vancouver High Capacity Transit Alignment

Broadway Two-way North (Representative Alignment)
On Broadway Street from McLoughlin to Main Street. Continues on Main Street to park and ride at 39th Street.

Broadway-Main
Northbound transit on Broadway Street and southbound transit on Main Street from McLoughlin to 29th Street. Two-way on Main Street from 29th Street to park and ride at 39th Street.

I-5 High Capacity Transit Alignment

16th St., Along I-5
Two-way transit travels on 16th Street to east side of I-5. Travels from Clark College, along I-5, to park and ride near Kiggins Bowl.

McLoughlin, Along I-5
Two-way transit travels on McLoughlin to east side of I-5. Travels from Clark College along I-5 to park and ride near Kiggins Bowl.

5.2.2.1 River Crossing Type

5.2.2.2 Transit Alignment Choices

Transit alignment choices are organized into three segments of the corridor, as shown in Exhibit 48. Within each segment the alignment choices can be selected relatively independently of the choices in the other segments. These alignment variations generally would not affect overall system performance but could have important differences in the impacts and benefits that would occur in each segment. These transit alignment choices will allow decision makers to determine how to package the components of the Locally Preferred Alternative independently of each other. Following is a description of the three segments and the choices that are under study within each segment.

- **Segment A1 – Delta Park to South Vancouver: River Crossing Type and Hayden Island Transit Alignment.**

  River Crossing Type. One segment-level choice is to retain and supplement the existing bridges; the other is to remove the existing bridges and replacement them with three new bridges.

  Replacement Bridge. The replacement river crossing option would remove the existing highway bridges across the Columbia River and replace them with three new parallel bridges – one for I-5 northbound traffic, another for I-5 southbound traffic, and a third for HCT, bicycles, and pedestrians. The replacement crossing would include three through-lanes and two auxiliary lanes for I-5 traffic in each direction. A second design option for the replacement bridge is the stacked transit/highway bridge, as described below.

  Stacked Transit/Highway Bridge. One option for bringing transit across the Columbia River is to include it on one of the new highway bridges to avoid building a third bridge, allow sharing of the foundations and reduce total width of the structures. To represent this option, the CRC project team has developed a design that would place HCT inside the structure supporting the highway lanes for the southbound replacement bridge. The multi-use path that would be alongside transit on the third bridge under the replacement and supplemental bridge scenarios would instead be placed under the deck of the northbound bridge on the east side and HCT would be placed under the deck of the southbound bridge.

  Supplemental Bridge. The supplemental river crossing option would build a new bridge downstream of the existing I-5 bridges, while retaining the existing I-5 bridges. The new supplemental bridge would carry southbound I-5 traffic and HCT, while the existing I-5 bridges would carry northbound I-5 traffic, bicycles, and pedestrians. The supplemental river crossing would include three through-lanes and one auxiliary lane for I-5 traffic in each direction.

- **Hayden Island Transit Alignment.** In Segment A1 there are two general transit alignment options under study: offset from or adjacent to I-5. An offset HCT guideway would place HCT approximately 450 feet west of I-5 on Hayden Island. An adjacent HCT guideway across Hayden Island would locate HCT immediately west of I-5. The final station design would be coordinated with the upcoming Hayden Island Master Plan to be conducted by the City of Portland.

- **Segment A2 – South Vancouver to Mill Plain District: Two-way on Washington or Couplet on Broadway and Washington Alignments.** In A2, HCT would touch down in downtown Vancouver just south of the intersection at Sixth Street and Washington Street with a replacement river crossing; with stacked transit/highway bridge, transit would touch down around Fifth Street. A supplemental crossing would push the touchdown north to Seventh Street. Once in downtown Vancouver, HCT has two alignment options– a two-way guideway on Washington Street or a couplet design with southbound HCT on Washington Street and northbound HCT on Broadway Street. Both options would have stations at Seventh Street, 12th Street, and at the Mill Plain Transit Center between 15th and 16th Streets.
- **Segment B – Mill Plain District to North Vancouver: Vancouver or I-5 Northern Transit Alignment.** In Segment B, from downtown Vancouver, the HCT alignment could either continue north on local streets or turn east and then north adjacent to I-5. Continuing north on local streets with the Vancouver alignment, HCT could either use a two-way guideway on Broadway Street or a couplet on Main Street and Broadway Street. At 29th Street, both of these options would merge to a two-way guideway on Main Street and end at the Lincoln Park and ride located at the current WSDOT maintenance facility at 41st Street.

  The I-5 alignment has two routing options from the Mill Plain station: head east on 16th Street and through a new tunnel under I-5, or head east on McLoughlin Boulevard and through the existing underpass beneath I-5. With either option, HCT would connect with the Clark College Park and Ride on the east side of I-5, then head north along I-5 to about SR 500 where it would cross back over I-5 to end at the Kiggins Bowl Park and Ride.

5.2.3 Full Alternatives

The four full alternatives represent combinations of system-level and segment-level choices described above. These alternatives have been assembled to represent the range of possibilities and total impacts at the project and regional level. Packaging different configurations of highway, transit, river crossing, tolling and other improvements helps to show how the performance and impacts of the system- and segment-level choices may be affected by changes in policy. For a more comprehensive discussion of the Alternatives, please refer to the *Final Definition of the Transit Alternatives*.

Alternative 1: No-Build Alternative

Alternative 1 is the project's No-Build Alternative, providing the project with a model of what would happen without the construction of the I-5 CRC project. The National Environmental Policy Act (NEPA) requires the evaluation of a No-Build or "No Action" alternative for comparison with the build alternatives. Alternative 1 would include the same reasonably foreseeable roadway and transit components included in the region's financially-constrained transportation system of the adopted RTPs, except for any CRC related improvements (these components are listed in detail in the *Final Definition of Transit Alternatives Report*). Under Alternative 1, C-TRAN's annual service hours would grow at approximately one percent to the year 2011, after which service would remain constant in terms of revenue hours delivered. As the No-Build Alternative, Alternative 1 provides a basis for comparing the build alternatives (Alternatives 2, 3, 4, and 5), and for understanding what would happen without construction of the CRC project.

Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll

Alternative 2 would include a replacement I-5 crossing and BRT; it has been analyzed with both the I-5 and full-length Vancouver transit alignments. This alternative would replace the existing I-5 bridges with three new bridge structures downstream of the existing crossing. These would carry Interstate traffic, BRT, bicycles, and pedestrians. There would be three through-lanes and two auxiliary lanes for I-5 traffic in each direction. Transit would include a BRT system that would operate in an exclusive guideway from either Lincoln or Kiggins Bowl Park and Ride in Vancouver to the Expo Center station, where riders could transfer to the existing light rail MAX Yellow Line. Some local buses would provide cross-river service utilizing the exclusive guideway. Other local bus service would be similar to Alternative 1 routing and service levels. Express bus service in the I-5 corridor would be equilibrated for future demand. This alternative would include a standard toll collected from vehicles crossing the Columbia River on the new I-5 bridge.

Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll

Alternative 3 would include a replacement I-5 crossing and LRT; it has analyzed with both the I-5 and Vancouver transit alignments. This alternative is similar to Alternative 2 in that it would replace the existing I-5 crossing with three new bridges downstream of the existing crossing. The principal difference between the two alternatives is the HCT mode. Where Alternative 2 is packaged with BRT, Alternative 3 is packaged with LRT; the alignment and station locations are the same within both alternatives. Transit operations, such as headways, would differ between alternatives, and the LRT guideway would connect to the existing MAX Yellow Line at the Expo Center station, providing a one seat ride from Vancouver to downtown Portland. Express bus service in the I-5 corridor would be equilibrated for future demand. Local bus service would be slightly modified, and three feeder routes would be added, to feed the LRT trunk line. This alternative would include a standard toll collected from vehicles crossing the Columbia River on the new I-5 crossing. The differences between Alternatives 2 and 3 are discussed within Section 5.5.1.

Alternative 4: Supplemental Crossing with BRT, Increased Level of Transit Service, and I-5 Higher Toll

Alternative 4 would include a supplemental bridge, BRT, and the Vancouver full-length alignment. This alternative would use the existing I-5 bridges for northbound Interstate traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and BRT. The existing I-5 bridges would be re-striped to provide two northbound lanes on each bridge structure and allow for an outside safety shoulder for disabled vehicles. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (eastern) bridge. Four southbound I-5 lanes (three through-lanes and one auxiliary lane) and BRT would be provided on a new downstream supplemental bridge. Operational details, such as headways, may differ, and the southbound BRT buses would turn around at the Expo station in Portland, where riders could transfer to the MAX Yellow Line. BRT service would be more frequent compared to Alternative 2. Express bus service and local and feeder bus service would also be increased to meet demand. This alternative would include a higher toll than Alternatives 2 and 3 to be collected from vehicles crossing the Columbia River on the new I-5 bridge.

Alternative 5: Supplemental Crossing with LRT, Increased Level of Transit Service, and I-5 Higher Toll

Alternative 5 would include a supplemental bridge, LRT, and the Vancouver full-length transit alignment. This alternative, as with Alternative 4, would use the existing I-5 bridge for northbound traffic, bicycles, and pedestrians. A new bridge would carry southbound Interstate traffic and LRT. As in Alternative 4, the existing I-5 bridges would be re-striped to provide two lanes on each bridge and allow for an outside safety shoulder for disabled vehicles. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (eastern) bridge. Four southbound I-5 lanes (three through-lanes and one auxiliary lane) and LRT would be provided on a new downstream supplemental bridge. LRT would have the same alignment options, station locations, and requirements as BRT in Alternative 4. LRT service would be more frequent, approximately 6.5 minute headways during the peak period, compared to 7.5 minutes with Alternative 3. Express bus service and local and feeder bus service would be increased significantly to serve the added transit demand. This alternative would include a higher toll than Alternatives 2 and 3. The differences between Alternatives 4 and 5 compared to Alternatives 2 and 3 are discussed within Section 5.5.2.

5.2.4 Future Choices

Within each alternative, there are other choices, like transit maintenance facilities and level of TDM and TSM, that have some impact on measures like ridership and capital cost. These items are consistent across the full alternatives (except when noted during the Clark College MOS discussion) so that direct comparisons can be drawn between the system- and segment-level choices.

5.3 Analysis Organization

Exhibit 49 summarizes the discussion of the system- and segment-level choices for the following metrics from the CRC Project Values.

Exhibit 49. CRC Project Values, Screening Criteria and Screening Measures

Value	Screening Criteria	Screening Measure
Mobility, Reliability, Accessibility, Congestion Reduction and Efficiency	Reduce travel times and delay in the I-5 corridor and within the Bridge Influence Area for transit modes.	P.M. peak transit vehicle travel speed in miles per hour (MPH) from selected corridor points along I-5.
		P.M. peak transit VHD from selected corridor points along I-5.
		Total transit vehicles per hour (p.m. peak direction) over the Columbia River within I-5 corridor.
	Improve person throughput of the I-5 Columbia River Crossing.	Total daily and annual transit trips over the Columbia River within I-5 corridor.
		Peak period/peak direction mode split between single-occupancy vehicles (SOV), high-occupancy vehicles (HOV) and transit for I-5.
Modal Choice	Provide for multimodal transportation choices in the I-5 corridor and within the Bridge Influence Area.	Percent of households and employment with access to transit within 0.25 mile of bus lines and 0.5 mile of HCT stations.
	Improve transit service to target markets in the I-5 corridor and within the Bridge Influence Area.	Transit travel times from the seven Clark County transit markets to the five major transit markets in Oregon.
Cost Effectiveness and Financial Resources[1]	Minimize the cost of construction.	Estimated transit capital costs.
		Estimated total capital, operations, and maintenance costs for each alternative package (National transit industry performance measures).
	Ensure transportation system maintenance and operation cost effectiveness.	Total HCT and Transit System operating costs as defined by the Transit Performance Calculation (annual platform hours[2], operating cost per passenger mile).
Bi-State Cooperation	Support adopted transportation plans.	Transit system and service supports local and regional transportation plans.

[1] Refer to the CRC DEIS, Financial Analysis chapter, for more information.

[2] Platform hours is the sum of revenue and deadhead transit service hours. Revenue hours are comprised of running time and layover/recovery time. Deadhead hours is the time that the vehicles travel when out of revenue service; this includes leaving or returning to the garage or yard facility, changing routes, and when there is no expectation of carrying revenue passengers.

5.3.1.1 Reliability and Travel Time

Several comparative exhibits are located in section 5.3.1.7 below. To capture the ability of each alternative to reduce travel times and congestion in the I-5 corridor Exhibit 50 compares the transit speeds within the guideway and the transit VHD. As stated in Section 4.4.2, VHD is the cumulative delay that all transit vehicles traveling on links with a volume to capacity (v/c) ratio of greater than 85 percent would experience during the time period. Exhibit 51 compares the number of transit vehicles and their combined vehicle capacity traveling over the Columbia River per peak hour in the afternoon peak direction. Exhibit 52 details the individual vehicle capacity by type of transit vehicle.

Exhibit 53 displays the travel time transit riders would experience to get to and from major destinations within the region. The transit systems' speed, amount of delay, and passenger trips (discussed under the heading of Ridership and River Crossings) reflect the alternative's reliability, congestion-reduction ability and efficiency.

5.3.1.2 Accessibility

Access is a function of where routes go and the HCT alignment. Exhibit 54 details the transit system accessibility of the Vancouver alignment. Except for the Hayden Island Station, the TriMet routing for all the build alternatives is the same and would have the same transit accessibility to households and employment in the region. The discussion of Accessibility is most revealing in the discussion within Section 5.6.4 where the transit alignment choice between I-5 and Vancouver is explored.

5.3.1.3 River Crossings and Ridership

Exhibit 55 provides information about transit person throughput of the I-5 crossing and Exhibit 56 shows the total annual transit trips over the I-5 crossing in 2030. Exhibit 57 shows the total daily transit system boardings for HCT (BRT or LRT), C-TRAN's system, and TriMet's North Portland system. River crossings are a good measure of the transit system's impact to move people through this bottleneck. Exhibit 58 shows the annual HCT boarding per annual HCT platform hour.

5.3.1.4 Mode Split

One way to reduce congestion on I-5 and increase the efficiency of the bridges over the Columbia River is to increase the number of passenger trips on transit (transit mode-split). By doing so, the total number of persons that cross over the river could increase without insignificant increases to the number of vehicles or the level of congestion. The transit market daily transit mode split is detailed within Exhibit 59 and the mode split over the I-5 crossing is detailed within Exhibit 60. Exhibit 61 shows a comparison of all trips taken on transit throughout the day in the bi-state transit market.

5.3.1.5 Transit System Costs

For transit capital cost estimates, unit costs were obtained from several different sources. The majority of unit costs were obtained from bid tabulations and schedules from local transit agencies in the Pacific Northwest. In some instances unit costs were developed from quotes for materials, labor and equipment in the Vancouver area. These unit costs have been compiled and documented with the *CRC Project Capital Cost Estimates*.

For the estimated transit capital costs of the build alternatives, it is Washington State Department of Transportation (WSDOT) policy to examine project costs through a Cost Estimate Validation Process (CEVP), rather than assigning a blanket contingency to the raw estimated costs of the entire project. The CEVP process assigns a cost escalation risk to each project element based on factors such as technical difficulty to complete and project scheduling. These risks are each assigned an associated dollar amount and a percent probability that they would occur. For more information, refer to: http://www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/Process/.

While the CEVP estimate provides a dollar amount using a contingency that is more closely related to individual project activities, it is important to note that this estimated number is not designed to be used for project financing. CEVP dollars are reported in Year of Expenditure (YOE), rather than in current dollars so the estimate depends heavily on construction scheduling. Also, the CEVP process reports a range of dollar amounts based on the probability of different factors. It is WSDOT policy to report the CEVP estimate based on a 10 percent chance of occurrence, which represents the most conservative estimate. Exhibit 62 shows the estimated transit capital cost for the full alternatives. Exhibit 62 also provides the annual HCT operating cost per HCT annual passenger, which has been determined by dividing the annual HCT operating cost by the annual number of passengers (detailed in Exhibit 55).

For the operating and maintenance costs, the CRC Transit Team worked jointly with TriMet and C-TRAN to develop the data for the proposed project alternatives. For each transit alternative, TriMet staff analyzed the HCT service and provided the estimated total operating and maintenance costs. The costs provided by TriMet included labor (such as operators, technicians and training) and materials/service (such as right-of-way expense and police services). For TriMet North Portland buses, the number of platform hours was determined by applying a factor to the vehicle hours traveled (VHT) from the 2030 travel demand forecasting outputs.

For the BRT routes, guideway buses, and C-TRAN local bus service, the CRC Transit Team worked with C-TRAN and used their scheduling program, The Master Scheduler, to create a detailed schedule for each transit alternative. With this schedule, The Master Scheduler determined the number of buses needed in the peak and off peak periods, which then provided the platform hours used to determine operating costs.

In addition, an annual Operating and Maintenance (O&M) cost model was developed (following the procedures presented in FTA guidance: Procedures and Technical Methods for Transit Project Planning, Federal Transit Administration, December, 2006, http://www.fta.dot.gov/planning/newstarts/planning_environment_2396.html) to estimate bus and bus-related costs using the following four steps: 1) develop O&M cost model for existing C-TRAN bus system, 2) apply productivity ratios for the each vehicle type (e.g., articulated buses) and service characteristics, 3) add expense line item unit costs for costs that are not part of current operations (i.e. BRT Stations), and 4) run the O&M cost model for the different alternatives to calculate the total O&M costs for each alternative.

Note that the FTA Cost Effectiveness Index (CEI) and other FTA Section 5309 New Starts Information has not been fully vetted with the FTA and, therefore, no assurances can be given that the alternatives considered, including the locally preferred alternative, would be eligible or competitive for New or Small Starts funding.

The operating and maintenance costs of the existing transit system are functions of the existing weekday and annual platform hours and vehicle miles traveled (VMT) for six categories of transit modes. These modes are: C-TRAN local buses, C-TRAN I-5 express buses, TriMet North Portland local buses, MAX LRT Yellow Line, C-TRAN's limited stop bus, and BRT. The transit system has been divided into these categories because each category has a different ratio of costs to platform hours and VMT. Exhibit 63 compares total transit weekday platform hours and the total transit annual operating costs for the full alternatives. Exhibit 51 shows the number of additional transit vehicles (the increment over the No-Build Alternative) that would be required to operate the alternative and would increase the O&M cost. Cost effectiveness indices (CEI) are noted in Exhibit 62 and are detailed in a series of bar charts, Exhibit 63 through Exhibit 65.

The CRC CEI measures the total annualized cost per transit guideway river crossing (Exhibit 63). This cost effectiveness measure directly relates to the CRC project in that it measures the cost (both capital and O&M) against the number of passengers using the transit guideway river crossing for their cross river trip. As defined in the *Final Definition of Transit Alternatives Report*, the purpose for the CRC project is to improve and reduce the congestion created by the bottleneck of the existing I-5 crossing; this CEI demonstrates how well the alternatives address the project purpose.

The No-Build Comparison CEI (Exhibit 64) measures the incremental transit cost per incremental transit passenger over No-Build (reported in YOE CEVP). This cost effectiveness measure reveals each alternative's ability to economically attract new transit ridership. It does not account for the benefit the existing riders would see from the implementation of a build alternative.

The Other CEI (Exhibit 65) measures the total annual incremental operating cost per place mile. Place mile is the annual seat and standing capacity of transit vehicles in operation multiplied by the annual VMT. This cost effectiveness measure reveals which alternative is most efficient providing additional transit capacity by dividing the annual incremental operating costs by total annual miles that all transit travels. This measure does not take into account the ridership on the routes provided, it simply measures the operational cost to the capacity provided.

5.3.1.6 Local and Regional Support

This section focuses on how choices perform regarding the CRC Bi-State Cooperation screening criterion. The metric evaluated is how the transit alternatives would support local and regional transportation goals and policies. Exhibit 66 details how each of the alternatives would rate with this comparison. Section 4.4.5 discusses the six primary planning documents for the analysis, which are:

- Vancouver City Center Vision (VCCV) Plan;
- Vancouver's Transportation System Plan (TSP);
- RTC's Metropolitan Transportation Plan (MTP) for Clark County;
- Portland's Transportation System Plan (TSP);
- Metro's 2040 Growth Concept; and
- Metro's Regional Transportation Plan (RTP).

5.3.1.7 Screening Measures

Exhibit 50 through Exhibit 66 present the raw data produced from the Screening Criteria discussed in Exhibit 49. These Exhibits are referenced throughout this Chapter.

Reliability and Travel Times: Exhibit 50 through Exhibit 53

Exhibit 50. Travel Speed and Delay in the I-5 Corridor and Bridge Influence Area by Alternative

Alternative Screening Measure	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System, and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
p.m. Peak Period[1] peak direction [2]Transit Vehicle Travel Speeds in Miles Per Hour (MPH)	Total Average	10	14.5	17.3	13.1	17.3
	Downtown Vancouver	7.5	9.6	12.9	7.5	12.9
Average Weekday p.m. Peak Period Transit Vehicle Hours of Delay[3]	Corridor VHD for Local/Express Bus	23.28	11.17	13.07	12.11	13.15
	Bridge Influence Area VHD for Local/Express Bus	10	0.97	0.73	0.42	0.49
	Bridge Influence Area VHD for HCT	0	.03	0	0	0

Source: 2007 CRC Evaluation of LRT travel speeds using simulator, 2007 CRC VISSIM analysis of BRT travel speeds, 2007 FDTAR service plan, 2030 Travel demand forecasting outputs

1 p.m. Peak Period: 3:00 p.m. to 7:00 p.m. weekdays

2 Peak direction: Northbound p.m. and southbound a.m.

3 VHD is the cumulative delay experienced by transit vehicles on links with a v/c ratio greater than 85 percent during the time period.

Exhibit 51. Transit Capacity – Vehicles and Passenger Capacity over I-5 River Crossing during the p.m. Peak Direction

Alternative Screening Measure	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System, and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
Total Transit Vehicles per Hour Over the Columbia River in I-5 Corridor (p.m. Peak Direction)	Standard 40-foot Buses	24	40	17	43	20
	Articulated 60-foot Buses	0	14	0	24	0
	LRT Two-Car Trains	0	0	8	0	10
	Total	**24**	**54**	**25**	**67**	**30**
Total Transit Vehicle Capacity per Hour Over the Columbia River in the I-5 Corridor (p.m. Peak Period/Peak Direction)	Combined Vehicle Capacity[1]	1,464	3,714	3,165	4,807	3,880

[1] Final capacity numbers based on FTA recommended standard of 3 persons per square meter.

Exhibit 52. Individual Vehicle Capacity by Type

Vehicle	Seats	Floor area for standees in square meters	Floor area for standees in square feet	Resulting number of standees at 3 per square meter	Total seats plus standees at 3 persons per square meter	Total seats plus standees at 2.7 persons per square meter (TriMet LRT standard for "achievable capacity")	Passenger Capacity per Vehicle
C-TRAN Express bus	43	6.14	65.9	18	61	N/A	61
C-TRAN Local bus	43	6.14	65.9	18	61	N/A	61
TriMet Light rail train (1-car train) [1]	64	25.5	274.5	77	141	133	133
TriMet Light rail train (2-car train)	128	51	549.0	153	281	266	266
TriMet Local Bus	39	6.7	71.9	20	59	N/A	59
BRT vehicle [2]	47	14.7	158	44	91	N/A	91

[1] LRT vehicle capacities based on TriMet system standard of 2.7 persons per square meter

[2] BRT vehicle capacities based on LTD's EmX seating-floor design specifications

Exhibit 53. Bi-State Transit Travel Times to Target I-5 Corridor Markets by Alternative

Alternative Screening Measure	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll[3]	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System, and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System and I-5 Higher Toll
HCT Transit Travel Times Using the Guideway (p.m. Peak Hour)	Northern Terminus to Expo Center	N/A	13.0	12.0	19.0	12.0
	Northern Terminus to Pioneer Square	N/A	43.4	39.9	47.4	39.9
	Downtown Vancouver (7th St. and Washington St.) to Pioneer Square	N/A	35.4	31.6	34.4	31.6
	Lombard Transit Center to Northern Terminus	N/A	22.7	17.5	26.7	17.5
Transit Travel Times from the Seven Clark County Transit Markets to the Five Major Transit Markets in Oregon	**Two-Hour p.m. Peak Period/Peak Direction**					
	Pioneer Square to Salmon Creek (C-TRAN route 134)	48.0	32.0	32.0	33.0	33.0
	Lombard Transit Center to Vancouver Mall (via LRT & 4L or 4G BRT)	56.6	40.1	38.8	46.3	36.3
	Hayden Island to 99th St. Transit Center (via LRT & 71L or 71GL BRT)	39.5	24.0	32.4	30.0	30.9
	Two-Hour a.m. Peak Period/Peak Direction					
	Salmon Creek to Pioneer Square (C-TRAN route 134)	55.9	50.9	50.9	50.9	50.9
	Vancouver Mall to Lombard Transit Center (via LRT & 4L or 4G BRT)	30.7	36.6	34.0	44.6	33.3
	99th St. Transit Center to Hayden Island (via LRT & 71L or 71GL BRT)	40.5	24.0	19.1	30.0	20.4

Accessibility: Exhibit 54

Exhibit 54. Household and Employment Access to Transit

Transit Characteristic	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System, and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
Percent of Households and Employment with Access to Transit within one quarter-mile of Bus Lines and one half-mile of HCT Stations	Households Region – one quarter-mile from bus route	60 %	60 %	60 %	60 %	60 %
	Employment Region – one quarter-mile from bus route	78 %	78 %	78 %	78 %	78 %
	Households Clark County – within one half-mile of HCT station	0	5 %	5 %	5 %	5 %
	Employment Clark County – within one half-mile of HCT station	0	11 %	11 %	11 %	11 %

Ridership and River Crossings: Exhibit 55 through Exhibit 58

Exhibit 55. Person Throughput Over the I-5 Columbia River Crossing by Alternative

Alternative Screening Measure	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System, and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
Total Daily and Annual Passengers on Transit Over the Columbia River via I-5 (Bi-Directional)	Daily Express Bus and Local Bus	8,800	11,300	2,200	13,800	2,700
	Daily HCT	0	5,400	18,600	6,000	20,500
	Total Daily Passenger Trips on Transit Over I-5 Crossing	**8,800**	**16,800**	**20,800**	**19,800**	**23,100**
	Annual Express Bus and Local Bus	2,508,000	3,227,000	552,000	3,938,000	679,300
	Annual HCT	0	1,601,000	6,121,000	1,764,000	6,731,000
	Total Annual Passenger Trips on Transit Over I-5 Crossing	**2,508,000**	**4,828,000**	**6,673,000**	**5,701,000**	**7,411,000**

Source: 2030 Travel demand forecasting outputs

SOV – Single Occupancy Vehicle, HOV – High Occupancy Vehicle

Exhibit 56. Total Annual Transit Trips Over the I-5 Crossing in 2030

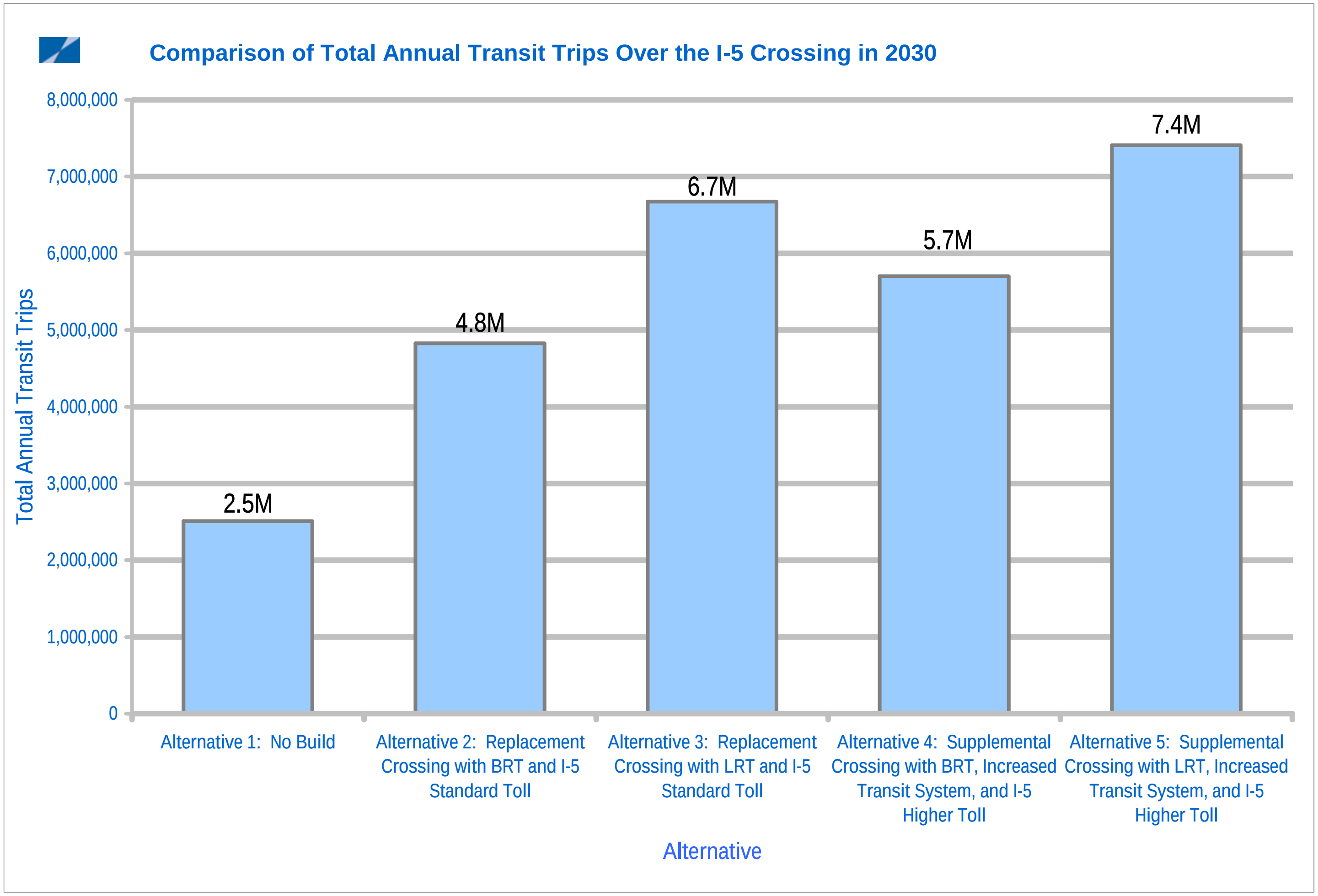


Exhibit 57. Total Daily Transit System Boardings by Alternative

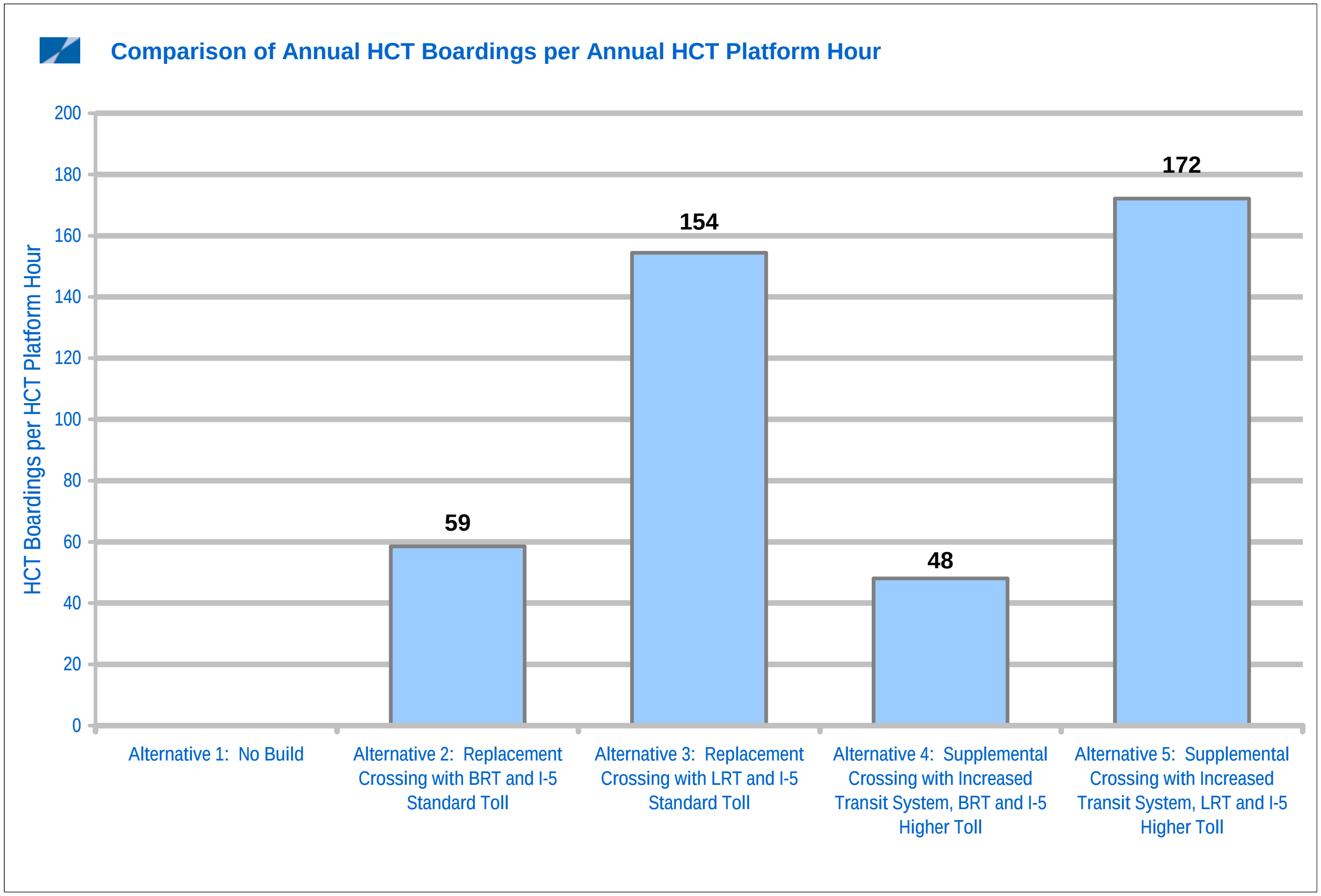
Characteristic	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System, and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
Total Daily Transit System Boardings	HCT Systems (LRT)	14,000	21,100	34,600	26,200	39,400
	C-TRAN System (includes BRT)	45,200	56,800	46,400	82,900	70,000
	TriMet North Portland System	82,500	97,900	94,800	114,500	110,400
	Total	**141,700**	**175,800**	**175,700**	**223,600**	**219,800**
Total Annual Transit System Boardings	HCT Systems (LRT)	4,619,000	6,939,000	11,377,000	8,613,000	12,964,000
	C-TRAN System (includes BRT)	12,776,000	13,473,000	13,359,000	20,798,000	2,0272,000
	TriMet North Portland System	25,250,000	29,958,000	29,006,000	35,040,000	33,797,000
	Total	**42,645,000**	**53,351,000**	**53,742,000**	**68,222,000**	**67,034,000**

Source: 2030 Travel demand forecasting outputs.

Transfers are considered a new boarding.

Columns may not total due to rounding.

Exhibit 58. Annual Incremental HCT Boarding per Annual Incremental HCT Platform Hour



Mode Split: Exhibit 59 through Exhibit 61

Exhibit 59. Daily Transit Mode Split by Transit Market

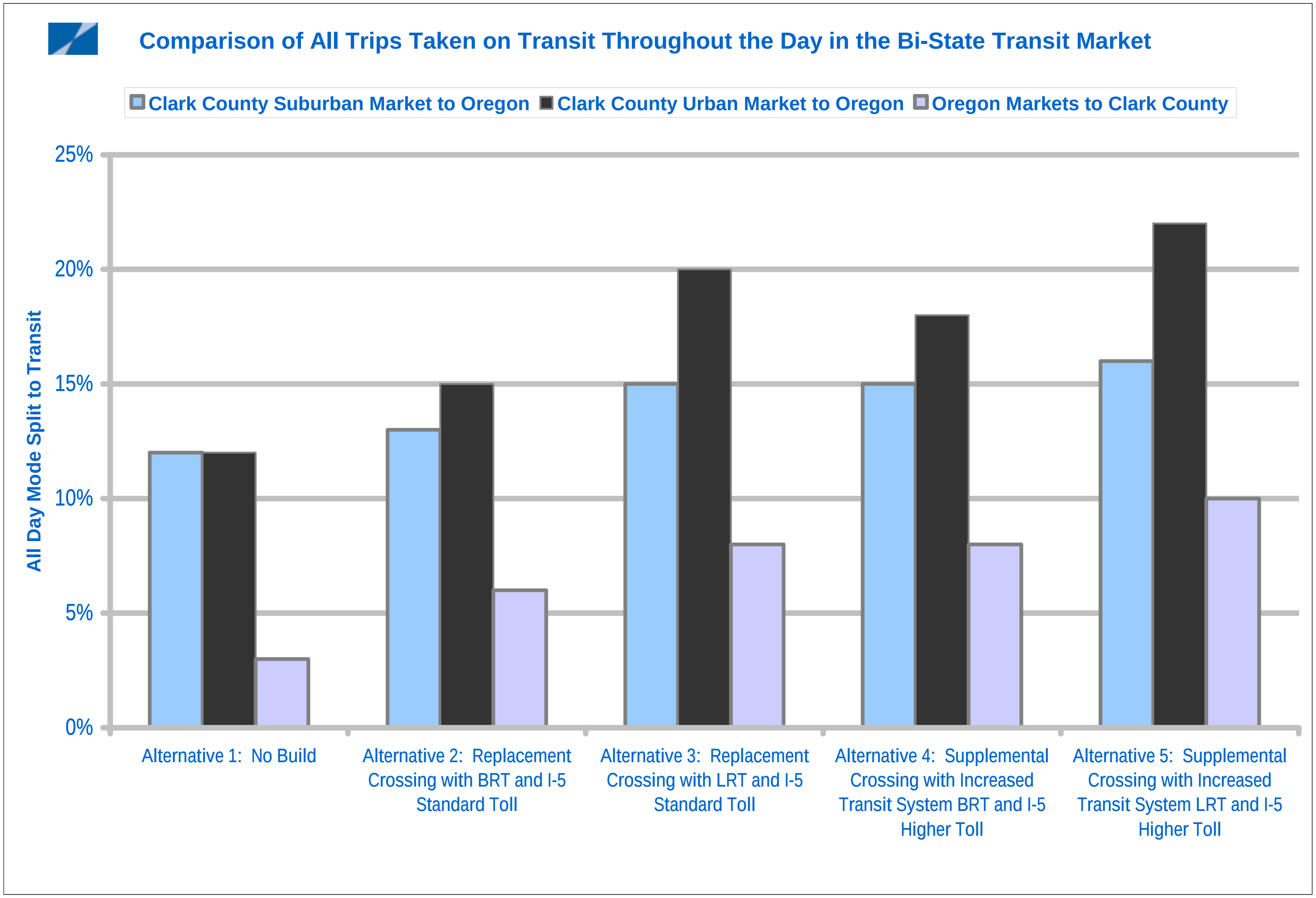
Transit Characteristic	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System and I-5 Higher Toll
Daily Transit Mode Split by Transit Market (All Trips)	Clark County Inner Urban Transit Market to Markets in Oregon	12 %	15 %	20 %	18 %	22 %
	Clark County Suburban Commuter Market to Markets in Oregon	12 %	13 %	15 %	15 %	16 %
	Markets in Oregon to Clark County	3 %	6 %	8 %	8 %	10 %

Source: 2007 CRC GIS evaluation of transit market daily transit mode split

Exhibit 60. Mode Split Over the I-5 Columbia River Crossing by Alternative

Transit Characteristic	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System and I-5 Higher Toll
Peak Period/Peak Direction Mode Split Over the Columbia River via I-5 Between SOV, HOV and Transit	p.m. Peak Direction SOV	54 %	53 %	50 %	44 %	41 %
	p.m. Peak Direction HOV	33 %	28 %	29 %	23 %	22 %
	p.m. Peak Direction Transit	13 %	19 %	21 %	33 %	37 %

Exhibit 61. Percentage of Daily Trips on Transit By Travel Market



Transit System Cost: Exhibit 62 through Exhibit 65

Exhibit 62. Capital Cost, Operating Cost and Cost Effectiveness Indices for 2030

Alternative Screening Measure	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System, and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
Platform Hours	Total Weekday Platform Hours	2,600	2,800	2,700	4,400	3,900
	Total Annual Platform Hours	798,700	850,800	823,000	1,322,000	1,185,000
Vehicle Miles Traveled	Total Weekday Vehicle Miles Traveled	30,800	32,700	31,800	50,100	47,700
	Total Annual Vehicle Miles Traveled	9,223,000	9,793,000	9,576,000	15,031,000	14,363,000
Place Miles	Total Annual Incremental Place Miles[1]	0	46,367,000	78,242,000	676,191,000	657,353,000
Estimated Transit Capital Cost in 2030[2]	**In Millions (YOE)**	**$0**	**$602.6 - $749.7**	**$783.1 - $940.8**	**$718.8 - $805.2**	**$879.1 - $975.7**
Estimated Transit Operating Cost in 2007 dollars	Total Transit Annual Operating Cost (2007 dollars)	$69,770,000	$75,071,000	$73,276,000	$114,379,000	$105,464,000
	Incremental Transit Annual Operating Cost Over the No-Build (2007 dollars)	**$0**	**$5,301,000**	**$3,506,000**	**$44,609,000**	**$35,694,000**
CRC Cost Effectiveness Index	Total Annualized Cost[3] per Guideway River Crossing	$0	$15.09	$11.55	$23.67	$16.58
No-Build Comparison Cost Effectiveness Index	Incremental Cost[4] per Incremental Passenger Over No-Build	$0	$25.93	$14.23	$11.31	$8.93
Other Cost Effectiveness Index	Total Annual Incremental Operating Cost per Place Mile	$0	$0.11	$0.04	$0.07	$0.10

[1] Place mile is the annual amount of seat and standing capacity of vehicles in operation multiplied by the annual VMT.
[2] The ranges were developed using the CEVP methodology described above in Section 5.3.
[3] Herein, Annualized Cost is defined as the total capital and operational cost of the project divided by the lifetime of the project.
[4] Both capital and O&M cost.

Columns may not total due to rounding.

Exhibit 63. CRC CEI: Total Annualized Cost per Transit Guideway River Crossing Incremental over No Build

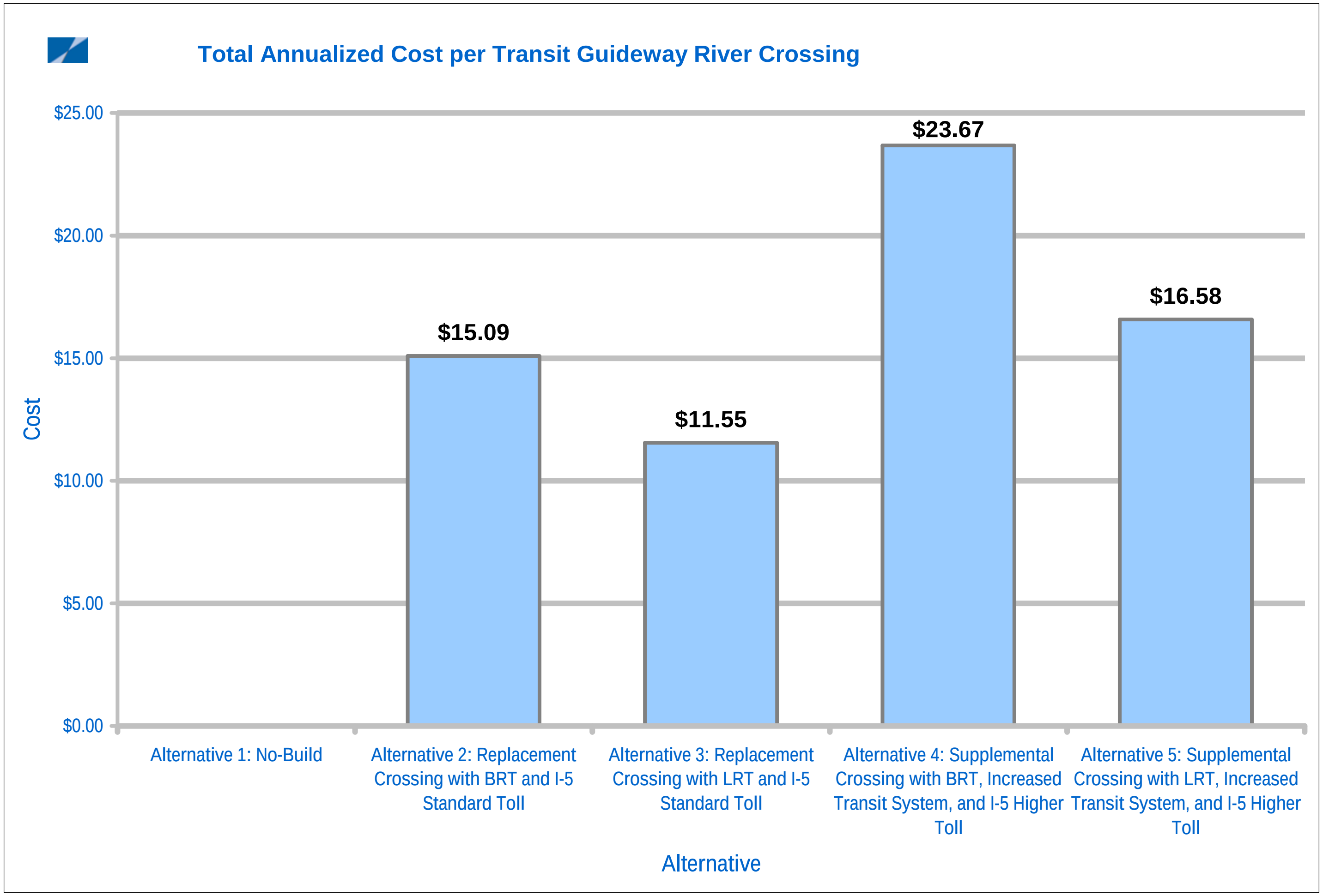


Exhibit 64. No-Build Comparison CEI: Incremental Cost per Incremental Transit Passenger over No-Build (YOE)

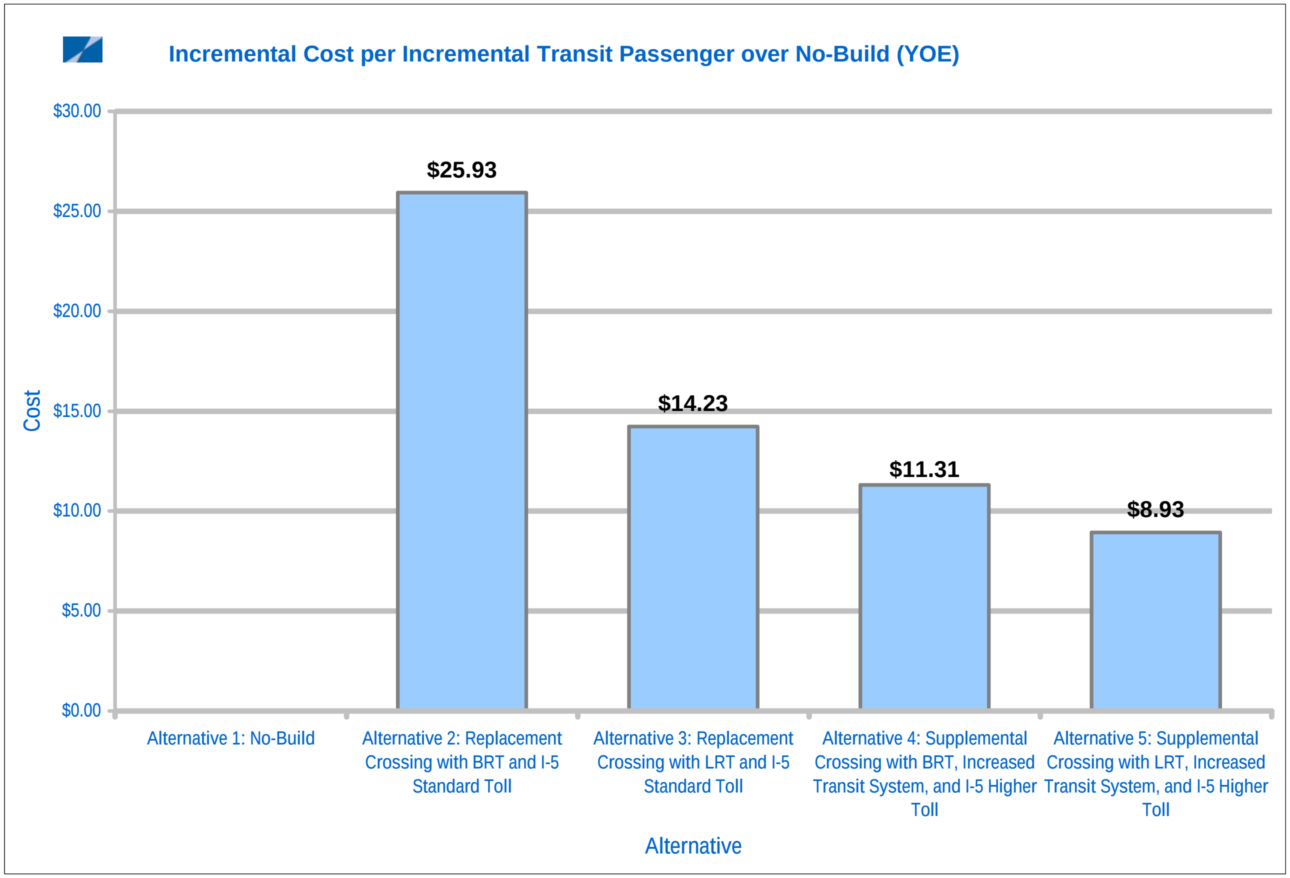


Exhibit 65. Other CEI: Total Annual Incremental Operating Cost per Place Mile

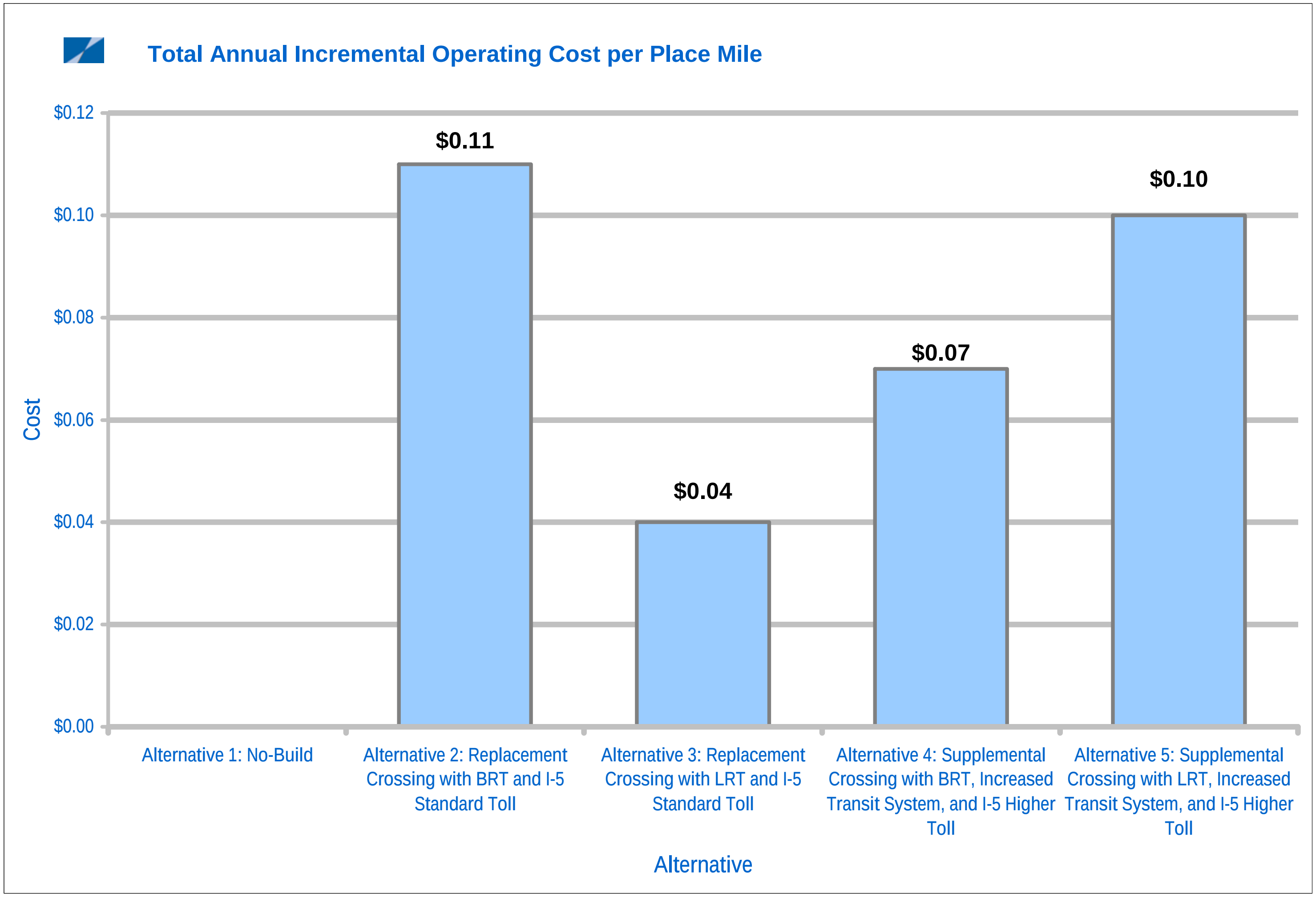


Exhibit 66. Support of Adopted Local and Regional Transportation Plans

Alternative Screening Measure	Metric	Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System, and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
Transit System and Service Supports Local and Regional Transportation Plans	Supports Vancouver's TSP and VCCV, RTC's MTP, Metro's 2040 Growth Concept and RTP, and Portland's TSP	Low – Does not include an HCT mode that would support adopted transportation plans.	Medium – Includes an HCT mode that would support adopted transportation plans. It is not the specific mode noted in some local plans.	High – Includes the HCT mode noted in some local transportation plans.	Medium – Includes an HCT mode that would support adopted transportation plans. It is not the specific mode noted in some local plans.	High – Includes the HCT mode noted in some local transportation plans.

5.4 How would transit change if the CRC project is not built?

This section discusses projected 2030 transit performance and conditions within the I-5 corridor as it compares to the existing conditions. For more information see the *CRC 2030 Transit Travel Markets Study*, and the *CRC Draft Detailed Definition of Transit Alternatives Report (August 2007)*. The existing conditions in the CRC project area are discussed in more detail in Chapter 4.

Compared to the build alternatives, the No-Build Alternative (for the 2030 forecast year) would:

- provide the fewest transit connections over the Columbia River,
- be subject to the most congestion as measured in VHD, and
- have the lowest person throughput as measured in daily and annual passenger trips on transit, vehicle capacity over the Columbia River and transit mode split.

5.4.1.1 Reliability and Travel Time

As detailed in Exhibit 51, if Alternative 1 (No-Build) were implemented, in 2030 Clark County and Portland would be connected by 24 forty-foot buses crossing the Columbia River in the corridor during the peak hour in the peak direction. The combined transit vehicle person-carrying capacity over the I-5 crossing would be 1,464 passengers during the afternoon peak hour. This would be an increase over the existing capacity of 1,045 passengers. Because buses would predominately use general-purpose lanes on I-5 when traveling between Oregon and Washington, bus service to Clark County would experience over 23 hours of VHD during the four-hour afternoon peak period, an increase of 12 VHD (nearly double the delay) above existing conditions. Ten VHD would occur in the Bridge Influence Area (five times 2007 delay), accounting for approximately 43 percent of the total corridor delay.

There would be no HCT in the Alternative 1 No-Build scenario. Generally, transit travel times during both the morning and afternoon peak two-hour period would increase from the current condition, as seen in Exhibit 67. For instance a transit trip from Salmon Creek Park and Ride to Pioneer Square on C-Tran Route 134 would increase during the two-hour morning peak period/peak direction from 36.4 minutes to 55.9 minutes, an increase of nearly 20 minutes.

Exhibit 67. Existing Average Weekday Total Transit Travel Times in the I-5 Corridor and Bridge Influence Area

Transit Characteristic		Metric	Existing Condition	Alternative 1: No-Build
Transit Travel Times from the Seven Clark County Transit Markets to the Five Major Transit Markets in Oregon for a Few Representative Pairs	Two-Hour p.m. Peak Period/Peak Direction[1]	Pioneer Square to Salmon Creek (via C-TRAN Route 134)	44.3 minutes	48.0 minutes
		Lombard Transit Center to Vancouver Mall (via LRT & Route 4L)	47.6 minutes	56.6 minutes
		Hayden Island to 99th Street Transit Center (via LRT & 71L)	34.5 minutes	39.5 minutes
	Two-Hour a.m. Peak Period/Peak Direction[2]	Salmon Creek to Pioneer Square (via C-TRAN Route 134)	36.4 minutes	55.9 minutes
		Vancouver Mall to Lombard Transit Center (via LRT & Route 4L)	30.7 minutes	30.7 minutes
		99th Street Transit Center to Hayden Island (via LRT & 71L)	39.5 minutes	40.5 minutes

Source: 2005 CRC VISUM analysis of I-5 and EMME/2

[1] P.M. Peak Direction: Northbound

[2] A.M. Peak Direction: Southbound

5.4.1.2 Accessibility

Within the region (Clark County in Washington, and Multnomah, Clackamas, and Washington in Oregon), 67 percent of households and 83 percent of employment are currently within walking distance (one-quarter mile) of a bus route. In the No-Build Alternative, HCT service would not be provided across the river and in Clark County. However, the C-TRAN and TriMet local bus service would be very similar to the local bus service provided with the build alternatives. Consequently, for this alternative and the build alternatives, 60 percent of households and 78 percent of employment in the region would be within one-quarter mile of transit routes in 2030 (see Exhibit 54). The proportion of households and employment near transit would slightly decline for the 2030 forecast year due to anticipated development in suburban Clark County that would be less dense and therefore not typically within walking distance of a bus route.

5.4.1.3 River Crossings and Ridership

As detailed in Exhibit 55, in 2030, if the No-Build Alternative were implemented, the total passenger trips on transit over the I-5 crossing would be about 2.5 million annually (about 8,800 daily); nearly three times the 2007 number of passenger trips.

In 2030, total annual transit system boardings would increase by more than half to 42.6 million boardings on both the C-TRAN and TriMet transit systems under the No-Build Alternative (see Exhibit 57). Generally, both today and in future land use forecasts, Clark County has more housing than jobs which results in a relatively large number of Clark County residents commuting across the Columbia River to employment in

Portland. Total daily transit system boardings in 2030 would be around 142,000, which would include trips on LRT, the C-TRAN bus system, and the TriMet North Portland system. Bus transfers for trips from Clark County to TriMet's Yellow Line would be around 1,400 daily.

5.4.1.4 Mode Split

In 2030, with the No-Build Alternative, the daily transit mode split between the Clark County Inner Urban Transit Market and Oregon Urban Transit Market would increase from six to 12 percent as shown in Exhibit 68. The daily transit mode split between the Clark County Suburban Commuter Market and the Oregon Urban Transit Market would increase from three percent to 12 percent with the No-Build Alternative. Daily transit mode split from markets in Oregon to Clark County would increase from one percent to three percent. As detailed with Exhibit 60, transit mode-split would be 13 percent of the afternoon peak direction trips (up from 7 percent in 2007) in the I-5 corridor. This compares to 54 percent SOV and 33 percent HOV mode-split. In 2030 more people would rely on transit for their daily trips around the region with the No-Build Alternative.

Exhibit 68. CRC Transit Market Transit Mode Split: Existing and 2030

Transit Characteristic	Metric	Existing Conditions	Alternative 1: No-Build
Daily Transit Mode Split by Transit Market (All Trips)	Clark County Inner Urban Transit Market to Markets in Oregon	6 %	12 %
	Clark County Suburban Commuter Market to Markets in Oregon	3 %	12 %
	Markets in Oregon to Clark County	1 %	3 %

5.4.1.5 Transit System Costs

Alternative 1 (No-Build) would not have transit capital cost associated with the CRC project, as shown in Exhibit 62. The transit system would provide about 2,600 weekday platform hours (with about 30,800 vehicle miles traveled), a seven percent increase. This weekday service results in nearly 800,000 platform hours annually (annual VMT of about 9.2 million), with an associated annual operating cost of about $69.8 million, an increase of $4.1 million over 2007.

5.4.1.6 Local and Regional Support

As described within Exhibit 66, the No-Build Alternative does not include an HCT component, which is called for in the VCCV, the RTP, the MTP, and both TSPs. In addition, the 2040 Growth Concept identifies Hayden Island as a station community; an area of urban activity centered on a transit station. The No-Build Alternative has been rated low for this metric for how it neglects to address the components of local and regional transportation plans.

5.5 How would transit change with the transit system-level choices?

This section compares the transit system-level choices. Effects of the system-level choices were modeled using the full alternatives described in Section 5.2.3. System-level options relevant to transit include:

- **HCT mode**: The HCT mode choice compares the impacts from a BRT or LRT transit system by comparing Alternative 2 (BRT) and Alternative 3 (LRT). These alternatives are very similar; they were both modeled with a replacement crossing downstream from the existing bridges, the same number of traffic lanes, a standard toll, and very similar bus routing. For this HCT analysis, they were both modeled with the Vancouver alignment, a northern terminus at the Lincoln Park and Ride, and very similar bus networking.
- **Level of transit operation**: The level of transit operation compares the impacts between the Efficient and Increased level of transit service levels using Alternatives 2 and 3 for the Efficient transit level and Alternatives 4 and 5 for the Increased transit level. These Alternatives have several variables that do not pertain to level of service; Alternatives 2 and 3 include a replacement crossing whereas Alternatives 4 and 5 were analyzed with a supplemental crossing. Although the bridge crossing choice for the greater CRC project is a system-level choice, for the transit comparison the bridge crossing choice is a segment-level choice. Segment-level choices have little impact within the greater corridor and study area, but do have impacts along the segment. Alternatives 2 and 3 were modeled with a standard toll rate and the Alternatives 4 and 5 were modeled with a high toll rate. The impacts of the toll rate are discussed below within Section 5.5.3. Transit operation levels are compared based on the full-length Vancouver alignment terminating at the Lincoln Park and Ride.
- **Toll rate**: The toll rate discussion centers around a sensitivity analysis that was completed for Alternative 3 (LRT Vancouver full-length alignment) with three different tolling scenarios. Segment-level choices are consistent for all tolling analysis.
- **Location of northern terminus**: This compares the full-length alignments with the minimum operable segments (MOS). The analysis is primarily associated with LRT as the HCT mode, with four northern terminal scenarios. The first discussion is between the full-length Vancouver alignment, with a terminus at Lincoln Park and Ride (Alternative 3), and the Mill Plain MOS, with a terminus between 15th and 16th Streets. The second discussion compares the full-length I-5 alignment, with a terminus at the Kiggins Bowl Park and Ride, and the Clark College MOS, with a terminus east of I-5 and north of McLoughlin Boulevard. This discussion uses LRT as the representative HCT mode.

5.5.1 How would transit mode choices affect transit?

This section compares BRT and LRT to distinguish the effects of the HCT mode choice. Alternative 2 and Alternative 3 are the representative BRT and LRT mode choices. The two alternatives have the same alignments, station locations, similar local and express bus routing, the same standard toll rate, and replacement crossing, allowing a comparison of performance differences attributable to mode choice.

5.5.1.1 Reliability and Travel Time

Reliability and travel times were determined by analyzing transit vehicle hours of delay (VHD), travel speeds for BRT and LRT vehicles, and overall transit travel times between major destinations. Vehicle hours of delay (VHD) measures the cumulative delay experienced by transit vehicles on roadway links with volumes of traffic over 85 percent of the roadway link's capacity (v/c ratio over 0.85). VHD provides an approximation of congestion which is an indicator of transit reliability.

As shown in Exhibit 50, the LRT alternative would have less transit VHD in the Bridge Influence Area, while the BRT alternative would have less VHD in the larger I-5 corridor. Within the Bridge Influence Area, local and express bus surface VHD associated with LRT would be 43 about minutes – 25 percent less VHD than associated with BRT. However, within the I-5 corridor, during the afternoon peak, local and express buses would experience about 15 percent less VHD (11 minutes of VHD in Alternative 2 compared to 13 minutes in Alternative 3) with the BRT alternative. This is because in addition to the BRT routes, seven local and limited stop bus routes would use the guideway, and would have no VHD there. With LRT, local and express buses would use general traffic lanes and experience greater VHD. Although the BRT vehicles in the exclusive guideway would be slower than trains in either LRT alternative, the slower speed would not be considered delay in Alternative 2. This is because bus volumes would not exceed 85 percent of v/c ratio on the guideway, which is VHD definition of delay.

LRT would have somewhat faster vehicle travel speeds than BRT (see Exhibit 50). Within the guideway, LRT would have average speeds of 17.3 mph, versus 14.5 mph for BRT, and average speeds in downtown Vancouver of 12.9 mph, versus 9.6 mph for BRT. BRT would be slower than LRT because BRT vehicles would not have signal priority, there would be more variation in operator performance, dwell times would be slightly longer, and acceleration would be slower. Signal priority in downtown Vancouver would not be possible for BRT because the high service frequencies would significantly disrupt cross traffic flow.

As shown in Exhibit 53, travel time between major markets would generally be faster for the LRT alternatives. During the peak hour, LRT would travel from the Lincoln Park and Ride to the Expo Center station in 12 minutes versus 13 minutes; from Lincoln Park and Ride to Pioneer Courthouse Square in downtown Portland in 39.9 minutes versus 43.4 minutes; and between downtown Vancouver and Pioneer Courthouse Square in 31.6 minutes versus 35.4 minutes. Although slower guideway speeds account for some of the slower travel times for BRT, the required transfer for BRT passengers wanting to travel south of Expo Center adds five minutes of waiting to peak period trips (see Exhibit 69).

During the two-hour morning and afternoon peak-period/peak-direction trips, the only location where the BRT alternative would be quicker than the LRT alternative would be for the trip from Hayden Island to the 99th Street Transit Center. This would occur because the BRT transfer would occur at the Expo Center and the BRT passengers would have a one-seat ride from Hayden Island to the 99th Street Transit Center because the BRT and local buses would extend outside of the exclusive guideway along their routes. The LRT alternative would require a transfer at the Lincoln Park and Ride to local bus service for the remainder of the trip to the 99th Street Transit Center.

5.5.1.2 Accessibility

Transit accessibility from households and employment would not differ based on the transit mode choice. Exhibit 54 shows the percent of Clark County households with transit access based on proximity to transit service. Alternative 2 provides the same access to the transit markets as Alternative 3, so the lower cross-river ridership for the BRT alternative compared to LRT is based on a factor other than accessibility.

5.5.1.3 River Crossings and Ridership

This section discusses the capacity, transit ridership, transit river crossings, and transfer characteristics of the different modes as represented in Alternatives 2 and 3.

5.5.1.3.1 Capacity

Transit capacity across the Columbia River is a factor of vehicle capacity and frequency of service across the river. As shown in Exhibit 52, standard buses can carry up to 61 passengers, BRT vehicles can carry up to 91 passengers, and two-car LRT trains can carry up to 266 passengers. The types of vehicles and frequency of service determine the river crossing transit capacity of each alternative.

Exhibit 51 shows the transit capacity over the Columbia River in the I-5 Corridor during the afternoon peak hour. The build alternatives more than double the transit capacity provided in the No-Build. Due to the frequency of service, BRT would provide more transit capacity over the river than LRT. Alternative 2 would provide a combined capacity for about 3,700 transit passengers over the Columbia River in the afternoon peak hour in the peak direction (14,800 persons in a four hour peak period) on BRT, local service, and express buses. In comparison, Alternative 3 would provide a combined capacity for about 3,100 transit passengers in the afternoon peak hour in the peak direction (12,600 persons in a four hour peak) on LRT and express buses.

Although Alternative 2 would provide more passenger capacity across the river than Alternative 3; it would be easier to expand capacity if needed using LRT than BRT. Congestion associated with adding more BRT buses to the guideway is significant and would impact reliability, travel speed, and travel time of the BRT. See the travel times discussion for Alternative 4 in the level of transit service discussion below. At the same time, decreasing the headways for the LRT to the Increased transit operations levels would increase capacity significantly but have little impact on congestion within the guideway or at downtown Vancouver intersections.

5.5.1.3.2 Ridership

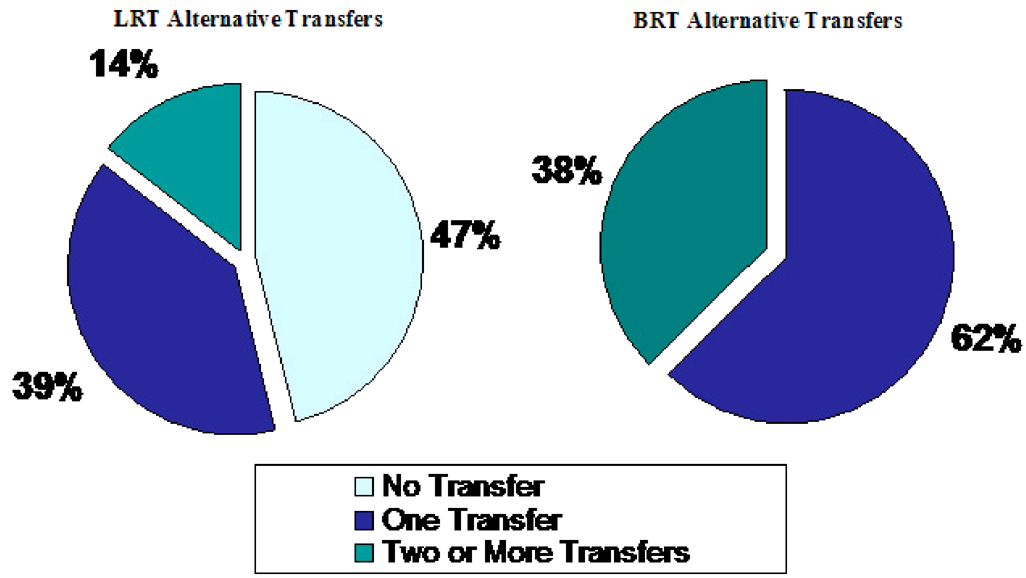
As shown in Exhibit 55 and Exhibit 56, transit ridership across the Columbia River would be much higher for the alternatives with HCT compared to the No-Build, and the LRT alternatives ridership would be much higher than for the BRT alternative. LRT would increase annual passenger trips on transit across the Columbia River by approximately 4.2 million compared to the No-Build Alternative, while BRT would increase annual transit trips across the Columbia River by approximately 2.3 million over No-Build. Comparing Alternatives 2 and 3, annual transit river crossings for LRT would be about 38 percent higher than for BRT, with 6.7 million versus 4.8 million crossings. Daily transit crossings for the LRT alternative would be about 24 percent higher. About 90 percent of the Alternative 3 daily passenger transit trips across the Columbia River would be on light rail; in comparison, about 67 percent of the daily passenger transit trips across the river in Alternative 2 would be on BRT.

This higher ridership across the river with LRT occurs despite the greater transit capacity provided with BRT. The higher ridership across the river can be explained by the need to transfer for all trips south of the Expo Center Station. Every Alternative 2 guideway bus trip would be required to transfer between BRT and TriMet's MAX LRT Yellow Line or a local bus routes, at the Expo Center station. Whereas with Alternative 3, no HCT trip would be required to transfer at Expo Center station to continue a transit ride.

As detailed in Exhibit 69, the effect of transfers is most pronounced for trips from Clark County to downtown Portland, a market that represents more than a third of all bi-state travel. The provision of LRT attracts approximately 8,600 new daily transit trips to this market compared to 6,400 for BRT. In the LRT alternative, about 47 percent of people making the trip would not need to transfer. These people can either drive, get dropped off, walk, or bicycle to an LRT station and have a one-seat ride to downtown Portland. Another 39 percent would make one transfer from a local C-TRAN bus to LRT; only 14 percent would need to make two or more transfers.

In the BRT alternatives, 100 percent of people making this trip would have to transfer to LRT at the Expo Center Station to continue southbound, regardless of whether they walked, biked, or drove to a BRT station. Two or more transfers would be required for the remaining 38 percent these transit trips with riders taking local C-TRAN buses to transfer to a BRT line, and then transferring again to the LRT at Expo Center.

Exhibit 69. Transit transfers required between Clark County and Downtown Portland for BRT and LRT Alternatives



As shown in Exhibit 55, the daily I-5 corridor transit river crossings would be higher with LRT as the HCT mode. Exhibit 57 reveals that the total daily MAX LRT Yellow Line boardings would be about 40 percent higher with LRT than with BRT. Further, as detailed with Exhibit 58 LRT would have 62 percent more annual boardings per platform hour than BRT.

Exhibit 57 shows that total system boardings are similar for LRT and BRT alternatives. Total daily and annual boardings for LRT and BRT vary by less than one percent. However, boardings for BRT can overstate ridership. This is because transfers are counted as boardings, and many BRT have multiple transfers for a single linked trip.

5.5.1.4 Mode Split

Exhibit 59 through Exhibit 61 detail the daily transit mode split by transit market in the I-5 corridor. Both Alternatives 2 and 3 would increase the transit mode split in the target markets compared to No-Build; these increases would be due to improved transit service and the addition of a bridge toll for general purpose vehicles. LRT would have a slightly higher transit mode split than BRT. This is most pronounced in the trips from the Clark County Inner Urban Transit Market to the Oregon Urban Transit Market, probably due to the need to transfer discussed above. Transit mode share would be 33 percent higher than with BRT (a 20 percent share compared to a 15 percent share). Between the Clark County Suburban Commuter Transit Market and the Oregon Urban Transit Market, LRT would have a greater daily transit mode split than BRT. For the reverse commute from markets in Oregon to Clark County, with LRT the daily transit mode split would be 33 percent greater than with BRT.

Exhibit 60 shows that during the peak period/peak direction, LRT river crossings would have a higher transit mode share than BRT, with 50 percent of trips via single-occupancy vehicles compared to 53 percent, 29 percent via high-occupancy vehicles compared to 28 percent, and 21 percent via transit versus 19 percent.

5.5.1.5 Transit System Costs

Exhibit 62 shows that estimated transit capital cost for BRT would be approximately 25 percent lower than for LRT. Both capital cost estimates include the construction of the exclusive guideway and the replacement bridge structures; the primary difference between the capital costs is the transit vehicles that would need to be purchased. For BRT this would include 24 60-foot articulated buses, and for LRT would include 14 light rail vehicles and no additional buses.

The annual cost to operate LRT (Alternative 3) would be approximately $1.8 million less than BRT (Alternative 2) as detailed in Exhibit 62. Higher operating costs for BRT reflect the passenger capacity of the respective modes. With LRT vehicles, one driver can ferry 266 passengers, while BRT vehicles can only carry 91 passengers. In addition, the lower number of vehicles that would be required for LRT would contribute to the lower annual operating and maintenance costs associated with BRT.

LRT scored higher on three measures of cost effectiveness. The total annualized cost per guideway river crossing would be about $11.55 for LRT compared to $15.09 for BRT (this calculation does not include the express bus transit river crossings provided with the BRT Alternative); the incremental cost per incremental passenger over No-Build would be $14.23 compared to $25.93; and the total annual incremental operating cost per place mile would be $0.04 compared to $0.11. The lower projected annual operating costs and higher ridership both contribute to the better cost effectiveness that would be seen with LRT Alternative 3 compared to BRT Alternative 2.

5.5.1.6 Local and Regional Support

Both HCT modes would help foster the compact urban growth in centers called for in local and regional plans. However, LRT is the preferred mode identified in Vancouver's Transportation System Plan and to serve Hayden Island in Metro's 2040 Growth Concept. Therefore, Alternative 3 has been rated higher than Alternative 2 in terms of how well it would support local and regional transportation plans.

5.5.2 How would the level of transit service affect transit performance?

This section compares Alternative 2 and 3 to Alternatives 4 and 5. This is a direct comparison of the combined effects of the Efficient level of transit service combined with the standard I-5 only toll, compared to the Increased level of transit service and the I-5 higher toll. For ease of comparison in the following discussion, Alternatives 2 and 3 are referred to as the Efficient transit service alternatives and Alternatives 4 and 5 are referred to as the Increased transit service alternatives, unless otherwise stated.

5.5.2.1 Reliability and Travel Time

Reliability and travel times for the two levels of transit service were measured by transit VHD and travel times between important I-5 markets. Travel times were reported with no penalties for added transfers. Travel times are affected by the frequency of service provided, wait times at transfers, and congestion levels in the guideway and on the roads. The exclusive guideway is only subject to congestion in the BRT Increased service alternative.

As detailed in Exhibit 50, during the weekday afternoon peak, all transit build alternatives would decrease VHD compared to the No-Build. Transit VHD in the corridor for local and express buses would increase by about one hour in the BRT Increased transit service alternative compared to the Efficient, with 11.17 VHD compared to 12.11. VHD would be nearly the same for either LRT transit service level. The VHD in the Bridge Influence Area for local and express buses would be decreased by nearly half an hour with the BRT Increased transit service and by about 15 minutes with the LRT Increased transit service alternatives compared to the Efficient alternatives. HCT would experience VHD in the guideway only for the BRT Increased transit service alternative.

Travel times for LRT Increased transit service would generally be the same or slightly less than LRT Efficient transit service. Travel times for BRT Increased transit service would generally be longer or the same as BRT Efficient transit service.

As shown in Exhibit 53, when comparing HCT only (excluding local and express bus service), travel times within the guideway are identical for LRT Efficient and Increased options since they have the same number of stations, the same alignment, and no congestion in the guideway. When comparing the BRT Efficient to Increased transit service alternatives, during the morning peak, travel time would increase by six minutes from the northern terminus to the Expo Center and by four minutes to Pioneer Courthouse Square and to the Lombard Transit Center. This additional travel time is the result of BRT Increased transit service having a much higher number of buses operating in the guideway, and the high frequency of buses exceeding the guideway's capacity. Guideway buses would be slowed due to long queues, bunching, bus tails jutting out into the travel lane at stations preventing other buses passing, and congestion at intersections. The result is six extra minutes of travel time in the guideway. The trip between downtown Vancouver at Seventh and Washington to Pioneer Courthouse Square would be shorter for BRT Increased transit service, because the congested segment would only add one minute to travel time, while the wait time to transfer to LRT would be two minutes shorter.

When including local and express buses, BRT Efficient transit service would be quicker than the Increased transit service alternative in all trip segments, both two-hour afternoon peak northbound and morning southbound trips. The northbound transfer would be from LRT at the Expo Center to BRT, where the BRT Increased option would operate three routes (#71, 71L, and 71S) traveling to the terminus at Lincoln Park and Ride. The combination of these three routes provides a shorter average headway and a shorter average transfer time than in the Efficient transit service system, but the congestion effects of the BRT Increased transit service alternative are greater than the time savings associated with the shorter transfer time.

BRT Increased transit service would have an exclusive guideway that local and express buses could operate in but, as detailed above, travel times would still be slower. BRT

Increased transit service would have 67 buses per afternoon peak hour over the I-5 Columbia River Crossing. At Washington and Seventh Streets, there would be 47 buses per afternoon peak hour (single direction). Compared to BRT Efficient transit service, Increased transit service would have 13 more buses over the Columbia River and 22 more buses at Washington and Seventh Streets during the afternoon peak hour. As discussed above, the increase of buses within downtown Vancouver and across the I-5 crossing would significantly impact transit travel times between key destinations in the region.

For LRT, Increased transit service would be slightly quicker, with about 1 to 2 minutes of travel time savings over the LRT Efficient transit service along each trip segment. The travel time savings is likely attributable to the increased frequency of bus service and resulting shorter transfer times. The travel times are slightly longer for the LRT Increased transit service alternative between the 99th Street Transit Center and Hayden Island because the higher number of buses would operate in general traffic through more slowly through downtown Vancouver.

The primary difference between the Efficient and Increased alternatives is the shorter transit headway associated with the Increased transit service alternatives. The improved headways provide greater reliability and access to transit passengers because the bus or light rail would be running more frequently.

5.5.2.2 Accessibility

Since the Efficient and Increased transit service levels would have the same HCT alignment and stations, there would be no difference in HCT accessibility to households and employers, as detailed in Exhibit 54. There would be a minor increase in transit access in the Increased alternatives due to the addition of a new bus lines adding coverage in growing areas of Clark County.

5.5.2.3 River Crossings and Ridership

The Increased transit service alternatives would increase the total number of transit vehicles per hour in the northbound afternoon peak period over the river. This would increase the transit capacity over the Columbia River by 600 to 1,100 seats and standing area compared to the Efficient transit service alternatives. The methodology for calculating the capacity of transit vehicles is described in the *Final Definition of Transit Alternatives Report*.

On an annual basis, the Increased transit service alternatives would see more transit passenger trips over the I-5 bridge than the Efficient transit service alternatives (Exhibit 55 and Exhibit 56). Alternative 4 would see about 5.7 million annual transit passenger trips over the I-5 crossing compared to about 4.8 million with Alternative 2, a difference of about 870,000 trips annually (15 percent). Alternative 5 would see about 7.4 million annual transit passenger trips over the I-5 crossing compared to about 6.7 million with Alternative 3, a difference of about 740,000 trips annually (10 percent). The annual boardings on the transit system for Increased BRT or LRT are comparable; both would increase the number of boardings on transit by about 13–14 million boardings annually, or 20 to 22 percent, over the Efficient transit service alternatives. (Exhibit 57). Note that the BRT calculations count a transfer as a new boarding. Still, adding capacity across the bridge would not significantly affect ridership on transit and, therefore, the operational costs would be higher but would not result in a proportionate increase in transit ridership.

5.5.2.4 Mode Split

In general, Increased transit service would increase the share of daily transit mode split compared to Efficient transit service for trips between the Clark County Inner Urban and Suburban Transit Markets to the Oregon Urban Transit Markets. In each direction, the increase is about 1 to 2 percent (see Exhibit 59).

Increased transit service would significantly increase the afternoon northbound peak mode split for transit to 33 percent from 19 percent with the BRT Efficient transit service alternative. BRT Increased transit service would decrease SOV mode split to 44 percent from 53 percent with the BRT Efficient transit service. The same relationship is apparent between LRT Efficient and Increased transit service. The afternoon northbound peak transit mode split would be 21 percent with LRT Efficient transit service and would increase to 37 percent with LRT Increased transit service. The LRT Increased transit service SOV mode split would decrease from 50 percent to 41 percent (see Exhibit 60).

5.5.2.5 Transit System Costs

Capital cost associated with the Increased transit service alternatives would be about \$110 million more than the Efficient transit service alternatives, as detailed in Exhibit 62. Capital cost are reported in ranges developed using the CEVP methodology, described in Section 5.3 under the Transit System Cost heading. The BRT Increased transit service alternative would cost approximately \$718.8 to \$805.2 million to construct, where the BRT Efficient transit service alternative would cost \$602.6 to \$749.7 million; the BRT Increased transit service alternative would have capital costs ranging about 6 to 16 percent more than the BRT Efficient transit service alternative. The LRT Increased transit service alternative would cost approximately \$879.1 to \$975.7 million to construct, where the LRT Efficient transit service alternative would cost approximately \$783.1 to \$940.8 million (YOE); the LRT Increased transit service alternative would have a capital cost ranging about 4 to 11 percent more than the LRT Efficient transit service alternatives.

The Increased transit service alternatives would cost substantially more to operate than the Efficient transit service alternatives, as demonstrated in Exhibit 62. The BRT Increased transit service alternative would cost \$114.4 million to operate annually, \$39.4 million more than BRT Efficient transit service. The LRT Increased transit service alternative would cost \$105.5 million, \$32.2 million more than LRT Efficient transit service. Comparing the incremental increases in cost over the No-Build, BRT Increased transit service was 8.5 times more costly than BRT Efficient transit service, and LRT Increased transit service was 10 times more costly than LRT Efficient transit service.

Exhibit 62 details the three cost effectiveness indices (CEI). The CRC CEI reveals the total annualized cost per guideway river crossing. The cost per guideway river crossing would be about five dollars more under the LRT Increased transit service alternative compared to the LRT Efficient transit service alternative. The BRT Increased transit service alternative would exceed the cost of the BRT Efficient transit service alternative by more than eight dollars per guideway river crossing (see Exhibit 63). The relatively high capital and operating costs of the increased transit service of Alternatives 4 and 5 would reduce their cost effectiveness when compared to Alternatives 2 and 3, as detailed by the annualized cost per guideway river crossing. The relatively high incremental increase in operating cost associated with adding capacity would not yield a proportionate increase ridership across the river.

The No-Build Comparison CEI reveals the incremental cost per incremental passenger over the No-Build. As detailed, the LRT Increased transit service alternative would cost $8.93 per new passenger incrementally over No-Build; whereas the LRT Efficient transit service alternative would cost $14.23 per new passenger incrementally over No-Build (see Exhibit 64), more than five dollars more expensive. BRT Increased transit service would cost $11.31 per new passenger incrementally over No-Build; whereas BRT Efficient transit service would cost $25.93 per passenger incrementally over No-Build, more than $14 more expensive. It is important to note that this includes all trips throughout the transit system rather than those focused on the I-5 corridor crossing.

The Other CEI reveals the total annual incremental operating cost per place mile. Place mile is defined as the annual total seat and standing capacity of vehicles in operation multiplied by the annual VMT. The annual incremental operating cost for the LRT Efficient transit service alternative is 4 cents per place mile and the LRT Increased transit service alternative is 10 cents. The annual incremental operating cost for BRT Efficient transit service is 11 cents; whereas BRT Increased transit service is 7 cents (see Exhibit 65).

LRT Efficient transit service would operate a total of 78.2 million annual place miles over No-Build; when divided by the annual incremental transit operating cost over the No-Build, $3.5 million, the low “Other CEI” cost results. Comparatively, LRT Increased transit service would travel 657 million annual incremental place miles over No-Build and would have an associated incremental transit operational cost of $35.7 million annually.

The BRT Efficient transit service alternative would operate a total of 46.4 million place miles over No-Build; when divided by the annual incremental transit operating cost over the No-Build, $5.3 million, the highest “Other CEI” cost for this measure among the alternatives would result. Comparatively, the BRT Increased option would travel 676.2 million annual incremental place miles over No-Build and would have an associated incremental transit operation cost of $44.6 million annually, this would result in a 10 cent CEI for this measure. BRT Efficient transit service would produce the highest CEI cost for this measure because it would travel significantly fewer miles than any of the other alternatives. The BRT Efficient transit service alternative would produce 93 percent fewer place miles than BRT Increased transit service, whereas LRT Efficient transit service would produce 88 percent less place miles than LRT Increased transit service; more telling is that between the Efficient alternatives, LRT Alternative 3 would produce 40 percent more place miles than BRT Alternative 2.

As detailed in Exhibit 56, BRT Efficient transit service would produce 4.8 million annual transit trips over the I-5 crossing, 2.3 million over No-Build and about 900,000 less than BRT Increased transit service. The LRT Efficient transit service alternative would have 6.7 million annually, 4.6 million over No-Build and about 700,000 less than LRT Increased transit service. Although this is not a factor in this CEI, note that for an increase in cost as measured by this CEI, LRT Increased transit service would not have a noteworthy increase in ridership; however, nearly one million more trips would be seen with BRT Increased transit service with a reduction in the CEI measure cost of 4 cents.

5.5.2.6 Local and Regional Support

The Increased alternatives have the same bi-state rating as the Efficient transit service alternatives. LRT is rated more highly than BRT, because BRT is not the specific transit mode identified in Vancouver's Transportation System Plan and Metro's 2040 Growth Concept to serve Hayden Island. Alternative 5 is rated high, while Alternative 4 is rated medium (see Exhibit 66).

5.5.3 How would the toll rate affect transit performance?

To assess the impact of I-5 bridge-tolls on transit ridership in terms of the project's adopted values, a sensitivity analysis was completed for the LRT Vancouver alignment, with three toll rate scenarios: no toll, standard toll, higher toll. In addition, Alternatives 4 and 5 were modeled with the higher tolling rate as well as other system-level choices that differ from those modeled with the sensitivity test, noted in Section 5.2.3. The tolling method does not impact Travel Times, Accessibility or the Transit System Cost measures but it does impact ridership and mode split as discussed below.

In the Standard Tolled scenarios, a peak period toll of $2.00 to $2.25 would be changed depending on trip purpose. This analysis assumes a 100 percent transponder use for work trips, thus these travelers would see a $2.00 toll in the peak period. Non-work trips assume a 75 percent/25 percent transponder/no transponder split, thus they see $2.25 in the peak period. Off-peak tolls contain the same transponder usage assumptions by trip purpose; tolls in the off-peak are $1.00 for work trips, and $1.25 for non-work trips. The Higher Tolled scenarios assumed a $0.50 increase over the Standard Toll in the peak period. These rates assume the same transponder split by trip purpose, $2.50 and $2.75, and the non-peak tolls were identical in both scenarios.

Exhibit 70. Tolling Rates

	Peak Period		Off-Peak Period	
	Transponder	No Transponder	Transponder	No Transponder
No Toll	None	None	None	None
Standard Toll	$2.00	$2.25	$1.00	$1.25
Higher Toll	$2.50	$2.75	$1.00	$1.25

5.5.3.1 Reliability

Tolling would not likely significantly affect reliability of transit service, particularly with LRT as the mode. Under a BRT scenario, a high-toll for autos could potentially shift a number of people to the transit mode, adding more buses to the roadway network.

5.5.3.2 Ridership and Mode Split

As stated, the sensitivity test was preformed on the Vancouver full-length alignment with the replacement bridge. Comparing transit ridership over the Columbia River reveals some quantitative differences:

- No Toll on I-5 = 19,300 transit trips on I-5 across the Columbia River daily;
- Standard Toll on I-5 only = 20,800 transit trips on I-5 across the Columbia River daily;
- Higher Toll on I-5 only = 21,400 transit trips on I-5 across the Columbia River daily; and
- Standard Toll on I-5 and I-205 = 21,700 transit trips on I-5 across the Columbia River daily.

The higher toll would decrease the attractiveness of cross river travel and destinations, relative to the standard toll. Therefore, total cross river trips would increase at a lower rate with the higher toll scenario than with the standard toll scenario. The decrease of cross-river transit riders in the higher toll scenario may be because the total pool of cross-river trips (SOV, HOV, and transit) would be less. However, the higher toll would increase the transit mode split because those trips that do cross the river would then have an even higher incentive to use transit. In summary; within the regional travel-demand model, higher tolls equate to a decrease in cross-river trips, but there would be an increase in cross-river transit mode share.

Exhibit 71 details the different components of the Higher Toll LRT Efficient transit service alternative versus the Higher Toll LRT Increased transit service alternative. As shown, the major differences between the two scenarios are the type of crossing and the level of transit service. As noted above, the higher toll on I-5 only (LRT Efficient transit service alternative) would produce 21,400 transit trips on I-5 across the Columbia River daily. In comparison, the Higher Toll LRT Increased transit service alternative would produce 23,100 transit trips; a difference of about 1,700 transit trips on I-5 across the Columbia River daily, or over 7 percent.

Exhibit 71. Higher Toll Rate Efficient LRT versus Increased LRT Alternative

Higher Toll Efficient LRT Alternative	Higher Toll Increased LRT Alternative
Higher toll	Higher toll
Replacement crossing	Supplemental crossing
Vancouver Alignment	Vancouver Alignment
Lincoln Park and Ride northern terminus	Lincoln Park and Ride northern terminus
Efficient level of transit service	**Increased** level of transit service

5.5.4 How would the location of the northern terminus affect transit performance?

Exhibit 72 provides information about the full-length Vancouver and I-5 alignments for comparison of the respective minimum operable segment, with LRT as the representative HCT mode. Although the Mill Plain District MOS could be compared with the I-5 full-length alignment, the description and analysis herein only compares the Vancouver full length alignment to the Mill Plain District MOS and the I-5 full-length alignment to the Clark College MOS.

If an MOS is chosen, it would have implications for any future extension to the full-length options defined in this document. All project development requirements, such as the environmental impact statement, FTA New Starts process, alternatives analysis, planning, engineering and design would likely need to be conducted as a separate new process. It would also change the potential for federal funding for any future extension, as well as adding costs for future inflation.

Exhibit 72. Full-length and MOS Northern Terminus Option: LRT Representative HCT Mode

Characteristic		Vancouver Full-length LRT Alignment	Mill Plain District LRT MOS	I-5 Full-length LRT Alignment	Clark College LRT MOS
Guideway Length (Expo Center to Northern Terminus)		3.43 miles	2.07 miles	4.22 miles	2.65 miles
Park and ride Spaces	**On Guideway**	1,800	1,100	2,500	1,100
	Satellite Lot	610	1,510	0	150
	Total	2,410	3,218	2,500	1,250
Daily Passenger Trips on Transit Over I-5 Crossing		20,800	19,100	21,100	18,200
Annual Passenger Trips on Transit Over I-5 Crossing		6,673,000	6,111,000	6,779,000	5,816,000
Total Transit System Daily Boardings		175,800	183,100	177,000	175,000
Peak Period/Peak Direction Mode Split over I-5 river crossing	**SOV**	50 %	50 %	50 %	52 %
	HOV	29 %	27 %	28 %	29 %
	Transit	21 %	23 %	22 %	19 %
Transit Accessibility	**Percentage of Clark County Households within ½ mile of HCT station**	5 %	3 %	4 %	3 %
	Percentage of Clark County Employment within ½ mile of HCT station	11 %	9 %	10 %	9 %
Estimated Capital Cost (in Millions)		$879.3M	$615.8M	$1,068.8M	$674.9M
Annual Operating Cost (Increment over No-Build)		$3.5M	$2.8M	$4.2M	$2.95M
CRC Cost Effectiveness Index	**Total Annualized Cost per Guideway River Crossing**	$11.55	$8.91	$13.67	$10.38

5.5.4.1 Vancouver Full-length Alignment vs. Mill Plain District MOS

Using LRT as the representative HCT mode, Exhibit 72 compares how transit operations would be affected under the full-length and MOS options. Shortening the HCT alignment would affect some of the CRC Project Values noted in Exhibit 49.

The LRT Mill Plain District MOS would have a guideway length (measured from Expo Center) of about 2.07 miles, compared to the 3.43 mile full-length of the LRT Vancouver alignment. With the MOS, no HCT stations would be constructed north of the Mill Plain station. The Kiggins Bowl Park and Ride would be a surface lot with approximately 150 parking spaces, the Lincoln Park and Ride would be a surface lot with 900 spaces, and a surface lot would be constructed at the BNSF lot and the I-5 loop for a total of 1,148 spaces; therefore, a combined total of 3,218 park and ride spaces would be provided with the Mill Plain District MOS. The full-length Vancouver alignment would have 1,800 park and ride spaces on the guideway alignment and 610 spaces in satellite lots for a total of 2,410 spaces. Other operational aspects of the transit service, such as the HCT headways, would be similar between the full-length and MOS Vancouver alignments.

5.5.4.1.1 Accessibility

The shortened guideway and the fewer HCT stations with the Mill Plain District MOS would reduce the percentage of Clark County households and employment within one-half mile of an HCT station. For the MOS, three percent of Clark County households (vs. five percent with the full-length Vancouver alignment) and nine percent of employment (vs. 11 percent with full-length) would be within one-half mile of an HCT station.

5.5.4.1.2 River Crossings and Transit Ridership

The Mill Plain District MOS daily and annual passenger trips on transit over the I-5 crossing would be approximately nine percent less than the full-length LRT Vancouver alignment—19,000 trips compared to 20,800. The reduction in trips on transit would result from the diminished accessibility of the HCT line to northern Vancouver and Clark County, from shortening the length of the guideway, the reduced number of park and ride spaces, and the longer travel time and required transfer associated with the shuttle bus between Lincoln and Kiggins Park and Rides to the Mill Plain District Transit Center.

5.5.4.1.3 Mode Split

The Mill Plain District MOS would have a peak period/peak direction mode split similar to the Vancouver full-length alignment. With the MOS, the peak period/peak direction mode split would be 50 percent SOV, 27 percent HOV and 23 percent transit. With the full-length alignment the mode split would be 50 percent for SOV, 29 percent HOV, and 21 percent for transit. The transit mode split for the Mill Plain District MOS would increase two percent above the Vancouver full-length alignment because of the number of park and ride spaces modeled with the alignment.

5.5.4.1.4 Transit System Costs

The transit capital cost would be less with the Mill Plain District MOS. Because the length of the MOS guideway would be one-third less than the length of the Vancouver alignment, the cost to operate light rail from the Expo Station to the Mill Plain terminus would be approximately 30 percent less than under the full-length alternative. However, the cost to operate the rest of the transit network (such as the limited stop buses and C-TRAN's local buses) would be similar to the full-length Vancouver alignment. Therefore, the total cost to operate the LRT Mill Plain District MOS would only be slightly less than the full-length LRT Vancouver alignment. With the full-length alignment the total annual transit operating cost (as an increment over the No-Build Alternative) would be $3.5 million, and with the Mill Plain District MOS would be $2.8 million.

The total annualized cost per transit guideway river crossing for the Mill Plain MOS would be $8.91 whereas the full-length alignment would be $11.55, a savings of $2.64 per transit guideway river crossing.

5.5.4.1.5 MOS Effects on Operating Costs

The BRT MOS exclusive guideway would terminate at Mill Plain District Park and Ride. The new BRT lines would follow the same route and at the same headways as with the full-length alignment, but the lines would extend outside of the exclusive guideway and would travel in mixed traffic for a greater distance. This would slightly increase the amount of congestion the BRT lines could be subjected to which would increase the total number of platform hours required. For this reason the BRT operating costs with the Mill Plain District MOS would be $5.1 million, nearly the same as the cost to operate the BRT full-length Vancouver alignment, at $5.3 million.

5.5.4.2 I-5 Full-length Alignment vs. Clark College MOS

As detailed in Exhibit 72, the LRT Clark College MOS would have a guideway length (as measured from the Expo Center) of about 2.65 miles, compared to the 4.22 mile full length of the LRT I-5 alignment. With the MOS terminus, there would be no HCT stations constructed north of Clark College and the proposed park and ride lot at Kiggins Bowl would be reduced to a surface lot, with approximately 150 parking spaces. Due to access constraints at the Clark College Park and Ride, the number of parking stalls would be limited along the MOS alignment to 1,100, for a MOS total of 1250 parking stalls. With the full length of the I-5 alignment there would be 2,500 park and ride spaces directly on the guideway. Other operational aspects of transit service, such as the HCT frequencies, would be similar to those associated with the I-5 alignment.

5.5.4.2.1 Accessibility

The full-length I-5 alignment would have seven stations whereas the Clark College MOS would have five stations north of the Columbia River. The shortened guideway with the Clark College MOS, and the lower number of HCT stations would reduce the percentage of Clark County households and employment within one-half mile of an HCT station. For the MOS, three percent of Clark County households (vs. four percent with the full-length

I-5 alignment) and nine percent of employment (vs. 10 percent with the full-length I-5 alignment) would be within one-half mile of an HCT station.

5.5.4.2.2 River Crossings and Transit Ridership

Daily and annual passenger trips on transit over the I-5 bridge would be approximately 13 percent less for the Clark College MOS than the full-length I-5 alignment – 18,200 daily transit trips compared to 21,100. This reduction could be attributed to the diminished accessibility of the HCT line to northern Vancouver and Clark County from shortening the length of the guideway and the reduced number of park and ride spaces and the longer travel time and required transfer associated with the shuttle bus from the Kiggins Park and Ride to the Clark College transit station.

5.5.4.2.3 Mode Split

The Clark College MOS would have a comparable peak period/peak direction transportation mode split to the I-5 full-length alignment. With the MOS the peak period/peak direction traffic over the Columbia River would be made up of 52 percent single-occupancy vehicles (SOV), 29 percent high-occupancy vehicles (HOV) and 19 percent transit. With the full-length I-5 alignment the mode split would be 50 percent for SOV, 28 percent HOV, and 22 percent for transit.

5.5.4.2.4 Transit System Costs

Although the transit capital cost would be less with the Clark College MOS, the annual operating costs would be similar to the full-length I-5 transit alignment. Because the length of the MOS guideway would be about 1.5 miles shorter than the full length of the I-5 alignment, the cost to operate light rail to the Clark College terminus would be 36 percent less. However, the cost to operate the rest of the transit network (such as the limited stop buses and C-TRAN's local buses) would be similar to the full-length I-5 alignment. Therefore, the total annual cost to operate the LRT Clark College MOS would be approximately $1.3 million per year less than the full-length I-5 alignment. With the full-length I-5 alignment the total annual transit operating cost (as an increment over the No-Build Alternative) would be $4.24 million and with the Clark College MOS would be $2.95 million. The CRC Cost Effectiveness Index reveals that the Clark College MOS would cost $10.38 per guideway river crossing annually, $3.29 less than the I-5 full-length alignment.

5.5.4.2.5 MOS Effects on the BRT I-5 Full-length Alternative Operating Costs

The BRT Clark College MOS exclusive guideway would terminate at Washington Street and McLoughlin Boulevard. With the MOS, the new BRT lines would follow the same route and at the same headways as the full-length alignments, but the lines would extend outside of the exclusive guideway and would travel in mixed traffic for a greater distance. This would slightly increase the congestion the BRT lines could be subjected to, which would increase the total number of platform hours required. For this reason the BRT operating costs with the Clark College MOS would be $5.154 million over the No-Build, approximately $6,000 more per year more than the cost to operate the full-length I-5 alignment, $5.149 million.

5.6 How would transit change with the CRC segment-level choices?

This section examines the segment-level transit effects that would vary by the options under examination for each segment described above in Section 5.2.2. The transit options under study in the three segments would generally not affect the metrics used to evaluate the long-term effects of alternatives at the system level, such as passenger trips on transit and VHD. However, the transit options at the segment level would affect the estimated transit capital costs. As a reminder, the segments are:

- **Segment A1**: Delta Park to South Vancouver
    - River Crossing Type (Replacement crossing with an option for stacked transit/highway bridge or Supplemental crossing)
    - Hayden Island Transit Alignment (Adjacent or Offset)
- **Segment A2**: South Vancouver to Mill Plain District
    - Two-way on Washington or Couplet on Broadway and Washington Transit Alignment
- **Segment B** – Mill Plain District to North Vancouver
    - Vancouver or I-5 Northern Transit Alignment.

5.6.1 Segment A1: How would the river crossing affect transit performance?

Segment A1 extends from Delta Park to south downtown Vancouver. The segment level choices for both LRT and BRT are between a supplemental or replacement crossing with a design option for stacked transit/highway bridge and if the Hayden Island station alignment is adjacent to or offset from the I-5 crossing and the main differences would depend on whether BRT or LRT is the mode selected.

5.6.1.1 Replacement Crossing Compared to Supplemental Crossing

Across the Columbia River the LRT guideway would have a width of 33 feet. The BRT guideway would have a width of 35 feet to allow for an 8-foot-wide median buffer for operational buses to pass broken down buses in the guideway without needing to encroach into the oncoming lane.

Once over the Columbia River, the HCT guideway would be required to clear the BNSF rail line before descending to grade into south Vancouver. With a replacement crossing, where the highest marine navigation clearance would be mid-river, the touchdown point to match street grade would occur at Sixth Street, and Fifth Street would be closed to cross-traffic. With a supplemental crossing, the highest marine navigation clearance would be at the north channel which means that the touchdown point for the transit guideway into south Vancouver would be Seventh Street, and Sixth Street would be closed to through traffic. Currently, Sixth and Eighth Streets are the only through east-west streets in downtown Vancouver (see the *CRC Traffic Technical Report*).

The major bus routing differences between the BRT and LRT alternatives would be the use of the guideway. In the BRT alternatives, additional local bus routes would cross the Columbia River and terminate at the Expo Center station. In the LRT alternatives, these bus routes would terminate at the proposed Seventh Street station in Vancouver. For both BRT and LRT, express buses would use the I-5 bridge general purpose lanes to cross the Columbia River. These buses would not stop in this segment; they would originate at outlying park and ride lots and terminate in downtown Portland or Marquam Hill.

The type of Columbia River Crossing structure does not impact many of the CRC project transit metrics except for Transit System Costs.

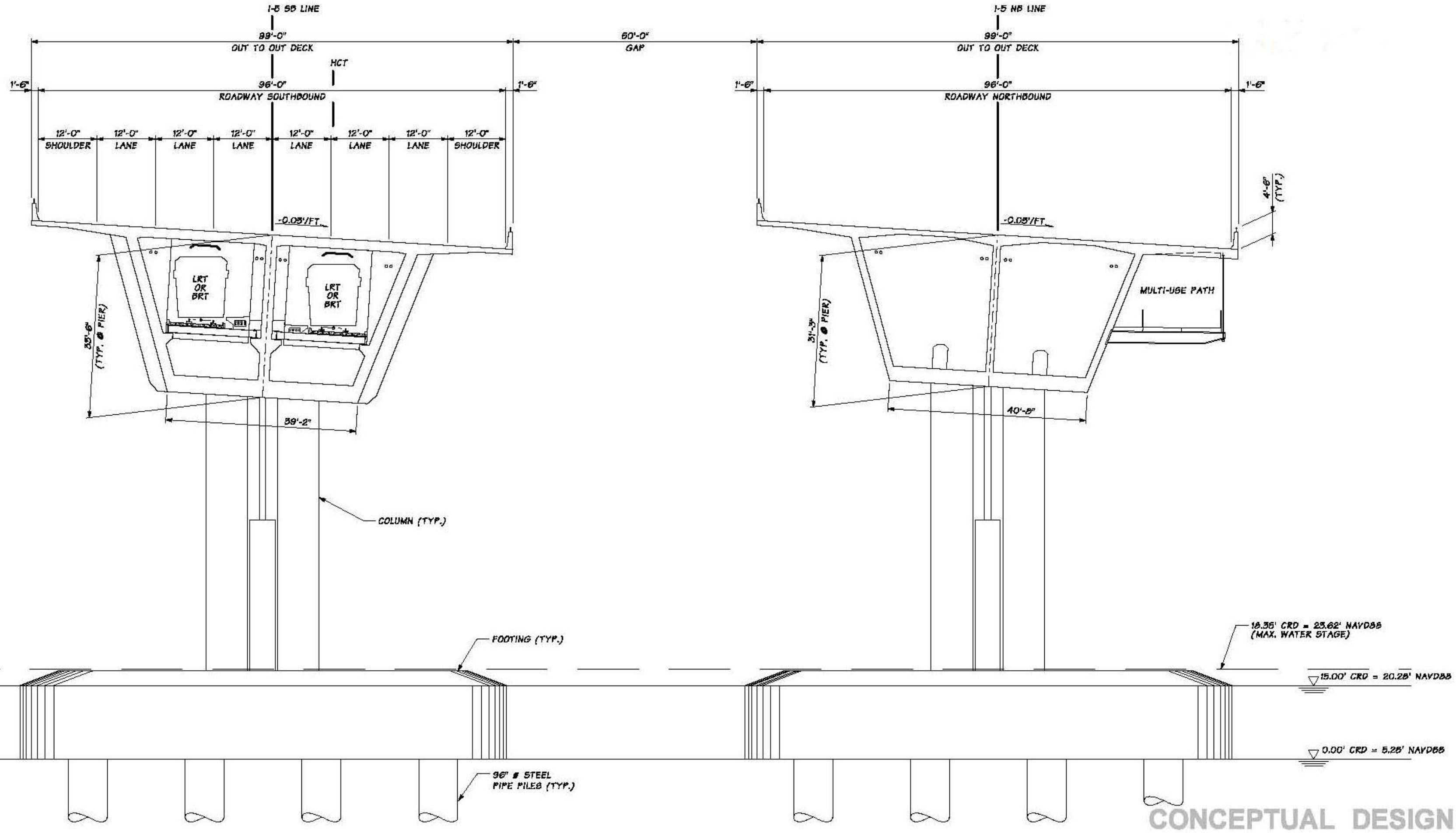
The capital cost of a replacement crossing with the Vancouver alignment (both transit and highway components) would range from 1.35 billion to 1.59 billion. The capital costs of a supplemental bridge with the Vancouver alignment would range from 1.19 billion to 1.44 billion. The annualized operating cost of the replacement crossing is $50,000, whereas the cost of the supplemental crossing, including construction of a third bridge for transit and the seismic retrofit, is $750,000. The cost to retrofit the existing bridges is significantly more expensive than the maintenance and operation of a replacement bridge; which would make the replacement bridge option more affordable.

5.6.1.1.1 Replacement Crossing with a Stacked Transit/Highway Bridge

A second option for bringing transit across the Columbia River is to place it inside the structure supporting the highway lanes for the southbound replacement bridge. The CRC project team has named this a stacked transit/highway bridge. This option would remove the need for a third bridge and the accompanying piers and footings. The multi-use path would be placed under the deck of the northbound bridge on the east side.

The stacked transit/highway bridge design has not been finalized but the concept is a concrete segmental bridge as shown in Exhibit 73. In effect, this would put transit in a pair of tunnels with the accompanying Fire, Life, and Safety considerations such as an air exchange system, fire suppression equipment and fire doors between the two box sections. A stacked transit/highway bridge would be more open to the air and so not have all of the Fire, Life, and Safety issues associated with transit in an underground tunnel. One concern associated with a stacked transit/highway bridge is, if an accident or incident that stopped or closed the transit system occurred within the stacked transit/highway bridge system, it could stop general traffic on the I-5 lanes above or close the bridge span altogether. With transit on a third bridge, it would be located 50 feet west of the highway bridges and so would most likely not create a safety issue with the general purpose lanes of I-5.

Exhibit 73. Stacked Transit/Highway Bridge – Concrete Segmental Bridge Configuration – Looking Northward



5.6.1.1.2 Reliability and Travel Times

Transit reliability would not be affected with the stacked transit/highway bridge option because nothing impedes transit movement in the river crossing section. The guideway length and speed of curves is not significantly different from the three bridge replacement option to make a difference in travel times.

5.6.1.1.3 Accessibility

Since high-capacity transit would be beneath the general purpose traffic lanes, the transit approach grades on the north and south bridge touch down points would be less than with a separate bridge for transit. Increasing the grade to six percent for a short distance, within allowable parameters, allows the transit guideway to reach ground level at Fifth rather than Seventh Street, allowing both Fifth and Sixth Streets to have cross transit intersections. The Fifth Street station would provide better access to proposed development along the riverfront. With the three bridge option, Fifth Street would be closed at Washington Street. A multi-use path for the crossing would be located on the east side of the guideway on Hayden Island and would connect at-grade to the east side of the northbound I-5 bridge with the stacked transit/highway bridge option. The north bike access ramp to the island would be shorter, though, since the guideway would be lower as it nears the box structure.

5.6.1.1.4 Transit System Costs

The CEVP estimate shows that a stacked transit/highway bridge will save $37.5 million over the three bridge configuration. This includes direct and schedule-related costs. The structural components of the southbound highway bridge would need to be enhanced to include supporting transit on the pier bents, but the fewer piers required would allow for a less expensive crossing.

There is also an estimated construction schedule savings of about 10 months to build the stacked transit/highway bridge configuration compared to the three bridge option based on the *Stacked Transit/Highway Bridge Technical Memo* updated in December, 2007.

5.6.1.2 Hayden Island Adjacent Compared to Offset

With BRT Alternatives 2 and 4, a new transfer facility would need to be constructed at Expo Center. With LRT Alternatives 3 and 5, the guideway would be a northern extension of the existing light rail tracks and the existing station would be used. Across Hayden Island and the Columbia River the BRT guideway would be 35-feet wide to allow for a median buffer to pass vehicles in the event one breaks down, as compared to the LRT guideway of 33 feet. In addition, the BRT station platforms would be 20 feet wider than the LRT station platforms to allow for a bypass lane, as the BRT alternatives would have several buses arriving and departing the platforms in a short period of time. As detailed in Exhibit 74, the HCT adjacent alignment would increase the estimated capital cost by less than one percent over the offset alignment.

Exhibit 74. Segment A1: Alternative 2 and 3 Transit Options

Characteristic		Alternative 2		Alternative 3	
		Adjacent	Offset	Adjacent	Offset
Expo Center Facility		Requires new BRT Transfer Center	Requires new BRT Transfer Center	Connects to existing Expo LRT station	Connects to existing Expo LRT station
Sharp Curves in Alignment		None	None	None	None
Average Travel Speed (Expo Center to 7th Street Station)[a]		21 mph	Not Available	33 mph	Not Available
Average Travel Time (Expo Center to 7th Street Station)a		4.6 min	Not Available	3.63 min	Not Available
Segment Length (Expo Center to North End of Segment A1)		7,661 feet	7,651 feet	7,725 feet	7,686 feet
Estimated Capital Cost		Less than 1 percent difference	Base Cost	Less than 1 percent difference	Base Cost
Width of Hayden Island Station Platform		75.5 feet	75.5 feet	55 feet	55 feet
Guideway Width Over Hayden Island and Columbia River		35 feet	35 feet	33 feet	33 feet
Touchdown in Downtown Vancouver	**Replacement Crossing**	6th Street	6th Street	6th Street	6th Street
	Supplemental Crossing	7th Street (6th Street closed)	7th Street (6th Street closed)	7th Street (6th Street closed)	7th Street (6th Street closed)

[a] Average travel speed and travel time have been calculated platform to platform from the Expo Center to the 7th Street station, which is actually within Segment A2. Speed calculations do not include dwell time. However overall travel time includes dwell time at stations.

5.6.1.2.1 Expo Center

In Alternative 2, with BRT as the HCT mode, there would be four BRT routes, two limited stop routes (#114 and #173), and four local routes traveling across the Columbia River in the guideway, with a total of about 24 buses per hour in each direction – 14 BRT buses and nine local or limited stop buses (Exhibit 75). With Alternative 3 or 5, with LRT as the HCT mode, only the LRVs would use the guideway.

In Segment A1 with LRT as the HCT mode, the guideway extension north of the Expo Center would be directly connected to the existing tracks and the existing Expo Center light rail station would be used. The proposed connection of LRT to the existing light rail tracks and station at Expo Center is shown in Exhibit 76.

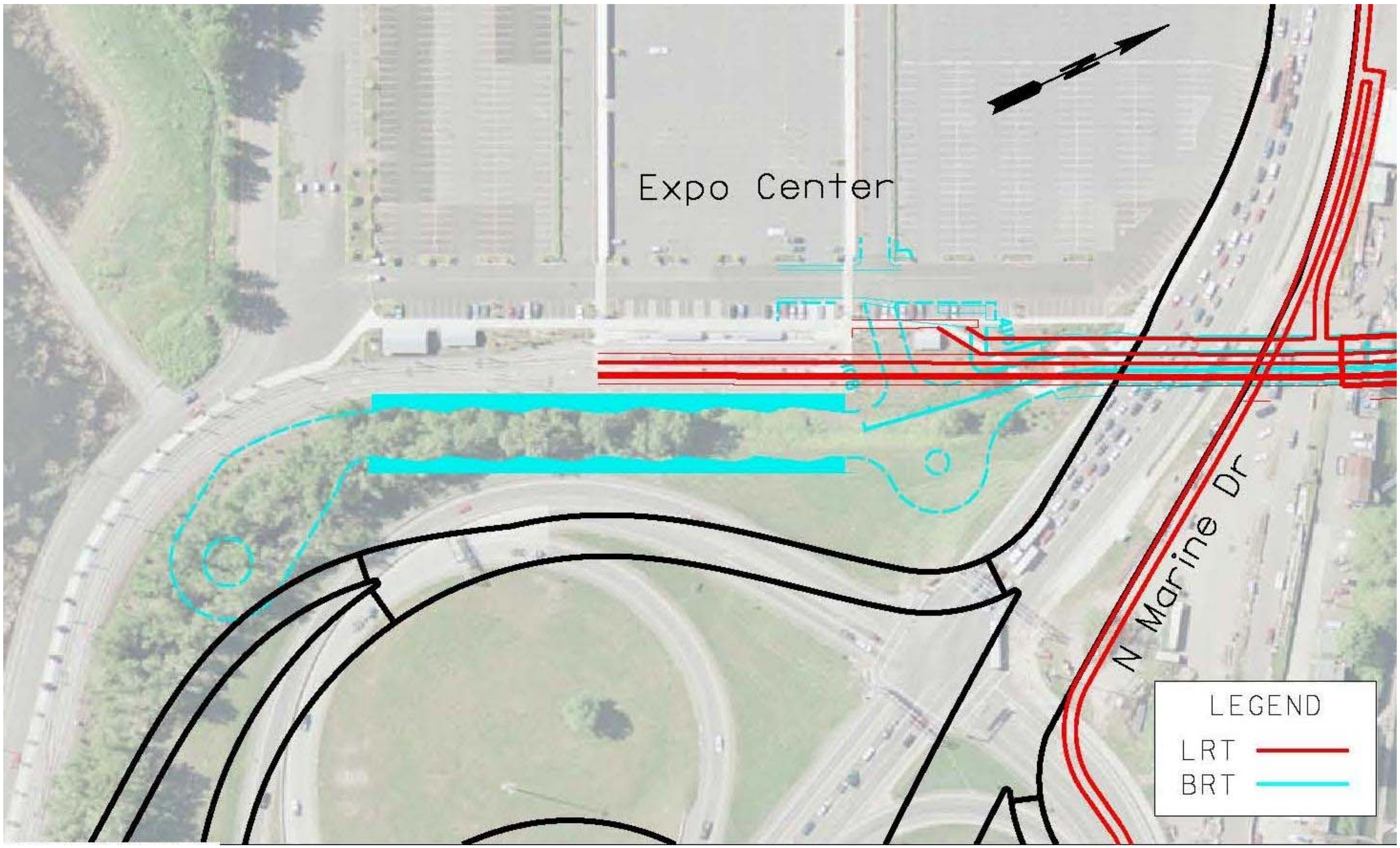
With BRT, the new BRT routes and the guideway buses would terminate service at the existing light rail line at the Expo Center and facilitate transfers to light rail. This would require a bus transfer and turnaround facility to be built alongside the existing light rail station. The proposed BRT Transfer Center at Expo is shown in Exhibit 76. This transfer center would not affect access to the existing Expo Center park and ride lot. To allow a bike and pedestrian path connection and allow bus and service vehicle access to the bus transfer facility, 18-20 parking spaces would be lost.

Exhibit 75. Alternative 2 Number of Buses in Guideway Over the Columbia River

Bus Route	Over the Columbia River Peak Period/Peak Hour/Per Direction
4OG (Local Orchards to Expo)	2
4G (Van Mall to Expo)	4
C030G (Local Fishers to Expo)	2
37TCG (Local Fishers to Expo)	1
37G (Fisher's Landing to Expo)	4
71XPO (Local SC to Expo)	2
71PKG (Lincoln to Expo)	4
71GL (SC to Expo)	2
114G (Washougal to Expo)	1
173GL (BG to Expo)	.1
Total Buses in Guideway	**24**

The shaded cells are the proposed BRT routes.

Exhibit 76. Proposed Transit Options at Expo Center



5.6.1.2.2 LRT Hayden Island I-5 Adjacent Alignment

Exhibit 77 shows the transit options with the Hayden Island I-5 adjacent and offset alignments.

From the Expo Center station, the adjacent alignment would curve east towards the highway and the guideway and station would be constructed immediately adjacent to the west side of I-5. Across Hayden Island, the exact location of the adjacent transit alignment would depend on the location of the bridge crossing. With an upstream replacement bridge for I-5, the Hayden Island guideway and station would be located just west of the existing I-5 right-of-way. With a downstream replacement bridge, or a supplemental bridge, the guideway and station would be located approximately where North Center Avenue exists today. See Exhibit 45.

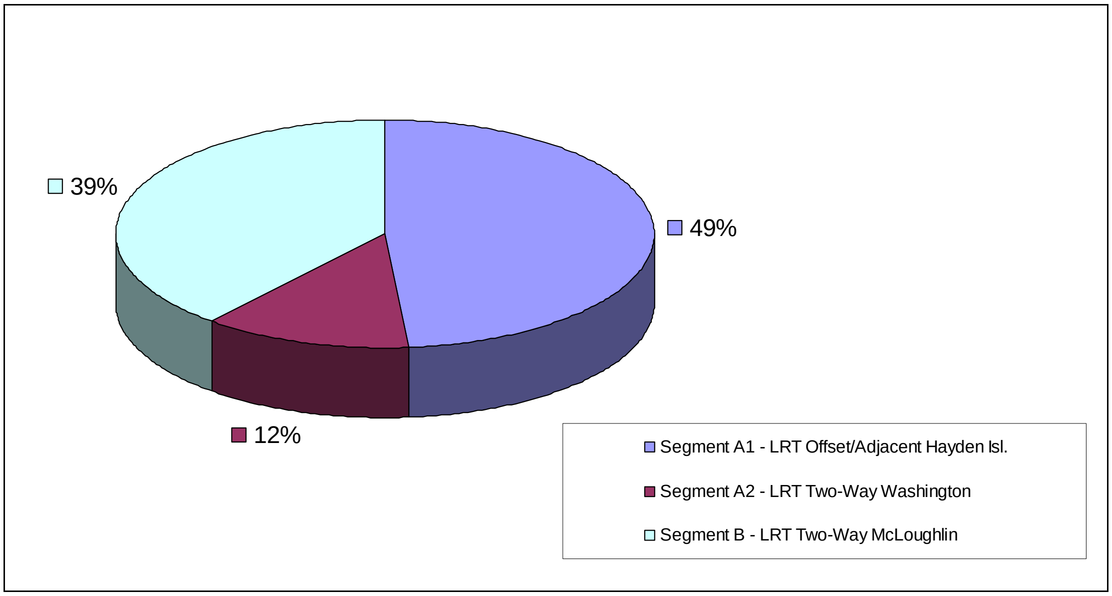
To avoid restricting auto movements near the Hayden Island I-5 interchange, as required by ODOT's interchange access control policies, the guideway across Hayden Island would need to be elevated. With LRT as the HCT mode, the width of the guideway over Hayden Island would be 33 feet. The guideway at the elevated station platform would be 55 feet in width and 200 feet in length. This would encompass two 15-foot platforms, two tracks 14 feet apart and 4.5 feet from the platform edges, and two feet for parapet walls.

In Segment A1, there would be no low speed curves in the alignment. The average speed from the Expo Center station to the Seventh Street station would be 27 mph and the average travel time for this segment would be 3.63 minutes. With this transit option the length of Segment A1 would be approximately 7,725 route feet.

5.6.1.2.2.1 Costs

With the I-5 transit alignment, Segment A1 represents approximately 49 percent of the total transit capital cost (see Exhibit 77). Within Segment A1 there would be a less than one percent decrease in cost estimated for the adjacent vs. the offset alignment, unless the elevated section could be placed on retained fill. This is a typically less expensive method of construction that may be possible for the adjacent alignment but not for the offset. It could save substantially but can not be confirmed until additional design of both highway and transit progress in later stages of the project.

Exhibit 77. LRT I-5 Representative Alignment: Percent of Total Capital Cost by Segment



5.6.1.2.3 BRT Hayden Island I-5 Adjacent Alignment

With the BRT Hayden Island I-5 adjacent alignment, from the Expo Center the transit alignment for BRT would have a sharper curve to Hayden Island so that the transit guideway would join the highway bridge farther south over Hayden Island. Once over Hayden Island, the BRT adjacent alignment would be the same as that for LRT. With an upstream replacement bridge for I-5, the guideway would be located just west of the existing I-5 right-of-way; with a downstream replacement or a supplemental bridge, the guideway would be located over North Center Avenue.

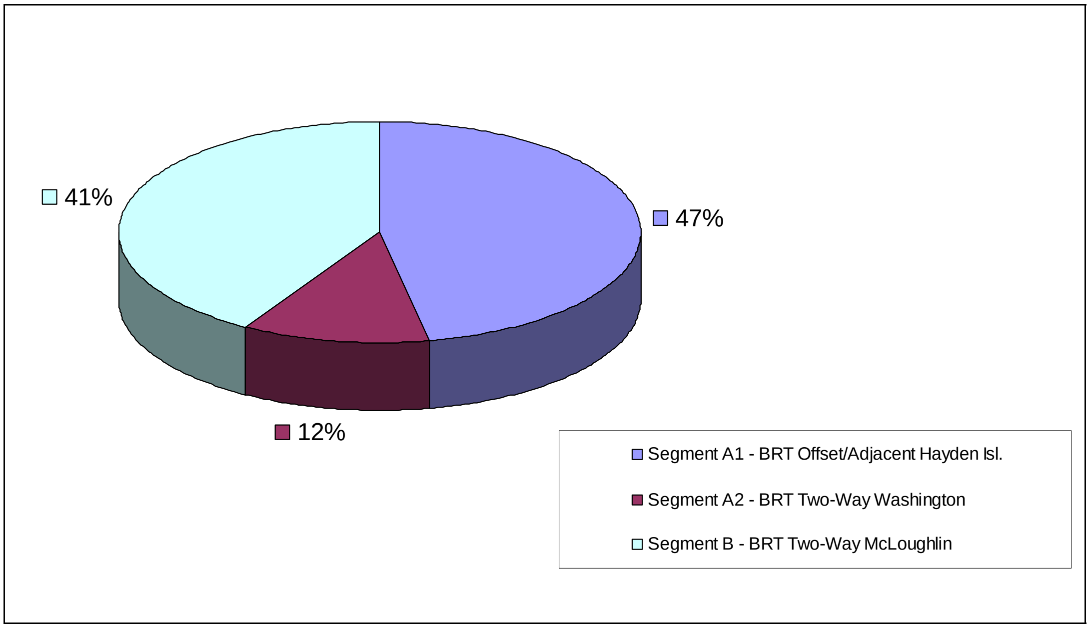
As with LRT, the BRT guideway and station would be elevated across Hayden Island. However, the width of the BRT guideway across Hayden Island would be 35 feet, two feet wider than the LRT guideway. This additional width would allow for an 8-foot wide median buffer allowing in-service buses to pass broken down buses without needing to encroach into the oncoming lane.

The Hayden Island station itself would also be wider than the LRT station. Currently, it is shown located over Hayden Island Drive, but could be located over Tomahawk Drive (as with the LRT transit options). Because the BRT vehicles will have different dwell times at the station, BRT must allow for multiple buses arriving and departing the platforms at different times. This means that the station would require a bypass lane in each direction for departing buses to pass buses loading/unloading at the station platform. The proposed width of the BRT Hayden Island station would be 75.5 feet—over 20 feet wider than with the LRT transit options. North and south of the station, the BRT guideway would also be wider than with the LRT transit options to allow the vehicles to maintain speed entering the station platform, as the number of lanes transitions from four to two.

The BRT Hayden Island adjacent option, as illustrated, would join I-5 farther south than the LRT adjacent option, and so would be about 59 route feet shorter, with a total Segment A1 length of 7,666 route feet. Similar to the LRT Hayden Island transit options, there would be no slow speed curves. Within Segment A1 the average BRT travel speeds would be 21 mph and the average BRT travel time would be 4.6 minutes.

For BRT, Segment A1 represents approximately 47 percent of the total transit capital cost of the representative alignment (see Exhibit 78). The adjacent alignment is estimated to cost less than one percent less than the offset alignment.

Exhibit 78. BRT I-5 Representative Alignment: Percent of Total Capital Cost by Segment



5.6.1.2.4 LRT Hayden Island Offset Alignment

With the offset alignment, from the Expo Center station, transit would curve west away from the replacement roadway. The LRT guideway would be separated from I-5 and would be located over N Jantzen Beach Center Drive. When this option is paired with a downstream replacement crossing or the supplemental crossing, the guideway and station would be separated from the highway by approximately 450 feet. When this option is paired with an upstream I-5 bridge, the guideway and station would be approximately 650 feet from the highway.

The elevation, width, and dimensions at stations would be the same as in the adjacent alignment option. The offset alignment would be shorter than the adjacent alignment by about 39 feet.

Similar to the adjacent alignment, there would be no slow speed curves with the offset alignment, and an average travel speed of 27 mph would be expected. Since the travel speeds of the adjacent or offset alignment would be the same and the alignment lengths would differ only by 39 feet, there would be negligible difference between the LRT travel times for Segment A1.

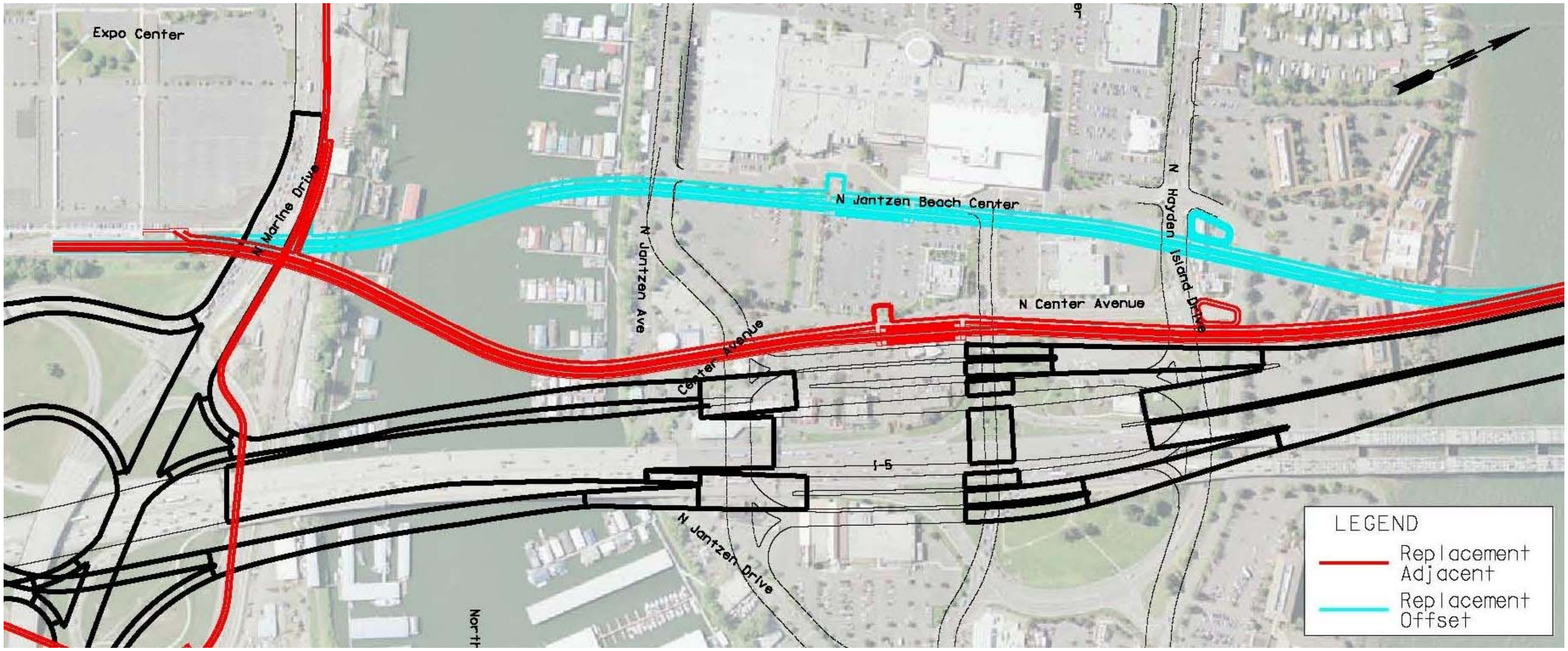
5.6.1.2.5 BRT Hayden Island Offset Alignment

The offset alignment for BRT would be the same as the LRT offset alignment. From the Expo Center, the transit alignment would curve west away from the replacement roadway and the guideway would be located over N Jantzen Beach Center Drive. When paired with a downstream replacement crossing or the supplemental crossing, the guideway and station would be separated from the highway by approximately 450 feet. When paired with an upstream I-5 bridge, the guideway and station would be approximately 650 feet from the highway.

The guideway would be elevated over Hayden Island with a width of 35 feet. The elevated station would be located over Hayden Island Drive but could also be located over Tomahawk Drive as with the LRT transit options. The BRT station platforms and guideway transition to stations would be the same as for the adjacent alignment.

The length of Segment A1 with offset BRT would be approximately 7,651 route feet—10 feet shorter than the BRT adjacent alignment and 30 feet shorter than the LRT offset alignment. With this transit option there would be no low speed curves. The average travel speed and average travel times would be the same as the BRT Hayden Island Adjacent alignment (21 mph and 4.6 minutes from Expo Center to the proposed Seventh Street station).

Exhibit 79. Segment A1: Hayden Island Alignment Options



5.6.2 Segment A2: How would the transit alignment through downtown Vancouver affect transit performance?

Segment A2 extends from South Vancouver to the Mill Plain District. In Segment A2 the transit options include operating two-way on Washington Street or in a couplet on Washington/Broadway. With the two-way on Washington Street option, HCT would operate in the center of the street, with one station platform for both travel directions, while with the couplet would be side-running with one platform for the northbound direction of travel on Broadway and the southbound direction of travel on Washington. The couplet on Washington/Broadway option would have an estimated capital cost 34 to 35 percent greater than the two-way on Washington Street option because the couplet would require rebuilding two streets.

Within Segment A2 the transit options would also have differences depending on whether BRT or LRT was the HCT mode. With the two-way on Washington Street option BRT would have to operate in contra-flow so that all transit vehicles in the guideway could access the center platforms while LRT (which has doors on both sides of the cars) would have normal circulation. In addition, LRT average travel speeds and average travel times would be somewhat faster than BRT due to differences in dwell times, driver variability and vehicle acceleration rates.

Building Segment A2 would incur 12 percent of the total transit cost whether LRT or BRT is the HCT mode. As detailed in Exhibit 80, the HCT couplet on Broadway-Washington would increase the estimated capital cost by 35 percent over the base cost over HCT two-way on Washington Street.

Exhibit 80. Segment A2 BRT & LRT Transit Options

	Alternative 2		Alternative 3	
Characteristic	Two-Way on Washington Street	Couplet on Broadway/ Washington	Two-Way on Washington Street	Couplet on Broadway/ Washington
Operations	Center Running Contra-Flow	Side Running Standard Circulation	Center Running	Side Running
Station Platforms	Center of street	Side of street	Center of street	Side of street
Stations	3	3	3	3 pairs (IB on Broadway, OB on Washington)
Segment Length	3,438 route feet	3,445 route feet	3,184 route feet	3,216 route feet
Sharp Curves	No	No	No	Yes
Average Travel Speed (7th Street Station to Mill Plain Station)	9.6 mph	Not Available	12.9 mph	Not Available
Average Travel Time (7th Street Station to Mill Plain Station)	3 minutes	Not Available	2.32 minutes	Not Available
Capital Cost in Segment	Base cost	35 percent higher than base	Base cost	35 percent higher than base

Exhibit 81 shows the Segment A2 design options through downtown Vancouver. Note that the north end of this exhibit shows HCT extending two-way north up Broadway, which is a Segment B option (see Section 5.3.5.2.1). Segment A2 is only concerned with the area bordered by Fifth Street to the south and the Mill Plain to the north. Exhibit 77 summarizes the main features and differences between the Segment A2 LRT and BRT transit alignment options.

5.6.2.1 LRT Two-Way on Washington Street

The representative LRT option (LRT two-way on Washington Street) would be center running with both the northbound and southbound travel direction on one street. A single LRT station platform in the center of the street would serve both directions of travel.

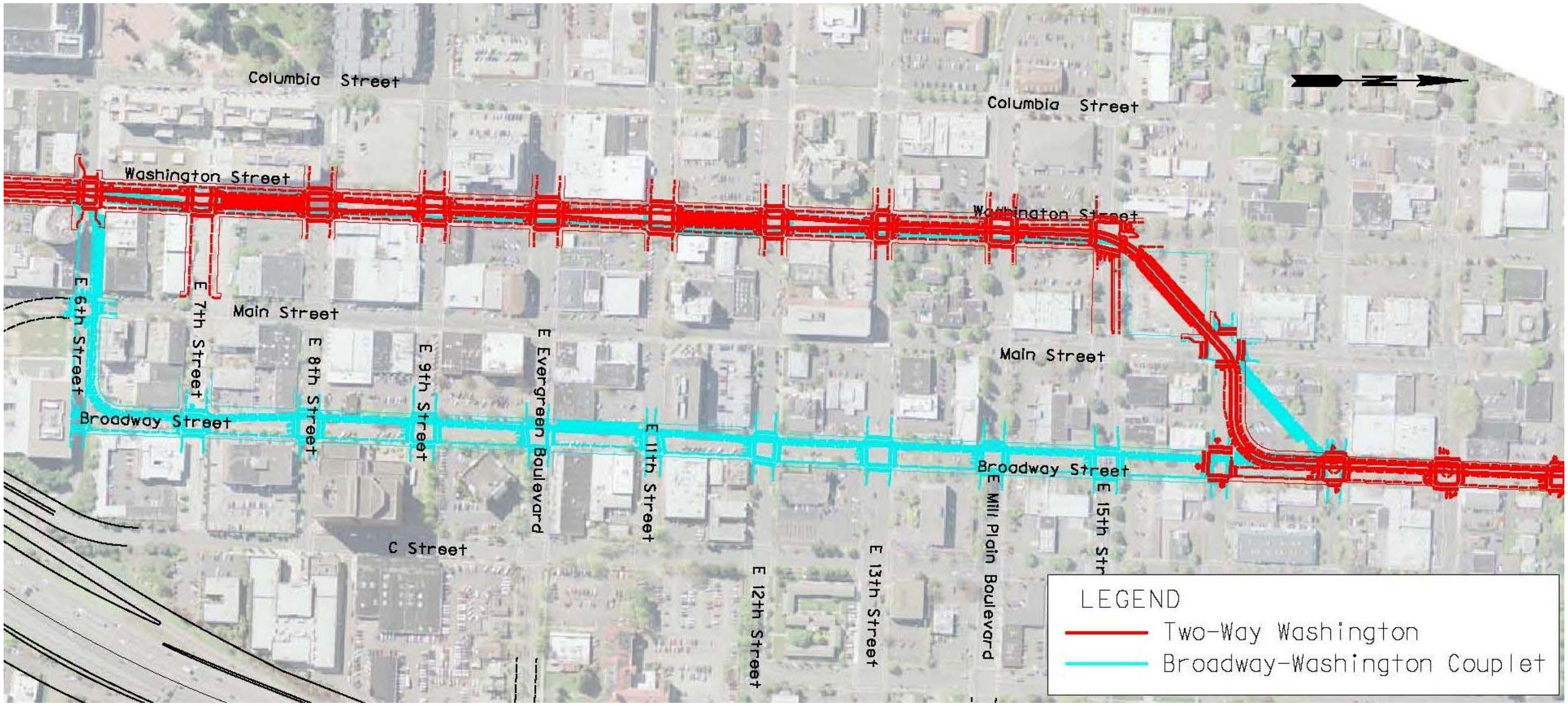
Within Segment A2 three stations are proposed at Seventh Street, 11th Street, and Mill Plain. The Mill Plain station would serve as a transit center for local bus connections to LRT. With the LRT two-way on Washington Street transit option, the total segment length would be 3,184 route feet. With this transit option there would be no sharp curves in the alignment between Sixth Street and the Mill Plain Transit Center. Average LRT travel speeds would be about 12.9 mph and the average travel time between the Seventh Street station and the Mill Plain station, including dwell time, would be 2.32 minutes.

With LRT on Washington Street, some local bus routes in downtown Vancouver may be shifted one or two blocks east or west (i.e., to either Columbia Street or Broadway Street). Local buses would still be able to use Washington Street with this transit option. However, traffic would be stopped behind buses because there would be no room for buses to pull out of the travel lane or for traffic to pull around the buses. Lower downtown Vancouver would have local bus service similar to the No-Build Alternative. Twelve bus routes would serve a Seventh Street station in the LRT alternatives—equating to 22 buses per hour at this location.

For track maintenance purposes, or if an LRT vehicle breaks down, the need can arise to shift an LRT train to the opposing track. With the two-way on Washington transit option, this shift (from the northbound to southbound track, for example) could occur anywhere cross-overs are constructed.

LRT would be a new mode of transportation introduced to Washington Street. In Segment A2, LRT would cross several signal-controlled intersections at grade. Many similar intersections exist on TriMet’s light rail system. Over the years, collisions on TriMet’s system have decreased even as the number of miles traveled within the system has increased. Despite the safety precautions, accidents may still occur; for example, while left turns across the guideway would not be allowed, they may be attempted by some drivers. Recent data show that at-grade crossings on light rail systems (such as the Blue Line in Los Angeles and the St. Louis LRT) have accident rates that are substantially lower than typical accident rates at high-volume signalized-traffic-only intersections.

Exhibit 81. Segment A2: South Vancouver to Mill Plain District Alignment Options



Interactions with other vehicles increase as the number of transit vehicles using an at-grade crossing or intersection increases. Therefore, safety equates to alternatives with fewer vehicles, or with more vehicles in a designated guideway where other modes expect to see transit vehicles. For this reason, both the LRT and BRT alternatives have the potential to improve safety over the No-Build Alternative. Alternatives 3 and 5 with LRT as the HCT mode would have fewer total transit vehicles (with Alternative 3 having the fewest vehicles), but a greater number of fixed route buses would be in mixed traffic on downtown city streets. Alternatives 2 and 4, with BRT as the HCT mode, would have a lower number of fixed route buses in mixed traffic on downtown Vancouver streets (because the routes would operate in the guideway) but the BRT alternatives would have the highest total number of bus vehicles.

For the representative alignment, the capital cost for this segment would be approximately 12 percent of the total transit cost as shown in Exhibit 78.

5.6.2.2 LRT Couplet on Washington/Broadway

For the LRT couplet on Washington/Broadway option, LRT would travel northbound on a one-way guideway along the west side of Broadway Street and southbound on a one-way guideway along the east side of Washington Street (two blocks west of Broadway Street). With this design option, general automobile traffic along Washington Street would remain one-way southbound in the same direction as LRT. Broadway Street would be converted from a two-way street to one-way northbound to match the LRT movements. (See the CRC *Traffic Technical Report* for further traffic information.)

Station platforms would be on the side of the street, with southbound platforms on Washington Street and northbound platforms on Broadway Street. Three stations are proposed: at Sixth Street, near 11th Street, and Mill Plain. The station at Mill Plain would also serve as a transit center. With this design option, station spacing on Broadway Street, between the Sixth Street and 11th Street stations would be six blocks. This would be a longer distance between stations than with the two-way on Washington Street transit option.

With a replacement crossing, the northbound LRT guideway would require trains to travel at slow speeds through a sharp curve onto Sixth Street near the touchdown point and a second sharp curve onto Broadway Street. The tight curve from Washington Street onto Sixth Street, where a northbound station platform would be located, encroaches onto the platform and may exceed the standard gap allowed in TriMet's design criteria between the train and the platform. In addition, if the LRT vehicle is not stopped correctly the trailing end of the train may encroach and partially obstruct the adjoining travel lane. Finally, with the transition of one direction of LRT from Washington Street onto Broadway, Washington Street would be narrowed to one lane at Sixth Street.

With a supplemental crossing, the touchdown point in downtown Vancouver would be moved north to Seventh Street because the grade differences between existing bridges and the proposed new one would make a Sixth Street transition impractical. Seventh is a designated pedestrian through-way and Eighth Street is one of two through east-west streets downtown, making LRT placement on these streets less feasible. Therefore, the transition of the northbound LRT guideway from Washington to Broadway would occur at Ninth Street.

Between Sixth Street and Mill Plain, both the northbound and southbound directions of the LRT guideway would be on the left side of general traffic. Signalized left turns would be allowed at each block.

With the LRT couplet on Washington/Broadway option, curves in the alignment would increase the total Segment A2 length to 3,216 route feet – about 32 feet longer than the two-way on Washington Street option. The additional route feet and the slower speed curves would make the travel time for the LRT couplet on Washington/Broadway a few seconds slower than the two-way on Washington Street option.

Broadway has been recently converted to a two-way street in downtown Vancouver and will be used by C-TRAN's local bus routes. With this transit option, Broadway would be converted to a one-way street northbound. As a result, some local bus routes in downtown Vancouver would need to shift one or two blocks (for example, to Columbia Street) or modified to operate in a couplet on Washington/Broadway as well. With this transit option, the same local bus routes would access the stations as with the LRT two-way on Washington Street, slightly modified. Twelve bus routes would serve lower downtown Vancouver at the Seventh Street station with approximately 24 buses per hour in the peak hour.

Operationally, for maintenance purposes, or if an LRT vehicle is inoperable, the need can arise to shift an LRT train to the opposing track. With the couplet on Washington/Broadway option, this shift (from the northbound to southbound track, for example) could occur only where the couplets converge – which for this option would be south of Sixth Street and then again at Mill Plain near 15th Street. From an operations standpoint, this is less desirable.

With the Washington/Broadway couplet option, safety could be increased because Washington and Broadway would be one-way streets, which are inherently safer than two-way streets (typically because all traffic flowing in the same direction means that there are fewer points of conflict). With a couplet, the potential safety considerations at at-grade intersection crossings (where the trains would interact with automobile traffic, bicycles and pedestrians) would be similar to the two-way on Washington Street transit option; however, a couplet would introduce twice as many intersection crossings.

The capital cost of the LRT couplet on Washington/Broadway would be approximately 35 percent greater than the cost for the two-way LRT on Washington transit option. The majority of the cost increase with the couplet can be attributed to the need to rebuild both Washington and Broadway Streets, instead of just Washington Street.

5.6.2.3 BRT Two-Way on Washington Street

With the BRT two-way on Washington Street option, the BRT guideway would be center running, with both the north and southbound direction of BRT on one street. Three single station platforms (at Seventh Street, 11th Street, and the Mill Plain Transit Center) in the center of the street would serve both directions of travel. However, unlike LRT trains that have doors on both sides of a car, not all of the buses that would use the BRT guideway would have doors on both sides of the vehicle. Therefore, with this transit option, transit vehicles on Washington Street would operate in a contra-flow configuration—meaning the northbound direction of travel would be on the west side (left side) of the street and the southbound direction of travel would be on the east side in the opposite direction of auto traffic. The vehicles would begin operating in contra-flow at the intersection of Washington and Sixth Street where the north and southbound bus lanes would weave across each other. At the Mill Plain Transit Center, buses would weave back into a normal flow configuration.

An optional configuration for median-running BRT does not require contra-flow operations. Narrow (10-foot) side platforms are placed on the near side of intersections. Buses are required to make a full lane shift through the intersections but this would be done directly from a stop at a station. Further analysis will be done to determine the best configuration.

There would be no sharp curves in the alignment with this Segment A2 transit option. The Segment A2 length of this transit option would be about 3,438 route feet (about 250 feet longer than the LRT Segment A2 length). BRT would have a longer segment length because at the Mill Plain Transit Center the articulated buses could navigate the existing 90 degree turns at intersections, and would therefore not need to have a diagonal crossing at the Mill Plain station. (See the section below on the Mill Plain configuration within Exhibit 82). As detailed in Exhibit 50, speeds for BRT in downtown Vancouver would be slower than LRT due to slightly longer average boarding times and somewhat slower vehicle acceleration rates. Within Segment A2 average bus travel speeds would be 9.6 mph. The average travel time would be 3 minutes.

With the BRT alternatives (Alternatives 2 and 4) local bus routes in downtown Vancouver would be able to operate within the guideway. Therefore, with the BRT two-way on Washington Street option, more local buses would benefit from being able to use the guideway. However, if too many buses are in the guideway, it could result in bus bunching and conflicts at stations due to block length and pull-out length limitations. Because the BRT two-way on Washington Street option would focus more local bus routes to the guideway onto Washington Street, route finding would be much easier. In Segment A2, five C-TRAN local routes (routes 1, 2, 3, 25, and 32) would travel outside of the BRT guideway.

The additional buses with Increased service in Alternative 4 would require buses to pull around stopped buses and into the adjoining lane. The volume of buses, at least during peak travel times, could slow auto traffic but is not anticipated to be a major impact to Washington Street.

Similar to LRT, BRT would be a new mode of transportation introduced to Washington Street. In Segment A2, BRT would cross several intersections at grade, where the transit vehicles would interact with automobile traffic, bicycles, and pedestrians. Crossings at intersections would be controlled by traffic signals to direct safe pedestrian, bicycle and auto movements and would include signage to increase the awareness of the new HCT mode. Despite these safety precautions, accidents may still occur; for example, although left turns across the guideway would not be allowed, they may be attempted by some drivers. Because of similarities in the construction and operation of the guideway, BRT would likely have similar accident rates to LRT at at-grade crossings. According to recent data collected by the FTA of the safety incidents (such as collisions) that occurred with LRT, 34 percent were at at-grade intersections. However, with safety measures, such as signal controlled intersections and the implementation of adequate signage, collisions on TriMet's light rail system have decreased over the years even while the number of miles in the system has increased. Recent accident rates at at-grade crossings on the Blue Line in Los Angeles and the St. Louis LRT are substantially lower than typical accident rates at high volume signalized intersections. In addition, with the BRT two-way on Washington Street transit option, potential contra-flow operations may raise safety concerns with auto drivers and pedestrians not expecting the BRT to operate in the opposite direction of general auto traffic.

For maintenance or passing purposes, if a BRT or local bus vehicle operating in contra-flow needed to shift to the opposing lane, it would have to cross over two lanes to the left instead of one to the right (for example, from the northbound guideway lane on the west side of the street to the northbound auto lane on the east side of the street). This shift could occur at any intersection provided the necessary safety measures are taken.

The capital cost for BRT with the two-way on Washington option represents approximately 12 percent of the total transit cost of the I-5 representative alignment, as shown in Exhibit 78.

5.6.2.4 BRT Couplet on Washington/Broadway

Unlike LRT, the BRT couplet on Washington/Broadway option would place the northbound one-way guideway along the east side of Broadway and the southbound one-way guideway would be along the west side of Washington Street. This would allow for right-side boarding. General automobile traffic along Washington Street would remain one-way southbound and Broadway would be converted from a two-way street to one-way northbound. With this option, the station platforms (at Sixth Street, 11th Street, and Mill Plain) would be on the right side of the street, and BRT vehicles and other local buses using the guideway would be able to operate in a normal road configuration (not in a contra-flow). This eliminates safety concerns that would be associated with the contra-flow operations discussed above.

With the BRT couplet option, curves in the alignment would increase the total Segment A2 length to about 3,445 route feet – 7 feet longer than the BRT two-way on Washington Street option. With the slower right-angle curves, the couplet option would have somewhat slower average speeds and the average travel times would be a few seconds longer than the BRT two-way on Washington Street option.

With a replacement crossing, the northbound BRT guideway would turn right onto Sixth Street and then cross onto Broadway Street. Articulated BRT vehicles would be able to make tight right-angle turns at intersections without having the technical challenges that the LRT couplet option would have at the Sixth Street station, such as design refinements to reduce chances of LRVs blocking the adjoining travel lane. On the south side of Sixth Street or on Broadway between Sixth and Seventh Streets, a BRT station would not be possible due to access impacts. Consequently, the first station would be located between Seventh and Eighth Streets on Broadway. This block is steeper than desired for a bus stop location.

With a supplemental crossing, the transition of the northbound lane of the guideway from Washington to Broadway would occur at Seventh Street. A transition placed north of Seventh would require a platform in Washington Street before the diverge point in the guideway. Placing the transition at Seventh Street allows the northbound transit lane to diverge near the touchdown point of the bridge. Side platforms can be placed on Seventh Street and on Washington between Seventh and Eighth and allow adjacent auto lanes.

Broadway has recently been converted to a two-way street in downtown and will be used by C-TRAN's local bus routes. With this transit option, Broadway Street would again be converted to a one-way street in the northbound travel direction. As a result, some local bus routes in downtown Vancouver may be shifted one or two blocks east or west (for example to Columbia Street) or could be modified to operate in a couplet on Washington/Broadway. With this option, the local bus network would be the same as the BRT two-way on Washington Street option. Five of C-TRAN's routes would travel on streets outside of the BRT guideway, limiting the number of streets used by transit and improving safety.

With the BRT couplet design option, vehicles in the guideway could pass inoperable vehicles, or during guideway maintenance, at any point along the alignment by simply changing lanes into a general purpose lane and then back into the guideway. Again, this would be because of the lack of contra-flow for this option.

Between Sixth Street and Mill Plain, both the northbound and southbound directions of the guideway would be on the right side of general traffic. This would require autos to make right turns across the transit guideway at signalized intersections with 'no right on red' signal warnings. Because drivers typically expect to be able to make free right turns at red lights, this would raise a potential safety issue of autos crossing the transit guideway. In addition, with a couplet, BRT would be a new mode of transportation introduced to both Washington and Broadway Streets. The potential safety considerations of at-grade intersection crossings (where the transit vehicles would interact with automobile traffic, bicycles, and pedestrians) would be similar to the two-way on Washington Street transit option; however, a couplet would have twice as many intersection crossings.

The capital cost of the BRT couplet on Washington/Broadway would be approximately 34 percent more than the cost for the BRT two-way on Washington. As with LRT, the capital cost increase can in large part be attributed to the need to rebuild two streets rather than one.

5.6.2.5 Mill Plain Transit Center

The Mill Plain transit center would function as a transfer point from several local and limited bus routes to HCT. It is the northernmost station within Segment A2 and serves as the transition of the alignments between Segment A2 and the Segment B transit options. There would be minor differences in the station placement as a result of which transit option is selected. Using LRT as the representative HCT mode, and Vancouver as the representative alignment for Segment B, Exhibit 82 shows different options for the placement of the station, depending on alignment options north and south of that station.

With most of the LRT transit options, the station Mill Plain transit center would be located diagonally through the block bounded by Washington, Main, 15th and 16th Street. Where a diagonal station would create additional right turns, the station would be located on the street alongside that block. For example, from the couplet on Washington/Broadway option in Segment A2 to the two-way on Uptown Broadway option in Segment B (see Exhibit 82), the northbound direction of the guideway would continue straight along Broadway. With this option the northbound platform would be located along the side of Broadway. The southbound direction of transit in this option would travel diagonally through a block to the northeast of the gravel lot, currently used by the Bank of America, and continue diagonally through the gravel parking lot. This would allow the stations for both northbound and southbound travel to be placed adjacent to each other.

Because BRT articulated vehicles would be able to make tighter right-angle turns, the Mill Plain station with BRT would stay alongside streets, rather than cutting across blocks.

Exhibit 82. Mill Plain Transit Center Options for LRT

5.6.3 Segment B: How would the northern transit alignment affect transit performance?

Segment B extends from the Mill Plain District to North Vancouver. It includes an alignment choice between constructing and operating HCT directly adjacent to the I-5 corridor or through existing Vancouver streets. The transit options in Segment B would have significant differences to the long-term effects of the build alternatives, as detailed below. Exhibit 83 is a reference table for the Segment B. Exhibit 86 though Exhibit 88 detail Segment B of the Vancouver alignment with the proposed Kiggins Bowl and Clark College Park and Ride lots. Exhibit 89 and Exhibit 91 detail Segment B of the I-5 alignment with the Clark College and Kiggins Bowl Park and Ride lots.

The reported comparison data are products of a sensitivity analysis preformed to analyze impacts of the Vancouver and I-5 transit alignments to the transit metrics. LRT is the representative HCT mode modeled for this analysis and the Efficient level of transit service was the transit operation level. The sensitivity test was not conducted with the BRT mode. As shown in Exhibit 22, there are numerous similarities between the two northern alignments in terms of ridership, boardings, and mode split. Most the transit metrics are within the models' range of error of one to three percent. As discussed below, the primary differences between the alignments are in guideway length and capital and O&M costs. Therefore, similar comparisons could be drawn from a BRT mode choice discussion around the northern transit alignment choice, which would result in similar if not the same conclusions.

5.6.3.1 Reliability and Travel Time

As detailed in Exhibit 83, VHD in the corridor for local and express buses with LRT Vancouver alignment (Alternative 3) would be 13 hours and with LRT I-5 alignment would be 12.5 hours. HCT travel times during the afternoon peak would not be affected by whether the I-5 or Vancouver alignment were chosen, even though the I-5 full-length alternative is .77 miles longer than the Vancouver alignment from Expo Center to the northern terminus. Due to differences in the operating environments, the I-5 alignment would have an average travel speed 3.5 mph faster than the Vancouver alignment, but because the Vancouver alignment would be shorter, the average travel times of the two alignments would be nearly the same. Most morning and afternoon two-hour peak direction trips from select locations within the region would have the same travel time for both alignments, although there are several instances where the Vancouver alignment would produce a quicker trip between locations.

5.6.3.2 River Crossings and Ridership

The Vancouver and I-5 alignments would provide similar annual transit passengers over the I-5 crossing. With LRT the Vancouver alignment would see about 6.7 million and the I-5 alignment would see about 6.8 million. The Vancouver alignment would see about 53.5 million annual transit boardings on all systems and the I-5 alignment would see about 54.0 million (daily transit boardings would see a difference of less than two percent between the alignments). In both instances, the I-5 alignment would slightly outperform the Vancouver alignment.

Exhibit 83. Bi-State Transit Performance – Segment B LRT Transit Alignments

Characteristic		Vancouver Alignment	I-5 Alignment
Route Feet (Expo Center to Northern Terminus)		18,150	22,220
Type of Alignment		Intra-Urban	Highway
Stations North or East of Mill Plain		3	3
Station Location		At-grade	Above or below grade
Park and ride Lot Spaces	**On Guideway**	1,800 (1 lot)	2,500 (2 lots)
	Satellite	610 (2 lots)	0
	Total	2,410	2,500
Impacts to I-5		None	Need to shift about 26 feet west
Structures		None	Extensive retaining walls and long aerial structure
Average Travel Time	**Expo Center to Northern Terminus**	12 min	11.7 min
	Pioneer Square to Northern Terminus	39.9 min	39.6 min
Daily Passenger Trips on Transit Over I-5 Crossing		20,800	21,100
Annual Passenger Trips on Transit Over I-5 Crossing		6,673,000	6,779,000
Total Daily Transit System Boardings		175,700	177,000
Transit Accessibility	**Clark County Households within ½ mile of HCT station**	5 percent	4 percent
	Clark County Employment within ½ mile of HCT station	11 percent	10 percent
Estimated Capital Cost		$879.3M	$1.07B
Annual Operating Cost (Increment Over No-Build)		$3.5M	$4.2M
CRC Cost Effectiveness Index	**Total Annualized Cost per Transit Guideway River Crossing**	$11.55	$13.67

LRT is the representative HCT mode for the data presented in this table

5.6.3.3 Accessibility

Although the park and ride lots would allow both alignments to provide Clark County residents with accessibility to HCT, the compatibility of uses immediately surrounding the transit stations vary significantly along each alignment. From Mill Plain Boulevard to the alignment endpoints, the I-5 alignment would have about 29 percent of its length along a residential/commercial street, 20 percent in a depressed section adjacent to non-residential uses, 19 percent at highway grade, and the remaining 22 percent would be on aerial structure adjacent to park and school property. The Vancouver alignment would be integrated into the arterial street system with only at-grade crossings predominantly adjacent to residential and commercial land uses. As detailed in Exhibit 72, the Vancouver alignment, five percent of Clark County Households and 11 percent of Clark County Employment would be within one-half mile of an HCT station. The I-5 alignment would have four percent of Clark County

Households and 10 percent of Clark County Employment within one-half mile of an HCT station. The difference between accessibility is more clearly illustrated when analyzing the 5-minute walking distance to transit stations along Segment B.

Exhibit 84 and Exhibit 85 below illustrate a 5-minute walking distance to the proposed stations along Segment B of the I-5 and Vancouver alignments. The 5-minute walking distance was measured along public right-of-way and existing public infrastructure like sidewalks and pedestrian paths; it was assumed that transit users would not cross private property or facilities to gain access to the transit stations. The City of Vancouver Comprehensive Plan Map was included within the map to illustrate the type of land uses within the 5-minute walking distance.

The Vancouver alignment would provide walking access to a larger area and higher density land uses than the I-5 alignment. Within a 5 minute walk of the Vancouver alignment there are 283 acres, whereas the I-5 alignment has 105 acres; I-5 has 63 percent less are within a 5-minute walking distance than the Vancouver alignment.

In addition, of the land uses within a 5 minute walk of the Vancouver alignment, 87 acres are urban high residential compared to 10 acres along the I-5 alignment. Fifty-two acres of the Vancouver alignment are commercially zoned, compared to 9 acres along the I-5 alignment. Conversely, the I-5 alignment has 38 public facility acres within 5 minutes walking distance, whereas the Vancouver alignment has 25 acres.

The acreage difference is because public right-of-way was used to measure the access routes. Using the Clark College station as an example, it is assumed that people would not cross through the private Clark College baseball field to gain access to the station, but would walk along a sidewalk. Southeast of the Kiggins Bowl station, there is a steep hillside that limits walking distance whereas, along the Vancouver alignment, all the transit stations are at-grade and there are no terrain obstacles. The Vancouver alignment has a higher rate of Urban High Density Residential and Community Commercial land uses adjoining stations; conversely, the I-5 alignment has a higher percentage of Public Facility land uses, including Clark College and Discovery Middle School. Since the Vancouver alignment has more intense commercial and residential development surrounding the stations, more people would be within walking distance of the stations than the I-5 alignment.

Exhibit 84. I-5 Alignment: 5-minute walking Distance from Station Locations

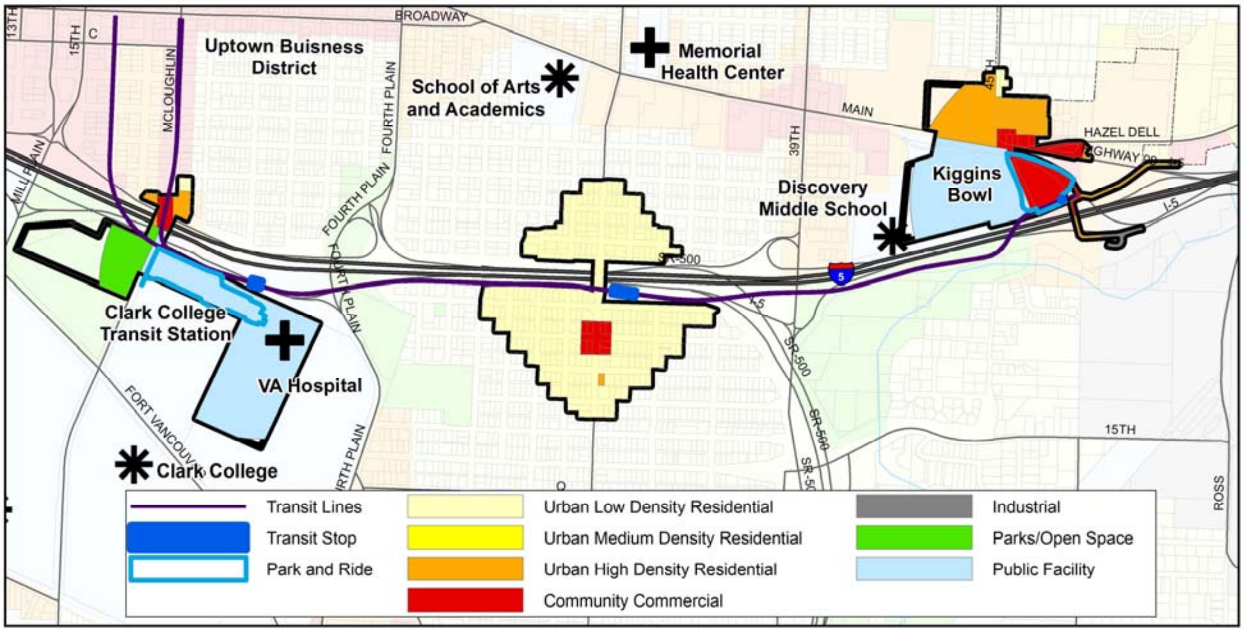
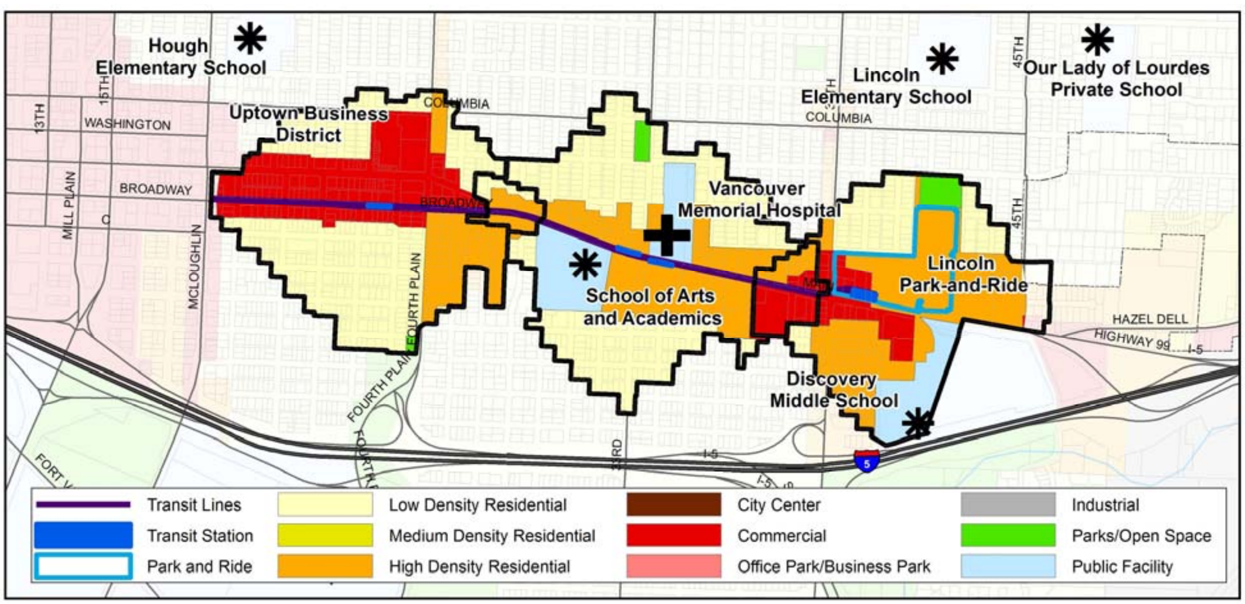


Exhibit 85. Vancouver Alignment: 5-minute walking Distance from Station Locations



5.6.3.4 Mode Split

The I-5 and Vancouver alignments would not significantly differ in the afternoon peak period transit mode split between the markets.

5.6.3.5 Transit System Costs

The capital cost of the I-5 alignment is would be approximately $189.5 million more than the Vancouver alignment because of design requirements. The I-5 alignment would require shifting the crown of the freeway 26 to 30 feet west to accommodate the transit guideway within the existing highway right-of-way to the greatest extent possible. In addition, the I-5 alignment would require building an extensive retaining wall alongside I-5 and an aerial structure over SR 500 and I-5 to access the Kiggins Bowl Park and Ride. In contrast, the guideway with the Vancouver alignment would be integrated into the streetscape and would not require construction of large, permanent structures. The estimated capital costs of the Vancouver alignment would be about 18 percent less than the I-5 alignment ($879.3 million compared to $1.07 billion for LRT). The annual cost to operate the alignments would be different as well. As an increment over the No-Build Alternative, the annual cost to operate the Vancouver alignment with LRT would be about $3.5 million and would be $4.2 million with the I-5 alignment—an operating cost difference of about 17 percent. The CRC Cost Effectiveness Index demonstrates the total annualized cost per transit guideway river crossing which would be $11.55 with the Vancouver alignment and $13.67 with the I-5 alignment; the Vancouver alignment would be $2.12 more cost effective than the I-5 alignment.

Exhibit 86. Segment B: Vancouver Alignment Transit Options – Mill Plain to 29th Only

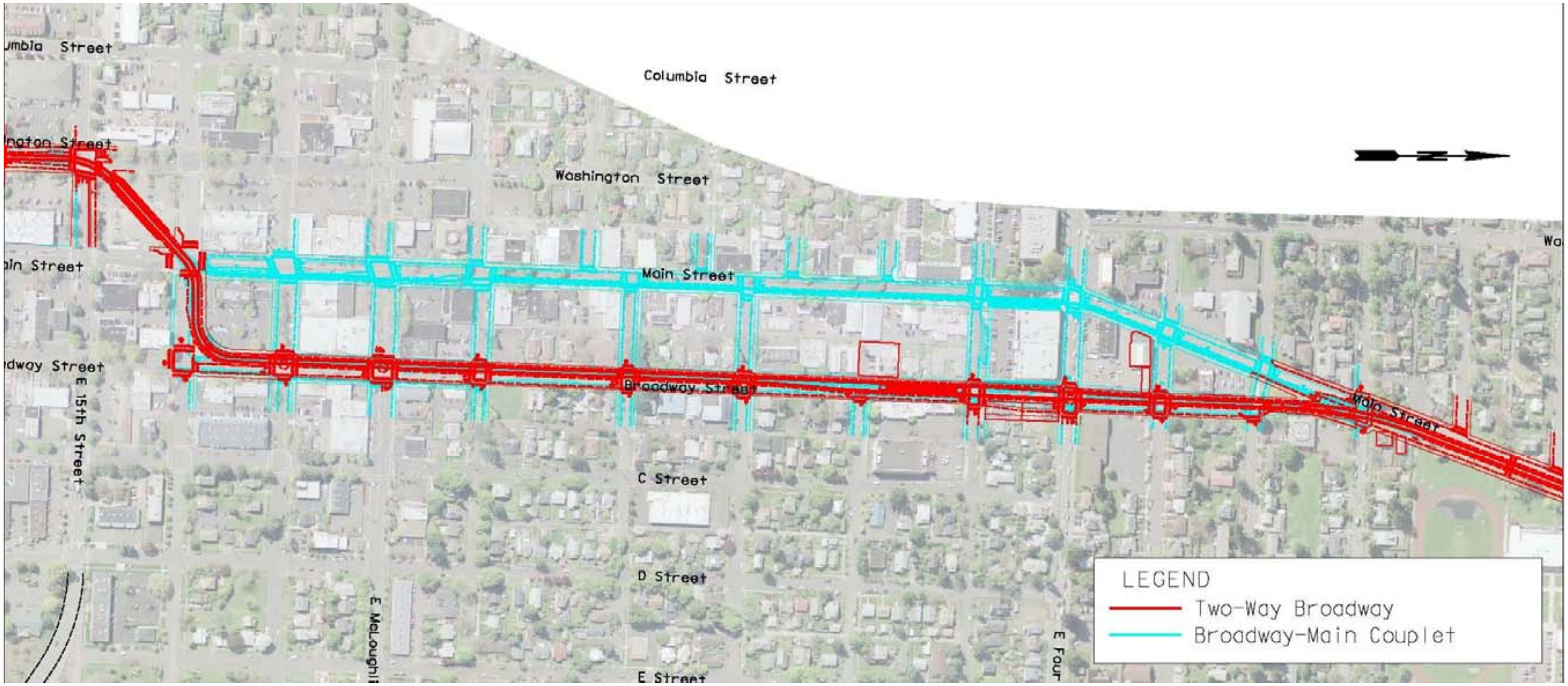


Exhibit 87. Proposed Kiggins Bowl Satellite Park and Ride Lot - Vancouver Alignment

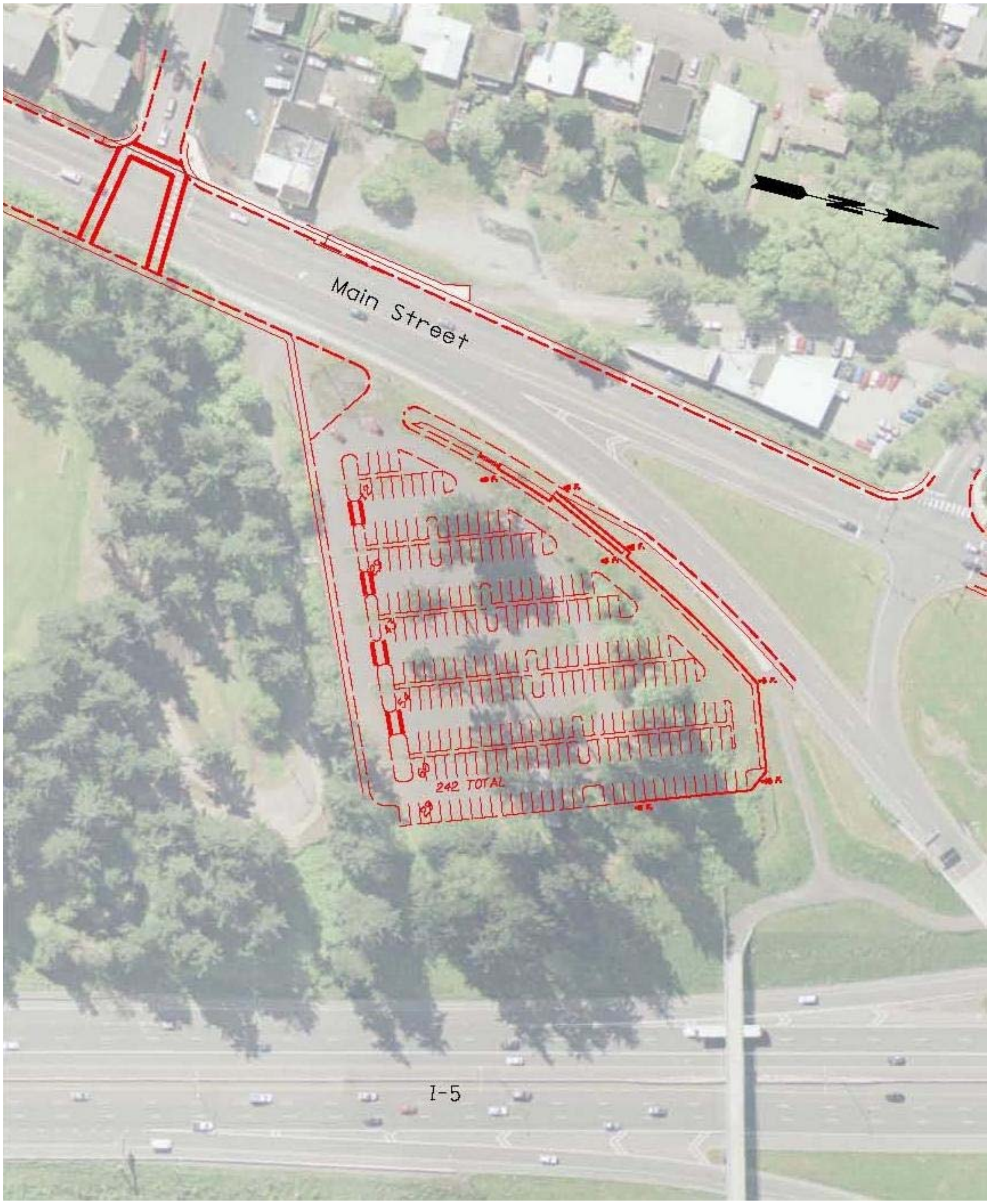


Exhibit 88. Proposed Clark College Park and Ride Lot - Vancouver Alignment

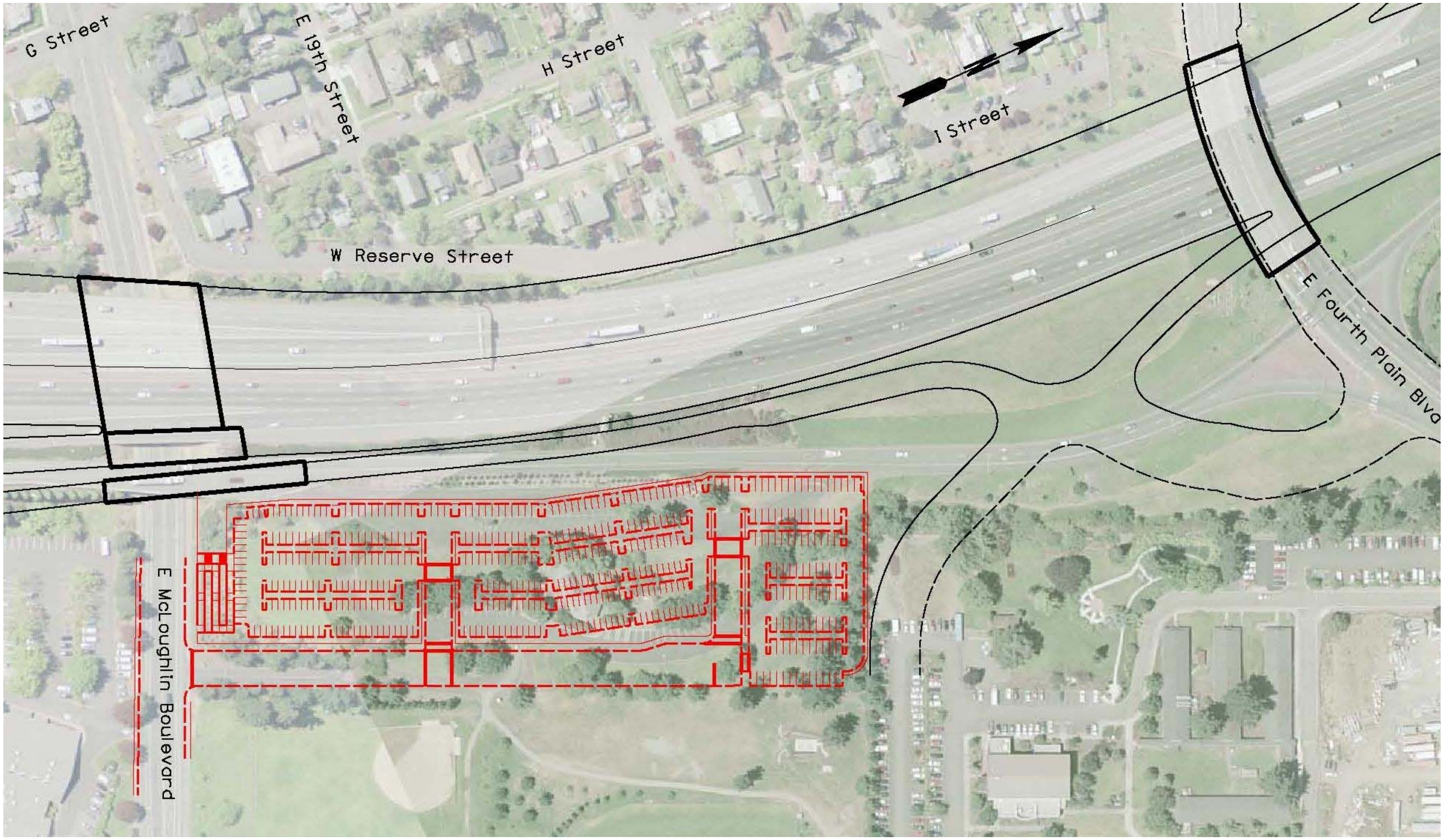


Exhibit 89. Segment B: I-5 Alignment Transit Options

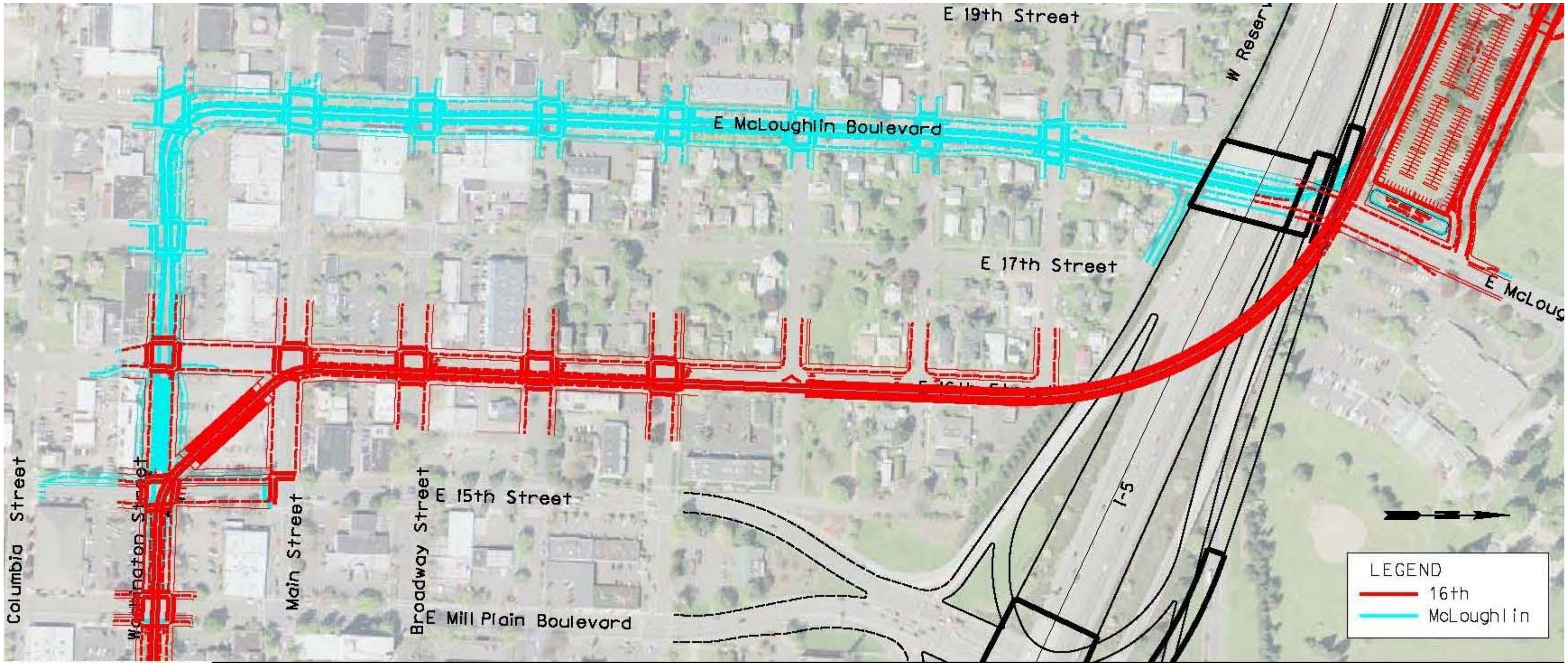


Exhibit 90. Clark College Park and Ride Lot - I-5 Alignment

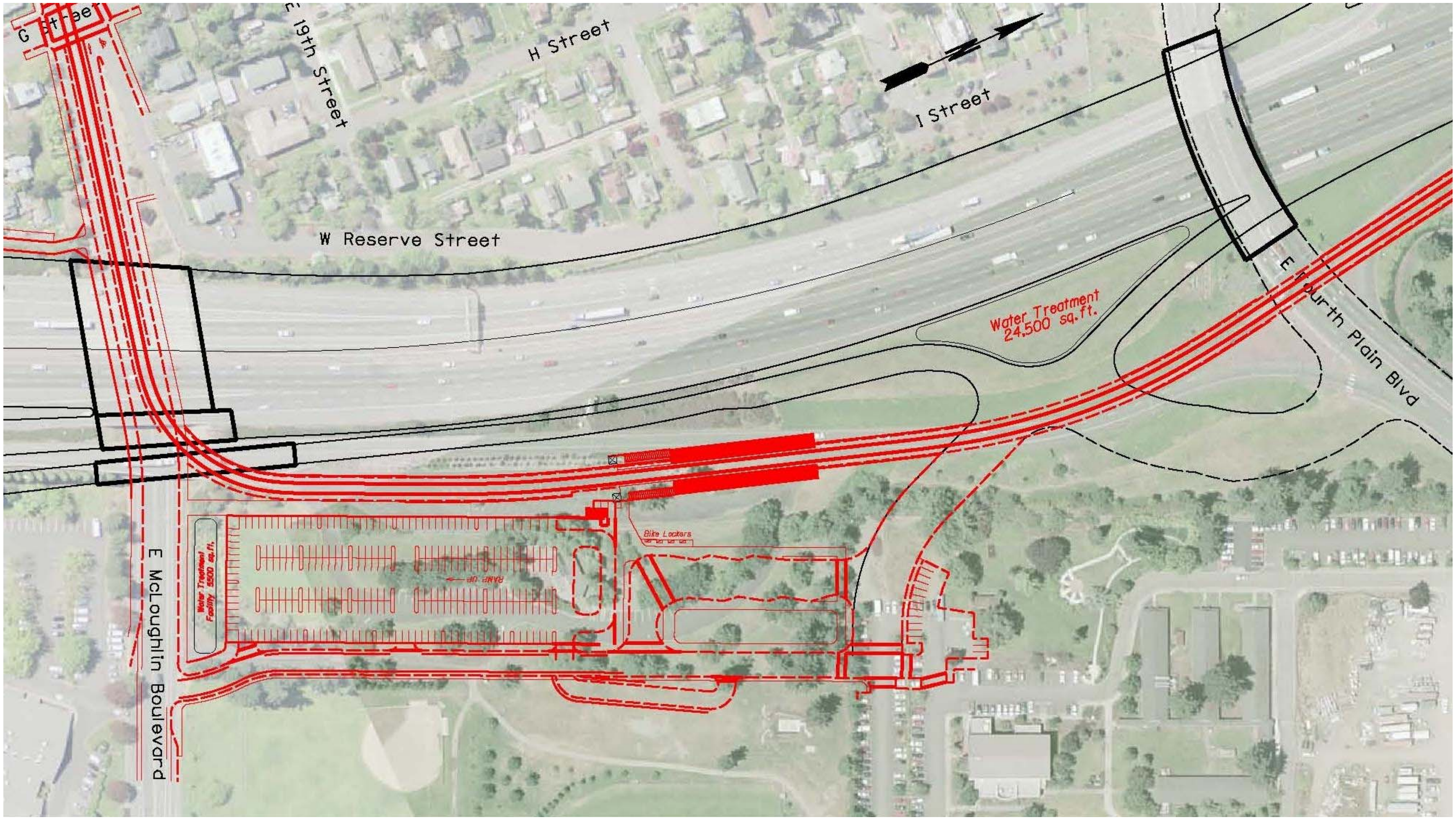
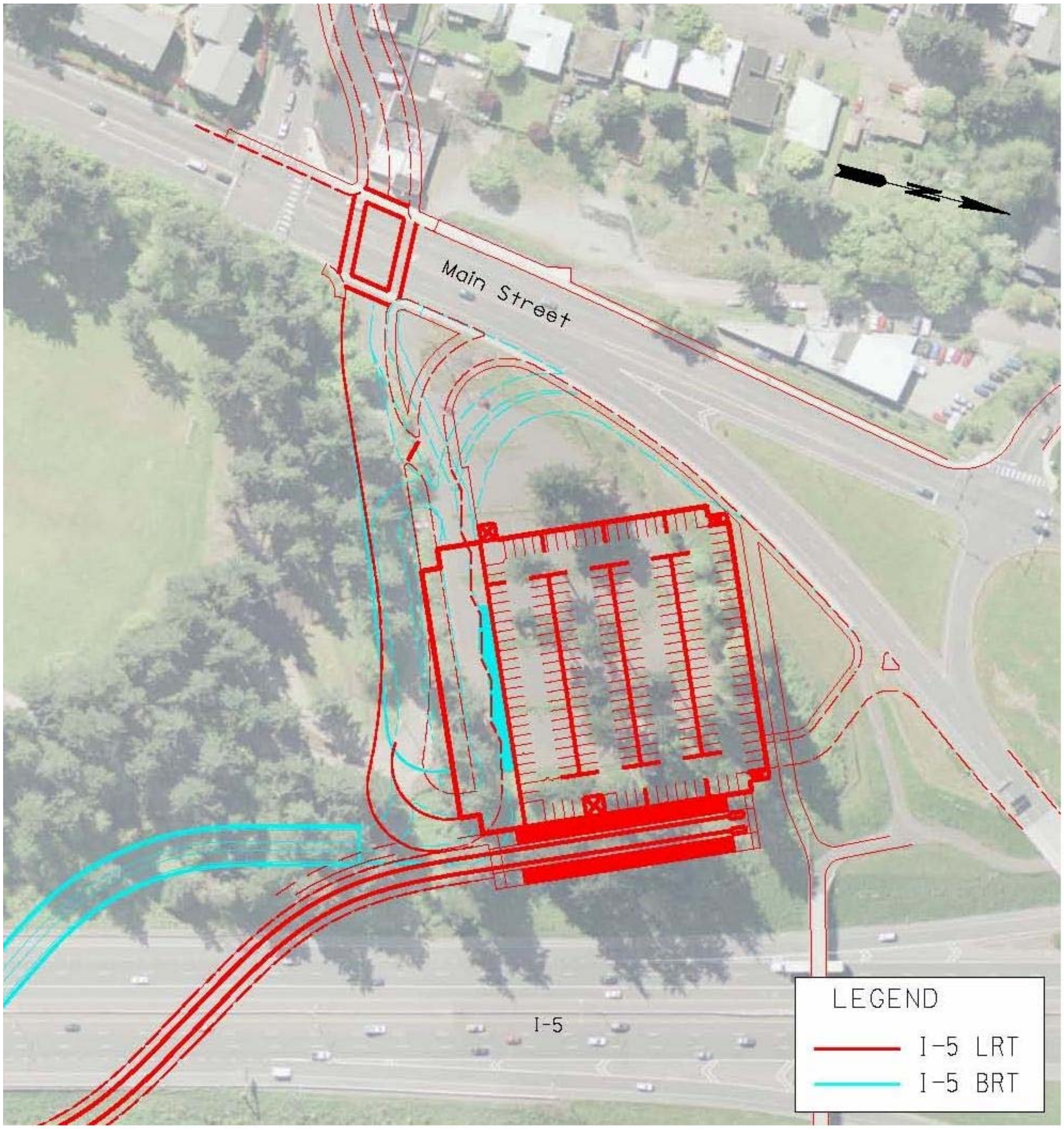


Exhibit 91. Kiggins Bowl Park and Ride Lot - I-5 Alignment



5.6.4 Transit Maintenance Facilities Options

This section describes maintenance facility options, depending on whether LRT or BRT is selected as the HCT mode.

5.6.4.1 LRT Maintenance Facility

Ruby Junction is one of two existing light rail maintenance facilities in TriMet's system, located near Gresham on the Blue Line. Maintenance facilities have a high overhead and so opening a new facility can only be justified with a high savings in deadheading costs and a large increase in vehicles.

The Ruby Junction facility will need to be enlarged to accommodate the next expansion project to be constructed on Portland's LRT system. This will be one of two projects currently in similar phases of the planning process: either the CRC project or the South Corridor, Phase 2 project (an expansion of the LRT system from downtown Portland south through the City of Milwaukie, Oregon).

The first project to go to construction will buy all right-of-way required for the maintenance facility expansion for both projects, but will only build tracks and infrastructure needed for the first project. The second project will build tracks and infrastructure for that project. There will be sufficient track storage space in the full build-out for any of the CRC alternatives as well as for the Milwaukie project. Note that the facility will be sized according to whether an MOS or a full-length alignment option is chosen for the CRC project.

5.6.4.2 BRT and New Local Bus Maintenance Facilities

Acquisitions on the south end of the existing C-TRAN maintenance facility property would be required to create enough space for the expected number of BRT and local buses to be added to the fleet in the BRT options. Expansion of the maintenance bays would also be required and would fit on this expanded facility. Additional acquisitions would be required to accommodate the number of vehicles planned for Alternatives 4 and 5. Options are available for acquisitions adjacent to the existing facility.

6. Temporary Effects

6.1 Introduction

Construction of the high-capacity transit (HCT) guideway, the highway bridge, and highway interchange reconstruction along I-5 in the project area would have temporary effects on the existing local, limited stop, and express bus system. C-TRAN's existing transit system is designed with downtown Vancouver as a central destination. Therefore, most of the local buses serve downtown, and construction in downtown Vancouver would affect a majority of the buses in the C-TRAN system.

This section outlines the regional and local effects to transit that would occur during construction of the bridges, highway, and HCT guideway. The guideway would take 2 years and 9 months to construct for bus rapid transit, and 3 years, 7 months for light rail transit. Many of the temporary effects would cease once the guideway was operational. Highway and bridge construction is estimated to last just over five years.

6.2 Effects to Transit during Construction

Temporary effects to transit during construction would consist mainly of an increase in travel time due to congestion on the I-5 highway during off-peak periods and on downtown Vancouver local city streets during all hours. This section reviews the regional and system-wide temporary effects to the local and express bus system on the ground during construction that would occur if a Locally Preferred Alternative were implemented. The November, 2007 C-TRAN Service Redesign was assumed as the network that will be in place during this construction period.

Buses serving downtown Vancouver, Hayden Island, and Delta Park (one local, three limited stop, and one express bus) would be impacted more significantly than buses terminating in downtown Vancouver due to the long-term ramp closure planned at the northbound I-5/SR 14 interchange.

Effects to peak only express buses running on I-5 would be minimal because one of the main design requirements of the project is to maintain three general purpose lanes in each direction during peak periods, when most express buses operate to downtown Portland or the Delta Park/Vanport Light Rail Transit (LRT) Station. Ten local bus routes and one express bus would be temporarily affected by the HCT guideway construction in downtown and uptown Vancouver, but these effects would be small and short in duration.

6.2.1 Regional and System-Wide Effects

Eleven local fixed routes, three limited stop routes, and one express-bus route serve downtown Vancouver and would be temporarily affected by the construction of an HCT guideway. These routes cross the proposed alignment of the guideway or run on the same street as the guideway. During project construction and construction related congestion, these buses would have slower travel speeds through downtown and consequently along their entire routes. This could reduce the efficiency and speeds of all buses in the region because most non-express bus routes are scheduled with timed transfers at transit centers to meet other routes, and lengthening the travel times of buses serving downtown Vancouver could lengthen the layover times of the feeder buses that serve the outlying areas (assuming the timed transfer would be maintained throughout the system).

Both C-TRAN routes #4 (Fourth Plain) and #105 (I-5 Express) cross the Columbia River during off-peak hours; these two routes in particular may be affected by slower travel speeds during off-peak hours where lane closures, ramp closures, bridge lifts, and detours create longer travel times. Because these two routes carry a large volume of passengers and travel to two of the major transit centers, this could interfere with transfers to outlying buses, causing further delays for users on a county-wide basis.

The existing section of the MAX Yellow Line would not be impacted by construction – existing service to downtown Portland would be maintained, and testing the new vehicles would not affect the existing LRT network. During testing, some empty trains would operate on existing lines, but this would not have a substantial effect on operations or service. Similarly, if bus rapid transit (BRT) were chosen as the preferred mode for the project, there would be no temporary effects to the existing local and express bus network due to the testing of new BRT buses, because they would not be put into revenue service until the guideway construction and testing is completed.

Five of the 15 bus routes serving downtown Vancouver would be affected by bridge and highway interchange construction. Although the project will maintain three general purpose lanes of traffic in each direction on I-5 during peak periods, off-peak periods of lane closures, ramp closures, and detours may cause delays to local buses crossing the Columbia River from downtown Vancouver to Hayden Island and the Delta Park/Vanport LRT Station.

Express buses running on I-5 would not have much impact from construction because they run only during the peak periods when lane closures and other traffic disruptions would be restricted. Still, even though three through traffic lanes would be open in each direction, some of the temporary alignments may not allow current 50 MPH speeds due to narrower lanes and less merging distance at on-ramps making more congestion a high probability. Off-peak travel speeds, especially at night, would be slower due to lane width reductions, ramp closures, lane closures, detours, and the associated increase in the length of bus routing. I-205 buses may be affected because some traffic would choose to cross the Columbia River on the I-205 Glenn Jackson Bridge to avoid construction delays.

The TriMet #6 – Martin Luther King Jr. Boulevard serves Hayden Island, North Portland, and downtown Portland. Many people transfer from the C-TRAN system to the TriMet #6 at Jantzen Beach Center, and there could be temporary travel time impacts to these buses when the local streets associated with the I-5 interchange ramp reconstruction are narrowed or closed due to construction. These effects are anticipated to last two or three years while the interchange on Hayden Island is being reconstructed.

6.2.2 Segment A1: Delta Park to South Downtown Temporary Effects

Segment A1 from Delta Park to downtown Vancouver would have the most effects to transit due to bridge and highway construction. Five bus routes would be impacted by construction of the crossing. These five bus routes (#4 – Fourth Plain, #41 – Camas/Washougal Limited, #44 – Fourth Plain Limited, #47 – Battle Ground Limited, and #105 – I-5 Express), serve downtown Vancouver from Delta Park, Hayden Island, and downtown Portland. With the replacement alternatives, northbound buses would be detoured for two to three years to the Mill Plain Blvd/I-5 interchange while the SR 14/I-5 interchange is reconstructed due to the closure of the ramps to downtown Vancouver. This would cause longer northbound travel times to downtown Vancouver, and perhaps require additional bus vehicles in order to maintain the same headways.

Express buses using I-5 would not experience many disruptions or longer travel times due to bridge and highway construction because they run during peak periods only and three general purpose lanes would be maintained in each direction during peak hours. The #105 would be the only express bus affected by off-peak construction activities.

Construction of the HCT guideway from the Expo LRT station to south downtown Vancouver would coincide with the construction of the highway bridges, regardless of whether a replacement or supplemental bridge was chosen. The effects to the buses would be mostly due to the bridge and highway construction in this corridor. The HCT guideway construction would be separated from most, if not all of the existing bus routes, and therefore, have a negligible impact on transit.

Temporary effects would be greatest to the #4 – Fourth Plain and #105 – I-5 Express (off-peak) because these buses run in the off-peak hours. Slower travel times in the off-peak hours could develop due to lane closures, bridge lifts needed for construction equipment, ramp closures, bus stop relocations, and bus route realignments. If two lanes are closed on the highway in one direction, this leaves one lane open for all travel. ODOT and WSDOT would need to work together to coordinate lane closures that will be appropriate to the traffic volumes at any given time. Transit buses could have delays over fifteen minutes if bridge lifts or two-lane closures delay traffic over the existing bridge.

6.2.3 Segment A2: South Downtown to Mill Plain District Temporary Effects

In Segment A2, the construction of the HCT guideway would have temporary effects to local and express buses. The magnitude of the impacts would depend significantly on the alignment chosen. If a one-way couplet on Washington and Broadway is chosen as the preferred alternative, then construction would have little or no impact to the existing buses because the current routing of buses on Washington and Broadway Streets could be maintained due to the large number of lanes available to shift traffic. However, if a two-way on Washington Street alignment is chosen, the whole street would have to be closed for periods of four to six weeks at a time, and any buses currently running on Washington would need to be relocated to parallel streets one or two blocks away from Washington.

In the case of a two-way Washington Street guideway, buses could be temporarily re-routed onto Columbia Street during construction. Seven bus routes, including one express bus (#105 – I-5 Express) stop on Washington Street. Other buses in downtown Vancouver run northbound and southbound on Broadway and then turn around in a loop along Evergreen Boulevard, Washington Street, and Eighth Street. These would be affected by construction on Washington only when the guideway from Evergreen Boulevard to Eighth Street is under construction.

In the case of the Washington/Broadway couplet for the HCT guideway, buses traveling southbound on Broadway would have to be permanently re-routed because the HCT guideway would be constructed on the west side of Broadway, converting the street to northbound only. Southbound buses on Washington Street would also be rerouted because there would not be room for bus pull-outs at bus stations (stopped buses would hinder the flow of all traffic in that direction).

6.2.4 Segment B: Mill Plain District to North Vancouver Temporary Effects

The temporary effects to transit north of McLoughlin Boulevard would differ depending on the HCT alignment option chosen. The Vancouver alignment option would affect more of the existing transit network than the I-5 alignment option because there are four bus routes (#4 – Fourth Plain, #32 – Hazel Dell, #37 – Highway 99, and #47 – Battle Ground Limited) that use Main Street in this segment. This street has two narrow lanes from McLoughlin Boulevard to 33rd Street, which would restrict transit and increase travel times during construction because buses run in general purpose traffic.

Construction of the I-5 alignment would affect one bus route: the #30 – Burton that runs adjacent to the proposed guideway on a half-mile length of McLoughlin Boulevard. I-5 is a wide highway where lanes can be shifted and the impacts to express buses would be negligible.

Other than the effects to bus routes during construction, the I-5 corridor park and ride lots would likely experience increased traffic and transit passenger volumes. Rider alerts and traffic advisory messages would likely shift some car trips to transit during construction. This would increase the demand for express bus service at the I-5 park and ride lots. Park and ride lots may fill to capacity earlier than normal, and a need for temporary expansion to accommodate the additional demand may arise. The traffic impacts associated with this increase in transit users are defined in the Traffic Technical Report.

7. Mitigation for Temporary Effects

7.1 Introduction

Temporary effects of construction outlined in Section 6 above, such as increased bus travel times and increased passenger volumes at park and ride lots, could be mitigated in various ways. Mitigation measures would need to be instituted as long as bus routes are impacted, potentially until opening day of the HCT guideway. Once the HCT is operational, many of the temporary effects to transit would be reconciled. At that point, the build alternative transit system would be in operation; which relies on the HCT guideway to cross the river. Only the effects to the TriMet #6 from Hayden Island to the Victory Blvd/I-5 interchange may remain until the bridge and highway are complete along its route. The HCT guideway construction is estimated to last 2 years, 9 months for a BRT guideway, and 3 years, 7 months for an LRT guideway. A detailed schedule of highway construction may be found in the Traffic Technical Report.

A possible, and significant, mitigation effort to transit impacts could be a large communications campaign to inform the public about the changes. Associated mitigation measures could be developed by the DOTs and transit agencies on both sides of the river. These agencies should communicate the new routing, potential for more crowded buses and slower travel times, and mitigation measures through TV, radio, e-mail, website, newspaper, and other multi-media instruments to broadcast rider alerts to potential impacted customers.

Bus routes needing temporary relocation could receive temporary benches and shelters at service stops depending on the duration of relocation (any relocation greater than six months would warrant such treatments) and the number of boardings per day. Transportation demand management (TDM) strategies, such as increased express bus and vanpool service should be implemented to assist in mitigating many of the effects to traffic during construction.

7.2 Transit Mitigation in Segment A1: Delta Park to South Downtown

The temporary effects of bridge and highway construction in Segment A1 of increased travel time during all hours due to the I-5 North to downtown Vancouver ramp closure (2 or 3 year closure) would require mitigation for five bus routes: one local fixed route C-TRAN bus (#4 – Fourth Plain), three limited stop peak period only routes (#41 – Camas/Washougal Limited, #44 – Fourth Plain Limited, and #47 – Battle Ground Limited), and one all day service express bus (#105 – I-5 Express). These buses could use the Mill Plain Boulevard interchange exit in order to access downtown Vancouver from the south. The southbound onramp from downtown Vancouver at SR 14 can be maintained during construction.

An additional bus or two may be necessary to maintain existing headways on the #4 during the nighttime hours, because this route has all day service at 15 minute headways and off-peak periods may be more congested due to lane closures, bridge lifts, etc. For instance, if a one-lane northbound lane closure were expected after 9:00 PM for a month, an additional bus may need to be added during this short time period (9:00-12:00 a.m.) in order to maintain the 15 minute headways at the Delta Park/Vanport LRT Station. The lane closure would have the potential for delay to transit because it runs in general highway traffic along this section, and if the lane closure occurs during the same time that the northbound ramp to downtown Vancouver is closed, then a second bus may need to be added due to the ten minutes added for the additional trip time to Mill Plain Blvd and back to lower downtown.

The new routing through downtown Vancouver would need new signs and temporary bus stops. Rider alerts could be made through a communications campaign via internet, e-mail, and hard copy postings on buses and service stops.

Guideway construction through Segment A1 may require rerouting the buses on Hayden Island, depending on the location of the new Hayden Island HCT Station. If the offset alignment is chosen, then the current transit center at Jantzen Beach would have to be relocated. The TriMet #6 route terminates at this transit center, and thus has ten minute layovers for driver break and route recovery. A suitable location nearby could be built for the duration of guideway and station construction in the Jantzen Beach Center parking lot. Rider alerts in the form of internet, e-mail, and hard copy postings on buses and the existing transit center service stops could facilitate the communication of the route and bus stop relocation due to guideway construction.

If the guideway is built adjacent to the I-5 highway, the existing Jantzen Beach Center transit center would not need relocation. Minor rerouting of the buses would be necessary as new ramps and access points are opened at the Hayden Island highway interchange. City streets may also be rebuilt in different locations, requiring a rerouting of the buses. The same communication campaign of rider alerts could be made for both C-TRAN and TriMet buses for all of these mitigation measures.

7.3 Transit Mitigation in Segment A2: South Downtown to Mill Plain District

Segment A2 is where most local bus transit riders either terminate their trip or transfer to another bus traveling northbound or eastbound. A map of the existing bus network in downtown Vancouver is shown in Exhibit 92. Most buses run two directions on Broadway in the existing transit network, but there are also seven routes that run southbound on Washington Street.

If the two-way Washington Street alignment is chosen, then all seven of these routes and the associated service stops could be permanently relocated to Columbia Street, one block west of Washington, since there would not be ample right-of-way for downstream transit stations offset from the through traffic lanes.

If a one-way couplet on Washington and Broadway is selected, then no northbound routes or bus stops would need to be relocated because there would be ample lanes available for traffic to pass stopped buses. However, buses currently running south on Broadway could be permanently relocated to either Columbia or C Street. C Street currently is a one way street to the north, but it may make sense for the City to convert it to a two way street because the new onramp to I-5 South would be located at Sixth and C Streets with this design option.

7.4 Transit Mitigation in Segment B: Mill Plain District to North Vancouver

Temporary effects to transit of construction in this section of Vancouver could be mitigated by temporary rerouting buses onto parallel streets one or two blocks east or west. This should be done along with rider alerts broadcast to the public as stated above. Bus routes and their associated stops on McLoughlin Boulevard (the #30 - Burton and #44 – Fourth Plain Limited) would need to be temporarily relocated if the I-5 alignment (McLoughlin Boulevard option) for the HCT guideway was selected as the preferred alternative. These two routes could be relocated to either 17th or 19th Streets on the west side of I-5 for the duration of construction on McLoughlin Boulevard. After construction is complete, routes could return to McLoughlin Boulevard, which will be a two-way, two-lane road with the HCT guideway in the center of the street.

Buses traveling on Broadway would require minor mitigation of rerouting to Main Street during construction because the HCT guideway construction would consume most of Broadway and limit traffic to one northbound lane. This only applies to the Vancouver alignment. If the I-5 alignment were selected, no mitigation measures would be needed on Main or Broadway Streets. In the Vancouver alignment, northbound buses could return to Broadway after construction of the guideway on Broadway between 16th Street and 28th Street is complete.

Also exclusive to the Vancouver alignment (HCT guideway on Main Street north of 28th Street), buses running on Main Street would need to be relocated during HCT guideway construction; relocation could take place on either Columbia or F Streets. Rider alerts and communication could be executed as the other route relocations above.

I-5 corridor park and ride lots would need mitigation for traffic and transit impacts. Express buses and vanpools could be increased as a TDM measure, thus increasing the demand for transit service at each I-5 corridor park and ride during construction. This would serve to decrease the number of vehicle trips across the river and lessen traffic congestion in the project area. The park and ride lots could be temporarily expanded, if necessary, in order to accommodate the increase in riders and vanpool participants. This may not be necessary because the current utilization of the Salmon Creek, 99th Street, and BPA/Ross Park and ride lots is, at the most, 70 percent. If expansion to any of these lots were necessary, this could be accomplished by leasing adjacent parking lots or expanding parking into adjacent grassy fields as part of a temporary construction easement (such as at the BPA/Ross Park and Ride).

Exhibit 92. Existing Transit Service Stop Locations in Downtown Vancouver

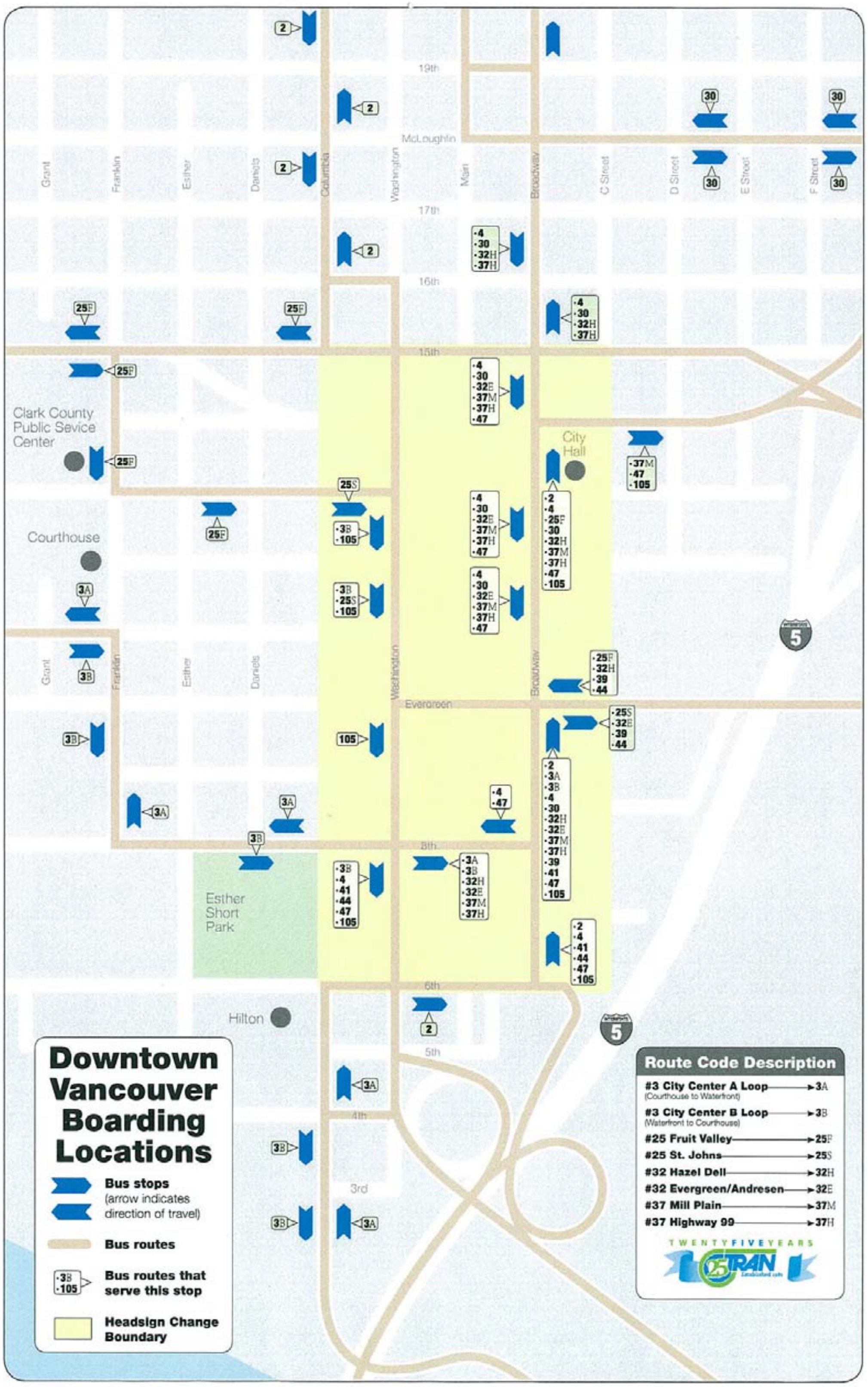
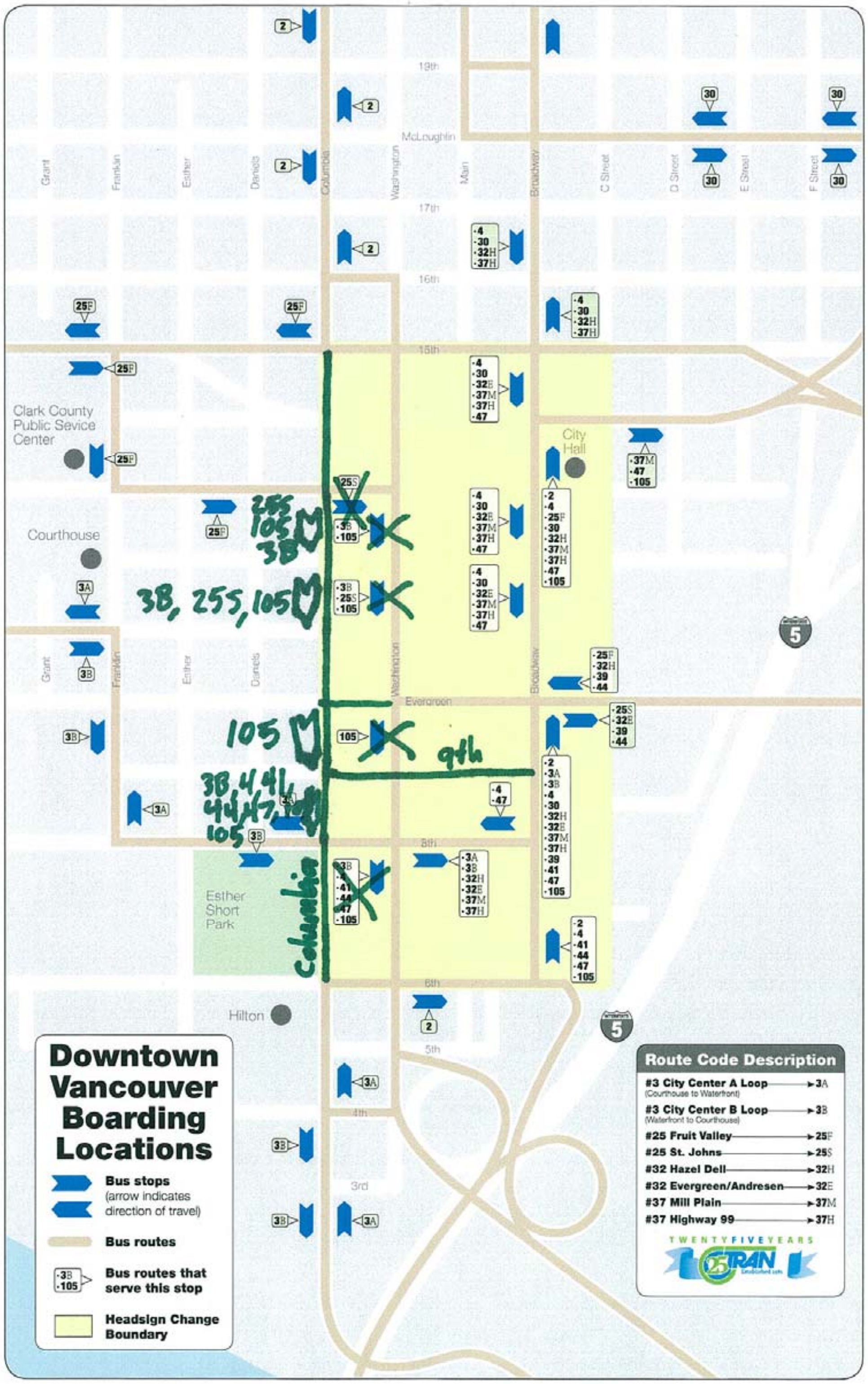


Exhibit 93. Proposed Detour (Shown in Green) for Existing Transit Stops in Downtown Vancouver in a Two-Way on Washington Alignment Option for the HCT Guideway



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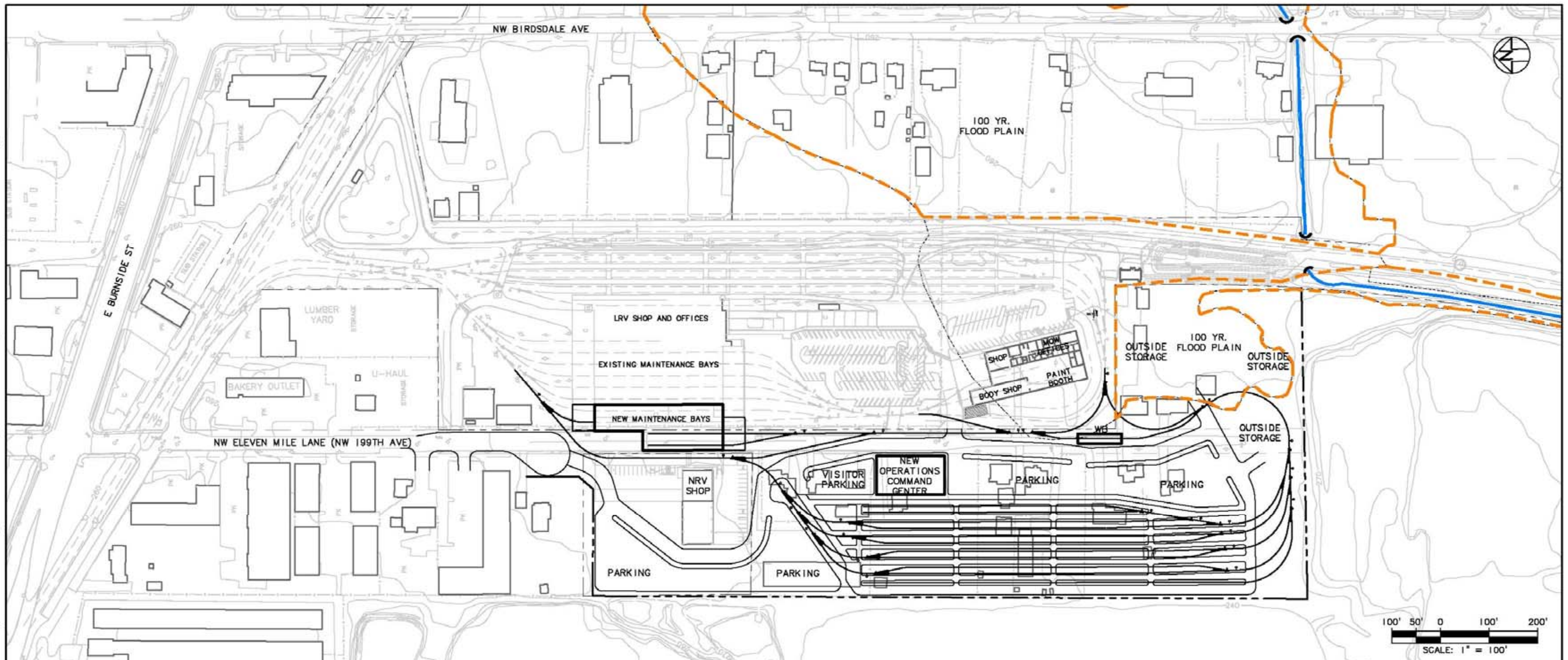
APPENDIX A

Ruby Junction Operations Facility



MILWAUKIE AND CRC EXTENSIONS, AND SYSTEM GROWTH
67 EXISTING STORAGE SPACES PLUS UP TO 46 NEW SPACES
6 NEW MAINTENANCE BAYS
NEW OPERATIONS COMMAND CENTER

NO.	DATE	BY / CHK.	APPD.	REVISIONS

JG — DESIGNED — 4/02 — DATE
JHM — DRAWN — 4/02 — DATE
CHECKED — DATE
APPROVED — DATE

TRI-COUNTY METROPOLITAN TRANSPORTATION DISTRICT OF OREGON

TRI MET
CAPITAL PROJECTS AND FACILITIES DIVISION
710 N.E. HOLLADAY STREET
PORTLAND, OREGON 97232

SUBMITTED: — DATE: — APPROVED: — DATE:

RUBY JUNCTION OPERATIONS FACILITY

CONCEPTUAL SITE PLAN
(NRV SHOP NOT RELOCATED)

SCALE:	DRAWING NO.:	CONTRACT NO.:	SHEET NO.:
1" = 100'	RJFXP-005		

S:\Work_Other projects\Ruby Expansion\RJFXP-005.dwg, 5/15/2007 10:45:48 AM, mcbride

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APPENDIX B

Condensed Calculable Sheet

CRC CRITERIA NUMBER	ALTERNATIVE SCREENING CRITERION	ALTERNATIVE SCREENING MEASURE	METRIC	LONG-TERM EFFECTS OF FULL ALTERNATIVES						SENSITIVITY TEST	MOS	MOS	SENSITIVITY TEST	SENSITIVITY TEST	SENSITIVITY TEST
				2007 EXISTING CONDITIONS	2030 NO BUILD (NA-3) [Alternative #1]	REPLACEMENT CROSSING WITH BUS RAPID TRANSIT AND I-5 STANDARD TOLL (T-18.1) [Alternative #2]	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL (T-17.3) [Alternative #3]	SUPPLEMENTAL CROSSING WITH BUS RAPID TRANSIT AND I-5 HIGHER TOLL (T-20.1) [Alternative #4]	SUPPLEMENTAL CROSSING WITH LIGHT RAIL TRANSIT AND I-5 HIGHER TOLL (T-19.1) [Alternative #5]	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL WITH I-5 FULL LENGTH ALIGNMENT(T-9)	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL, MOS TO CLARK COLLEGE PARK-AND-RIDE (T-11)	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL, MOS TO MILL DISTRICT TRANSIT CENTER (T-21.2) [Post-Processed]	BRT ON I-5 FULL LENGTH ALIGNMENT	BRT CLARK COLLEGE MOS	BRT MILL DISTRICT MOS
2.2	Reduce travel times and delay in the I-5 corridor and within the bridge influence area for transit modes.	PM Peak Period Vehicle Travel Speeds	Total average in MPH	N/A	10	14.5	17.3	13.1	17.3	21.5	20.7	17.3			
			Downtown Vancouver in MPH	8.3	7.5	9.6	12.9	7.5	12.9	12.9	12.9	12.9			
		PM 4 hr peak period/peak direction VHD (transit vehicle hour delay)	Corridor VHD for HCT Modes	0	0	0	0	0	0	0.00	0.00	0.00			
			BIA VHD for HCT Modes	0.00	0	0.03	0	0	0	0.00	0.01	0.01			
			Corridor VHD for Local/Express Bus	11.23	23.28	11.17	13.07	12.11	13.15	12.36	12.66	12.66			
			BIA VHD for Local/Express Bus	2.02	10.00	0.97	0.73	0.42	0.49	0.49	0.45	0.45			
		Total Transit Vehicles per Hour over the Columbia River in Exclusive Guideway or in I-5 General Purpose Lanes (PM peak direction, Does not include vehicles on I-205)	Standard 40' Buses	19	24	40	17	43	20	17	19	17			
			Articulated 60' Buses	N/A	N/A	14	N/A	24	0	N/A	N/A	N/A			
			LRT Two Car Train	N/A	N/A	0	8	0	10	8	8	8			
			Total Transit Vehicles:	**19**	**24**	**54**	**25**	**67**	**30**	**25**	**27**	**25**			
2.5	Improve person throughput of the I-5 Columbia River Crossing.	Total Vehicle Capacity per Hour over the Columbia River (PM peak period/peak direction, Does not include vehicles on I-205) Average Vehicle Capacity Standard Bus = 61 Articulated 60' Bus = 91 LRT Two Car Train = 266	Combined Vehicle Capacity	1,045	1,464	3,714	3,165	4,807	3,880	3,165	3,287	3,165			
		Total Daily and Annual transit trips and persons over the Columbia River via I-5; and Total Daily and Annual CTRAN and TRIMET System Transit Trips Annualization Factors for Trips C-TRAN Local Bus = 300 Express Bus = 253 Limited Stop Bus = 253 TriMet Local Bus = 306 BRT = 315 LRT = 329	Daily Express Bus transit passengers over I-5 Crossing	1,410	2,978	3,653	2,182	4,319	2,685	2,268	2,443	2,273			
			Daily Local Bus transit passengers over I-5 Crossing	1,903	5,849	7,677	N/A	9,483	N/A	N/A	N/A	N/A			
			Daily HCT passengers over I-5 Crossing	N/A	N/A	N/A	18,606	N/A	20,460	18,862	15,800	16,828			
			Daily BRT 71S passengers over I-5 Crossing	N/A	N/A	3,609	N/A	3,780	N/A	N/A	N/A	N/A			
			Daily BRT "Triple Trunk" passengers over I-5 Crossing (4G, 37G, 71G)	N/A	N/A	1,834	N/A	2,265	N/A	N/A	N/A	N/A			
			Total Daily Transit passengers over I-5 Crossing	**3,313**	**8,827**	**16,773**	**20,788**	**19,847**	**23,145**	**21,130**	**18,243**	**19,101**			
			Annual Local Bus transit passengers over I-5 Crossing	570,900	1,754,700	2,303,100	0	2,844,900	0	N/A	N/A	N/A			
			Annual Express Bus transit passengers over I-5 Crossing	356,730	753,434	924,209	552,046	1,092,707	679,305	573,804	618,079	575,069			
			Annual BRT 71S passengers over I-5 Crossing	N/A	N/A	1,136,835	N/A	1,190,700	N/A	N/A	N/A	N/A			
			Annual BRT "Triple Trunk" passengers over I-5 Crossing	N/A	N/A	464,002	N/A	573,045	N/A	N/A	N/A	N/A			
			Annual HCT transit passengers over I-5 Crossing	N/A	N/A	N/A	6,121,374	N/A	6,731,340	6,205,598	5,198,200	5,536,412			
			Total annual transit passengers over I-5 Crossing	**927,630**	**2,508,134**	**4,828,146**	**6,673,420**	**5,701,352**	**7,410,645**	**6,779,402**	**5,816,279**	**6,111,481**			
			Total Daily CTRAN I-5 Express Bus transit boardings	1,482	7,327	3,811	2,664	5,361	3,885	2,421	2,556	2,491			
			Total Daily CTRAN I-205 Express Bus transit boardings	1,184	4,317	4,823	4,797	4,992	6,345	5,105	5,019	5,048			
			Total Daily CTRAN Local Bus transit boardings	12,656	32,768	37,629	34,632	60,594	54,550	34,981	36,756	40,919			
			Daily BRT 71S transit boardings	N/A	N/A	4,985	N/A	4,926	N/A	N/A	N/A	N/A			
			Daily BRT "Triple Trunk" transit boardings	N/A	N/A	5,576	N/A	7,052	N/A	N/A	N/A	N/A			
			Total Daily CTRAN Limited Stop Bus transit boardings	0	757	0	4,275	N/A	5,213	4,740	5,336	6,189			
			Total Daily TRIMET North Portland local bus transit boardings	43,736	82,515	97,903	94,790	114,505	110,449	95,581	95,244	95,678			
			Total Daily TRIMET Yellow Line LRT transit boardings	9,449	14,041	21,091	34,581	26,179	39,405	34,242	30,180	32,803			
			Total Daily BRT/BRT Triple Trunk transit boardings	N/A	N/A	10,561	N/A	11,978	N/A	N/A	N/A	N/A			
			Total Daily CTRAN System Transit Boardings	15,322	45,169	56,824	46,368	82,925	69,993	47,247	49,667	54,647			
			Total Daily TRIMET System Transit Boardings	53,185	96,556	118,994	129,371	140,684	149,854	129,823	125,424	128,481			
			Total Daily Transit Boardings (All Systems)	**68,507**	**141,725**	**175,818**	**175,739**	**223,609**	**219,847**	**177,070**	**175,091**	**183,128**			
			Total Annual CTRAN I-5 Express Bus transit boardings	374,946	1,853,731	964,183	673,992	1,356,333	982,905	612,513	646,668	630,223			
			Total Annual CTRAN I-205 Express Bus transit boardings	299,552	1,092,201	1,220,219	1,213,641	1,262,976	1,605,285	1,291,565	1,269,807	1,277,144			
			Total Annual CTRAN Local Bus transit boardings	3,796,800	9,830,400	11,288,700	10,389,600	18,178,200	16,365,000	10,494,300	11,026,800	12,275,700			
			Total Annual BRT 71S transit boardings	N/A	0	1,570,275	0	1,551,690	0	N/A	N/A	N/A			
			Total Annual BRT "Triple Trunk" transit boardings	N/A	0	1,410,728	0	2,221,380	0	N/A	N/A	N/A			
			Total Annual CTRAN Limited Stop Bus transit boardings	N/A	0	0	1,081,575	0	1,318,889	1,199,220	1,350,008	1,565,817			
			Total Annual TRIMET North Portland local bus transit boardings	13,383,216	25,249,590	29,958,318	29,005,740	35,038,530	33,797,394	29,247,786	29,144,664	29,277,468			
			Total Annual TRIMET Yellow Line LRT transit boardings	3,108,721	4,619,489	6,938,939	11,377,149	8,612,891	12,964,245	11,265,618	9,929,220	10,792,187			
			Total Annual CTRAN System Transit Boardings	4,471,298	12,776,332	13,473,102	13,358,808	20,797,509	20,272,079	13,597,598	14,293,283	15,748,884			
			Total Annual TRIMET System Transit Boardings	16,491,937	29,869,079	36,897,257	40,382,889	43,651,421	46,761,639	40,513,404	39,073,884	40,069,655			
			Total Annual Transit Boardings (All Systems)	**20,963,235**	**42,645,411**	**53,351,362**	**53,741,697**	**68,222,000**	**67,033,718**	**54,111,002**	**53,367,167**	**55,818,539**			
		Peak period/peak direction mode split between SOV, HOV, and	PM Peak Direction SOV	67%	54%	53%	50%	44%	41%	50%	52%	50%			
			PM Peak Direction HOV	27%	33%	28%	29%	23%	22%	28%	29%	27%			
			PM Peak Direction Transit	6%	13%	19%	21%	33%	37%	22%	19%	23%			
			Daily Transit Mode Split: Clark County Urban Transit Market to 5 Markets in Oregon (All Trips)	6.0%	12.0%	15.0%	20.0%	18.0%	22.0%	21.0%	20.0%	20.0%			

				LONG-TERM EFFECTS OF FULL ALTERNATIVES						SENSITIVITY TEST	MOS	MOS	SENSITIVITY TEST	SENSITIVITY TEST	SENSITIVITY TEST
CRC CRITERIA NUMBER	ALTERNATIVE SCREENING CRITERION	ALTERNATIVE SCREENING MEASURE	METRIC	2007 EXISTING CONDITIONS	2030 NO BUILD (NA-3) [Alternative #1]	REPLACEMENT CROSSING WITH BUS RAPID TRANSIT AND I-5 STANDARD TOLL (T-18.1) [Alternative #2]	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL (T-17.3) [Alternative #3]	SUPPLEMENTAL CROSSING WITH BUS RAPID TRANSIT AND I-5 HIGHER TOLL (T-20.1) [Alternative #4]	SUPPLEMENTAL CROSSING WITH LIGHT RAIL TRANSIT AND I-5 HIGHER TOLL (T-19.1) [Alternative #5]	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL WITH I-5 FULL LENGTH ALIGNMENT(T-9)	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL, MOS TO CLARK COLLEGE PARK-AND-RIDE (T-11)	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL, MOS TO MILL DISTRICT TRANSIT CENTER (T-21.2) [Post-Processed]	BRT ON I-5 FULL LENGTH ALIGNMENT	BRT CLARK COLLEGE MOS	BRT MILL DISTRICT MOS
		transit over I-5.	Daily Transit Mode Split: Clark County Suburban Commuter Markets to 5 Markets in Oregon (All trips)	3.0%	12.0%	13.0%	15.0%	15.0%	16.0%	18.0%	13.0%	15.0%			
			Daily Transit Mode Split: 5 Markets in Oregon to Clark County (All trips)	1.0%	3.0%	6.0%	8.0%	8.0%	10.0%	8.0%	7.0%	8.0%			
3.1	Provide for multi-modal transportation choices.	Percent of households and employment with access to transit within 1/4 mile of bus lines and ½ mile of HCT stations.	Households Region - 1/4 mile from bus route	67%	60%	60%	60%	60%	60%	60%	60%	60%			
			Employment Region - 1/4 mile from bus route	83%	78%	78%	78%	78%	78%	78%	78%	78%			
			Households Clark County - within 1/2 mile of HCT stations	N/A	N/A	5%	5%	5%	5%	4%	3%	3%			
			Employment Clark County - within 1/2 mile of HCT stations	N/A	N/A	11%	11%	11%	11%	10%	9%	9%			
3.2	Improve transit service to target markets in the I-5 corridor and within the bridge influence area.	Transit travel time in minutes (uses guideway)	**PM Peak Direction**												
			Terminal Park and Ride to Expo Center (HCT Only)	N/A	N/A	13.0	12.0	19.0	12.0	11.7	8.5	7.0	13.0	9.8	7.3
			Terminal Park and Ride to Pioneer Courthouse Square (HCT Only)	N/A	N/A	43.4	39.9	47.4	39.9	39.6	36.4	33.9	43.4	40.2	37.7
			Lombard Transit Center to Terminal Park and Ride (HCT Only)	N/A	N/A	22.7	17.5	26.7	17.5	17.3	14.1	12.6	22.7	19.5	17.0
			Downtown Vancouver at 7th and Washington to Pioneer Square (HCT Only)	N/A	N/A	35.4	31.6	34.4	31.6	31.6	31.6	31.6	35.4	32.2	29.7
		Transit travel times from the seven Clark County transit markets to the five major transit markets in Oregon (both in vehicle and out of vehicle for a few representative pairs). Average transit travel times in minutes. Two Hour Peak Period Time for NB and SB	**Two Hour PM Northbound (VISSIM and EMME/2)**												
			Pioneer Square to Salmon Creek PNR (CTRAN #134)	44.3	48	32.0	32.0	33	33	31.4	31.4	31.4	32.0	32.0	32.0
			Lombard Transit Center to Vancouver Mall (via LRT and 4PIRX, 4L or 4G Branded BRT)	47.6	56.6	40.1	38.8	46.3	36.3	38.8	36.3	36.3	40.1		
			Hayden Island to 99th Street Transit Center (via LRT and 71L or 71GL Branded BRT)	34.5	39.5	24.0	32.4	30.0	30.9	42.4	42.4	42.4	24.0		
			Two Hour AM Southbound (VISSIM and EMME/2)												
			Salmon Creek PNR to Pioneer Square (CTRAN #134)	36.4	55.9	50.9	50.9	50.9	50.9	54.4	54.4	54.4	50.9		
			Vancouver Mall to Lombard Transit Center (via 4L or 4G Branded BRT to LRT)	30.7	30.7	36.6	34.0	44.6	33.3	34.0	34.0	34.0	36.6		
			99th Street Transit Center to Hayden Island (via LRT and 71L or 71GL Branded BRT)	39.5	40.5	24.0	19.1	30.0	20.4	34.1	34.1	34.1	24.0		
		Additional vehicles required for each alternative	# of 40' buses required over the No-Build (C-TRAN)	N/A	N/A	0	0	91	94	0	0				
			# of 40' buses required over the No-Build (TriMet)	N/A	N/A	0	0	52	53	0	0				
			# 60' buses required over the No-Build	N/A	N/A	24	0	38	0	0	0				
			#Light Rail Vehicles required over the No-Build	N/A	N/A	0	14	0	18	14	12				
8.1	Minimize the cost of construction.	Estimated transit capital costs by mode.	In millions, YOE CEVP Dollars	$0	$0.0	$692.2	$879.3	$769.6	$935.2	LRT $1068.8 BRT $883.0	$674.9	$615.8			
		Annualized transit capital costs by mode.	In millions, YOE CEVP Dollars	N/A	N/A	$53.6	$67.2	$64.5	$75.9	$80.6	$51.0	$46.5			
		Incremental Cost per Incremental Passenger	FTA Cost effectiveness index	N/A	N/A	$25.93	$14.23	$11.31	$8.93	$16.87	$13.83	$8.71			
		Total annualized cost per transit guideway river crossing	CRC Cost effectiveness index	N/A	N/A	$15.09	$11.55	$23.67	$16.58	$13.67	$10.38	$8.91			
8.3	Ensure transportation system maintenance and operation cost effectiveness.	Transit Performance Indicators	Annual Total System Operating Cost per Boarding	N/A	$1.64	$1.41	$1.36	$1.68	$1.57	$1.37	$1.36	$1.30			
			Annual HCT Boardings per Annual HCT Platform Hour	N/A	N/A	58.5	154.4	48.1	172.1	152.9	134.8	146.5			
			Total Annual Incremental Place Miles	N/A	N/A	46,366,871	78,241,838	676,190,604	357,353,090	108,246,112	72,576,562	108,446,587	53,290,421	46,366,871	46,366,871
			Total Annual Incremental Operating Cost per Place Mile	N/A	N/A	$0.11	$0.04	$0.07	$0.10	$0.04	$0.04	$0.03	$0.10	$0.11	$0.11
		Weekday Platform Hours Required Transit Operating Costs	**Weekday Platform Hours**												
			C-TRAN Local Bus	786	881	904	859	1,791	1,479	886	886	886	913	913	913
			C-TRAN Express Bus	190	346	356	312	594	520	304	309	295	356	356	356
		Annualization Factors for Operating Costs Express Bus = 253 C-TRAN Local Bus = 300 Limited Stop Bus = 253 TriMet Local Bus = 314 BRT = 352 LRT = 352	Daily TriMet North Portland Local Bus Routes #4, #6, #8, #16, #33, #40, #72, #75	1,240	1,244	1,238	1,238	1,604	1,571	1,238	1,238	1,238	1,238	1,238	1,238
			LRT **VHT** (Yellow Line)	135	135	135	208	148	214	208	190	181	135	135	135
			Limited Stop Bus	32	26	0	95	0	164	105	114	114	0	0	0
			Branded BRT (71S)		0	39	0	51		0	0	0	39	42	42
			Branded BRT Triple Trunk (4G, 37G, 71G)	N/A	0	147	0	239	0	0	0	0	147	152	152
			Total	**2,383**	**2,632**	**2,819**	**2,712**	**4,427**	**3,948**	**2,741**	**2,738**	**2,714**	**2,828**	**2,836**	**2,836**
			Annual Platform Hours												
			C-TRAN Local Bus	246,268	264,300	271,200	257,700	537,300	443,700	265,800	265,800	265,800	273,837	273,837	273,837
			C-TRAN Express Bus	48,260	87,538	90,058	78,810	150,282	131,560	76,958	78,273	74,635	90,058	90,058	90,058
			Daily TriMet North Portland Local Bus Routes #4, #6, #8, #16, #33, #40, #72, #75	389,222	390,475	388,804	388,804	503,650	493,209	388,804	388,804	388,804	388,804	388,804	388,804
			LRT (Yellow Line)	47,520	49,801	49,801	73,682	52,096	75,328	73,682	73,682	73,683	49,801	49,801	49,801
		Annualization Factors for VMT and Operating Costs Express bus = 253 CTRAN local bus = 300 Limited stop bus = 253 TriMet local bus = 314 BRT AM/PM peak only = 253 BRT = 352 LRT = 352	Limited Stop Bus	8,128	6,578	0	24,035	0	41,492	26,565	28,842	28,842	0	0	0
			Branded BRT (71S)	N/A	0	13,612	0	18,072	0	0	0	0	13,612	14,946	14,946
			Branded BRT Triple Trunk (4G, 37G, 71G)	N/A	0	37,310	0	60,378	0	0	0	0	37,310	38,438	38,438
			Total	**739,398**	**798,692**	**850,785**	**823,031**	**1,321,778**	**1,185,289**	**831,809**	**835,401**	**831,764**	**853,422**	**855,884**	**855,884**
			O&M Model Input Articulated Bus Hours			**50,922**	**0**	**78,450**	**0**	**0**	**0**	**0**	**50,922**	**53,384**	**53,384**
			O&M Model Input CTRAN Standard Bus Hours	**302,656**	**358,416**	**361,258**	**360,545**	**687,582**	**616,752**	**369,323**	**372,915**	**369,277**	**363,895**	**363,895**	**363,895**
			Weekday Vehicle Miles Traveled												
			C-TRAN Local Bus	11,701	10,841	11,327	11,183	21,582	20,437	10,470	10,513	10,470	11,327	11,327	11,327
			C-TRAN Express Bus (I-5 and I-205 routes)	4,472	5,273	5,603	4,744	6,903	6,421	6,413	4,740	6,233	5,603	5,603	5,603
			Daily TriMet North Portland Local Bus Routes #4, #6, #8, #16, #33, #40, #72, #75	10,833	13,249	13,249	13,249	17,453	17,061	13,962	13,962	13,962	13,249	13,249	13,249
		O&M Model Version 2.7 Cost to Operate per Platform Hour (FY 2007) 2007 CTRAN bus = $85.99 2030 CTRAN bus = $81.61 2030 CTRAN BRT/Bus combo = $84.17 2030 CTRAN bus portion of LRT = $81.35 2030 CTRAN ETS BRT/Bus combo = $83.85 2030 CTRAN ETS bus portion of LRT = $85.05 2007 TriMet bus = $85.07 2030 TriMet bus = $85.07 2030 C-TRAN bus portion of LRT (I-5 Full Length T-9) = $80.85 2030 C-TRAN bus portion of LRT (Clark College MOS T-11) = $78.60	LRT (Yellow Line)	1,134	1,222	1,222	2,008	1,890	2,841	2,062	2,062	2,062	1,222	1,222	1,222
			Limited Stop Bus	528	182	0	607	0	988	1,400	710	1,593	0	0	0
			Branded BRT (71S)	N/A	0	564	0	816	0	0	0	0	685	564	564
			Branded BRT Triple Trunk (4G, 37G, 71G)	N/A	0	744	0	1,490	0	0	0	0	876	744	744
			Total	**28,668**	**30,767**	**32,709**	**31,791**	**50,134**	**47,748**	**34,307**	**31,987**	**34,320**	**32,962**	**32,709**	**32,709**
			Annual Vehicle Miles Traveled												
			C-TRAN Local Bus	3,510,165	3,252,300	3,398,100	3,354,900	6,474,600	6,131,100	3,141,000	3,153,900	3,141,000	3,398,100	3,398,100	3,398,100
			C-TRAN Express Bus (I-5 and I-205 routes)	1,131,527	1,334,069	1,417,458	1,200,126	1,746,459	1,624,513	1,622,383	1,199,306	1,576,949	1,417,458	1,417,458	1,417,458
			Daily TriMet North Portland Local Bus Routes #4, #6, #8, #16, #33, #40, #72, #75	3,401,562	4,160,186	4,160,186	4,160,186	5,480,242	5,357,154	4,384,068	4,384,068	4,384,068	4,160,186	4,160,186	4,160,186
			LRT (Yellow Line)	399,168	430,144	430,144	706,816	665,280	1,000,032	725,824	725,824	725,824	430,144	430,144	430,144
			Limited Stop Bus	133,463	46,046	0	153,571	0	249,964	354,200	179,630	402,920	0	0	0

				LONG-TERM EFFECTS OF FULL ALTERNATIVES						SENSITIVITY TEST	MOS	MOS	SENSITIVITY TEST	SENSITIVITY TEST	SENSITIVITY TEST
CRC CRITERIA NUMBER	ALTERNATIVE SCREENING CRITERION	ALTERNATIVE SCREENING MEASURE	METRIC	2007 EXISTING CONDITIONS	2030 NO BUILD (NA-3) [Alternative #1]	REPLACEMENT CROSSING WITH BUS RAPID TRANSIT AND I-5 STANDARD TOLL (T-18.1) [Alternative #2]	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL (T-17.3) [Alternative #3]	SUPPLEMENTAL CROSSING WITH BUS RAPID TRANSIT AND I-5 HIGHER TOLL (T-20.1) [Alternative #4]	SUPPLEMENTAL CROSSING WITH LIGHT RAIL TRANSIT AND I-5 HIGHER TOLL (T-19.1) [Alternative #5]	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL WITH I-5 FULL LENGTH ALIGNMENT(T-9)	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL, MOS TO CLARK COLLEGE PARK-AND-RIDE (T-11)	REPLACEMENT CROSSING WITH LIGHT RAIL TRANSIT AND I-5 STANDARD TOLL, MOS TO MILL DISTRICT TRANSIT CENTER (T-21.2) [Post-Processed]	BRT ON I-5 FULL LENGTH ALIGNMENT	BRT CLARK COLLEGE MOS	BRT MILL DISTRICT MOS
		2030 C-TRAN bus portion of LRT (Mill District MOS T-22.2) = $81.31 2030 C-TRAN BRT/Bus combo (I-5 Full Length BRT) = $83.27 2030 C-TRAN BRT/Bus combo (Clark College P&R MOS BRT) = $82.79 2030 C-TRAN BRT/Bus combo (Mill District P&R MOS BRT) = $82.68 2030 C-TRAN BRT/Bus combo (Mill District P&R MOS LRT) = $81.02	Branded BRT (71S)	N/A	0	198,528	0	287,232	0	0	0	0	241,168	198,528	198,528
			Branded BRT Triple Trunk (4G, 37G, 71G)	N/A	0	188,232	0	376,970	0	0	0	0	221,675	188,232	188,232
			Total	**8,575,885**	**9,222,745**	**9,792,648**	**9,575,599**	**15,030,783**	**14,362,763**	**10,227,475**	**9,642,728**	**10,230,761**	**9,868,731**	**9,792,648**	**9,792,648**
			C-TRAN Bus Portion of VMT	4,775,155	4,632,415	4,815,558	4,708,597	8,221,059	8,005,577	5,117,583	4,532,836	5,120,869	4,815,558	4,815,558	4,815,558
			BRT Combined	N/A	N/A	386,760	0	664,202	0	0	0	1	462,843	386,760	386,760
			Annual Incremental Transit VMT over No Build	N/A	N/A	**569,903**	**352,854**	**5,808,038**	**5,140,018**	**1,004,730**	**419,983**	**1,008,016**	**645,986**	**569,903**	**569,903**
			C-TRAN Local Bus	$21,176,585	$21,569,523	$22,826,904	$20,963,895	$45,052,605	$37,736,685	$21,489,930	$20,891,880	$21,535,116	$22,802,407	$22,670,965	$22,640,843
			C-TRAN Express Bus	$4,149,877	$7,143,976	$7,580,172	$6,411,153	$12,601,146	$11,189,178	$6,222,017	$6,152,269	$6,046,928	$7,499,120	$7,455,892	$7,445,986
			TriMet North Portland Local Bus	$33,111,102	$33,217,683	$33,075,575	$33,075,575	$42,845,482	$41,957,308	$33,075,575	$33,075,575	$33,075,575	$33,075,575	$33,075,575	$33,075,575
			LRT (Yellow Line)	$6,799,309	$7,301,925	$7,301,925	$10,869,906	$7,301,925	$11,051,483	$11,077,268	$10,336,707	$9,603,049	$7,301,925	$7,301,925	$7,301,925
			Limited Stop Bus	$698,927	$536,831	$0	$1,955,247	$0	$3,528,895	$2,147,780	$2,266,981	$2,336,779	$0	$0	$0
			Branded BRT	$0	$0	$4,286,084	$0	$6,578,043	$0	$0	$0	$0	$4,240,254	$4,419,679	$4,413,806
			CTRAN System Total	$26,025,389	$29,250,330	$34,693,159	$29,330,295	$64,231,794	$52,454,758	$29,859,727	$29,311,130	$29,918,823	$34,541,781	$34,546,536	$34,500,635
			Total Transit Annual Operating Costs (Current 2007 dollars)	$65,935,800	$69,769,938	$75,070,660	$73,275,776	$114,379,201	$105,463,549	$74,012,570	$72,723,412	$72,597,447	$74,919,281	$74,924,036	$74,878,135
			Incremental Transit Annual Operating Costs over No Action (Current 2007 dollars)	**N/A**	**N/A**	**$5,300,722**	**$3,505,839**	**$44,609,263**	**$35,693,611**	**$4,242,633**	**$2,953,474**	**$2,827,509**	**$5,149,343**	**$5,154,098**	**$5,108,198**
9.1	Support adopted regional growth management and comprehensive plans.	Proximity of proposed HCT stations to areas of higher density, either existing or planned (in local comprehensive plans) and with supportive parking, pedestrian and other policies in place.	Supports Vancouver TSP, VCCV, RTC's MTP, 2004 RTP, Metro 2040 Growth Concept, and Portland TSP	Low - Does not include an HCT mode that would support existing plans and areas of higher density.	Low - Does not include an HCT mode that would support existing plans and areas of higher density.	Medium - Includes an HCT mode that would support higher density. It is not the specific mode noted in local plans.	High - Includes the HCT mode noted in local plans that would support higher density.	Medium - Includes an HCT mode that would support higher density. It is not the specific mode noted in local plans.	High - Includes the HCT mode noted in local plans that would support higher density.	High - Includes the HCT mode noted in local plans that would support higher density.	High - Includes the HCT mode noted in local plans that would support higher density.	High - Includes the HCT mode noted in local plans that would support higher density.	Medium - Includes an HCT mode that would support higher density. It is not the specific mode noted in local plans.	Medium - Includes an HCT mode that would support higher density. It is not the specific mode noted in local plans.	Medium - Includes an HCT mode that would support higher density. It is not the specific mode noted in local plans.

	Information still needed
	Ted Stonecliffe speed output

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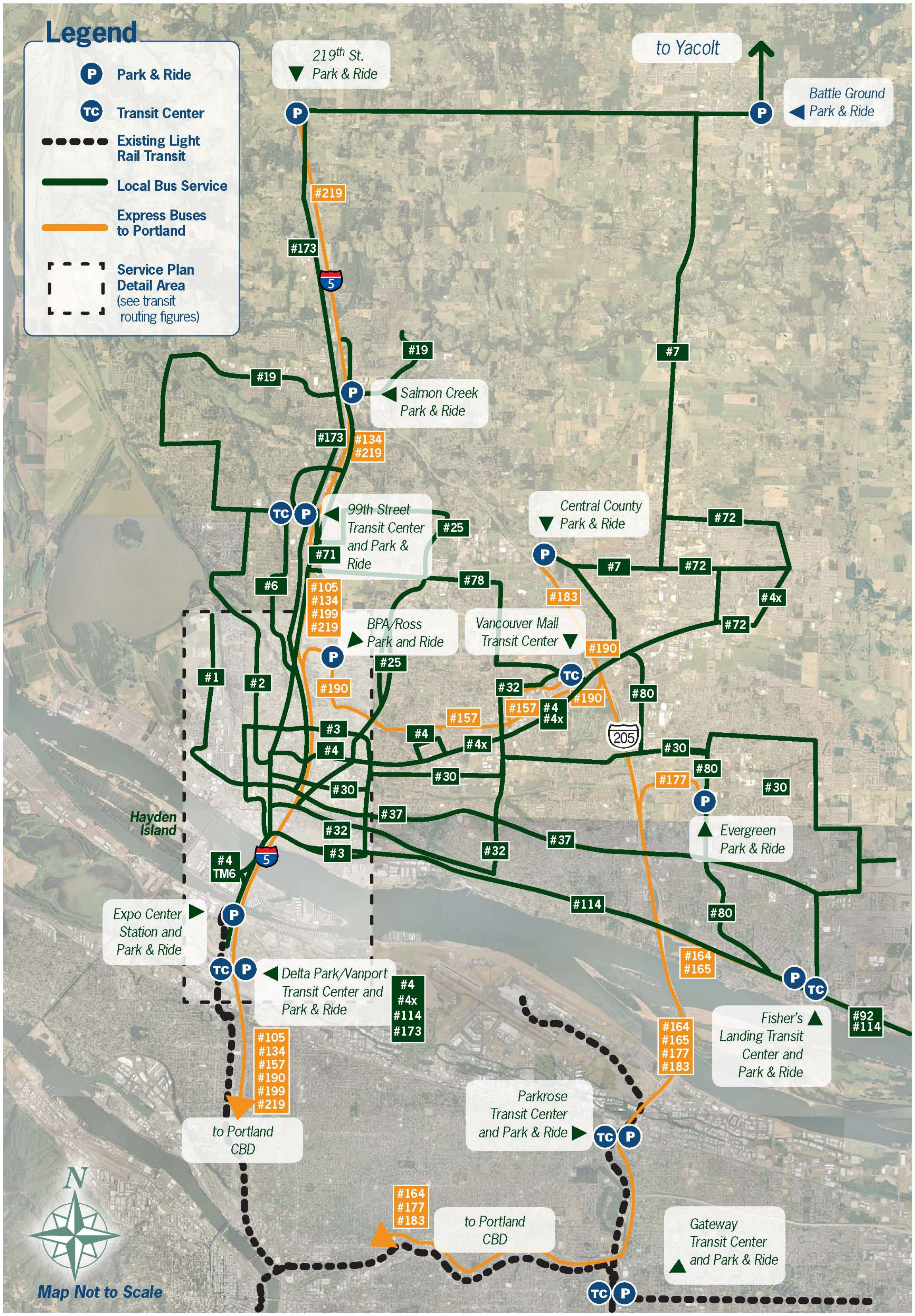
APPENDIX C

Maps of Service Areas and Routes

Map of Service Areas and Routes: Alternatives 1, 2 & 3

Alternative 1: Local, Express and Trunk Line Service



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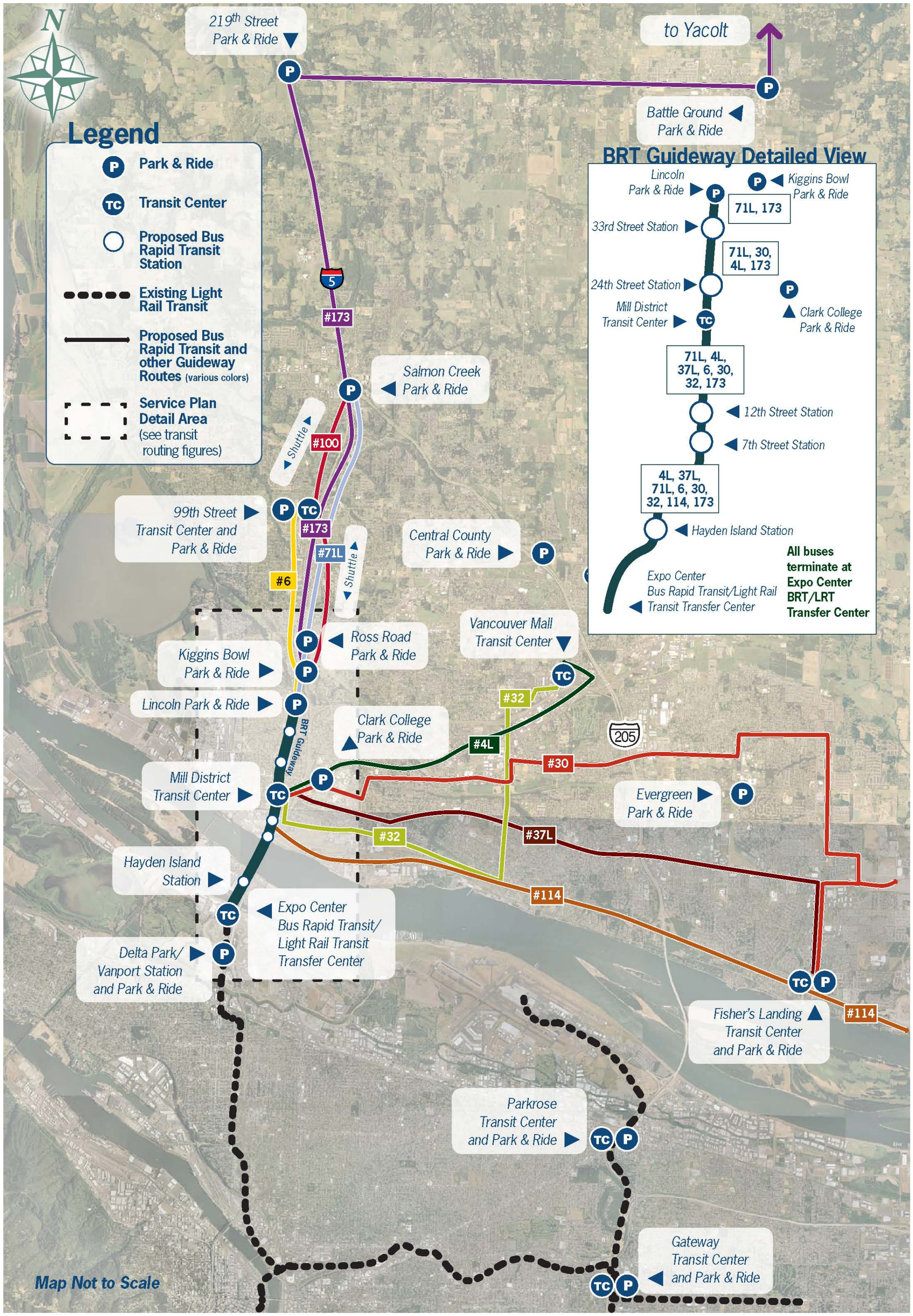
Alternative 2 – Vancouver Alignment: Transit Crossing the Columbia River (Local Network Not Shown)



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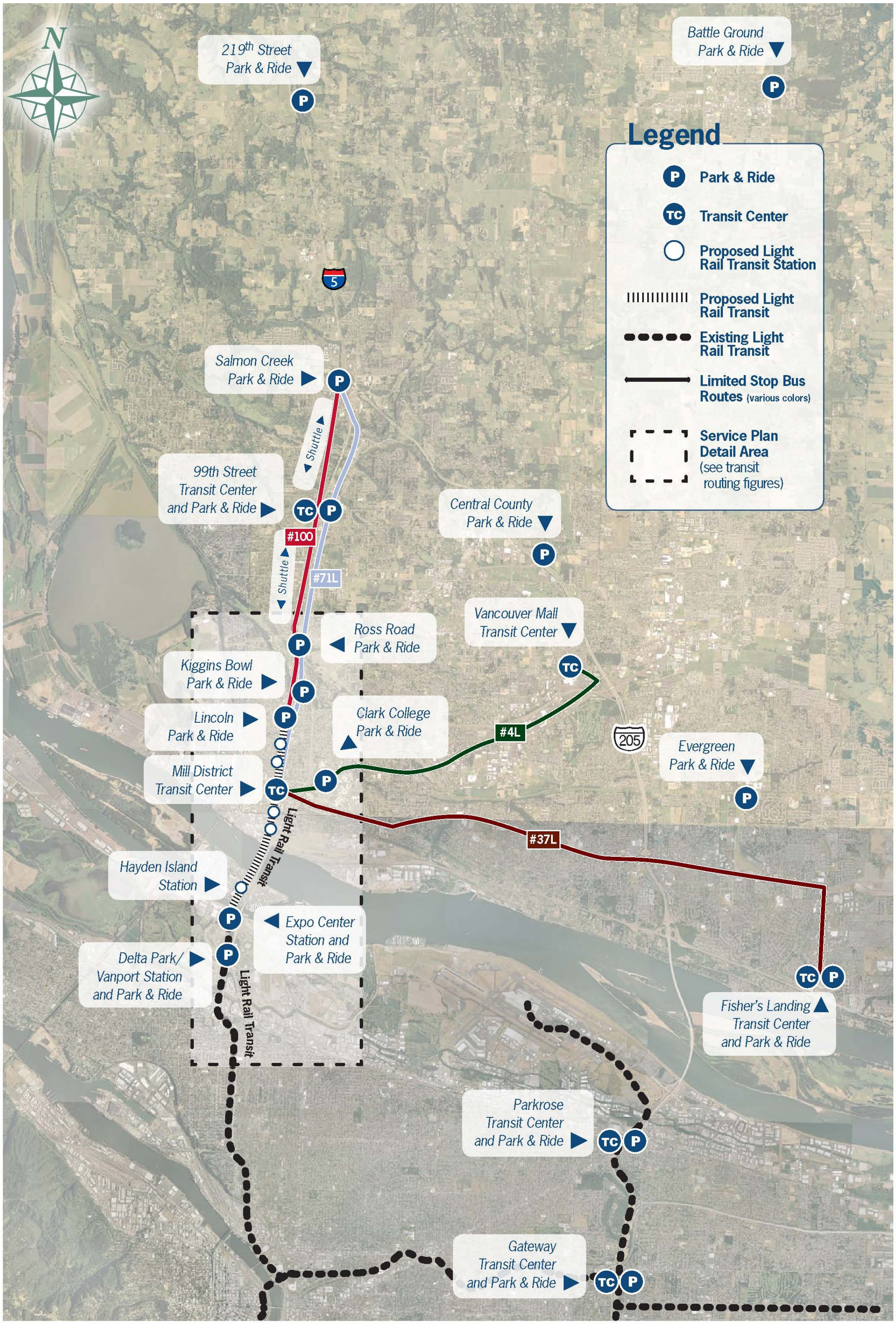
Alternative 3 Vancouver Alignment: Trunk Line and Limited Service (Local and Express Bus Network Not Shown)



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APPENDIX D

Expert Review Panel Comments

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)			
Job Charge: N/A	Combined Comments from Expert Review Panel			Sheet 1 of 32

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
1	p.1-1 1st para Lehto	The CRC Transit Technical Report provides technical detail and background about transit alternatives analyzed for the Columbia River Crossing in support of developing the DEIS. After the Executive Summary (Section 1), the next section discusses the methods (Section 2) and coordination (Section 3) that went into developing the transit alternatives.	Inserted text	SA
2	p.1-1 2nd para Lehto	Other choices – such as whether to build high-capacity transit (HCT) on Washington Street or Washington and Broadway Streets – have differences that are focused only on the area immediately surrounding that proposed change and no measurable effect on regional impacts or performance; these are called "segment-level choices."	Inserted text	SA
3	p.1-1 2nd para Lehto	Good examples really help the discussion of "system-level" and "segment-level". Thanks.		
4	1-2 PDOT Mike Coleman, Ning Zhou	4th paragraph. Elaborate on the various tolling methods. Explain why there is a range. Explain why all tolling methods aren't applied to all crossing type/HCT mode combinations.	See Traffic Transit Report	SA
5	p.1-2 3rd para Lehto	Add at end of paragraph: "The final level of service chosen may differ from either of these alternatives."	Inserted text	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
6	1-2 PDOT Mike Coleman, Ning Zhou	In the second paragraph: "BRT would use 60-foot articulated buses ….", add ", and it will connect the existing MAX line at Expo Center in Portland." Or combine this sentence with next one by saying: "Both HCT mode are designed to connect the existing MAX line at Expo Center in Portland." Since this is the first time to introduce the BRT and LRT lines, this sentence makes reader feel that the LRT will connect the Yellow line but BRT might not.	Corrected.	SA
7	1-2, 3rd par Bob Hart	Change enhanced "operations" scenario to "transit"	Replaced also, enhanced transit system was changed to increased transit system and standard transit system was changed to efficient transit system throughout the report.	SA
8	1-2 Reviewed By McDonald	Can Steel Br handle the 7.5 minute headways considering all the other lines crossing it in the design year? LRT trains leaving Vanc appear to be about ¼ full. Is it necessary to have 7.5 min headways with this loading? 3rd para talks about evaluating the doubling of the number of BRT vehicles or LRT trains. Yet the biggest increase per the exhibits is from 14 to 24 buses (71%) and all the others only increase 8-25%.	Yes Not correct; peak load point for LRT is near Rose Quarter Revised to say increased not doubling	GS
9	Exhibit 1 Bob Hart	Add note or text in body of section to touch on what aggressive and very aggressive differences are	Refer to Traffic Technical Report	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
10	p.1-3 Lehto	Discussion of segments needs a map to be more clear.	Clarified Reference Map included within Chapter 5	SA
11	p.1-3 3rd para Lehto	HCT would touch down in downtown Vancouver just south of the intersection at Sixth Street and Washington Street with a replacement river crossing.	Inserted text	SA
12	1-3 PDOT Mike Coleman, Ning Zhou	In the second paragraph: Add a sentence like: The final station design would depend on the upcoming Hayden Island Master Plan to be conducted by the City of Portland. Same as the one on the page 4-45 and 4-136 of the Detailed Definition of Transit Alternatives (draft report, June, 2007)	Inserted: The final station design would be coordinated with the upcoming Hayden Island Master Plan to be conducted by the City of Portland.	SA
13	1.3.1, 3rd par Bob Hart	Add to practically the same… "for the 2 replacement and the 2 supplemental modes. Although BRT has lower trips…..	This sentence has been deleted	SA
14	p.1-4 sec 1.2.3 1st para in section Lehto	Add at end of first paragraph: "This packaging also allows components to be better understood and 'mixed-and-matched' if necessary for the choice of the Locally Preferred Alternative."	Inserted: These transit alignment choices will allow decision makers to specially package the Locally Preferred Alternative.	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
15	p. 1-4 sec 1.2.3 last para on page Lehto	Delete first two sentences of paragraph at bottom of p1-4 and top of p1-5. Analyses were conducted on these various options, even if travel demand modeling was not run individually, so this seems like a distinction that doesn't need to be made.	Deleted as follows: Modeling software used to assess each alternative's performance does not distinguish between smaller details, such as most segment-level transit alignments. ~~However, the geographic difference between the Vancouver and I-5 HCT alignments is significant enough to warrant including this variable in the model.~~	SA
16	1-4 PDOT Mike Coleman, Ning Zhou	Exhibit 1 illustrates the previous comment. If there are four possible tolling methods (None, standard, two options, higher), why aren't there four variations for each "Full Alternative?" Why are only certain tolling methods applied to the alternatives? Without an explanation, it appears that each Full Alternative has a different value in the tolling method "variable." How can the conclusions and comparisons make sense to the decision makers?	Full Alternatives replacement has standard toll, supplemental has a higher toll. For more detail see the Traffic Technical Report.	GS
17	p.1-5 sec 1.2.3 first full para on page Lehto	**Alternative 1:** <u>This alternative provides a baseline for comparing the Build Alternatives, and for understanding what will happen without construction of the I-5 CRC project.</u> The National Environmental Policy Act (NEPA) requires the evaluation of a No-Build or "No Action" alternative for comparison with the Build Alternatives. The No-Build analysis includes the same 2030 population and employment projections and the same reasonably foreseeable projects assumed in the Build Alternatives. It does not include any of the I-5 CRC related improvements.	Inserted text: **Alternative 1:** Alternative 1 is the project's no-build alternative, providing the project with a model of what would happen without the constriction of the I-5 CRC project. The National Environmental Policy Act (NEPA) requires the evaluation of a No-Build or "No Action" alternative for comparison with the Build Alternatives. Alternative 1 would include the same reasonably foreseeable roadway and transit components included in the region's financially-constrained transportation system of the adopted RTPs, except for any I-5 CRC related improvements. As the no-build alternative, Alternative 1 provides in this report and in the DEIS an alternative for comparing the build alternatives (i.e., Alternatives 2, 3, 4 and 5), and for understanding what will happen without construction of the I-5 CRC project.	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
18	p.1-5 sec 1.2.3 2nd full para on page Lehto	Express bus service would remain the same as the No-build Alternative. Local bus service would be modified to serve the added transit capacity and increase the number of passengers that would have a one transfer trip to downtown Portland. [it's up to the riders whether they 'enjoy' it]	Replaced text	SA
19	p.1-5 sec 1.2.3 last para on page Lehto	The southbound BRT buses would turn around at the existing Expo Station in Portland, where riders could transfer to the MAX Yellow Line. BRT service would be more frequent compared to Alternative 3. Express bus service and local and feeder bus service would also be increased significantly.	Inserted text	SA
20	1-5 PDOT Mike Coleman, Ning Zhou	• Alternative 1: Add a statement about the assumed transit service. • Alternative 2: Why wasn't a "No tolling" option analyzed?	Added: Under Alternative 1, C-TRAN's annual service hours would grow at approximately one percent to the year 2011, after which service would remain constant in terms of revenue hours delivered. See Traffic Tech Report See Traffic Tech Report	EM
21	p.1-6 1st para Lehto	LRT service would be more frequent (approximately 6.5 minute headways during the peak period) compared to 7.5 minutes with Alternatives 2 and 3.	corrected	SA
22	p.1-6 last para Lehto	Both BRT and LRT would substantially reduce the delay to transit vehicles due to congestion (measured in vehicle hours of delay - VHD) for local and express buses within the I-5 corridor, and there would be no delay for HCT within the exclusive guideway.	Inserted text	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	**Draft Transit Technical Report (October 2007)**				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
23	1-6 PDOT Mike Coleman, Ning Zhou	• Alternative 5: Why are the LRT headways different from other alternatives? This introduces a range of possible values in the HCT variable. Why aren't all the possible headways applied to all the Full Alternatives? Without an compelling explanation, the conclusions and comparisons are suspect. • Describe what VHD means?	Headways are determined by 2 hour pm peak load point. The transit system is designed to have a robust system and it is equilibrated to be comparable to the "efficient" Alternatives. Description inserted: 1 VHD is the cumulative delay experienced by transit vehicles on links with a v/c ratio greater than 85 percent during the time period.	SA
24	1-6 PDOT Mike Coleman, Ning Zhou	In first sentence on the last paragraph: "Both BRT and LRT would substantially reduce …." Please add a data to back up the statement of substantially reduce, or point the readers to exhibit-5	Referenced exhibit 5	SA
25	1-6 PDOT Mike Coleman, Ning Zhou	In the fourth paragraph: Somehow the document need to show where the additional riders come from: are they the new trips or converted auto trips. So is it possible to add a comparison chart to show the mode split data for the major transit market area?	They are a blend of both The number of total trips in the corridor between alternatives 2 and 3 is almost the same (X vs. Y). The difference can be accounted for by a change in the distribution of trips (i.e., some trips in one alternative may use I-205 to get to the same destination). The additional transit users in Alt. 3 are most likely converted auto trips from Alt. 2. There is a stiff penalty for the transfer at Expo for BRT users in Alt. 2, which causes the shift from transit to auto in Alt. 2. The tables are included within Exhibit 11 and 14 in the Executive summary and as Exhibits in Chapter 5.	TS

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)			
Job Charge: N/A	Combined Comments from Expert Reviewers			Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
26	1-6 PDOT Mike Coleman, Ning Zhou	The title of 1.3.1: Does the "Bi-State Transit Effects" mean to system-level effect? If it is, the words could changed to "System-Level Effects".	Section titles and chapter organization has changed throughout the report. This title was changed to: How will transit change with the CRC system-level choices?	SA
27	1-6 Mullen & Putney	in the Exec Summary says BRT would be slower because no signal prioritization would occur - too many buses would be needed and it would mess up the rest of traffic. I think we need to be careful around this issue - the level of bus service could be adjusted to carry more riders, but not at the full "enhanced" level, and signal priority would work.	Editorial Comment Noted	
28	1-6 Reviewed By McDonald	Should state design year someplace in 3rd para of 1.3.1	Stated: As shown in Exhibit 11, Alternatives 2 through 5 would substantially increase the number of daily and annual passenger trips over the I-5 crossing on transit above Alternative 1 in 2030.	SA
29	1-7 PDOT Mike Coleman, Ning Zhou	Why have Exhibit 2 and 3? They illustrate the same point. They just apply a different time frame	Took out daily exhibit	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
30	1-7 Reviewed By McDonald	Feasible to show in Ex 2 what happens when I-205 is tolled? And what would ridership look like if there were no tolls?	No. See Traffic Tech Report	SA
31	1-9 PDOT Mike Coleman, Ning Zhou	2nd paragraph: "Travel times between markets are shorter for the build alternatives versus the No-build. The LRT alternatives…" How can this statement make sense given that there is no HCT in the No-build, only express bus?	HCT plus limited stop bus travel time (i.e., from downtown Portland to Vancouver Mall) is shorter in the Build alternatives than the No-Build. This makes sense since people have to transfer from HCT to a limited stop bus (or Branded BRT bus) in both the Builds and the No-Build.	TS
32	1-9 PDOT Mike Coleman, Ning Zhou	In the first paragraph line 11, Alternative 5, … Is typo for alternative 4?	It was a typo and was corrected.	SA
33	1-9 PDOT Mike Coleman, Ning Zhou	It looks like the second paragraph is pointing to the local bus and/or express bus, but not HCT. Please make it clear in the statement.	These comparisons include local and express buses and HCT as noted in the table	SA
34	Page 1-9, 1st par Bob Hart	Match up text with table. Text says 1 minute; Exhibit 5 says 2 minutes	Numbers were checked and changed where necessary due to rounding.	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
35	p.1-11 Exhibit 5 Lehto	Numbers for Alt 2 & 4 don't look consistent. Why would Alt 4 BRT ETS travel times be substantially longer when there is more bus service provided? Needs fix or explanation.	The northbound travel time depends on a longer transfer time than the southbound travel time in all alternatives since the transfer time is defined as half the headway of the vehicle to which one transfers. Therefore, in the northbound direction, the transfer time can be as much as 15 minutes, but in the southbound direction, the transfer time is only 3 minutes in Alt. #4 (since LRT runs at 6 minute headways) and 3.75 minutes in Alt. #5 (LRT runs at 7.5 minute headways).	TS
36	p.1-11 Exhibit 5 Lehto	Travel times for Alts 3&5 don't look consistent for Hayden Island-99th trip. The am vs pm travel times seem surprisingly different. Needs fix or explanation.	Same as response to #35	TS
37	1-11 Mullen & Putney	Can the number of transfers required be included in this chart? The cost per new rider info is compelling.	Not in the Executive summary. This information is discussed within Chapter 5 when discussing the HCT mode choice.	SA
38	1-11 Reviewed By McDonald	In Ex 5 suggest changing Seven and Five each to Three under measures and end sentence after Oregon. Under Alt 3 The HI to 99th time is 32.4. Yet going from Downtown PDX to Salmon Ck takes 31.4 min. Looks like 32.4 is in error.	There are seven transit districts within Clark County and five within Oregon. See # 35	TS

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
39	P 1-13 P1-14 (ex 8) p. 5-21 (Ex 35) p5-67 (Ex 53) p5-124 p 5-127 (Ex 82) p 5-130 p5-131 (Ex 83) Lehto	Use of "annual incremental operating cost per annual incremental new rider" here and elsewhere is a concern. These are a few of many uses throughout document. Check with Gregg: "Has Richard been briefed?"	Chart is replaced with Total annualized cost per guideway river crossing within Chapter 5.	GS
40	1-13 and in all other related sections/exhibits Bob Hart	"Cost per new rider" RB spent his entire career fighting this measure…!	Same as #39 above	GS
41	1-13 Mike Coleman, Ning Zhou PDOT	• What is "the enhanced transit network?" And why isn't it applied to all 5 full alternatives? I think this is the first place that the term is used in the report. • The color is missing in some of the bars in Exhibit 6	The "enhance transit network" is now refered to as the "increase transit network" and is now described in more detail earlier in document. It is referring to the level of transit service within Alterantives 4 and 5. Color has been fixed	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
42	1-13&18 Reviewed By McDonald	Ex 6 shows capital costs and next page the O&M. How about putting together a lifecycle cost or present day value of all the expenditures for say a 50 year period? Granted the agencies look at this as money from different sources, but in the long run it is all money is all money out of the taxpayers' pocket. Ignoring interest, it would take 170 years to have the Capital cost of LRT catch up to BRT.	Same as # 39 above	SA
43	1.3.2 Bob Hart	Segment map would be very helpful here	Included within Chapter 5	SA
44	1.3.2.2, 3rd Par Bob Hart	Remove the word minor in first sentence. Segment B would have significant design differences, including….	Inserted Text Change	SA
45	1st par Bob Hart	Remove "some minor"	Changed to significant	SA
46	1-17 PDOT Mike Coleman, Ning Zhou	The last sentence of the third paragraph: "…. A one percent difference in cost." Change to "…. A one percent difference in capital cost."	No longer an issue; this section was revised.	SA
47	1-17 Mullen & Putney	visuals of the footprint required for station design would be good. Need to show bus bypass lane.	This level of detail will be addressed at the PE stage of the project; not in the Transit Technical Report.	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	**Draft Transit Technical Report (October 2007)**				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
48	P 1-19 2nd to last para Lehto	With the full length alignment, the daily ridership would be approximately 20,800, and with the Mill Plain MOS, it would be XXX – XX percent less. The total depends partially on the number of park and ride spaces provided in each. The shorter alignment length would also reduce transit accessibility.	Inserted text	SA
49	1-19 PDOT Mike Coleman, Ning Zhou	The second paragraph: "…. 336 % less than the …." Is this right?	No. Its 36%.	SA
50	1.3.3.1 Bob Hart	Don't you mean 36% less?	Yes.	SA
51	1-19 Reviewed By McDonald	In 1.3.3.1 give the actual numbers rather than just percentage of households and employment within ½ mile of HCT station. Percentages don't mean much without some reference.	CRC metric is % within ½ mile of stations	GS
52	2-1 Reviewed By McDonald	API appears to be for transit, not project. So is it still 5 miles long? 4th para states it narrow down south of river xing. Ex 9 shows it south of Marine Drive.	Confirmed that yes, API for transit	SA
53	2-3 Reviewed By McDonald	Exhibit 9 doesn't appear wide enough to include the I-5 HCT option.	Confirmed that it does include the guideway alignment	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	**Draft Transit Technical Report (October 2007)**				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	**Sht/Pg**	**Reviewer's Comment**	**Designer's Response**	**Init.**
54	2-5 Reviewed By McDonald	5th para indicates screening was done for the DEIS alts rather than saying screened all these options to select those that would be considered in the DEIS.	In February 2006 the CRC Task Force, composed of 39 leaders from both Washington and Oregon, adopted the CRC *Screening and Evaluation Framework* that established a six step formal process for screening a list of more than 75 transportation components and 12 multi-modal alternative packages that would be combined to create the DEIS Alternatives.	SA
55	P 2-6 top of page Lehto	The alternatives have not yet been fully vetted with the FTA. Discussions and submittals will still need to occur with FTA to be eligible for New Starts funding. This is normal for this stage of a project.	Inserted text	SA
56	p.2-6 Exhibit 10 Lehto	**Operating Costs:** For each transit alternative TriMet staff analyzed the LRT service and provided the estimated costs based on projected demand for service in the regional travel demand modeling results.	Inserted text	SA
57	2-6 Reviewed By McDonald	Under operating costs the term 'platform hours' is used. It also is used elsewhere in the document. I'm ignorant enough to not know what it means. Worthwhile to define it for me and maybe a few others?	Defined in Executive Summary with Exhibit 6	SA
58	2-7 Bob Hart	Change to Regional Transportation Council	Corrected from committee to council	SA
59	Exhibit 11 Bob Hart	Will there be any data for this?	The information is touched on in the Executive summary and described in detail within Chapter 5.	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
60	2-8 Reviewed By McDonald	#3 in Ex 11 has the description of VHD as 'vehicle hours traveled'. Isn't it the accumulated hours of delay? 2nd sent under 2.5 says '…has been evaluated…'. Suggest changing to '…has also been evaluated…'	Corrected Exhibit to have correct definition. inserted	EM
61	2-9 Mullen & Putney	Says the recommended mitigation measures are feasible, but doesn't say what those measures are, or refer to a place in the report where they can be found.	Reference inserted to chapter 7	SA
62	P3-3 Alan Lehto, TriMet	Consider adding other groups, such as FTA/FHWA Coordination.	Rewrote sentence: The CRC Transit Team has provided individual agency briefings with the local agency partners and federal agencies (FTA and FHWA).	SA
63	3.3 Bob Hart	Include RTC in briefings list?	See #62	SA
64	P3-3 Alan Lehto, TriMet	Community input has guided and will guide many HCT design elements…	Inserted : Community input has guided and will continue to guide…	SA
65	p.4-1 last para Alan Lehto, TriMet	The current C-TRAN transit network is the result of a service redesign that was adopted by C-TRAN in January of 2007 and fully implemented with minor modifications in November of 2007.	Inserted text	SA
66	4.1 Bob Hart	Change to Delta Park LRT station from park and ride	corrected	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	**Draft Transit Technical Report (October 2007)**				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
67	Exhibit 41 and other map exhibits Bob Hart	Improve resolution	Forwarded to document control	SA
68	4-2 to 4-4 Mullen & Putney	Suggest a map of service areas and routes	Appendix 2	TS
69	p. 4-3 section 4.3 2nd para in section Alan Lehto, TriMet	TriMet's transit network consists of a 44-mile, 64-station, light-rail system shown in Exhibit 16 (including Interstate MAX, which extends from downtown Portland to the Expo Center, approximately two miles south of downtown Vancouver) with 103 light rail vehicles (LRVs). *[currently have 103 LRVs – plus 2 in major overhaul mode, which will bring it to 105 when they are done but before we start taking delivery of new cars for I-205/Mall project]*	Inserted text	SA
70	p. 4-5 Exhibit 14 Alan Lehto, TriMet	Change "Frequency" heading to "Headway"	Updated text	SA
71	4-8 Mullen & Putney	Suggest a chart comparing/showing peak info vs mid day (4-8) Exhibit 17 on 4-10 can be clearer, i.e. 8.5 mph, 11.2 vhd (take this approach on all the charts.)	Information is not available inserted	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)			
Job Charge: N/A	Combined Comments from Expert Reviewers			Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
72	4-10 Reviewed By McDonald	In last para talks about 3,300 weekday trips across bridge – would be nice to add in how many are in the 4hr peak p.m. direction just for comparison to later charts.	Info is not available Bus routing across the Columbia River has changed substantially based on service redesign in the past year. A new on-board survey is not planned	SA
73	4-11 Reviewed By McDonald	4.4.3 first sentence is difficult to understand – looks like everything before the verb is a prepositional phrase with no subject. Reword?	Reworded: To determine the existing options for bi-state multimodal transportation choices the transit service provided to target markets in the study area were analyzed.	SA
74	4-13 Reviewed By McDonald	Text under Ex 19 mentions I-205 corridor but the exhibit doesn't show it. Footnote talks about Parkrose and Gateway P&R for Clark Co folks riding the rail to downtown. What about the Cascade Station. Can people park there and ride into town?	Delete sentence from report There is no park-n-ride at Cascade Station	SA
75	4-15 Reviewed By McDonald	Mention 3 I-205 express bus routes. I couldn't find a 165. And what affect does the I-205 routes have on the I-5 corridor? Nothing mentioned on why we're including this information.	This info is from 2006 and modeling packages. The 165 has changed to the 65 in the 2007 service redesign but all our packages and models are based on the 165.	TS
76	4-17 Mullen & Putney	The chart on p. 65 - 4-17 is interesting, but I'm not sure I fully understand it or its purpose. A succinct statement might work better – like: "About half of all trips that start in Washington stay in Washington (or Clark County) and the other half travel to Oregon." We had better maps that showed the O's and D's before, which I think tells a better story of where people start and where they go.	Not an O-D map. Green = Washington Park-n-riders Red = Oregon Park-n-riders	GS

Columbia River CROSSING

FORM REVIEW COMMENTS

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
77	4-19, 1st par Bob Hart	Add "time" between longest and segment	corrected	SA
78	4-19 Reviewed By McDonald	Ex 22 shows 3:15 for buses going southbound between the bridge and MD. This is probably correct, but it is only because they come across the bridge in the A lane, crowd over into the C lane between the bridge hump and JB exit, then drive as far as they can until having to merge into the B lane at Denver. If they stayed in one lane it might take them longer, but it would eliminate all the turbulence they cause to traffic and help the overall flow.	Editorial Comment Noted	GS
79	Exhibit 25 Bob Hart	Is ms for this confirmed?	yes	SA
80	Exhibit 25	Exhibit 25 Transit mode split - Be clear - is this on a 24 hour basis or during peak period travel times? It appears to be daily, not peak period. If so, this reporting style feeds the perception that transit doesn't do enough/isn't viable. (and mode split during peak times is provided in Chapter 5)	Daily Number	GS
81	Exhibit 26 Bob Hart	This doesn't say much. You are using 2 measures. All bus/HCT for the region, but only HCT for Clark. Why not measure the same transit access for both?	This is a standard CRC evaluation metric	GS
82	Exhibit 27 Bob Hart	Why even show a BRT row at all?	Need to show even if it is noted as N/A	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)			
Job Charge: N/A	Combined Comments from Expert Reviewers			Sheet 1 of 32

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
83	P 4-21 Exhibit 23 Alan Lehto, TriMet	Cite source for Transit LOS methodology as a footnote.	Included explanation within executive summary	SA
84	4-21 Reviewed By McDonald	Ex 23 footnote – add 0's to times.	Corrected	SA
85	4-21&22 Reviewed By McDonald	Show travel times Lombard to Vanc Mall. Who cares? Why not show Downtown Vanc to the Rose quarter which in my mind is more meaningful to where people may actual travel. Last para says 83% of employment in 4 county region is within ¼ mile of a bus route. Seems high. Verified?	Travel time pairs were pre determined in consultation with the Transit Working Group The 4 county region includes downtown Portland	GS
86	P70 Mullen & Putney	P. 70 - 67 percent of households and 83 percent of businesses are within a quarter mile of transit service? I don't believe that that is true in Clark County. It looks like an attempt to skew statistics.	Region = 4 county area	SA
87	4-23 Reviewed By McDonald	Under 4.4.4 have platform hours again. Hopefully defined by now. Stated that we used the current Trimet budget for calculating O&M costs. If this is for LRT are we really capturing the avg O&M cost. Seems like the catenary and other items might be on a longer cycle and not show up in budgets for many years. Last para has 28,350 for weekday VMT while Ex 27 has 25,883. Similar difference in annual VMT.	Stated in last sentence. Corrected/updated	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
88	4-25, middle of page bottom of page Bob Hart	MTP does not identify I-5 as HCT. It does discuss CRC Why measure existing conditions against future plans?	Removed last sentence CRC Evaluation Criteria Comment noted	SA
89	4-26 Mullen & Putney	Take out the statement in parens (in particular light rail as the HCT mode). It's biased.	removed	SA
90	Exhibit 29 Bob Hart	Why is VHD in BIA lower in ETSs than in 2 and 3. Other VHDs are higher? Same question applies to text sections	All estimates are below 1 hour VHD daily and are 90% than no build. Minor differences are due to model variation	SA
91	Chapter 5 Bob Hart	Would be vest organized by moving 5.5 to just after 5.1. This is the section that has the key choices. 5.2 to 5.4 is pretty dense and easy to lose the message. It also seems as if many parts of chapter 5 are repetitive. It tries to too many comparisons, for example, alignment and mode choices when describing design option differences.	Chapter 5 has been reorganized to provide a more structured comparison of the system and segment level choices.	SA
92	Chapter 5	Move the Exhibits to the front part of each topical section. It is unfriendly for the reader to make them wade through narrative before providing the context.	Editorial Comment Noted	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	**Draft Transit Technical Report (October 2007)**				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
93	5-1 to 5-9 PDOT	• Exhibit 29 and 30 do a pretty good job of comparing and contrasting the information in the text. But in Exhibit 30 consider expanding the "Total Transit Vehicle Capacity…" metric from "Combined Vehicle Capacity" to "Daily Express Bus and Local Bus" and "Daily HCT." A decision-maker should be able to see their individual capacities. • The text needs to explain why each alternative has a different number of transit vehicles during the peak. They also need to no why/how the specific number was determined.	Transit capacity is not a CRC evaluation criteria and is provided for reference only Transit frequencies are determined by 2 hour PM peak end point.	SA
94		I did not come across any comparison of BRT and LRT ridership between Portland and Hayden Island. (I may have overlooked it.) But I am very concerned that Portlanders will be much less likely to use HCT to get to/from Hayden Island if they have to transfer at Expo.	Editorial Comment Noted	SA
95	5-1 Reviewed By McDonald	Good place to state design year in first para. Last sent says '…without increasing the number of vehicles …'. Maybe more proper to say '…with insignificant increases to the number of vehicles…'	Inserted text	SA
96	5-2 Reviewed By McDonald	Last para state 5,200 person, elsewhere is 5280. Last sent says 33% HOV and several of the exhibits give an HOV percent. Without an HOV lane (very shortsighted by the way not to have 3 GP lanes and one SP lane from SR 500 to I-405 split) how is this determined? Seems high.	Added about 5,200	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	**Draft Transit Technical Report (October 2007)**				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
97	p.5-3 last para Alan Lehto, TriMet	The number of daily passenger trips on transit over the river with this BRT alternative would be about 19 percent fewer than the LRT alternative (from 20,800 passenger trips for LRT to 17,000 for BRT with a difference of 3,800).	Inserted text	SA
98	5-3, last par Bob Hart	Don't you mean 13,000 in guideway and the rest on express? Which are split between local and BRT buses.	Unable to clarify comment	
99	Exhibit 30 Bob Hart	For alt 3 and 5. Are bus transfers shown occurring in Clark County for bus to rail?	Unable to clarify comment	
100	Exh. 30 Mullen & Putney	- peak period mode split - This doesn't look good to me. Looks like we are spending billions to shift people from HOV to transit. The SOV number hardly changes, at least in terms of percentage. What about raw numbers, since volumes are going up?	Editorial Comment Noted	SA
101	Exh 31 Mullen & Putney	- Shows both BRT and LRT, but also lists a total ridership number. I don't understand this. Is that Express Bus?	Includes express and local bus ridership	SA
102	Exhibit 32 Bob Hart	How do travel times shown compare to finding document?	Findings document updated	SA
103	5.2.2 Exhibit 33 Bob Hart	Not sure that access to pop/emp is too useful as they are all so similar.	Editorial Comment Noted	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
104	Exhibit 35 Bob Hart	Same new rider issue as earlier	See comment #39	SA
105	5.3 Bob Hart	Each new section comparing design options should have segment map to remind reader	Editorial Comment Noted	SA
106	5.3.3 Bob Hart	For all Hayden Island comparisons. Is there a difference in station height between the adjacent and off-set? If so, it should be mentioned. Map graphics need improvement	No difference in height. Editorial Comment Noted	SA
107	5.3 Bob Hart	The capital cost pie charts scattered throughout this section are hard to follow. Maybe there is some way to get them together at the front of this section. The differences in cap cost between the segments get lost.	Reorganized for final draft	SA
108	5-3 Reviewed By McDonald	We state capacity is 14,800 in 4hr p.m. peak direction, with only 17,000 daily trips predicted in the design year in both directions. Seems like very poor utilization. This is obvious in all the following alt's too. Seems like we shouldn't be buying as many train sets or 60 foot buses as we are estimating as they will never be but 25% full during the peak hours. And maybe increase headways. Under alt 4 with ETS the 4 hr p.m peak direction capacity is 20,000 and the daily trips, both ways is only 19,900. Why have ETS?	Capacity numbers are removed from report. They are not a CRC metric.	SA
109	p. 5-4 last bullet point Alan Lehto, TriMet	• a higher transit person throughput than either BRT or the No Build.	Inserted: a higher transit person throughput than either Alternative 1 or 2.	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
110	5-4 Reviewed By McDonald	Get into a little bit about what ETS is in later sections, but it would be nice to give it a good definition here as to what it consists of. 5th para says combined peak hr capacity is about 5,000. Calculates to 4,909 which is closer to 4,000.	recognized Kept 5,000	SA
111	5-6 Reviewed By McDonald	6th para says combined peak hr capacity is about 4,300 and 17,000 in 4hr. Exhibit says 3760 – giving 15,0000 in 4 hr. And once again we can get 15,000 in the p.m. 4 hr peak yet we only predict 23,200 all day. Too much capacity!	Recalculated Capacity numbers are out	SA
112	p.5-9 Exhibit 30 Alan Lehto, TriMet	It looks as though mode split for Alt 4 HOV and transit may have been flipped. They don't seem consistent with results from other alternatives.	It is correctly stated	SA
113	p. 5-10 Exhibit 31 Alan Lehto, TriMet	Suggest the No build column be deleted and remainder be reported as change from no build. Substantial differences get washed out due to relatively high base numbers because it's a larger system.	Editorial Comment Noted	SA
114	p.5-14 Exhibit 32 Alan Lehto, TriMet	Alt 4 travel times seem high for first three times. Why would Alt 4 BRT ETS travel times be substantially longer when there is more bus service provided? Needs fix or explanation.	Congestion issue – too many buses. Explained in report within the level of transit service section of Chapter 5.	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
115	5-14 Reviewed By McDonald	No footnotes for all the numbers shown. Change Seven and Five to Three as suggested earlier under measures and end sentence after Oregon. And change out Lombard TC (is it really a TC?) if done so in exhibit 5.	Not going to change market definition	SA
116	P5-17 2nd para Alan Lehto, TriMet	The alternatives have not yet been fully vetted with the FTA. Discussions and submittals will still need to occur with FTA to be eligible for New Starts funding. This is normal for this stage of a project.	Inserted text	SA
117	p.5-18 bullet points Alan Lehto, TriMet	• Back-of-sidewalk to back-of-sidewalk reconstruction of affected streets within the City of Vancouver (using two-way on Washington Street and two-way on Broadway and Main Streets); • 24 BRT sixty-foot articulated vehicles;	Deleted	SA
118	5-18 Reviewed By McDonald	Top of page, 3 of the bullets are for I-5 alignment, not Vanc. Add in a new bullet for HCT maintenance facility costs?	Deleted Added	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)			
Job Charge: N/A	Combined Comments from Expert Reviewers			Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
119	P5-19 Middle para Alan Lehto, TriMet	These hours can be attributed to an additional 73 hours to extend the LRT Yellow Line from the Expo Center to the northern terminus and 95 weekday platform hours to operate the three new proposed limited lines that would facilitate transfer opportunities to LRT in Vancouver. These hours would be offset by a reduction in the number of hours needed for other buses that would no longer need to cross the Columbia River.	Inserted text	SA
120	5-23 Reviewed By McDonald	Ex 37 – the numbers don't seem to jive with those given in 5.2.1 or in Ex 76.	Exhibit 37 shows the number of transit vehicles to be purchased. Exhibit 76 hows the number of transit vehicles over the Columbia River during one peak hour during the pm peak direction Confirmed that reported numbers match	SA
121	p.5-31 Exhibit 40 Alan Lehto, TriMet	See comment below regarding cost difference of adjacent vs offset.	(Actually exhibit 43 & 44) No cost difference	SA
122	5-33 Reviewed By McDonald	Routes 37TCG and 37G. Are these proposed routes? Don't show on maps.	They are proposed BRT routes	SA
123	p.5-39 last para Alan Lehto, TriMet	Add to end of last paragraph: "… unless the elevated section could be placed on retained fill. This is a typically less expensive method of construction that may be possible for the adjacent alignment but not for the offset. It could save substantially but can not be confirmed until additional design of both highway and transit are progressed in later stages of the project."	Inserted text	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
124	P5-41 Exhibit 45 Also text on p5-43, last para Alan Lehto, TriMet	Label needs to be clear: is this for MOS or does "LRT Two-Way McLoughlin" also include I-5 section?	For both	SA
125	Exhibit 45 & 46 Mullen & Putney	Exh 45 and 46 - I don't think pie charts are the most effective way to illustrate the comparative capital costs of each segment - bar charts would allow you to do that and compare against options too. General comment - 3-D pie charts are harder for the reader to look at than 2-D. Why so many pages left blank? This might appear to be unnecessarily wasteful.	Editorial Comment Noted Editorial Comment Noted Editorial Comment Noted	SA
126	5-47 Reviewed By McDonald	States need for 8 foot median buffer so bus can get around a stall and not encroach in oncoming lane. Considering there are only busses in the lanes and they aren't that frequent, and no bus is going to pass a stall at a high rate of speed – why do we need this additional room. Let them pass in the oncoming lane when the coast is clear and save some dollars.	Editorial Comment Noted	SA
127	Exhibits 48 and 49 Bob Hart	Do we know enough to say that travel time and speed are about the same for the couplet? We have already said that it would not affect transit ridership.	Yes, they are comparable	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
128	5-53 Reviewed By McDonald	3rd para states 'The grade differences between existing and proposed…' Difference is between supplemental and replacement isn't it?	Unable to clarify comment	
129	Exhibits 50, 60, & 65 Alan Lehto, TriMet	Split exhibit into two. One with BRT and one with LRT. Otherwise, it seems to suggest that BRT and LRT representative alignments cost exactly the same – which isn't the case.	Exhibit has been revised	SA
130	5-55 Reviewed By McDonald	Don't see much need for this exhibit and others like it. But if we do use, we ought to split them up into two exhibits as there is not correlation between the LRT and BRT percentages and the graph indicates the 2-ways are both 100%.	Exhibit has been revised	SA
131	5.3 Mullen & Putney	Pictures of platforms etc as discussed in section 5.3 Maps of the routes with stations and P&R locations	Editorial Comment Noted	SA
132	5.3.4.3 Bob Hart	It would be good to illustrate some of what you describe for the configurations, especially at south end, contra-flow and transitions.	Editorial Comment Noted	SA
133	5-58, 2nd par Bob Hart	You could make shorter and refer back to 5.3.4.1. The key here is the last sentence	Editorial Comment Noted	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
134	P 5-58 Mullen & Putney	Mentions low accident rates in LA and St. Louis. Do we know why and can we apply lessons learned? Mitigation is of course not in here. We should note that because people are going to ask things like operational safety in terms of police and security. We should say mitigation will be identified once the LPA is known.	Editorial Comment Noted	SA
135	5-59, 2nd par Bob Hart	Last sentence. What is the grade? Is it acceptable?	The acceptable grade was based off of TriMet grade criteria	BD
136	5-63 Bob Hart	Note that exhibit 53 is showing the full length differences. Same note on exhibit. For example, cost, etc. is not for segment, but for full length.	Confirmed that table shows full length differences	SA
137	5-63 Mullen & Putney	MOS ins mentioned but not explained in the first paragraph	MOS in subsequent section	SA
138	5-68 Reviewed By McDonald	Geez – round the Avg travel time to the tenth of minute rather than the hundredth shown. Although it is impressive to see you calculating transit times to a half a second.	The average speed is detailed to the tenth of a minute for other analysis purposes.	SA
139	Exhibit 54 and 55 Bob Hart	Same as comment 31		

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
140	p.5-70 2nd para Alan Lehto, TriMet	This is a difference of less than two percent, which is not a statistically significant difference.	inserted text	SA
141	5-70 Reviewed By McDonald	Ist para - same rounding issue with minutes.	Corrected	SA
142	p.5-71 Alan Lehto, TriMet	Traffic safety may be of more concern with the Vancouver option.	Inserted text	SA
143	p.5-71 middle short para Alan Lehto, TriMet	To compare capital costs, the Uptown Broadway two-way option has been selected for the Vancouver Alignment as a representative alignment against which to compare options. Costs for the Uptown Main/Broadway couplet have been reported as a percentage increase/decrease from this cost.	Inserted text	SA
144	5-71 Reviewed By McDonald	4th para, 1st sent states '…vast majority of transit users are destined for downtown Vancouver….' Seems like express buses carry more people, plus for those that do travel downtown, isn't it more because the transit mall is there so they have to? With transit center moving to 99th St, I doubt this statement is accurate.	incorrect deleted take out '…vast majority of transit users are destined for downtown Vancouver….'	SA
145	5-74 Bob Hart	You have maps of satellite PnR for Vancouver alignment. Why not show Lincoln that has direct access? I think this is the only PnR you do not show.	Comment unclear	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
146	Exhibit 58 Bob Hart	Add "satellite" to title	This is not a satellite lot it is the Clark College transit station and park-and-ride	GS
147	5.3.5.3, 2nd par Bob Hart	Misspelled surveillance	Corrected	SA
148	p.5-81 2nd para, last sentence Alan Lehto, TriMet	The modifications would slow C-TRAN's local bus routes 6 and 4 in their trips to and from downtown Vancouver, but staying on the bus would be faster than the combined wait and travel time for a transfer to LRT because the distance is relatively short.	inserted text	SA
149	p.5-83 1st para Alan Lehto, TriMet	Because there would be fewer BRT buses using this station, smaller platforms (approximately 100 feet long compared to the 200-foot LRT platforms) would be constructed [reference to streetcar platforms is probably not helpful for most readers – use an actual dimension – 100' is only suggested, it should match the actual design]	Corrected	SA
150	5-83 Reviewed By McDonald	2nd para – might add that buses can also go north of Kiggens as mentioned in 5.3.5.3.3	However, because BRT vehicles can and would travel outside of the exclusive guideway in mixed traffic, the BRT routes would be able to directly serve both the Clark College and Kiggins Bowl park-and-ride lots and, potentially, beyond.	SA
151	p.5-85 1st para Alan Lehto, TriMet	This station would include the small, 100-foot-long platform as proposed with the BRT Uptown Broadway two-way transit option.	Corrected	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet 1 of 32

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
152	5-95 Reviewed By McDonald	There is no information given as to what the consideration is for the 16th alignment. Should discuss why it's even an option.	16th is an alternative alignment to McLaughlin; different set of traffic impacts and property acquisitions	SA
153	5-97 Reviewed By McDonald	Have the same issue as before of showing LRT and BRT in the same chart at 100%. A statement in the text seems sufficient for % information. The actual numbers would be the most impressive.	Revised	SA
154	5-98 Reviewed By McDonald	Ist para change 'fore' to for. MOSs – should it have an apostrophe?	corrected	SA
155	5-103, last para Bob Hart	Very confusing. It's difficult to differentiate references to HCT op cost and the rest of the transit op cost. It says LRT costs less for MOS, remainder to system costs similar, total costs for MOS would be slightly less, followed by numbers that show MOS cost a lot higher. In addition, numbers shown do not match Exhibit 66 numbers.	MOS Section Updated	SA
156	5-103 Reviewed By McDonald	3rd para – saying that Clark College MOS has 3% of the households seems high considering you are eliminating more than 15 blocks of west Vanc. In parentheses it states a 10% reduction – should it be 1%?	MOS Section Updated	SA
157	5-108 Bob Hart	You have no numbers yet, but caution with same general comment as number 40.	MOS Section Updated	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
158	5.4.1 Mullen & Putney	Re-explain why an MOS would be considered for the project	MOS Section Updated	SA
159	p.5-109 section 5.4.2.1 2nd para in section Alan Lehto, TriMet	This will be one of two projects currently in similar phases of the planning process: either the CRC project or the South Corridor, Phase 2 project (an expansion of the LRT system from downtown Portland south through the City of Milwaukie, Oregon).	Inserted text	SA
160	5-109 Reviewed By McDonald	3rd para under 5.4.2.1 says the first project will purchase R/W for maint facilities. Was any of this cost captured in our estimates?	Yes	SA
161	p.5-110 last para Alan Lehto, TriMet	System-wide, whether LRT or BRT is the HCT mode, the total daily boardings would be practically the same (see *[fix reference]*) . This is because with BRT as the HCT mode, passengers traveling between Clark County and downtown Portland must transfer at the Expo Center station to the existing MAX Yellow Line or another TriMet local bus line.	corrected	SA
162	5-110 Reviewed By McDonald	2nd para under 5.5.2 the last sentence says LRT would have a higher cost than BRT – should put the number here rather than having someone having to go to the exhibit and interpolate.	Inserted text	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
163	5-115, last par Bob Hart	Add description of what transit VHD is.	Included	SA
164	Exhibit 74 Bob Hart	If there is no delay for HCT modes, why have a category for it? You already say so in the text.	Removed	SA
165	5-117 Reviewed By McDonald	BIA VHD for HCT modes doesn't appear in exhibit.	Removed	SA
166	p.5-121 Alan Lehto, TriMet	Add to end of paragraph: "BRT has lower demand than LRT but many more routes crossing the river, so available capacity is not used as efficiently."	Inserted	SA
167	5-121, 1st par Bob Hart	Text says that LRT has more capacity than BRT in third sentence, but does match with last sentence of para or in Exhibit 77	Reworked paragraph	SA
168	5-121 Reviewed By McDonald	Exhibit agrees with some of the numbers given in other sections, however if all the Trimet additions et al are true as given elsewhere, then this chart should be revised. Or the others! Ex 80 and	revised	SA
169	5-123 Reviewed By McDonald	Text elsewhere says there could be buses on Washington with LRT down to 6th St. Show some for Alt 3 & 5?	Editorial Comment Noted	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
170	5-124 Exhibit 82 Bob Hart	Again – cost per "new" rider..See Richard Brandman	See comment # 39	GS
171	5-125 Reviewed By McDonald	Ex 80 doesn't agree with Ex 76.	Exhibit 76 represents the number of transit vehicles over the Columbia River during one peak hour in the pm peak direction and Exhibit 80 compares the number of transit vehicles that are required for purchase in each alternative	SA
172	5-127 Reviewed By McDonald	Be interesting to have another chart showing the combined present worth.	Editorial Comment Noted	SA
173	Exhibit 79 Bob Hart	If gray bar means no information or not estimated, you should have footnote noting that fact.	Fixed	SA
174	5.5.3, last par Bob Hart	Change "can be" to "were". They were the only elements that were incorporated into the model.	replaced	SA
175	5-129 Reviewed By McDonald	3rd para says TDM policies can be evaluated using the regional model. Were they and if so what were the changes/results?	See traffic technical report	SA
176	Exhibit 87 Bob Hart	Maybe I missed something earlier. Why would transit capital cost for #5 be lower that #3	Corrected	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)			
Job Charge: N/A	Combined Comments from Expert Reviewers			Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
177	p.5-130 1st full para Alan Lehto, TriMet	The difference between the daily and annual passenger trips on transit would be fewer than two percent – the difference is not statistically significant.	Inserted text	SA
178	5-130 Reviewed By McDonald	Middle 2nd para the 20% number is questionable and I think the 10% should be 1%.	Confirmed to be correct	SA
179	p.5-131 1st para Alan Lehto, TriMet	With the I-5 alignment, to maximize the use of the existing highway right-of-way, the centerline of the highway would need to be relocated 20 feet west to accommodate the guideway.	Changed	SA
180	5-131 Reviewed By McDonald	Ist para – subliminal message in MAXimize?	Corrected	SA
181	5-132 Reviewed By McDonald	Last para – states Clark College BRT MOS would have 9% higher on a daily basis and 10 percent higher on an annual basis. How does this occur? The it follows saying the LRT MOS would have 8% fewer daily, but 2% less annually.	MOS Section updated	SA
182	5-133 Reviewed By McDonald	Have an extra space in 2nd sentence. Percentages don't really give the information here – numbers would.	Editorial Comment Noted	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
183	p.6-1 last full para Alan Lehto, TriMet	Effects to peak only express buses running on I-5 would be minimal because one of the main design requirements of the project is to maintain three general purpose lanes in each direction during peak periods,…	Inserted Text	SA
184	6-1 Reviewed By McDonald	2nd para under 6.2 should say the ramp closure is for I-5 NB only as stated later. Under 6.2.1 would it be prudent to mention the potential to open the HCT crossings of the Columbia and the slough with pus traffic even if the eventual PA is LRT?	Corrected : … Vancouver due to a long-term ramp closure planned at the northbound I-5/SR-14 interchange Editorial Comment Noted	
185	p.6-2 2nd full para Alan Lehto, TriMet	The existing section of the MAX Yellow Line LRT would not be impacted by construction – the existing service to downtown Portland would be maintained, and testing the new vehicles would not affect the existing LRT network. During testing, some empty trains would operate on existing lines, but this would not have a substantial effect on operations or service.	Inserted text	SA
186	6-2 Reviewed By McDonald	4th para – we state express buses on I-5 would not see much impact due to construction. Might mention that even though 3 lanes will be open in each direction, some of the temporary alignments may not allow current 50 MPH speeds (big deal in rush hour, but it might extend the times), narrower lanes and less merging distance at on-ramps making more congestion a high probablility.	Added: Both C-TRAN routes #4 (Fourth Plain) and #105 (I-5 Express) travel across the Columbia River during off-peak hours; these two routes in particular may be affected by slower travel speeds during off-peak hours where lane closures, ramp closures, bridge lifts, and detours create longer travel times. Because these two routes carry a large volume of passengers and travel to two of the major transit centers, this could interfere with transfers to outlying buses, causing further delays for users on a county-wide basis.	SA
187	6-3 Reviewed By McDonald	Ist para4th sent should say '…these NB buses would be…' 3rd para – again could expect more congestion due to altered geometry.	Inserted text	SA

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
188	7-1 Reviewed By McDonald	If agreeable, in intro could talk about early opening of river crossings with bus traffic. Any thought of putting commuter rail on BNSF during peak hours.	Editorial Comment Noted	SA
189	7-2 Reviewed By McDonald	Ist para – there are only 3 buses after 9 PM on the #4 and they quit at 10 p.m. Why would add buses? Change 12:0a.m. to 9:43 a.m.	Editorial Comment Noted	SA
190	7-3 Reviewed By McDonald	Last para – not possible to expand or lease additional parking at Salmon Ck. Plus isn't Salmon Ck 100% utilization now?	Not part of CRC project potential mitigation	GS
191	7-1 through 7-7 Alan Lehto, TriMet	This whole section needs an adjustment in how it is portrayed. This document is not intended, nor should it, commit to any specific mitigation action. It must offer list of potential mitigation efforts that could be applied in order to demonstrate that the short-term impacts do have reasonable mitigations. For example: "would" and "will" should be replaced with "could" and "may". The section probably needs an introduction that makes clear these are potential mitigations, but that advanced design, the LPA, the FEIS may all effect the potential mitigations and that they will be determined in the ROD.	Good!	GS

Columbia River CROSSING

REVIEW COMMENTS FORM

Project Title:	Draft Transit Technical Report (October 2007)				
Job Charge: N/A	Combined Comments from Expert Reviewers				Sheet **1 of 32**

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
192	7-7 Exhibit 89 Alan Lehto, TriMet	One example of the changes that need to happen in this section: Change caption of exhibit: **Exhibit 89. Illustration of Potential Detour (Shown in Green) for Existing Transit Service Stop Locations in Downtown Vancouver in a Two-Way on Washington Alignment Option for the HCT Guideway**	Good!	GS

APPENDIX E

Additional Transit Data Requests

ADDITIONAL TRANSIT DATA REQUESTS (UPDATED 12-13-07)

#	Date Received	Question	Data Request	Response	In progress SAG	In progress CRC Transit Team	Compl.	Source
1	10-12-07	What is the mode of access to LRT and BRT stations north of Expo?	Mode of Access to LRT Stations north of Expo Station	Between Alternatives 2 & 3 the mode of access to stations is approximately the same. See attachment #1.			X	CTRAN
2			Mode of Access to BRT Stations north of Expo Station	See answer to #1 See attachment #1.			X	CTRAN
3	10-12-07	What is the breakdown of modes in daily and annual rider crossings?	Prepare breakdown	In Alt. 2, guideway riders are distributed between branded BRT and local buses based on headways and vehicle frequencies Peak – 12BRT vehicles and 11 local buses /hr Off-peak – 4 BRT vehicles and 16 local buses/hr. Please see details within Transit Technical Report.			X	CTRAN
4	10-12-07	What is the intra Clark County mode split suburban commuter to urban market?	Clark county inner urban to/from Clark County suburban	About 2% intra-state mode split for BRT and LRT. Please see details within Transit Technical Report.			X	RTC
5			North Portland to/Portland downtown, where North Portland = {North Portland, Hayden, Delta, St. Johns districts} and Portland downtown is the districts used before as "Oregon"	About 13% intra-state mode split for BRT and LRT from downtown Portland to North Portland. About 33% intra-state mode split for BRT and LRT from North Portland to Downtown Portland			X	CRC Transit Team
6	10-12-07	How many new riders are crossing the river under each alternative?		Over the Existing 2007 Conditions: Alt 2 would have 3,900,516 new riders and Alt 3 would have 5,745,790 new			X	CRC Transit Team

				riders. Over the No-Build Alt: Alt 2 would have 2,320,012 new riders and Alt 3 would have 4,165,286 new riders.				
7	10-15-07	How many new riders are there in each alternative?	Calculate boardings and transfer trips for corridor transit routes	BRT Alt. 2 has about 8,800 new riders daily. LRT has about 14,500 new riders daily.			X	CTRAN
8	10-15-07	How many transfers are being made in each alternative to both downtown Portland and downtown Vancouver?	TAZ transfer map and transfers table (to VCBD and PCBD markets).	(walk access) VCBD: More 2+ transfers from Oregon with Alt 2 vs Alt 3. PCBD: There is slightly more 2+ transfers with Alt. 2 vs Alt 3. See attachment #5.			X	CTRAN
9	10-15-07	Add new travel time pairs to further articulate travel times between LRT and BRT	New travel time pairs	Detailed within item no. 15			X	CTRAN
10	10-15-07	Can you map out the production of cross river trips for each alternative?	Map out the production of trips crossing the river (all person trips).	See attachment #2.			X	CTRAN
11	10-16-07	Is 31 seconds really the added LRT run time between Expo and Lincoln?	Transmit LRT travel time tables	Yes, slight increase in travel time is due to schedule variability. Please see details within Transit Technical Report.			X	CTRAN
12	10-16-07	Does it make sense that 70 percent of BRT ridership comes from local routes not the 71 S or the branded BRT lines?	QAQC analysis re-check underway	See attachment #3.			X	CTRAN
13	10-16-07	Regarding the branded routes only running during the peak hour being part of the reason BRT ridership is lower: If the 71 S basically replicates LRT service during the offpeak what is causing the drop in ridership? Just the additional transfer at Expo? What is the transfer penalty coefficient?	See above – calculate total boardings and total transfers on the 71S. Need to develop a short statement regarding the transfer penalty coefficient (pending)	See attachment #3.			X	CTRAN
14	10-12-07	Can we see the ridership difference between	Sum all day transit trips from downtown Vancouver district to	See attachment #2.			X	C-TRAN

		representative TAZs in dtn Vancouver to/from Hayden Island for LRT vs BRT to see the differences	Hayden Island district					
15	10-19-07	2. Can you break out ridership on the respective HCT alternatives to the Jantzen Beach/Hayden Island TAZ or TAZ's. I consider this a sensitivity test of the model. Even though the number of trips will be relatively small, I would expect the BRT options to show higher ridership because they would mostly have a one seat ride.		See attachment #2.			X	CTRAN
16	10-19-07	3. What were the LRT and BRT travel time inputs used by the model.	LRT & BRT travel time inputs	Travel-times are not an input to the model.			X	CTRAN
17	10-19-17	4. What are the fare assumptions used in the model for express bus versus BRT/LRT. Staff has told me that the express bus continues to have a premium surcharge vis a vis the HCT modes.		See attachment #4.			X	CTRAN
18	10-19-07	5. Will the TAZ transfer maps and tables show the reverse commute patterns as well? Specifically will it show how many reverse commuters will need to transfer and how many times to reach their destinations under the BRT vs. LRT alternatives?		See attachment #5.			X	CTRAN
19	10-25-07 In relation to Q? # 1&2	Why the 84% BRT & 87% LRT mode of access to Vancouver CBD?		Less total ridership on BRT vs. LRT. Please see details within Transit Technical Report.			X	CTRAN

20.	10-25-07 In relation to Q? # 8	How many NB trips are CBD bound and not CBD bound (Vancouver)?		See attachment #5.			X	
21.	10-30-07 In relation to Q? # 10	Vancouver Mall Regional Center	Transfer Map	See attachment #5.			X	CTRAN
22	10-30-07 In relation to Q?	Total Clark Co. boardings per alternative.		Please see details within Technical Report.			X	CTRAN
23	10-30-07	Hayden Island ons & offs	*Under LRT Alternative.	*440 ons; 255 offs in 4-hour PM Peak period.			X	CTRAN
24	10-19-07	1. For the ridership charts that have been developed for the open houses can the ridership be broken out by the type of transit i.e. Alternative 2: BRT guideway (71S); BRT branded/limited in guideway; local in guideway; local feeder; and express bus. Alternative 3: LRT guideway; branded feeder; local feeder; express bus.	Break out ridership by the type of transit – chart	See attachment #6.			X	CTRAN
25	10-18-07	Please summarize transit travel times by representative O-D pairs in a 6x6 matrix. The pairs are: Vancouver CBD Hazel Dell Salmon Creek Fisher's Landing Portland CBD North Portland	Will be the equivalent of data request #9, so these pairs will be summarized for both.	In all instances LRT is quicker than BRT except from Fisher's Landing to Salmon Creek. Please see details within Technical Report. See Attachment # 7.			X	RTC

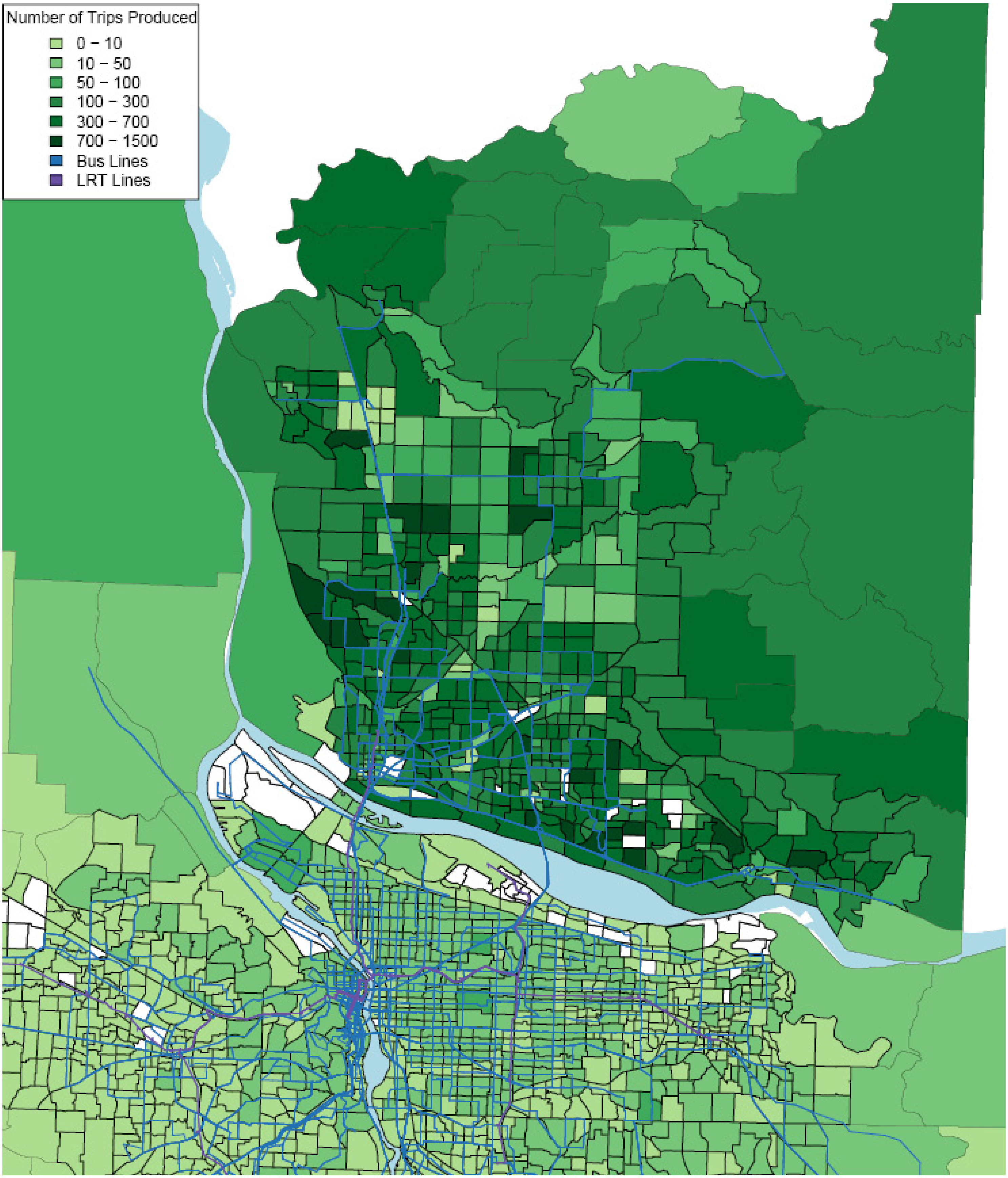
Attachment #1

MODE OF ACCESS TO STATIONS NORTH OF EXPO

Mode	LRT 17.3	BRT 18.1	LRT 19.1	BRT 20.1
Walk Access	21%	21%	23%	23%
Drive Access	41%	43%	34%	33%
Bus Transfer	39%	36%	43%	44%
All Modes	100%	100%	100%	100%

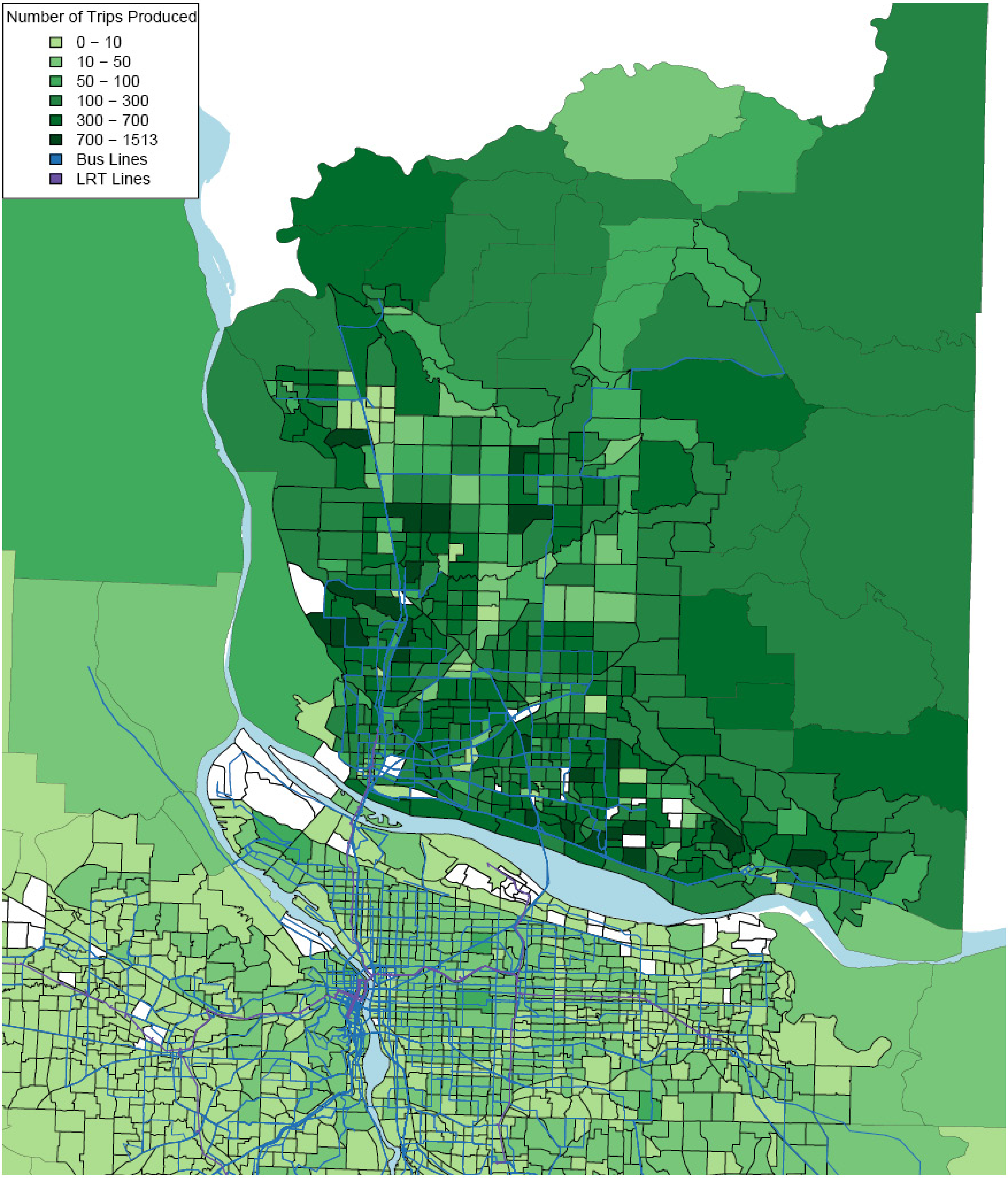
Mode of Access to all routes serving stations north of Expo (LRT only for LRT alternatives, all buses on guideway for BRT alternatives)
Based on egress mode for peak period trips (evening commute), access mode for off-peak trips; both NB and SB trips

Home Based Work Total Productions, All Modes



T17.3 LRT Main St

Home Based Work Total Productions, All Modes



T18.1 BRT Main St

12. Does it make sense that 70 percent of BRT ridership comes from local routes not the 71S or the branded BRT lines?

Yes. The ridership is a result of the EMME/2 model multipath assignment. The model assumes that riders arrive at a steady rate across the 4-hour peak, and a steady rate across the off-peak. In the EMME/2 multipath assignment for each origin-destination, trips leave a TAZ and enter the transit system via only one connector. Once they leave via that connector they evaluate transit options that exist at the node at the end of the connector. In the case where multiple routes exist at the end of the connector that will all get the traveler to their destination, the trips are assigned to the routes based on arrival, essentially resulting in trips proportionate to the headway of the routes available. Consequently, the model assigns riders to the next arriving bus without preference for the BRT.

This is why analysis of EMME/2 results by individual lines is discouraged. The model tells us more in aggregate than line-by-line. It is more accurate to look at ridership in a corridor than by transit line, since the model does a better job of assigning to a group of lines in a corridor, instead of discerning which line would be favored between multiple choices serving the same origins and destinations.

13. Regarding the branded routes only running during the peak hour being part of the reason BRT ridership is lower: If the 71S basically replicates LRT service during the offpeak, what is causing the drop in ridership? Just the additional transfer at Expo? What is the transfer penalty coefficient?

A number of factors explain the lower ridership on the 71S (BRT) across the river in T-18.1 compared to the LRT in T-17.3 despite the two HCT modes having the same length of guideway and alignment and the same headways north of the Exposition Center Station.

The primary reason that the 71S carries fewer riders across the river is because of the way that the model works. EMME/2 multipath assignment for transit boardings on the 71S is diluted by the high number of other transit choices for crossing available that travel in the guideway with the 71S route. In Alternative 2, nine other routes (the 4, 4G, 30G, 37, 37G, 71, 71L, 114G, and 173GL) provide service on some or all the 71S route. In the EMME/2 multipath assignment for each origin-destination, trips leave a TAZ and enter the transit system via only one connector. Once they leave via that connector they evaluate transit options that exist at the node at the end of the connector. In the case where multiple routes exist at the end of the connector that will all get the traveler to their destination, the trips are assigned to the routes based on arrival, essentially resulting in trips proportionate to the headway of the routes available. Consequently, travelers wishing to travel between downtown Vancouver and Expo, are assigned to both the 71S and the nine other routes available based on headways. In Alternative 3, LRT does not have any competing bus service along its route that also crosses the Columbia River.

Attachment #3

An EMME/2 test run was conducted to understand how the multipath assignment was impacting the 71S river crossing numbers. All nine competing routes were eliminated and the model was run with only the 71S and the point-to-point express buses crossing the river. The result was that 71S daily river crossings increased from 3,609 to 10,368. The increase accounts for the majority of the riders that were crossing on local buses in Alternative 2. This test supports the assumption that the model is distributing the river crossings across all available routes.

Other reasons the 71S river crossings modeled would be less than those on LRT include-

- LRT peak hour headways are shorter in Alternative 3 than 2 (7.5 versus 10 minutes) so there is a longer transfer time at Expo for BRT to LRT, than in Vancouver for buses to LRT .
- Annualization factors are lower for BRT than LRT (315 versus 329)
- Express Bus 199 (99th Street Park and Ride to downtown Portland) is more attractive compared to the BRT than the LRT because 199 headways are 5 minutes in Alternative 2 versus 10 minutes in Alternative 3

<u>Explanation of the transfer penalty coefficient is as follows:</u>

Transfers are onerous to the traveler in the model. The model accounts for the impact of transferring through a coefficient that is applied to both the amount of time waiting to transfer and the absolute number of times the traveler experiences a transfer on their trip. The table below shows the different components of a transit trip as compared to and expressed in in-vehicle travel time. For example, a home-based-work trip sees a transfer as being equivalent to 9.4 minutes of in-vehicle time. This is made up of the Transfer Wait time and Transfers (per transfer) values combined.

Attachment #3

Metro Travel Demand Model Parameters and In-Vehicle Time Equivalents

Purpose	HBW	HBS	HBR	HBO	HBC	NHW	NHO
Generic Parameters							
IV	-0.03608	-0.0215	-0.0215	-0.0215	-0.053	-0.025	-0.025
Walk	-0.0996	-0.1033	-0.1033	-0.1033	-0.211	-0.1493	-0.1493
First Wait	-0.0576	-0.06847	-0.06847	-0.06847	-0.0652	-0.1337	-0.1337
Second Wait	-0.04002	-0.0524	-0.0524	-0.0524	-0.053	-0.079	-0.079
Transfers	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Mode Constants							
LRT	-3.809	-3.635	-3.635	-4.135	0	-1.613	-1.184
COMBO	-3.809	-3.635	-3.635	-4.135	0	-1.613	-1.184
BUS	-4.35	-3.85	-3.85	-4.35	-0.532	-1.862	-1.434
Equivalent IVT Minutes							
Time Parameters							
First Wait	1.6	3.2	3.2	3.2	1.2	5.3	5.3
Transfer Wait	1.1	2.4	2.4	2.4	1.0	3.2	3.2
Transfers (per transfer)	8.3	14.0	14.0	14.0	5.7	12.0	12.0
Total Transfer IV MINUTES	9.4	16.4	16.4	16.4	6.7	15.2	15.2
Walk Time	2.8	4.8	4.8	4.8	4.0	6.0	6.0
Constants							
LRT Mode	15.0	10.0	10.0	10.0	10.0	10.0	10.0
COMBO Mode	15.0	10.0	10.0	10.0	10.0	10.0	10.0

Memo

To: Columbia River Crossing (CRC) project team

From: Transportation Research & Modeling Services

Date: February 22, 2007

Re: C-Tran fares methodology – CRC project Phase 2

METRO

Attachment #4

In Metro's transportation models, transit fare is a major determinant of mode share. Current models require a transit fare matrix representing the average fare paid for travel between all possible zone pairs. Fares are expressed in 1994 dollars for compatibility with the model estimation data from the1994-95 household activity survey. The purpose of this memo is to document the methodology used to generate the transit fare assumptions for the Columbia River Crossing study and other projects that use the 2029 zone system in the near term.

For the CRC base year model, we aim to reflect conditions (land use, network, costs, etc.) in May 2005. Average fare data were collected from TriMet as follows. The 2005 to 1994 dollar conversion factor is 0.77.

Table 1: TriMet 2005 estimated average fares

Fare Type	May 2005 Cash Fare	Pass Factor	Average Fare	Avg Fare in 1994$
1-zone	$1.40	0.771	$1.079	$0.831
2-zone	$1.40	0.791	$1.107	$0.852
3-zone	$1.70	0.702	$1.194	$0.919

We met with C-Tran staff on 2/17/2006 to discuss the fare approach. They suggested some modifications to the pass factor used for TriMet fare calculations. Table 2 summarizes the fare scheme that was recommended by C-Tran staff. This maintains consistency with the methodology used to arrive at TriMet average fares, while including some adjustments unique to C-Tran. One adjustment accounts for the significant number of riders using C-Tran's low-cost monthly passes (factor=0.540). The other adjustment is to reflect the proportion of premium service riders who use of monthly passes versus yearly stickers (factor=0.799). C-TRAN service design is being reflected in the route structure, as actual fare costs did not change with the service redesign.

Table 2: C-Tran 2005 estimated average fares using methodology consistent with TriMet, but accounting for the low-cost monthly passes in the C-Tran system.

Fare Type	May 2005 Cash Fare	Pass Factor	Average Fare	Avg Fare in 1994$
C-Zone	$1.25	0.540	$0.68	$0.52
All-Zone	$2.25	0.540	$1.22	$0.94
Premium	$3.00	0.799	$2.40	$1.85

- The C-Zone fare would apply to all travel within Clark County.
- The All-Zone fare would apply between Clark County and any point in Oregon that does not require a trip through the Portland CBD (including Lloyd District and OHSU).
- The Premium fare would apply between Clark County and any point in Oregon that does require a trip through the Portland CBD (including Lloyd District and OHSU).

In application, two transit fare matrices will be used. Fare matrices will be separated by park-and-ride access and walk access.

- Park-and-ride access will reflect a premium fare for customers using express service from park-and-ride lots in Clark County that offer one-seat rides into and through the Portland CBD (this would include service to Lloyd Center and OHSU).

- Walk access will reflect a full zone fare from Clark County to Oregon ($2.25 cash fare rate from Table 2) rather than a Premium Fare.

Attachment #4

Date: March 1, 2007

To: CRC Transit Working Group

From: Jennifer John

Subject: Phase 2 Transit Fare Application

Agreement was reached at the Modeling Technical Team meeting on Tuesday February 27th with regard to how transit fares would be applied in the modeling work for Phase 2. The purpose of this memo is to document these final assumptions.

In application, two transit fare matrices will be used. There will be one for park and ride access and one for walk access.

- Park and Ride Access will reflect a premium fare ($3.00 one way) for customers using express service from park and ride lots in Clark County that offer a one-seat ride into and through the Portland CBD (this would include service to Lloyd Center and OHSU).

- Walk Access will reflect a full zone fare from Clark County to Oregon ($2.25 one way cash fare rate) rather than a Premium Fare. The exception to this will be for zones that have direct walk access at park and ride lots with premium service as described above (except for the 99th Street park and ride lot, discussed below). The meeting participants agreed that the walk access zones for Clark County park and ride lots served by express bus service to downtown Portland (and Lloyd Center and OHSU) will see the premium fare for their trip if they are traveling to or through the Portland CBD.

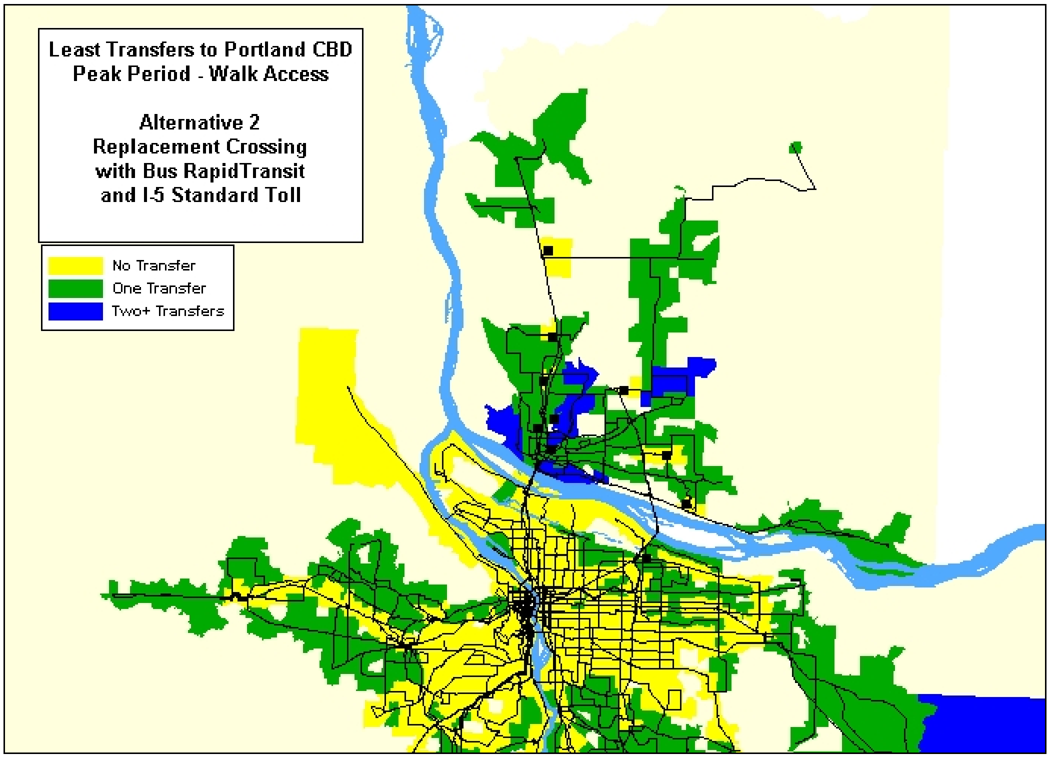
- The 99th Street park and ride lot fare was discussed at length because of the nature of the service that is being provided there. The concern was that based on this service, customers at this location would use local service to get to Oregon just as often as they would be using premium service. The meeting participants agreed that Metro would average the two fares (i.e., $2.25 and $3.00) at this park and ride lot for the walk access trips only.

Transit fare matrices will vary by alternative based on the type of service that is offered at the park and ride lot locations. Only park and ride lots with premium express bus service will be seeing the premium fares. As a result, part of the input process will be to identify how the transit fare matrices are defined for the alternative. A subgroup of the Technical Team will work together to do this.

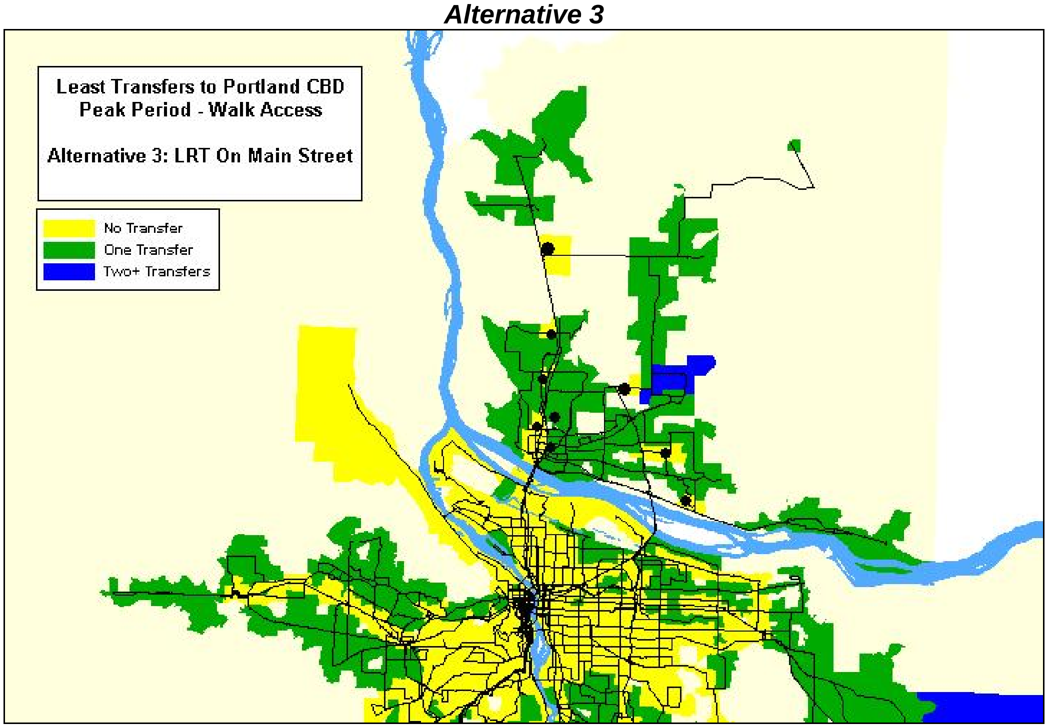
Attachment #5
Transfer Maps: Peak Period – Walk Access

Least Transfers to Portland CBD

Alternative 2

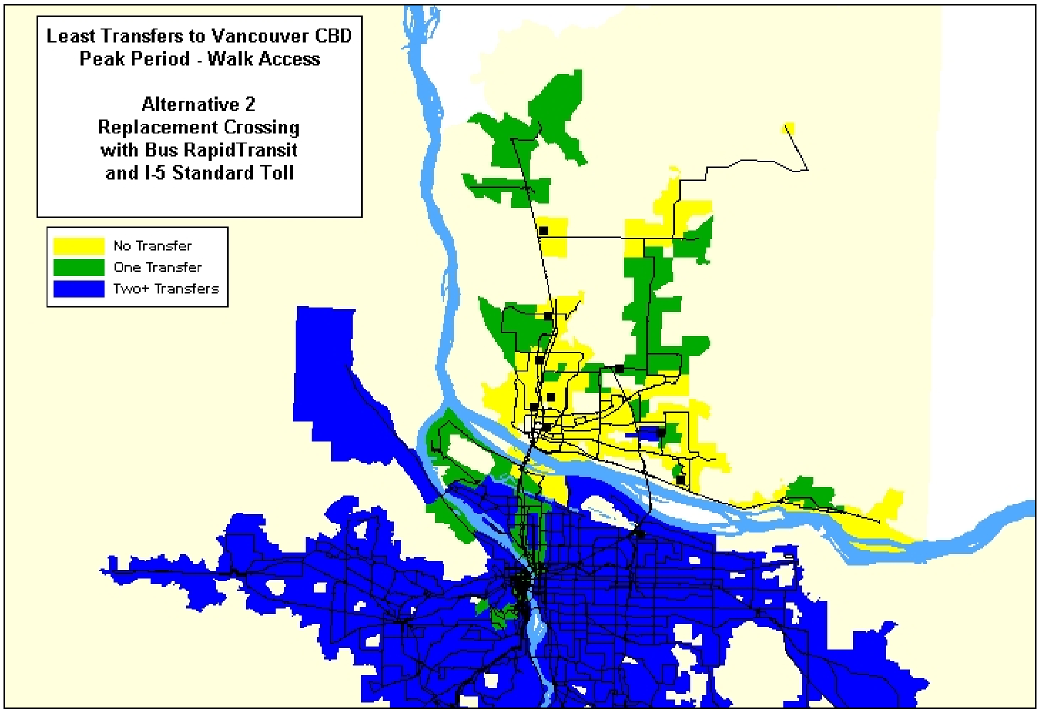


Alternative 3

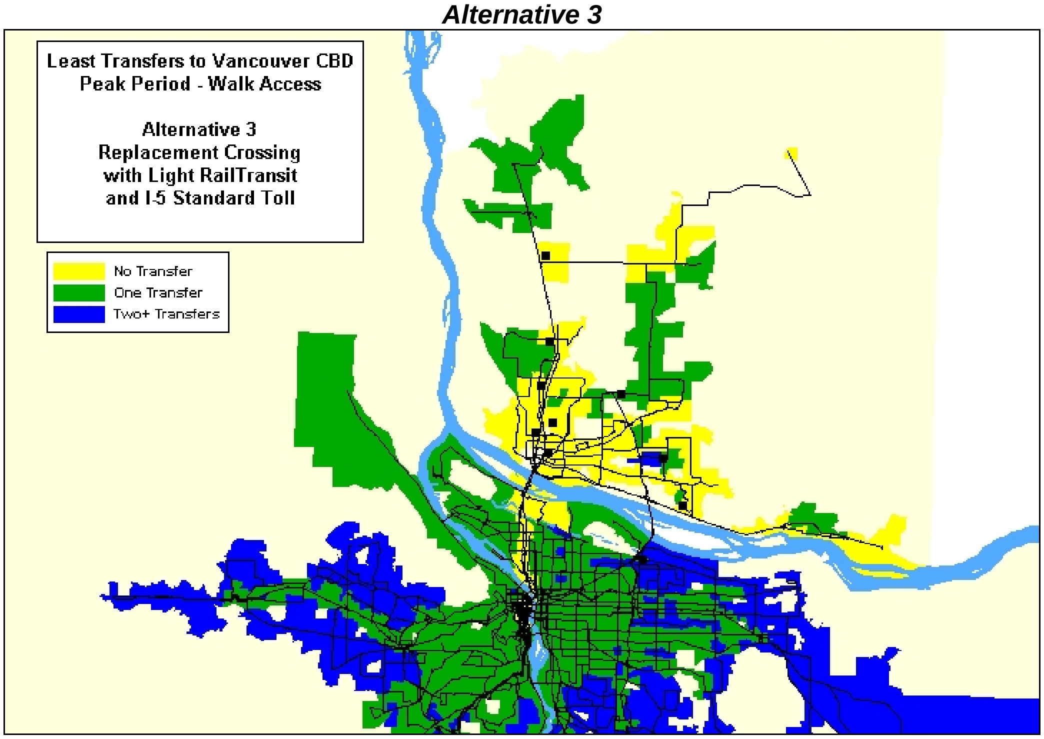


Least Transfers to Vancouver CBD

Alternative 2

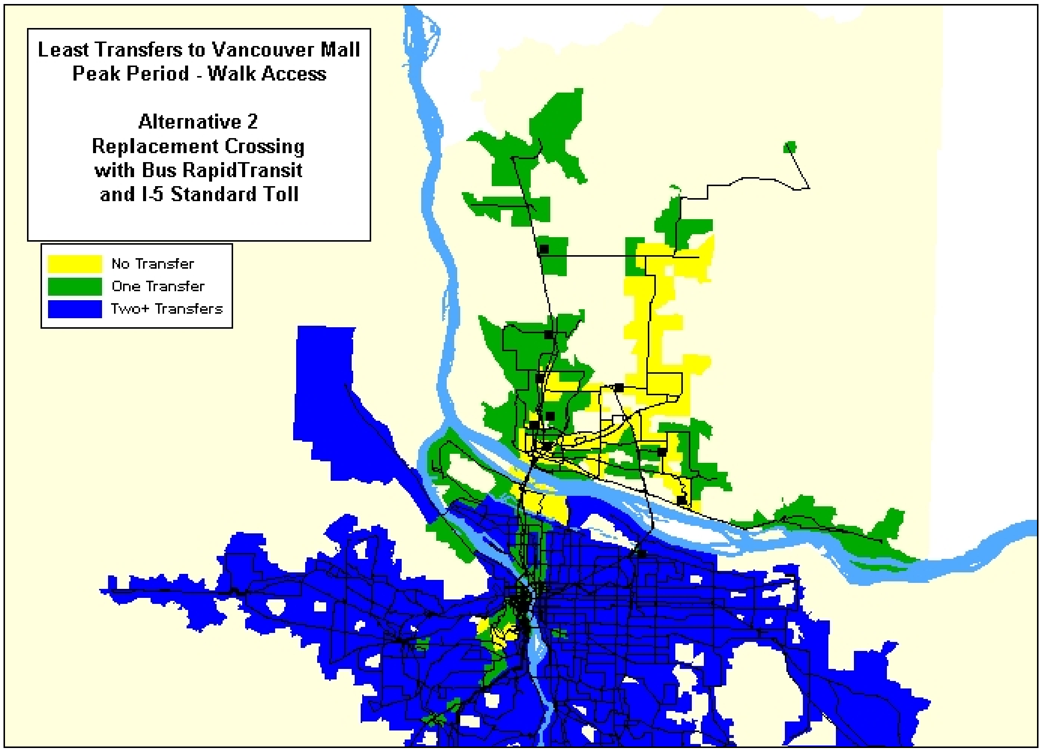


Alternative 3

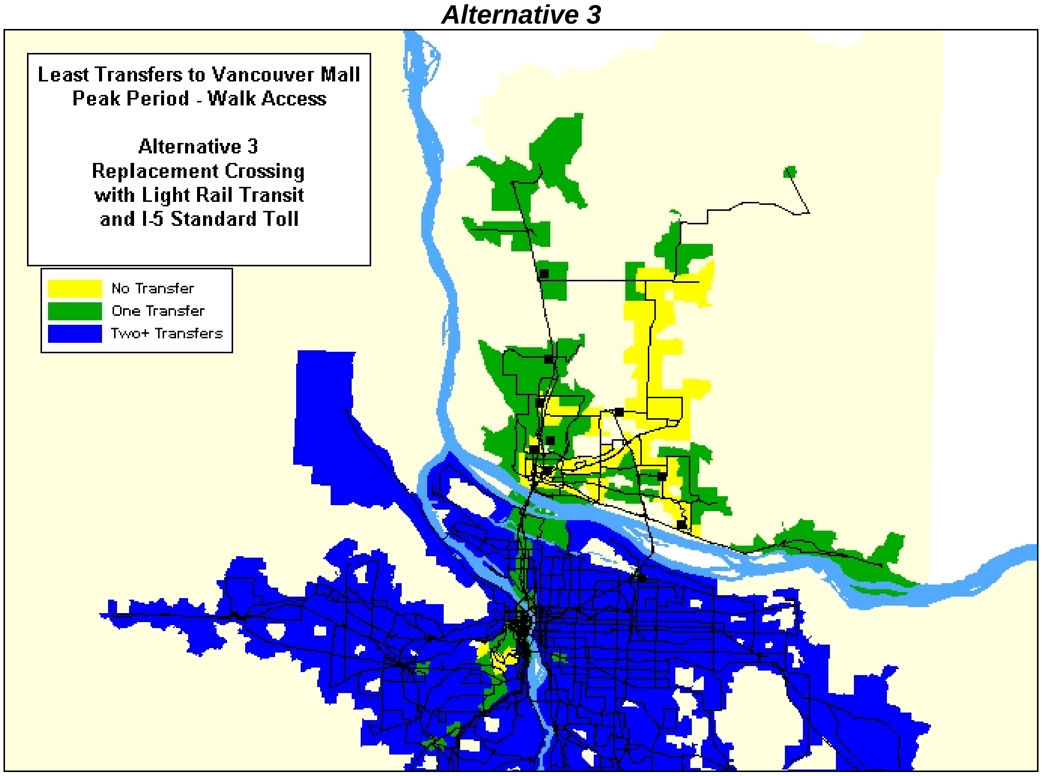


Least Transfers to Vancouver Mall

Alternative 2



Alternative 3



Attachment #6

Columbia River Transit Crossings at Interstate 5
Oregon vs. Washington Residents
Split

LRT on Main Street T17.3

	Peak Period		*Off Peak Period*		*Home State*			
Line	***SB***	***NB***	***SB***	***NB***	***WA***	***OR***		
01MAIN	1,039	6,279	9,196	2,092	15,475	3,131		
C134PN	0	463			463	0		
C134PS	19	0			0	19		
C164PN	0	841			841	0		
C177PN	0	272			272	0		
C183PN	0	576			576	0		
C190P	9	180			180	9		
C199PN	0	1,241			1,241	0		
C199PS	103	0			0	103		
C219XN	0	343			343	0		
C219XS	13	0			0	13		
							WA	***OR***
LRT					***15,475***	***3,131***	***83%***	***17%***
Bus					***3,916***	***144***	***96%***	***4%***
Bus - excluding I-205 routes					***2,227***	***144***	***94%***	***6%***
Total					***19,391***	***3,275***	***86%***	***14%***
Total - excluding I-205 routes					***17,702***	***3,275***	***84%***	***16%***

In the peak period, trips produced in Clark County travel NB across the bridge (person trip table is in AtoP format);
in the off-peak period, trips produced in Clark County travel SB across the bridge.
The home end of a NHB trip is unknown, therefore we assume it is the same as the production end.

Attachment #6

Columbia River Transit Crossings at Interstate 5
Oregon vs. Washington Residents
Split

BRT on Main Street T18.1

	Peak Period		Off Peak Period		Home State			
Line	***SB***	***NB***	***SB***	***NB***	***WA***	***OR***		
C004G	178	625	0	0	625	178		
C004MG			969	299	969	299		
C004OG	38	185	0	0	185	38		
C030G	76	362	783	217	1,144	293		
C037GL	108	497	0	0	497	108		
C037TC	30	89	1,021	426	1,110	456		
C071	52	374	2,492	263	2,867	315		
C071GL	52	374	0	0	374	52		
C071GP	105	749	2,492	263	3,241	368		
C114G	2	11	0	0	11	2		
C134PN	0	469	0	0	469	0		
C134PS	19	0	0	0	0	19		
C164PN	0	894	0	0	894	0		
C173GL	7	47	0	0	47	7		
C177PN	0	275	0	0	275	0		
C183PN	0	565	0	0	565	0		
C190P	13	242	0	0	242	13		
C199PN	0	2,486	0	0	2,486	0		
C199PS	140	0	0	0	0	140		
C219XN	0	456	0	0	456	0		
C219XS	18	0	0	0	0	18		
							WA	***OR***
Total					***16,456***	***2,306***	***88%***	***12%***
Total - excluding I-205 routes					***14,722***	***2,306***	***86%***	***14%***

In the peak period, trips produced in Clark County travel NB across the bridge (person trip table is in AtoP format);
in the off-peak period, trips produced in Clark County travel SB across the bridge.
The home end of a NHB trip is unknown, therefore we assume it is the same as the production end.

Attachment #7

Net AM Southbound Transit Travel Time Difference Using TMS Schedules

	Vancouver CBD	Hazel Dell	Salmon Creek	Fisher's Landing	Portland CBD	North Portland
Vancouver CBD		8.0	8.0	0.0	6.3	6.3
Hazel Dell			0.0	4.0	10.6	10.6
Salmon Creek				-3.0	10.6	10.6
Fisher's Landing					14.6	14.6
Portland CBD						0.0
North Portland						

Net PM Northbound Transit Travel Time Difference Using TMS Schedules

	Vancouver CBD	Hazel Dell	Salmon Creek	Fisher's Landing	Portland CBD	North Portland
Vancouver CBD						
Hazel Dell	6.0					
Salmon Creek	6.0	0.0				
Fisher's Landing	0.0	15.0	15.0			
Portland CBD	2.8	11.0	11.0	5.0		
North Portland	2.8	7.3	7.3	1.3	0.0	

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APPENDIX F

Final Definition of Transit Alternatives

FINAL DEFINITION OF TRANSIT ALTERNATIVES

DRAFT Report

February 2008

Columbia River CROSSING

Title VI

The Columbia River Crossing project team ensures full compliance with Title VI of the Civil Rights Act of 1964 by prohibiting discrimination against any person on the basis of race, color, national origin or sex in the provision of benefits and services resulting from its federally assisted programs and activities.

Americans with Disabilities Act (ADA) Information

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Cover Sheet

DRAFT Report:

Final Definition of Transit Alternatives

Submitted By:

Columbia River Crossing Transit Team

Abstract:

The *Final Definition of Transit Alternatives Report* (FDTAR) provides a description of the transit alternatives that will be analyzed as part of the Columbia River Crossing (CRC) Project's Draft Environmental Impact Statement (DEIS). The description of the transit alternatives in this report focuses on the transit operating improvements and transit capital improvements that would be included with each of the alternatives.

TABLE OF CONTENTS

Appendices

List of Figures

List of Tables

ACRONYMS

AOM	Administration, Operation, and Maintenance
BNSF	Burlington Northern-Santa Fe
BPA	Bonneville Power Administration
BRT	Bus Rapid Transit
CBD	Central Business District
CRC	Columbia River Crossing
CX	City Center Mixed Use Zoning
DDTAR	Detailed Definition of Transit Alternatives Report
DEIS	Draft Environmental Impact Statement
FDTAR	Final Definition of Transit Alternatives Report
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HCT	High Capacity Transit
HOV	High Occupancy Vehicle
I-5	Interstate 5
I-205	Interstate 205
ITS	Intelligent Transportation System
LPA	Locally Preferred Alternative
LRT	Light Rail Transit
LRV	Light Rail Vehicle
MOS	Minimum Operable Segment
MTP	Metropolitan Transportation Plan
NEPA	National Environmental Policy Act
ODOT	Oregon Department of Transportation
OHSU	Oregon Health Sciences University
OMSI	Oregon Museum of Sciences and Industry

PE	Preliminary Engineering
PSU	Portland State University
RTC	Regional Transportation Council
RTP	Regional Transportation Plan
SR	State Route
TC	Transit Center
TDM	Transportation Demand Management
TSM	Transportation System Management
TSP	Transportation System Plan
VA	Veteran's Administration
VCCV	Vancouver City Center Vision
VMT	Vehicle Miles Traveled
WSDOT	Washington State Department of Transportation

1. Executive Summary

1.1 Background and Introduction

The *Final Definition of Transit Alternatives Report* (FDTAR) provides a description of the transit alternatives that are analyzed as part of the Columbia River Crossing (CRC) Project's Draft Environmental Impact Statement (DEIS). This executive summary, Section 1, describes each transit alternative and its main characteristics, and provides a brief description of the fare policy and highway networks to be used in the alternatives analysis. Section 2 of the report provides background information on the project's process and how the alternatives were developed. Section 3 documents key transit-related policy assumptions such as transit fares; existing and forcased land use; transit operations, including span of service, vehicle type, and capacity; and the highway network. The description of the transit alternatives in Section 4 focuses on the transit operating improvements and transit capital improvements that would be included in each DEIS Alterantive.

The CRC Project has adopted a six-step evaluation framework for screening a list of more than 75 transportation components, 12 multimodal alternative packages, and the DEIS Alternatives. In general, the framework establishes: screening criteria and performance measures to evaluate the effectiveness in addressing the project's Purpose and Need; problems identified in the project's Problem Definition; and values identified in the Task Force's Vision and Values Statement.

In February 2007, the CRC Task Force adopted three transit alternatives to advance for further analysis in the DEIS. At this meeting, they appointed a subcommittee to engage in a one month process to develop a Fourth Alternative that would utilize the existing bridges with a goal of creating a lower cost alternative. In March 2007, the CRC Task Force adopted the Fourth Alternative[1], which was broken into two alternatives paired with different high capacity transit (HCT) mode options (light rail transit – LRT, and bus rapid transit – BRT). The transit alternatives to advance for further analysis in the DEIS are:

- **Alternative 1** – No-Build
- **Alternative 2** – Replacement Bridge and BRT with Express Bus Service
- **Alternative 3** – Replacement Bridge and LRT with Express Bus Service
- **Alternative 4 –** Supplemental Bridge and BRT with Express Bus Service and an Increased Level of Transit Service
- **Alternative 5 –** Supplemental Bridge and LRT with Express Bus Service and an Increased Level of Transit Service

[1] For more information, please see the *Fourth Alterantive Memo* attached in Appendix F.

1.2 Transit Operating Strategy

Alternatives 2 through 5 would use a similar transit operating strategy. This operating strategy consists of three types of transit service:

- Local bus service (fixed route local service with comparatively frequent stops);
- Express bus service (point-to-point bus service across the Columbia River); and
- Trunk line service (primary cross-river service, provided by standard bus, Bus Rapid Transit and/or light rail, depending on the alternative).

For the CRC Project, local bus service is defined as the traditional fixed routes that would provide radial service to and from the central business district. Local bus service would have frequent stops and headways, depending on demand.

Express bus service is defined as point-to-point service from Clark County Park and Ride lots (such as 99th Street, Salmon Creek, and Fisher's Landing) to downtown Portland, the Lloyd District, or the Oregon Health and Sciences University (OHSU) with no intermediate stops. Express buses would travel in general purpose lanes along Interstate 5 (I-5), except when operating in the existing northbound managed lane from Going Street to Marine Drive in the PM peak period. Express bus service would operate at 5- to 120-minute headways in the AM and PM peak periods only, and only on weekdays. (However, in the No-Build Alternative, C-TRAN's 105 express bus would operate during the off-peak periods).

Trunk line service is defined as those routes that would provide the main bi-state transit service. Generally, the trunk line service would be the most frequent, have a high capacity, and have a long span of service, including on weekends. Additional characteristics of the trunk line service would include exclusive lanes separated from general traffic within the CRC Bridge Influence Area (a section of I-5 from State Route (SR) 500 in the north to Columbia Boulevard in the south, as shown in Figure 2-1), a stop spacing of ½ to 1 mile, larger stations with passenger amenities, higher operating speeds, and it would receive signal priority. With BRT (DEIS Alternatives 2 and 4), the trunk line service would be provided by the addition of three BRT lines originating from points in Vancouver to the existing Expo Center light rail station. With LRT (DEIS Alternatives 3 and 5), the trunk line service would be provided by an extension of the Interstate MAX Yellow LRT Line from the Expo Center light rail station to downtown Vancouver.

1.3 Transit Components of the DEIS Alternatives

As introduced above, there are five transit alternatives evaluated in the DEIS. These transit alternatives are comprised of four main components, called system-level choices, and numerous design options, called segment-level choices. They are organized as such because of the degree of impact the choice would have on the project as a whole. The components are strategically combined in each transit alternative and were evaluated in the DEIS to reveal the impact and effect of each system- and segment-level choice. As detailed below in Table 1-1, these components are:

System-Level Transit Choices

System-level transit choices are choices that would have ramifications throughout the CRC corridor and beyond. These choices would impact transit ridership, traffic and transit congestion, transit reliability, and numerous other factors that are discussed in the *Transit Technical Report* (February 2008). Associated with the CRC Project are four system-level choices, as follows:

- **HCT Mode:** Mode is defined as the high capacity transit (HCT) proposed in each alternative. The CRC project has two build HCT transit alternatives: BRT and LRT.
- **Level of Transit Service**: Efficient and Increased levels of transit service for both the BRT and LRT HCT mode, and for some of their supportive local bus lines, is analyzed. The level of service chosen may differ from either of these choices in the build project. The Increased level of transit operation was created as a system-level choice to distinguish the effect that more transit capacity and operations would have upon the transit alternatives.
- **Toll Rate:** This report examines three levels of tolls and two tolled scenarios. The three levels of tolls examined are: no toll; a standard toll; and a higher toll (see the *Traffic Technical Report* (February 2008) for a more detailed explanation of the cost assumptions for these toll categories). The two tolled scenarios include: tolling I-5 only; tolling both I-5 and I-205.
- **Location of Northern Terminus:** Terminus is the location along the alignment where the exclusive transit guideway would end. Both the Vancouver and the I-5 alignments were evaluated with a full-length alignment and a Minimum Operable Segment (MOS) alignment.

Segment-Level Transit Choices

Segment-level transit choices are composed of design options that would have little impacts to the entire CRC corridor. Typically, the impacts would be seen within a block or two radius of the choice. For instance, a segment-level choice discussed in this report is whether to place an LRT or BRT guideway two-way on Broadway Street in downtown Vancouver, or in a couplet on Broadway and Main Streets. Although these decisions would have significant impacts locally (i.e., during construction), they would not impact transit ridership or travel time.

The full-length transit alignments are broken into three segments: A1, A2, and B (see Figure 1-1). They are segmented as illustrated because these three parts have design options that are specific to the section and do have impacts outside of the segment. Segment A1 includes the bridge crossing; herein, the discussion revolves around issues that affect the river and the bridge. Segment A2 is the portion of the transit alignment that is in downtown Vancouver. Lastly, Segment B is composed of the northern alignment options. This portion of the discussion is characterized by the differences between the Vancouver and I-5 alignment.

- **Design Options:** Within Segment A1, A2 and B, design options are potential variations of the alignment (such as a one block shift in the location of the guideway), station locations, or the guideway cross section that would not affect the regional travel demand forecasting model.

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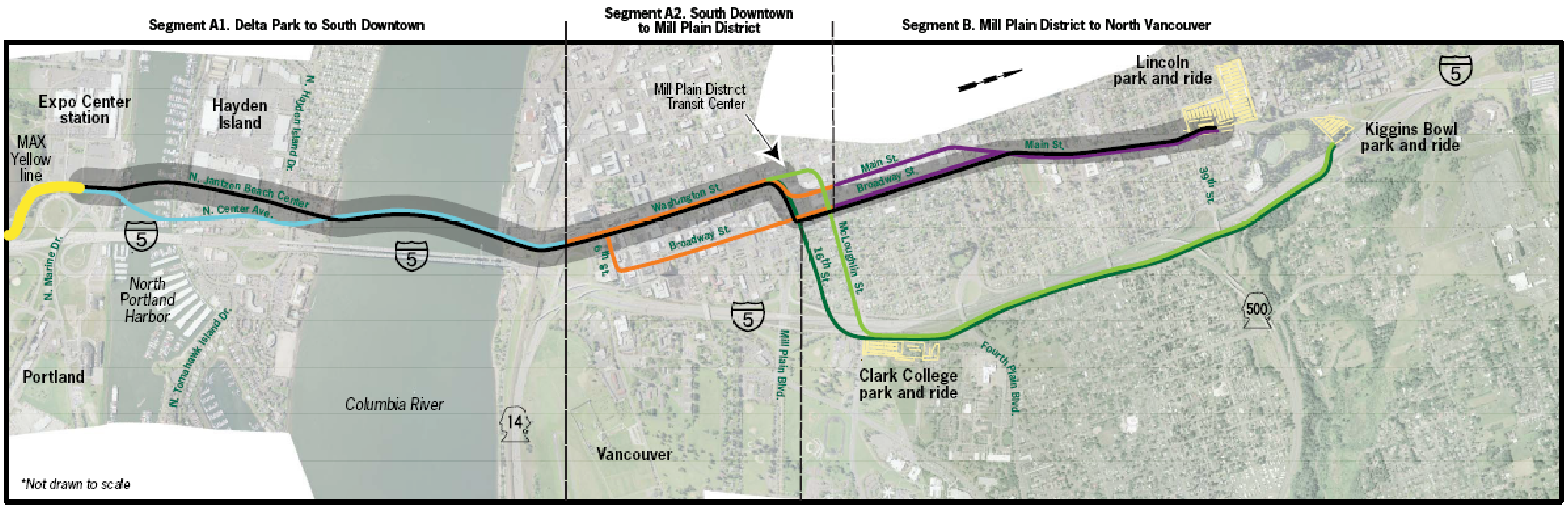
Figure 1-1. Transit Segments and Design Options



DESIGN OPTIONS

HAYDEN ISLAND TO DOWNTOWN VANCOUVER

N. Jantzen Beach Center, Replacement Downstream Bridge (Representative Alignment)
Travel beside Jantzen Beach SuperCenter to connect with new bridge west of existing bridge.

Along I-5, Replacement Downstream Bridge
Travel along I-5 near N. Center Avenue to connect with new bridge west of existing bridge.

DOWNTOWN VANCOUVER TO 16TH STREET/MCLOUGHLIN

Washington Two-way (Representative Alignment)
Northbound and southbound transit on Washington Street.

Broadway-Washington
Northbound transit on Broadway and southbound transit on Washington.

NORTH OF DOWNTOWN VANCOUVER

Vancouver High Capacity Transit Alignment

Broadway Two-way North (Representative Alignment)
On Broadway Street from McLoughlin to Main Street. Continues on Main Street to park and ride at 39th Street.

Broadway-Main
Northbound transit on Broadway Street and southbound transit on Main Street from McLoughlin to 29th Street. Two-way on Main Street from 29th Street to park and ride at 39th Street.

I-5 High Capacity Transit Alignment

16th St., Along I-5
Two-way transit travels on 16th Street to east side of I-5. Travels from Clark College, along I-5, to park and ride near Kiggins Bowl.

McLoughlin, Along I-5
Two-way transit travels on McLoughlin to east side of I-5. Travels from Clark College along I-5 to park and ride near Kiggins Bowl.

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In more detail, the CRC transit alternatives that were studied in the DEIS include:

- **Alternative 1**: Alternative 1, the No-Build Alternative, would include only those transit services and facilities that can be reasonably anticipated for funding and construction by the transit service providers and in Metro's and Southwest Washington Regional Transportation Council's (RTC) regional transportation plans.
- **Alternative 2**: Alternative 2 would include an all-day BRT system that, within the CRC Bridge Influence Area, would operate in an exclusive guideway from Vancouver to the existing Expo Center light rail station where the service would provide a transfer opportunity to the existing Interstate MAX Yellow Line. The BRT system would have supplemental Express Bus service from locations within Clark County to the Portland CBD and OHSU. Alternative 2 is evaluated with a replacement bridge paired with both the Vancouver and I-5 alignments. In total, there are four termini evaluated with this alignment. The Vancouver full-length alignment would terminate at the Lincoln Park and Ride; the Mill Plain District MOS, which travels along this alignment, terminates at the Mill Plain District Transit Center. The I-5 full-length alignment would terminate at the Kiggin's Bowl Park and Ride; along that alignment are both the Mill Plain District MOS terminus and the Clark College MOS terminus at the Clark College Park and Ride.
- **Alternative 3**: Alternative 3 would include an extension of TriMet's all-day Interstate MAX Yellow Line that would operate in an exclusive guideway from the Expo Center light rail station to Vancouver, within the CRC Bridge Influence Area. The LRT system would have supplemental Express Bus, local and feeder service from locations within Clark County to the Portland CBD and OHSU. Alternative 3 is evaluated with a replacement bridge paired with both the Vancouver and I-5 alignments. Like Alternative 2, Alternative 3 is evaluated with the two full-length termini and two MOS termini.
- **Alternative 4**: Alternative 4 would include the same components as Alternative 2 where the BRT system, within the CRC Bridge Influence Area, would operate within an exclusive guideway from Vancouver to the existing Expo Center light rail station but at higher frequencies of service, referred to as an Increased Level of Transit Service. The Express Bus, local, and feeder bus service would also have a higher level of service. Alternative 4 is evaluated with a supplemental bridge and the Vancouver Alignment with only one full-length terminus at the Lincoln Park and Ride.
- **Alternative 5**: Alternative 5 would include the same components as Alternative 3 where the LRT system, within the CRC Bridge Influence Area, would operate within an exclusive guideway from Vancouver to the existing Expo Center light rail station but at higher frequencies of service, also referred to as an Increased Level of Transit Service. The Express Bus, local, and feeder bus service would also have a higher level of service. Alternative 5 is evaluated with a supplemental bridge and the Vancouver Alignment with only one full-length terminus at the Lincoln Park and Ride.

Table 1-1 provides a detailed outline of the transit components represented as system- and segment-level choices as discussed above. As presented, River Crossing (Replacement or Supplemental Bridge) is a segment-level transit choice because this decision would have little influence on the transit metrics, like transit ridership. In conjunction with Table 1-1, Figure 1-2 provides a diagram of the CRC DEIS Alternatives and the transit components. Due to a focus on lower capital costs, for modeling purposes DEIS Alternatives 4 and 5 would be paired only with the Vancouver Alignment and supplemental bridge crossing. All of the alternatives include the design options described as segment-level choices.

The transit networks and operating characteristics developed for the transit alternatives were intended to serve the two transit travel markets (inner urban and suburban commuter defined in detail in Section 2.3 of this report), identified for the CRC project. Generally, the Build Alternatives (Alternatives 2 through 5) were designed to minimize the number of transfers for travel from points in Vancouver to downtown Portland. In Alternatives 2 and 4, a transfer would occur to the Yellow Line at the Expo Center light rail station. In Alternatives 3 and 5, a transfer would occur from the limited or local bus lines to one of the new LRT stations that would be located in Vancouver.

There are two ways to access the HCT system: either direct access from walk-ons, drop-offs, bicycles, and Park and Ride lots; or a transfer from the local bus network. With Alternatives 2 and 4, direct access to the bus routes that would use the guideway would have one transfer for travel to downtown Portland from the guideway bus to the MAX Yellow Line. Access from the local bus network that does not cross the Columbia River would have two transfers for travel to downtown Portland. Two transfers are unavoidable for those riders utilizing the local bus system to gain access to the guideway with the BRT Alternatives because of the existing Interstate MAX LRT guideway terminus at the Expo Center light rail station. The only way to ensure zero to one transfer with Alternatives 2 and 4 would be if the BRT guideway continued south of the Expo Center light rail station to downtown Portland allowing transit riders to transfer from local and limited buses to the BRT guideway for their trip to downtown Portland. With Alternative 3 and 5, direct access to the light rail line would have no transfers for travel to downtown Portland, and access from the local bus network to LRT would have one transfer.

Table 1-1. System and Segment Level Transit Choices by Alternative

Level	Choice[1]	Full-Length Alternative Choices				
		Alternative 1: No-Build	**Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll**	**Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll**	**Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll**	**Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll**
System	**HCT Mode**	None	BRT	LRT	BRT	LRT
	Level of Transit Operation	Existing	Efficient	Efficient	Increased	Increased
	Toll Rate[2]	None	Standard Rate	Standard Rate[3]	Higher Rate	Higher Rate
	Location of Northern Terminus	N/A	Kiggins Bowl/Lincoln Park and Ride/Mill Plain District Transit Center/Clark College Park and Ride	Kiggins Bowl/Lincoln Park and Ride/Mill Plain District Transit Center/Clark College Park and Ride	Lincoln Park and Ride/Kiggins Bowl	Lincoln Park and Ride/Kiggins Bowl
Segment	**Segment A1** ***River Crossing***[4]	Existing	Replacement/Stacked Transit-Highway Bridge[5]	Replacement/Stacked Transit-Highway Bridge	Supplemental	Supplemental
	Segment A1 ***Bridge Crossing Transit Alignment***	N/A	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset
	Segment A2 ***Two-way or Couplet Transit Alignment***	N/A	Two-Way on Washington/Couplet on Broadway and Washington	Two-Way on Washington/Couplet on Broadway and Washington	Two-Way on Washington/ Couplet on Broadway and Washington	Two-Way on Washington/ Couplet on Broadway and Washington
	Segment B ***Northern Transit Alignment***	N/A	Vancouver/I-5	Vancouver/I-5	Vancouver	Vancouver

[1] *Modeling software used to assess each alternative's performance does not distinguish between smaller details, such as most segment-level transit choices.*
[2] *In addition to standard and high toll rates, this report evaluates options that would toll only the I-5 river crossing and options that would toll both the I-5 and the I-205 crossings.*
[3] *Alternative 3 was evaluated with the standard rate, but was also tested with four different tolling scenarios: non-tolling, standard toll I-5, high toll I-5, and standard toll I-5 and I-205. For more information on the tolling methodology see the Traffic Technical Report.*
[4] *River Crossing is reported and analyzed within the Transit Technical Report as a segment-level choice because of the limited effect this choice has upon the transit performance.*
[5] *Stacked Transit/Highway Bridge (STHB) is defined and discussed in Section* ***Error! Reference source not found.****: Segment-Level Transit Choices.*

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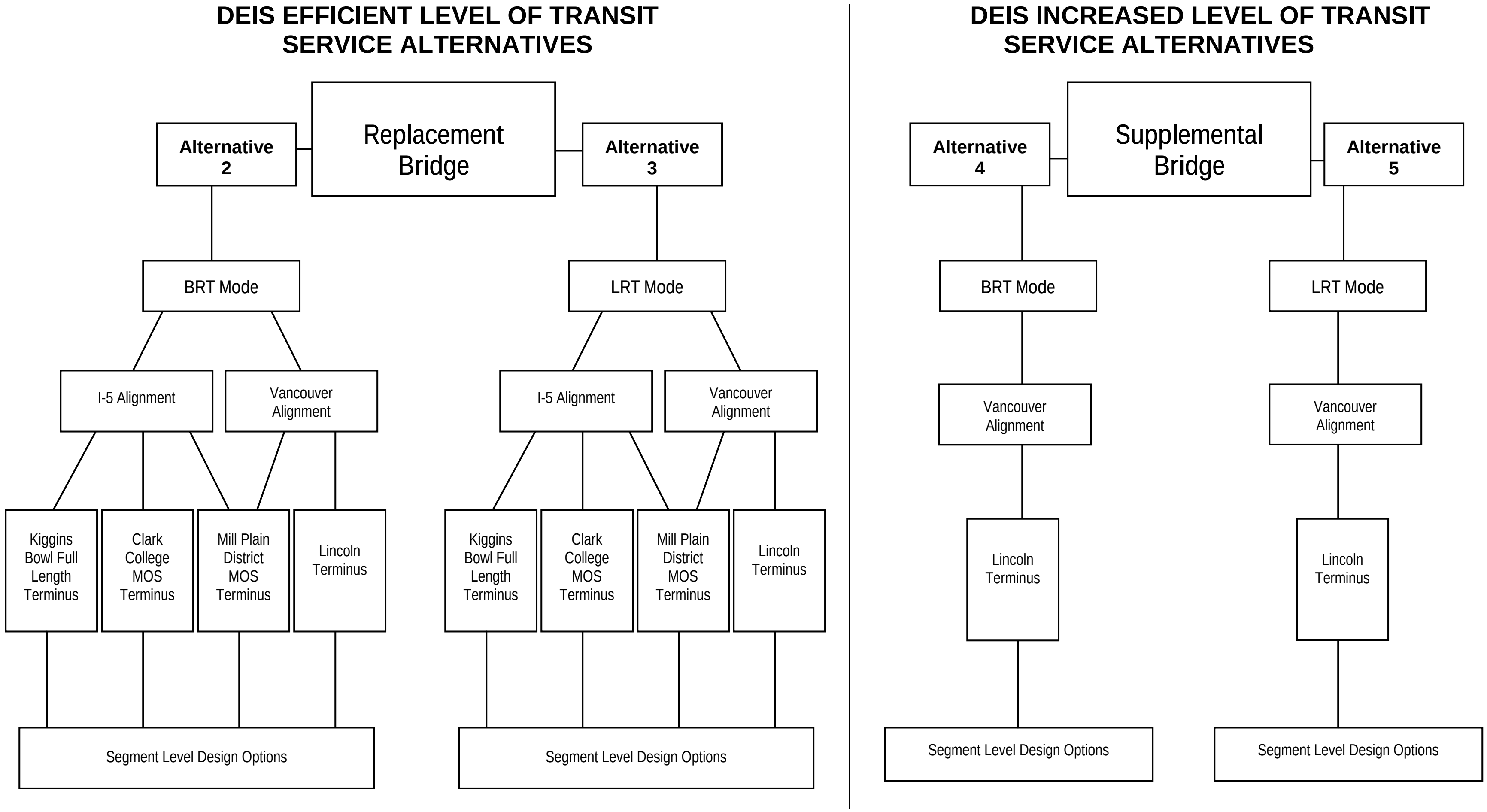
Figure 1-2. CRC DEIS Alternatives and Transit Alignments



DEIS Alternatives 4 and 5, with a supplemental bridge over the Columbia River, could also be paired with the I-5 alignment.

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1.4 Transit Vehicle Type and Capacity

Table 1-2 lists the vehicle type, length, the number of seats, and the total passenger capacity (seated passengers and standees) assumed for the analysis of the transit alternatives. Although the FTA recommended standard is three persons per square meter, the TriMet light rail train capacity is estimated using the "achievable capacity" standard of 2.7 persons per square meter. All other vehicle capacities are measured with the FTA standard. The transit vehicles used for BRT and LRT were selected from the table below based on the passenger demand at the peak load point.

Table 1-2. Transit Vehicle Characteristics

Vehicle	Length	Seats	Floor area for standees in square meters	Floor area for standees in square feet	Resulting number of standees at 3 per square meter	Total seats plus standees at 3 persons per square meter[1]	Total seats plus standees at 2.7 persons per square meter	Maximum Passenger Capacity per Vehicle
C-TRAN Express bus	40 feet	43	6.14	65.9	18	61	N/A	61
C-TRAN Local bus	40 feet	43	6.14	65.9	18	61	N/A	61
TriMet Light Rail Train (1-car train)[2]	90 feet	64	25.5	274.5	77	141	133	133
TriMet Light Rail Train (2-car train)	180 feet	128	51	549.0	153	281	266	266
TriMet Local Bus	40 feet	39	6.7	71.9	20	59	N/A	59
BRT vehicle[3]	60 feet	47	14.7	158	44	91	N/A	91

[1] *Three persons per square meter is the FTA recommended standard.*

[2] *LRT vehicle capacities based on TriMet system standard of 2.7 persons per square meter (TriMet's "achievable capacity").*

[3] *BRT vehicle capacities based on LTD's EmX seating-floor design specifications.*

1.5 Transit Alternatives: Operating and Capital Improvements

The following is a summary of the main transit operating and capital improvements for the five transit alternatives.

1.5.1 Alternative 1: No-Build

Figure 1-3 and Figure 1-4 show the transit facilities and transit routing for Alternative 1. The No-Build Alternative transit operations and capital improvements are discussed in further detail in Section 4.2.

The No-Build Alternative provides a reference point for comparison across the alternatives by showing what would occur if, between now and 2030, no significant transit capital and operating improvements were developed within the CRC Bridge Influence Area. The operating improvements that would be included in the No-Build Alternative are based on TriMet's 2030 financially constrained transit network and C-TRAN's 2007 Service Redesign, adopted in January 2007, with some additional service to support two new Park and Ride facilities. The capital improvements are based on a financially constrained network, including those projects in Metro's *2004 Regional Transportation Plan* (RTP) *Financially Constrained Project List* (with a 2030 horizon), and the Southwest Regional Transportation Council's (RTC) *2030 Metropolitan Transportation Plan* (MTP) *Financially Constrained Project List* (attached as Appendix C).

Transit Operating Improvements

Table 1-3 details the main characteristics of the No-Build Alternative transit operations.

TriMet: In addition to TriMet's current transit service, in the No-Build Alternative TriMet's transit operations would include the Central City Streetcar line to the South Waterfront, the Portland Streetcar Loop line, the Interstate 205 (I-205)/Portland Mall MAX light rail line, and the Washington County Commuter Rail line. TriMet would operate 641 buses and 105 light rail vehicles (LRVs) in service and in spares. The existing span of service for buses and light rail would be maintained. TriMet's fixed route transit network for the No-Build Alternative is based on an annual projected growth in fixed route service hours of approximately one percent. Within the Bridge Influence Area, TriMet would operate the Interstate MAX Yellow Line that terminates at the Expo Center light rail station. The Yellow Line would have peak period headways of 10 minutes and off-peak period headways of 15 minutes.

C-TRAN: C-TRAN's operations for the No-Build Alternative would be consistent with their 2007 Service Redesign, adopted in January 2007, with some additional service to support two new Park and Ride facilities. C-TRAN would operate 130 buses in service and in spares. C-TRAN's existing span of service for both local bus and express bus service would be maintained. C-TRAN's annual service hours are projected to grow at approximately one percent to the year 2011, after which service would remain constant in terms of revenue hours delivered. In the No-Build Alternative, C-TRAN would operate the bi-state service within the Bridge Influence Area. In the I-5 corridor, the bi-state service would include six existing express bus routes to downtown Portland, the Lloyd District or OHSU (105, 114, 134, 157, 173, and 190), two new express bus routes to downtown Portland (199, and 219), one new limited route (4X) and one new local route (4) to the Delta Park/Vanport light rail station.

Table 1-3. Alternative 1: No-Build Transit Operations

Characteristic		TriMet	C-TRAN
Vehicles	**Standard Bus**	641	126[1]
	LRVs	105	N/A
Span of Service	**Bus**	365 days per year, 19 hours per day	Local – 365 days per year, 16 hours per day Express – 255 days per year, peak period only
	LRT	365 days per year, 19 hours per day	N/A
Annual Platform Hours	**Bus**	390,475	358,416
	LRT	49,801	N/A
Annual Vehicle Miles Traveled	**Bus**	4,160,186[2]	4,632,415
	LRT	430,144[3]	N/A

[1] *With the four additional Limited Stop Vehicles the C-Tran bus total would be 130.*
[2] *Daily North Portland Local Bus Routes #4, #6, #8, #16, #33, #40, #72, #75*
[3] *LRT MAX Yellow Line Only*

Capital Improvements

The No-Build Alternative includes roadway and transit capital improvements in the financially constrained RTP and MTP (see Appendix C) which includes estimated program years for each project, except for the Milwaukie light rail project and including the Portland Streetcar Loop project.

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Figure 1-3. Alternative 1: Local, Express and Trunk Line Service

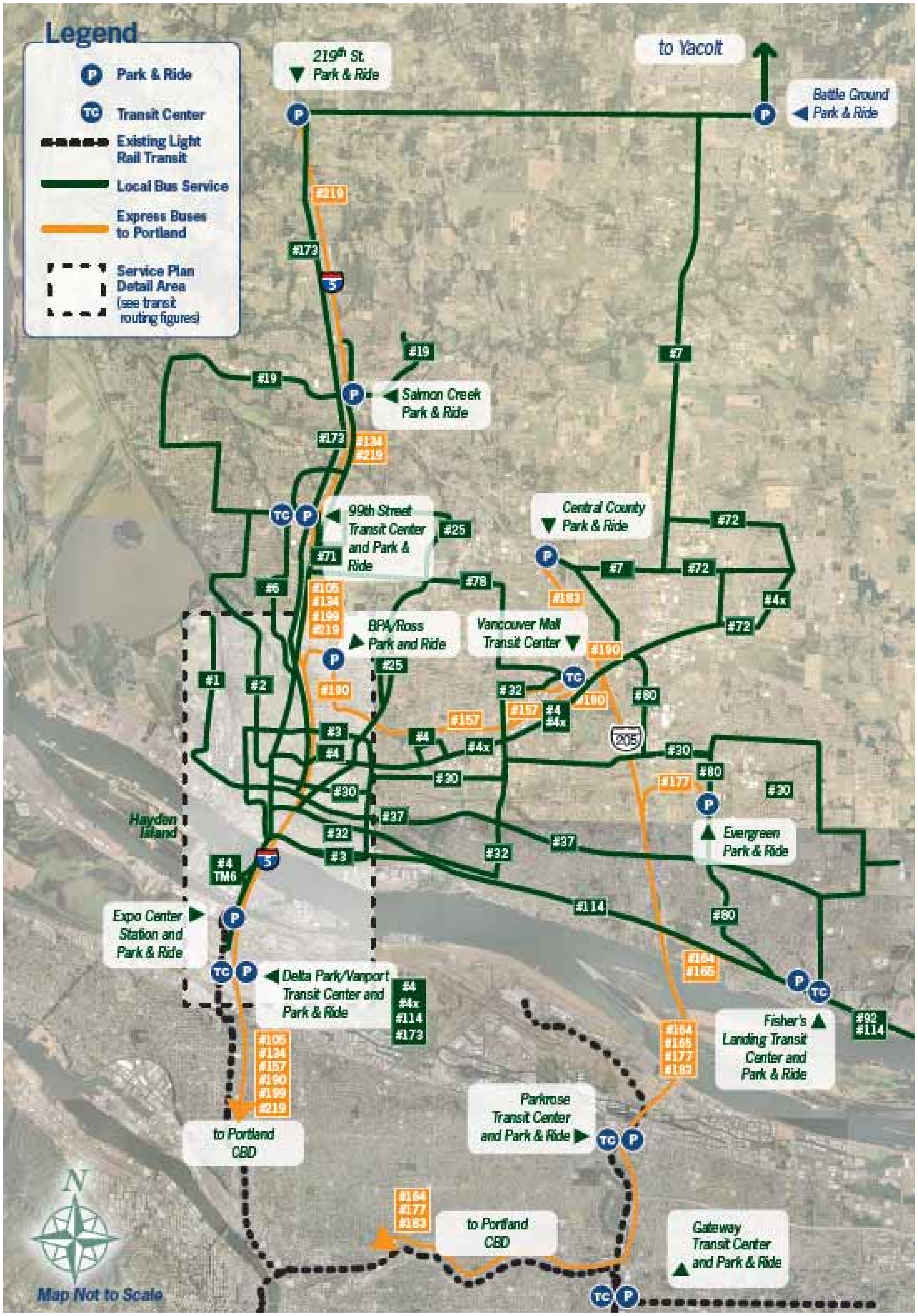

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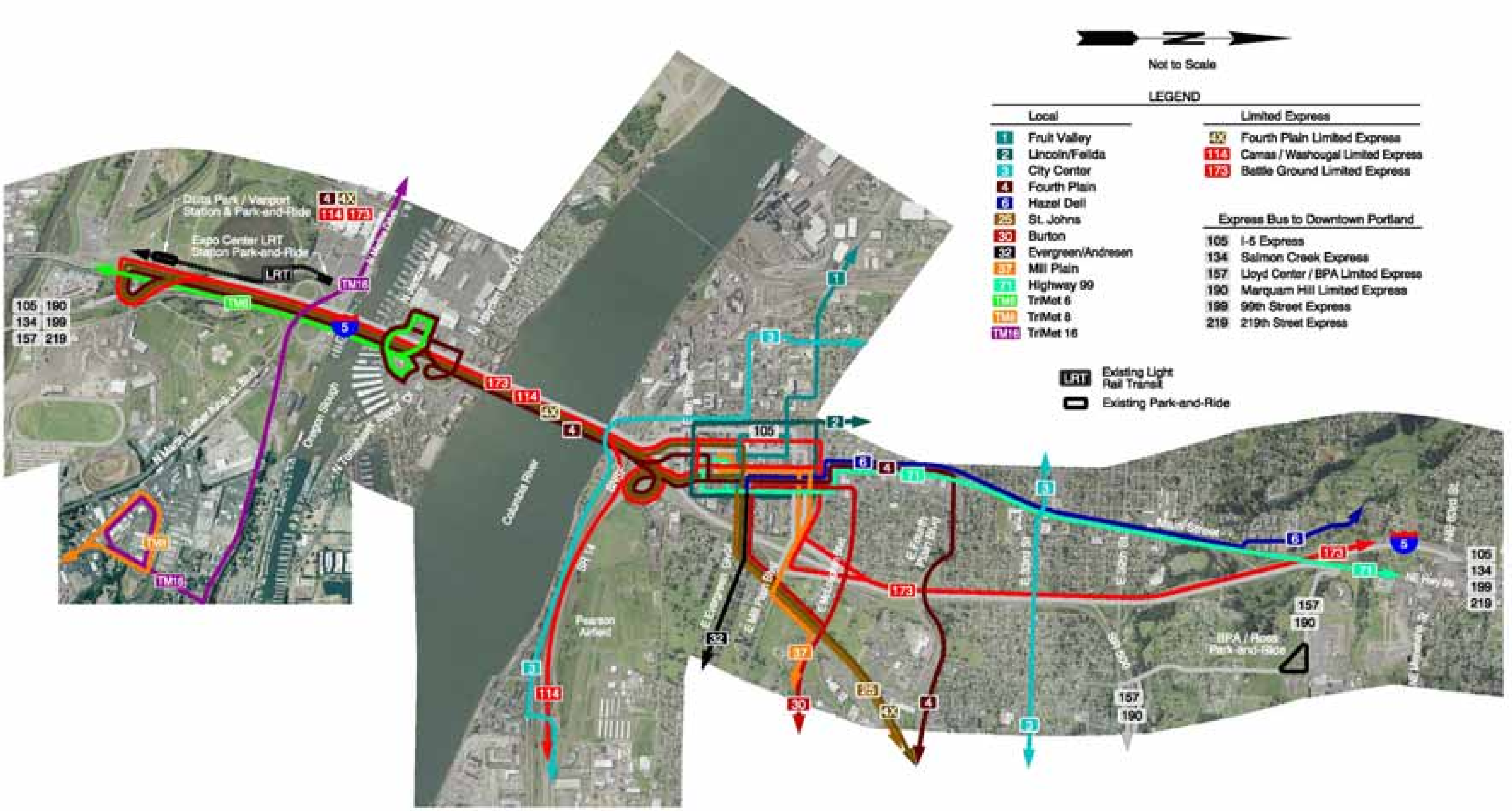
Figure 1-4. Alternative 1 Transit Routing: Includes Local, Express and Trunk Line Service



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Highway

The following are some of the highway capital improvements that would be included within the CRC Corridor if Alternative 1 were implemented:

- I-5 Delta Park to Lombard Avenue: Widen I-5 southbound between Victory Boulevard and Lombard Street in North Portland, adding a third southbound through lane and standard emergency lanes in each direction;
- I-5 at the Columbia Boulevard Interchange: Construct full direction access interchange based on recommendations from the I-5 North Trade Corridor Study;
- North Lombard Improvements: Widen Lombard Street to three lanes from Rivergate Boulevard to south of the Columbia Slough bridge;
- North Lombard Overcrossing: Construct overpass from the Columbia/Lombard intersection into the South Rivergate entrance to separate rail and vehicular traffic;
- Main Street in Vancouver: Convert Main Street for two-way vehicular travel from Sixth Street to 15th Street;
- Broadway Street in Vancouver: Convert Broadway Street in downtown Vancouver for two-way vehicular travel from Sixth Street to 15th Street;
- St. Johns Interchange Project: This project will replace the current signalized intersection at SR 500 and St. Johns Boulevard in Vancouver with a highway-style interchange; and
- Salmon Creek Interchange Project: Construct NE 139th Street from NE 20th Ave to NE 10th Ave, reconstruct interchange, improve access to I-205 with flyover from 134th Street to I-205 southbound NE Tenth Ave, relocate the Salmon Creek Park and Ride lot to NW Tenth Avenue and 139th Street.

Alternative 1 does not include reconstruction of the I-5 Columbia River bridge.

Transit

Alternative 1 also includes construction of the following improvements to the existing regional HCT system:

- Extension of the Central City streetcar line to Portland's South Waterfront area (expected completion 2007);
- Portland Streetcar Loop to OMSI;
- I-205/Portland Mall MAX light rail project, including construction of the I-205 light rail line from the Gateway Transit Center to the Clackamas Transit Center and adding light rail to the Portland Mall (expected completion 2009); and
- Construction of the Washington County Commuter Rail line (expected completion September 2008).

Figure 1-3 shows the transit facilities included in Alternative 1. These facilities include eleven existing Park and Ride lots and two new planned Park and Ride lots at NE 99th Street, NE 219th Street, and Central County for a total of 13 Park and Ride lots consisting of 4,464 spaces. Of these Park and Ride lots, five would also include a transit center to accommodate transfers at: 99th Street, Fisher's Landing, Delta Park/Vanport, Gateway, and Parkrose. The existing transit center at the Vancouver Mall and 99th Street would remain.

1.5.2 Alternative 2: Replacement Bridge and Bus Rapid Transit with Express Bus Service

Alternative 2 includes three BRT routes paired with a replacement bridge and an exclusive BRT guideway from Expo Center light rail station to downtown Vancouver. The Alternative was analyzed with two full-length and two minimum operable segment (MOS) alignments. The Vancouver alignment is shown in Figure 1-5 and the I-5 alignment is shown in Figure 1-6. The transit routing of the BRT Vancouver full-length with a terminus at the Lincoln Park and Ride is shown in Figure 1-7; the transit routing of the BRT I-5 full-length with a terminus at the Kiggins Bowl Park and Ride is shown in Figure 1-8. The BRT Mill Plain District MOS transit routing is shown in Figure 1-9 and the transit routing for the BRT Clark College MOS is shown in Figure 1-10.

In addition to the BRT routes, Alternative 2 would include:

- An exclusive transit guideway in downtown Vancouver and across the Columbia River;
- Intelligent transportation system (ITS) treatments, such as signal priority;
- Highway_1 capital improvements[2];
- Simplified, faster fare payment methods on the BRT lines (such as the use of off board ticket vending machines);
- 60-foot articulated vehicles with special markings and paint colors, a "branded identity";
- Passenger stations with increased amenities, similar in size and scale to existing light rail stations in Portland;
- Queue jump lanes for buses accessing I-5;
- Additional Park and Ride lots;
- Express bus service from outer Clark County Park and Rides to Portland CBD, the Lloyd District and OHSU; and
- A standard toll for river crossing.

The three BRT limited bus lines would travel from Vancouver across the Columbia River to connect to the existing light rail station at the Expo Center. To provide a one-transfer ride from points in Vancouver to downtown Portland, these three branded BRT bus lines would operate beyond the Bridge Influence Area and outside of the exclusive guideway to the existing Salmon Creek Park and Ride lot, and the Vancouver Mall and Fisher's Landing Transit Centers. Compared to Alternative 1, the BRT Alternative would reduce transit travel time, improve transit schedule reliability, and increase service to transit markets.

[2] The highway network, and components of $\text{Highway}_{1\text{-}3}$, is discussed within the Executive Summary in Section 1.6. More detail on this subject is included in Chapter 3 of this document.

For Alternative 2, the Vancouver full-length alignment terminus is the representative alignment. With this alignment, the exclusive guideway would consist of a length of approximately 3.41 miles. In the south, the alignment would begin at the existing Expo Center light rail station. From there, the alignment would rise northward, over the Oregon Slough, to an elevated station on Hayden Island and then continue to rise to travel over the Columbia River. Once over the river, the alignment would descend into downtown Vancouver to a touch down point near Sixth Street and Washington Street. Along Washington Street in downtown Vancouver, there would be BRT stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street. From the Mill Plain District Transit Center, both travel directions of the guideway would continue north along Broadway with stations located at 24th Street, to 29th Street. From there, both travel directions of the guideway would continue north up Main Street, with a station at 33rd Street, and to the terminus at the proposed Lincoln Park and Ride lot located at the intersection of Main Street and East 40th Street. A structured Park and Ride lot would be provided at Clark College, and surface lots would be provided at the Kiggins Bowl. The existing BPA/Ross Park and Ride lot would be eliminated.

The BRT I-5 alignment, which includes a 4.22-mile exclusive guideway, would be the same as the representative alignment from Expo Center light rail station to the proposed Mill Plain District Transit Center. From the Mill Plain District Transit Center, the alignment would turn east onto McLoughlin Boulevard and then pass under I-5 to the proposed Clark College Park and Ride lot, located near East McLoughlin Street and East K Street. From the Clark College Park and Ride lot, the alignment would travel north along the east side of I-5, with a station located at 33rd Street, and to the terminus in Vancouver at the proposed Kiggins Bowl Park and Ride lot located at the intersection of Highway 99 and Main Street, to the west of I-5. The existing Bonneville Power Administration (BPA)/Ross Park and Ride lot would be eliminated.

In the BRT Mill Plain District MOS, the alignment of the 2.07-mile exclusive guideway would be the same as the Vancouver full-length alignment, but it would end at the proposed Mill Plain District Transit Center. However, the BRT vehicles would continue to operate on general purpose lanes beyond the exclusive HCT guideway.

In the BRT Clark College MOS, the alignment of the 2.65-mile exclusive guideway would be the same as the BRT I-5 full-length alignment, but it would terminate at the proposed Clark College Park and Ride lot. As noted in the Mill Plain District MOS, the BRT vehicles would continue to operate in general purpose lanes beyond the exclusive HCT guideway.

In addition, Alternative 2 includes several design options. Design options for segments of the alignment, station locations, and for the guideway cross section are discussed in Section 4.7.

Transit Operating Improvements

Table 1-4 summarizes the transit operating characteristics for Alternative 2, including the full-length Vancouver and I-5 alignments and the two MOS alignments. The BRT system would terminate at the Expo Center light rail station where riders would transfer to the Interstate MAX Yellow Line for trips to northern and downtown Portland. The Yellow Line headways would be the same as in Alternative 1 - 10 minutes AM and PM peak period and 15 minutes in the off-peak period.

The BRT bus lines would consist of three new limited routes, (4L, 37L, and 71L), which would be companion lines to C-TRAN's existing routes 4, 37, and 71. These lines would travel on the existing routing as their corresponding companion lines, from the Salmon Creek Park and Ride lot and the Vancouver Mall and Fisher's Landing Transit Centers, but they would operate with limited stops and within the BRT exclusive guideway to the Expo Center light rail station. The 71L would serve areas north of Vancouver prior to entering the exclusive transit guideway. In all alignments, the 71L would travel the entire length of the guideway. In the Vancouver full-length alignment, it would run in the guideway from the Lincoln Park and Ride to the Expo Center light rail station; in the I-5 full-length alignment, it would run in the guideway from the Kiggin's Bowl Park and Ride to the Expo Center light rail station; in the Clark College MOS, it would run in the guideway from Clark College Park and Ride to the Expo Center light rail station; and in the Mill Plain District MOS, it would run in the guideway from the Mill Plain District Transit Center to the Expo Center light rail station. The 71S would be a complimentary route to the 71L; this route operates only during the weekday peak periods and runs in the same alignment as the 71L from the Expo Center light rail station to Lincoln Park and Ride. Since the demand for the 71L would exceed its capacity during the peak periods, the 71S would relieve overcrowding on the guideway. The 4L (which would replace C-TRAN's route 4X in the No-Build Alternative) would travel along East Fourth Plain Boulevard and enter the guideway at the Mill Plain District Transit Center in the Vancouver alignment and at the Clark College Park and Ride lot in the I-5 alignment. With both the Vancouver and I-5 alignments the 37L would travel along East Mill Plain Boulevard and then enter the guideway at the Mill Plain District Transit Center. Local versions of these lines would serve all existing stops. Three other existing C-TRAN local routes, (30, 114, and 173), which have a high percentage of bi-state passengers today, would also use the exclusive guideway to the Expo Center light rail station.

Figure 1-5. Alternative 2 – BRT Vancouver Alignment: Transit Crossing the Columbia River (Local Network not Shown)

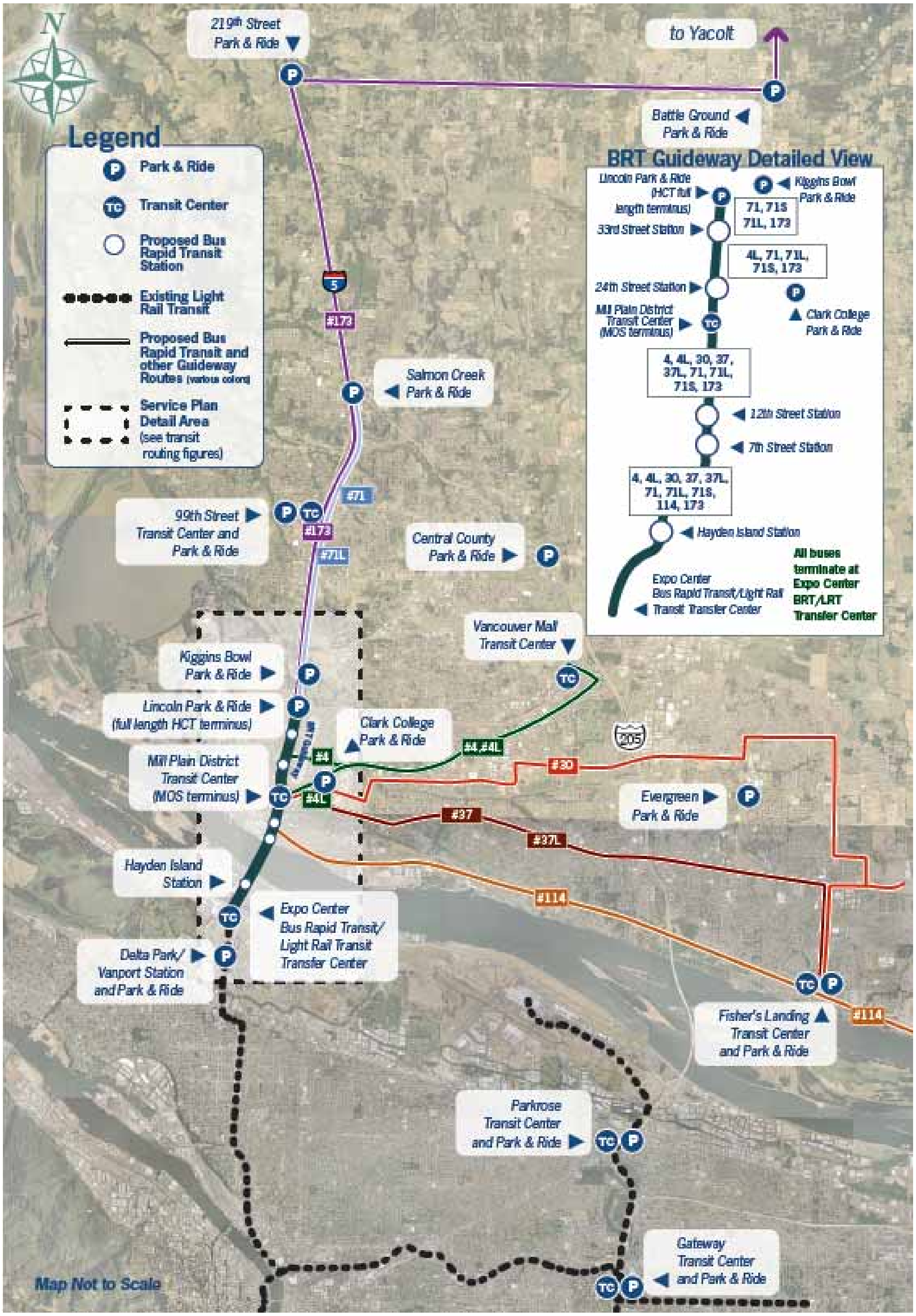

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Figure 1-6. Alternative 2 – BRT I-5 Alignment: Transit Crossing the Columbia River (Local Network not Shown)

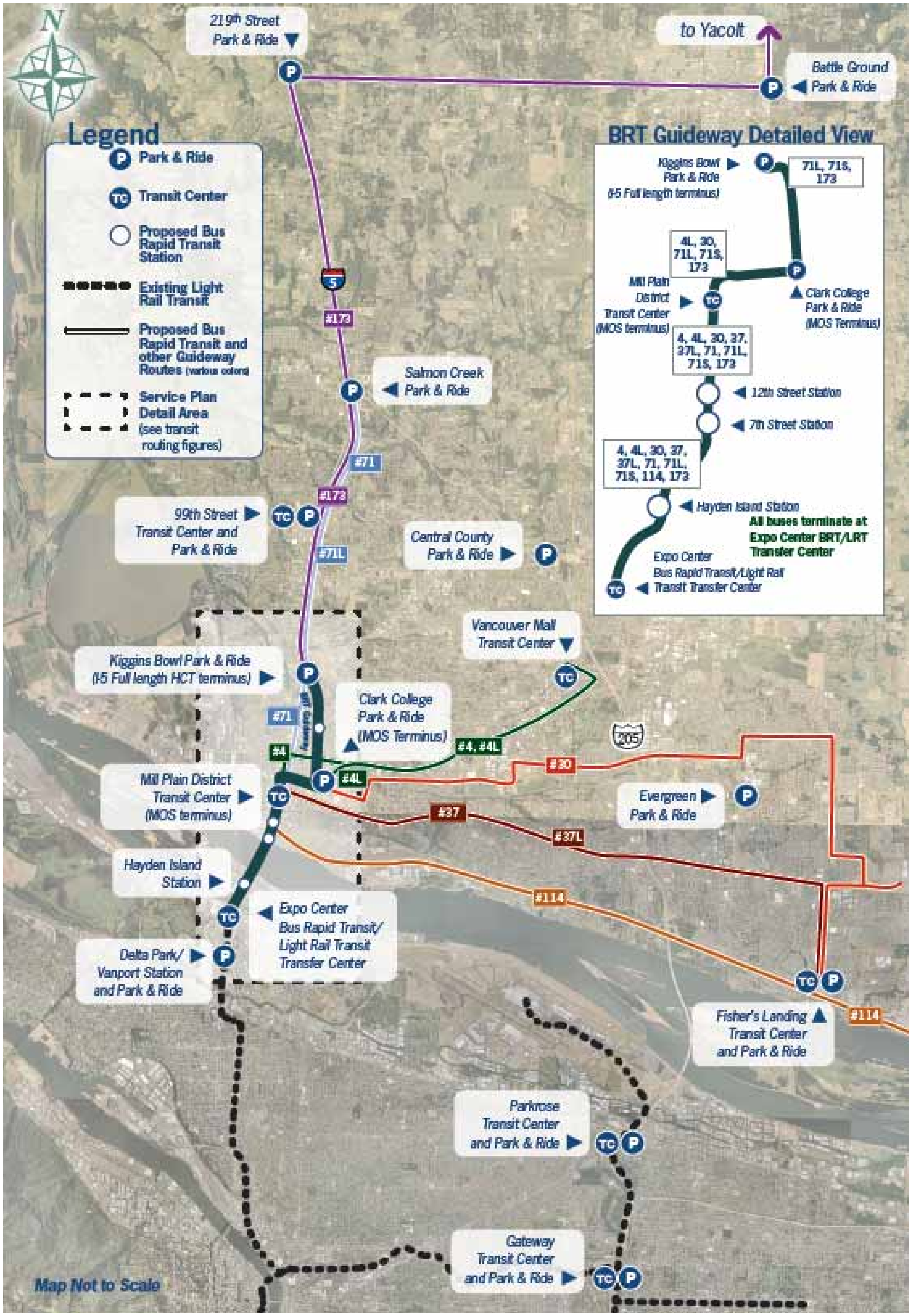

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Figure 1-7. Alternative 2 – BRT Vancouver Alignment Transit Routing: Includes Local, Express and Trunk Line Service

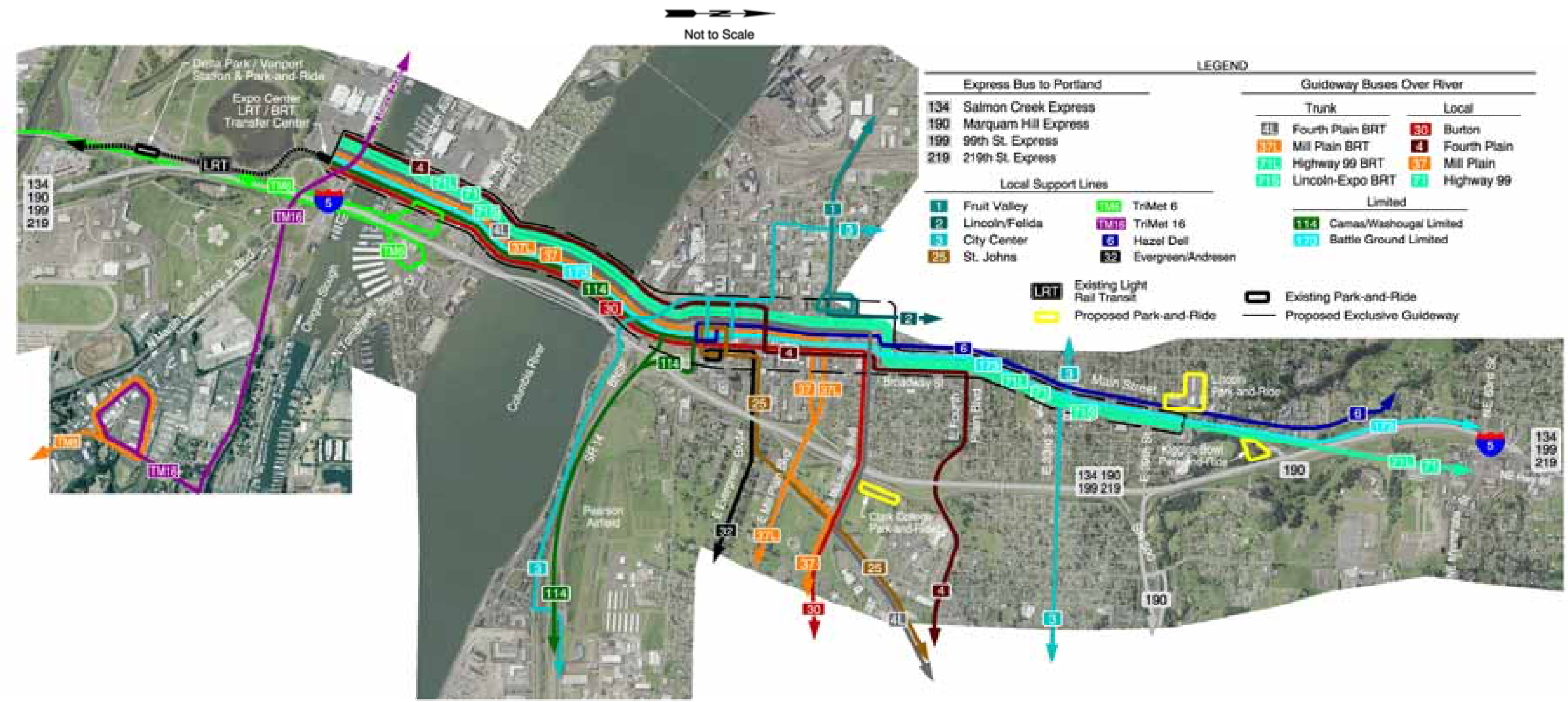

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Figure 1-8. Alternative 2 – BRT I-5 Full-Length Alignment Transit Routing: Includes Local, Express and Trunk Line Service

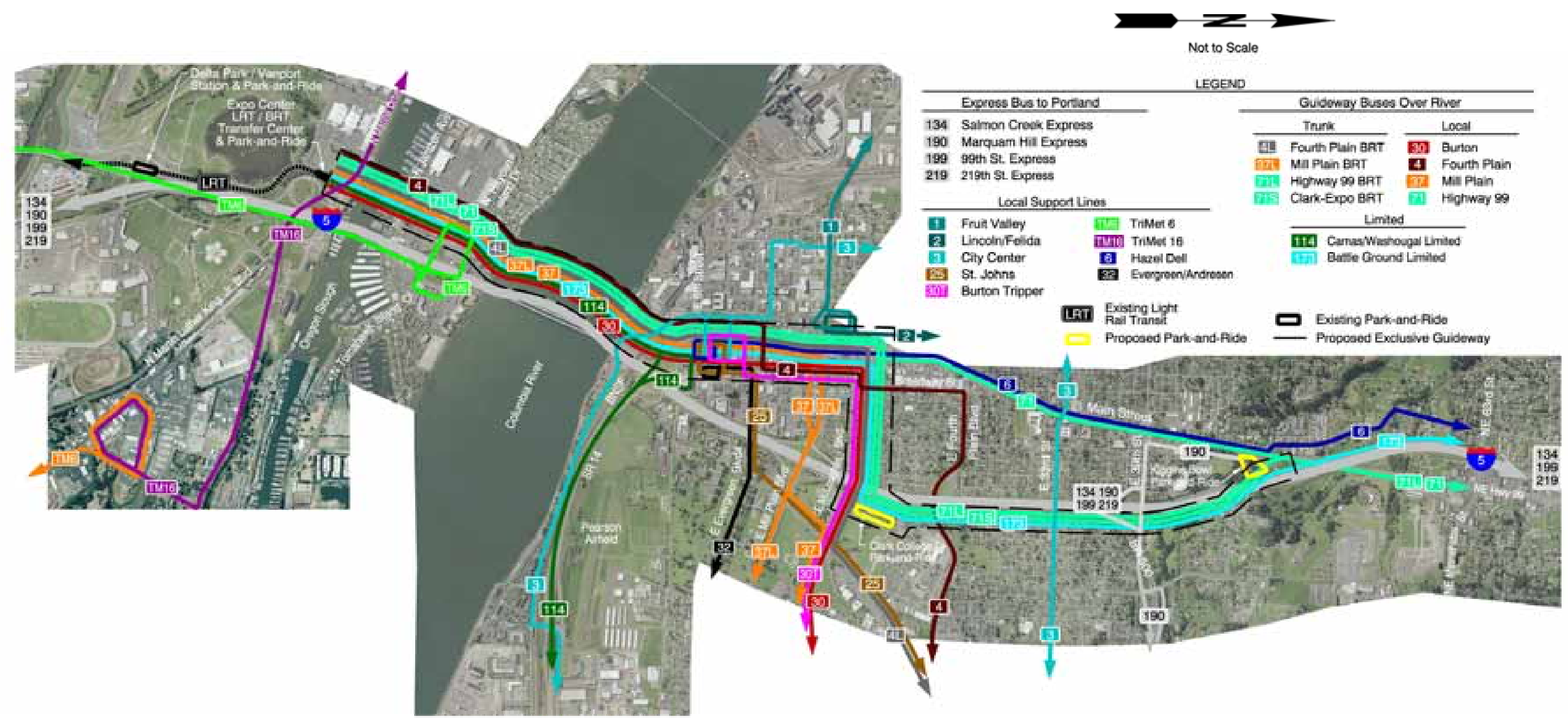

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Figure 1-9. Alternative 2 – BRT Mill Plain District MOS Transit Routing: Includes Local, Express and Trunk Line Service

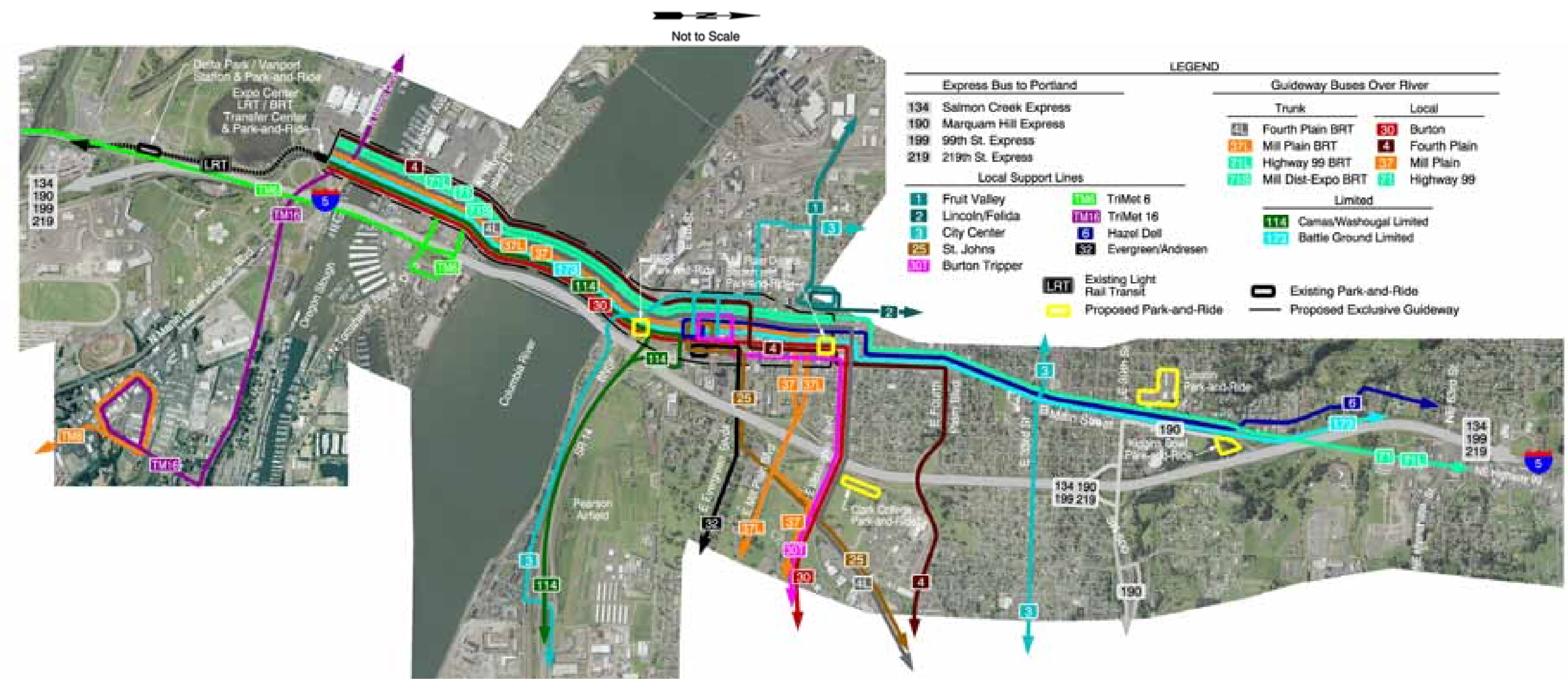

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Figure 1-10. Alternative 2 – BRT Clark College MOS Transit Routing: Includes Local, Express and Trunk Line Service

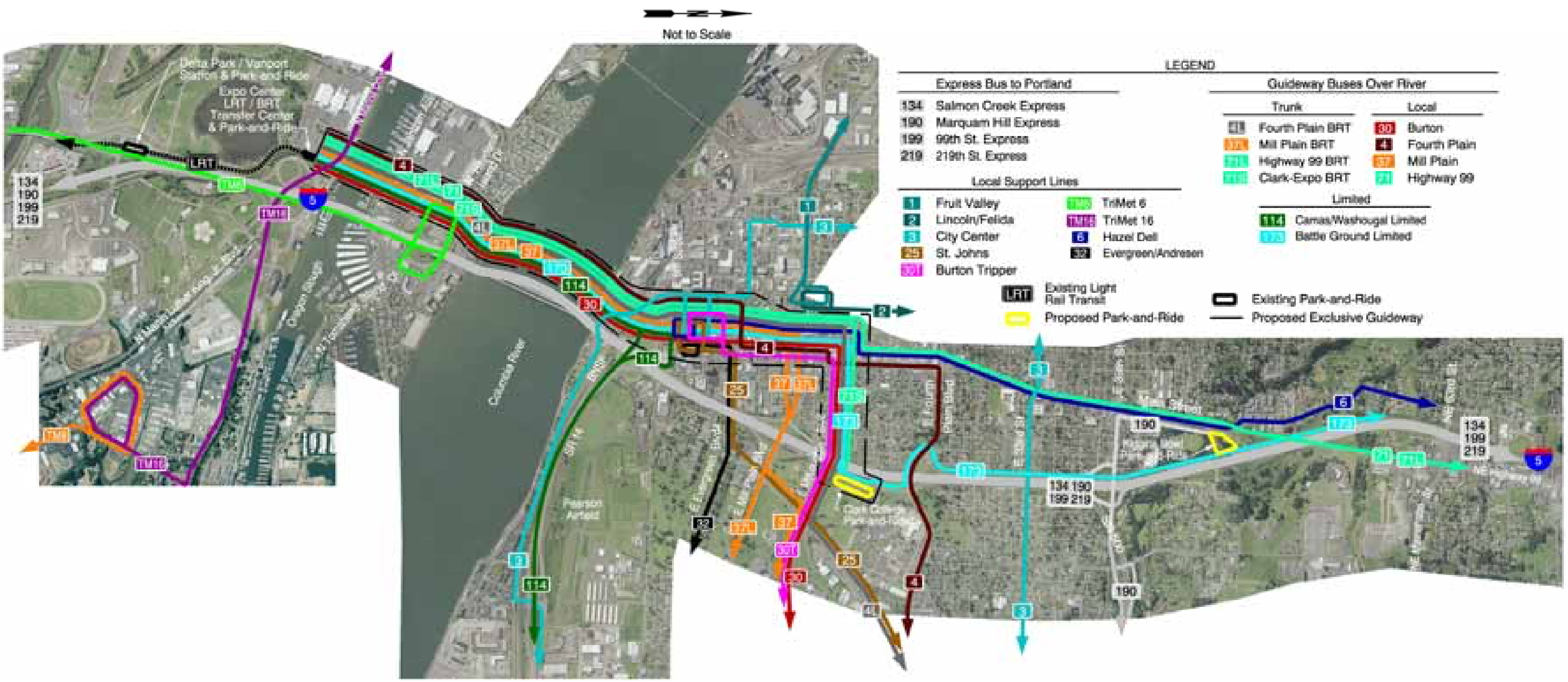

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Table 1-4. Alternative 2 – BRT Transit Operating Characteristics in 2030

Characteristic		Alternative 2			
		Full-Length Alignments		**MOS Alignments**	
		Vancouver	**I-5**	**Mill Plain District**	**Clark College**
BRT Lines		4L, 37L, and 71L	4L, 37L, and 71L	4L, 37L, and 71L	4L, 37L, and 71L
BRT Vehicles[1]		24	24	26	26
BRT Headways[2]	**4L**	10 peak, 0 off-peak	10 peak, 0 off-peak	10 peak, 0 off-peak	10 peak, 0 off-peak
	37L	12 peak, 0 off-peak	12 peak, 0 off-peak	12 peak, 0 off-peak	12 peak, 0 off-peak
	71L	10 peak, 15 off-peak	10 peak, 15 off-peak	10 peak, 15 off-peak	10 peak, 15 off-peak
Yellow Line Headways		10 min peak, 15 min off-peak	10 min peak 15 min off-peak	7.5 min peak, 15 min off-peak	10 min peak, 15 min off-peak
Routes Crossing in Guideway to Expo Center Light Rail Station		4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173	4, 30, 4L, 37, 37L, 71, 71L, 71S, 114, and 173	4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173	4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173
Total Vehicles in Guideway per Hour (Two Directions)		50	50	50	50
Local Bus Connections to Guideway	**Limited**	N/A	N/A	N/A	N/A
	Other	1, 2, 3, 4, 25, 37, and 71	1, 2, 3, 4, 25, 37, and 71	1, 2, 3, 4, 25, 37, and 71	1, 2, 3, 4, 25, 37, and 71
BRT Route Span of Service		365 days per year, 19 hours per day	365 days per year, 19 hours per day	365 days per year, 19 hours per day	365 days per year, 19 hours per day
Annual Platform Hours	**C-TRAN Local Bus**	271,000	274,000	274,000	274,000
	C-TRAN Express Bus	90,000	90,000	90,000	90,000
	BRT	51,000	51,000	53,000	53,000
	LRT	50,000	50,000	50,000	50,000
Annual Vehicle Miles Traveled	**C-TRAN Local Bus**	3,400,000	3,400,000	3,400,000	3,400,000
	C-TRAN Express Bus	1,420,000	1,420,000	1,420,000	1,420,000
	BRT	387,000	463,000	387,000	387,000
	LRT	430,000	430,000	430,000	430,000

[1] The peak vehicle requirement is the same for the Full-Length Alignment and MOS Terminus because the lines extend outside of the guideway for the same distance and the headways are the same.
[2] In the peak period, the combined headway for the BRT Routes would be 3 to 4 minutes and in the off-peak period the combined headway would be 5 minutes.

Additional local bus lines would operate on routes similar to Alternative 1, but would connect as feeder routes to BRT in downtown Vancouver at two locations - the Mill Plain District Transit Center and the Seventh Street station. Express bus operations would be similar to the Alternative 1, except that C-TRAN's express bus routes 105 and 157 would be eliminated as they would be redundant to BRT service. The Yellow Line LRT headways would remain 10 and 15 minutes during the peak and off-peak periods.

Transit Capital Improvements

Table 1-5 summarizes the existing and proposed (additional) capital facilities that would be included in Alternative 2 and would be used for bi-state travel, for the Vancouver Alignment and the I-5 alignment (and both MOS terminus locations). Section 4.7 describes the capital improvements and the design options in greater detail.

Table 1-5. Alternative 2 – BRT Transit Capital Facilities in 2030

Characteristic		Alternative 2			
		Full-Length Alignments		MOS Alignments	
		Vancouver	I-5	Mill Plain District	Clark College
Guideway Length		3.41 miles	4.22 miles	2.07 miles	2.65 miles
New Stations (Expo Center Light Rail Station to Northern Terminus)		8	8	4	6
Park and Ride Lots	**Existing/No-Build Alternative**	12	12	12	12
	Additional	3	3	5	2
Park and Ride Spaces	**Existing/No-Build Alternative**	4,289	4,289	4,289	4,289
	Additional	2,410	2,500	3,218	2,500
Transfer Center		1	1	1	1
Transit Centers	**Existing/No-Build Alternative**	5	5	5	5
	Additional	1	1	1	1
BRT Vehicle Maintenance Facility		1	1	1	1

1.5.3 Alternative 3: Replacement Bridge and Light Rail Transit with Express Bus Service

Alternative 3 includes a light rail transit extension from the existing terminus of the Yellow MAX Line at the Expo Center light rail station to downtown Vancouver paired with replacement bridge structures. The Alternative was analyzed with two full-length and two MOS alignments. The Vancouver alignment is shown in Figure 1-11 and the I-5 alignment is shown in Figure 1-12. The transit routing of the LRT Vancouver full-length alignment with a terminus at Lincoln Park and Ride is shown in Figure 1-13; the transit routing of the LRT I-5 full-length alignment with a terminus at Kiggin's Bowl Park and Ride is shown in Figure 1-14. The transit routing of the LRT Mill Plain District MOS with a terminus at the Mill Plain District Transit Center is shown on Figure 1-15, and the transit routing for the LRT Clark College MOS with a terminus at Clark College Park and Ride is shown in Figure 1-16.

Alternative 3 would include:

- An exclusive LRT guideway in downtown Vancouver and across the Columbia River;

- Intelligent transportation system (ITS) treatments, such as signal priority;
- Highway[1] capital improvements;
- Simplified, faster fare payment methods on the LRT lines (such as the use of off board ticket vending machines);
- One- and two-car transit trains;
- Passenger stations with increased amenities, similar in size and scale to existing light rail stations in Portland;
- Additional Park and Ride lots;
- Express bus service from outer Clark County Park and Rides to Portland CBD and OHSU; and
- A standard toll for river crossing.

Alternative 3 would include an extension of TriMet's Interstate MAX Yellow Line from the existing Expo Center light rail station to Vancouver with characteristics similar to TriMet's regional light rail system. Compared to Alternative 1, Alternative 3 would reduce transit travel time, improve transit system reliability, and increase service to transit markets.

For Alternative 3, the representative alignment is the Vancouver full-length. With this alignment, the exclusive guideway would consist of a length of approximately 3.41 miles. In the south, the alignment would begin at the existing Expo Center light rail station. From there, the alignment would rise northward, over the Oregon Slough, to an elevated station on Hayden Island and then continue to rise to travel over the Columbia River. Once over the river, the alignment would descend into downtown Vancouver to a touch down point near Sixth Street and Washington Street. Along Washington Street in downtown Vancouver, there would be LRT stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street. From the Mill Plain District Transit Center, both travel directions of the guideway would continue north along Broadway Street, with a station located at 24th Street, to 29th Street. From there, both travel directions of the guideway would continue north up Main Street, with a station at 33rd Street, and to the terminus at the proposed Lincoln Park and Ride lot at the intersection of Main Street and E 40th Street. A structured Park and Ride lot would be provided at Clark College, and a surface lot would be provided at the Kiggins Bowl Park and Ride lot. The existing BPA/Ross Park and Ride lot would be eliminated.

The LRT I-5 alignment, which includes a 4.22-mile exclusive guideway, would be the same as the representative alignment from Expo Center light rail station to the proposed Mill Plain District Transit Center. From the Mill Plain District Transit Center, the alignment would turn east onto McLoughlin Boulevard and then pass under I-5 to the proposed Clark College Park and Ride lot located near E McLoughlin Street and E K Street. From the Clark College Park and Ride lot, the alignment would travel north along the east side of I-5, with a station located at 33rd Street, and to the terminus in Vancouver at the proposed Kiggins Bowl Park and Ride lot located at the intersection of Highway 99 and Main Street, to the west of I-5. The existing BPA/Ross Park and Ride lot would be eliminated.

In the LRT Mill Plain District MOS, the alignment of the 2.07-mile exclusive guideway would be the same as the representative alignment, but it would terminate at the proposed Mill Plain District Transit Center. Surface Park and Ride lots would be located at the Lincoln, Kiggins Bowl, Clark College and BNSF & Loop Park and Rides. The existing BPA/Ross Park and Ride lot would be eliminated.

In the LRT Clark College MOS the alignment of the 2.65-mile exclusive guideway would be the same as the representative alignment, but it would end at the proposed Clark College Park and Ride lot. Surface Park and Ride lots would be provided at the Kiggins Bowl and the Clark College Park and Ride lots. The existing BPA/Ross Park and Ride lot would be eliminated.

In addition, Alternative 3 includes several design options. Design options for segments of the alignment, station locations, and for the guideway cross section are discussed in Section 4.7.

Transit Operating Improvements

Table 1-6 summarizes the transit operating characteristics for Alternative 3, including the full-length Vancouver and I-5 alignments and the two alternate MOS termini. The extension of the Yellow Line would be integrated into TriMet's regional light rail system operating plan. The Yellow Line headways would be decreased from 10 minutes to 7.5 minutes in the AM and PM peak period; the off-peak headways would remain as in Alternative 1 at 15 minutes.

The transit network would include three new limited bus lines: the 4L (which would replace C-TRAN's route 4X in Alternative 1); the 37L; and the 71L. These lines would travel on the existing routing as their corresponding companion lines, from the existing Salmon Creek Park and Ride lot and the Vancouver Mall and Fisher's Landing Transit Centers, but they would operate with limited stops. The 4L, 37L and 71L would facilitate transfers to LRT in downtown Vancouver. The 71L would provide transfers at Kiggins Bowl, Lincoln Park and Ride and the Mill Plain District Transit Center lot in the Vancouver full-length alignment and the Mill Plain District MOS. In the I-5 alignment and the Clark College MOS, the 71L would serve the Kiggins Bowl Park and Ride, Mill Plain District Transit Center and the Clark College Park and Ride.

Figure 1-11. Alternative 3 – LRT Vancouver Alignment: Trunk Line and Limited Service (Local and Express Bus Network not Shown)

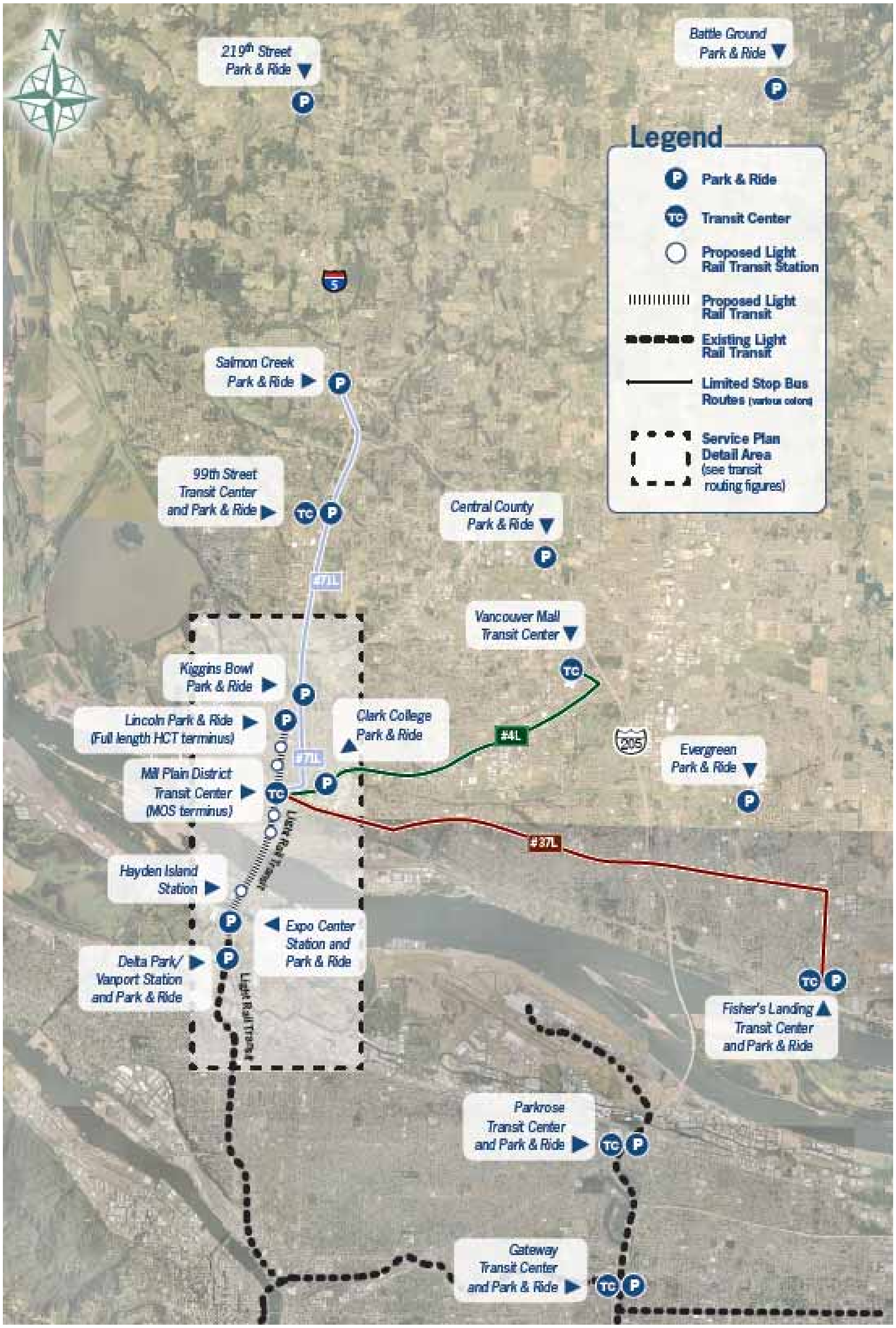

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Figure 1-12. Alternative 3 – LRT I-5 Alignment: Trunk Line and Limited Service (Local and Express Bus Network not Shown)

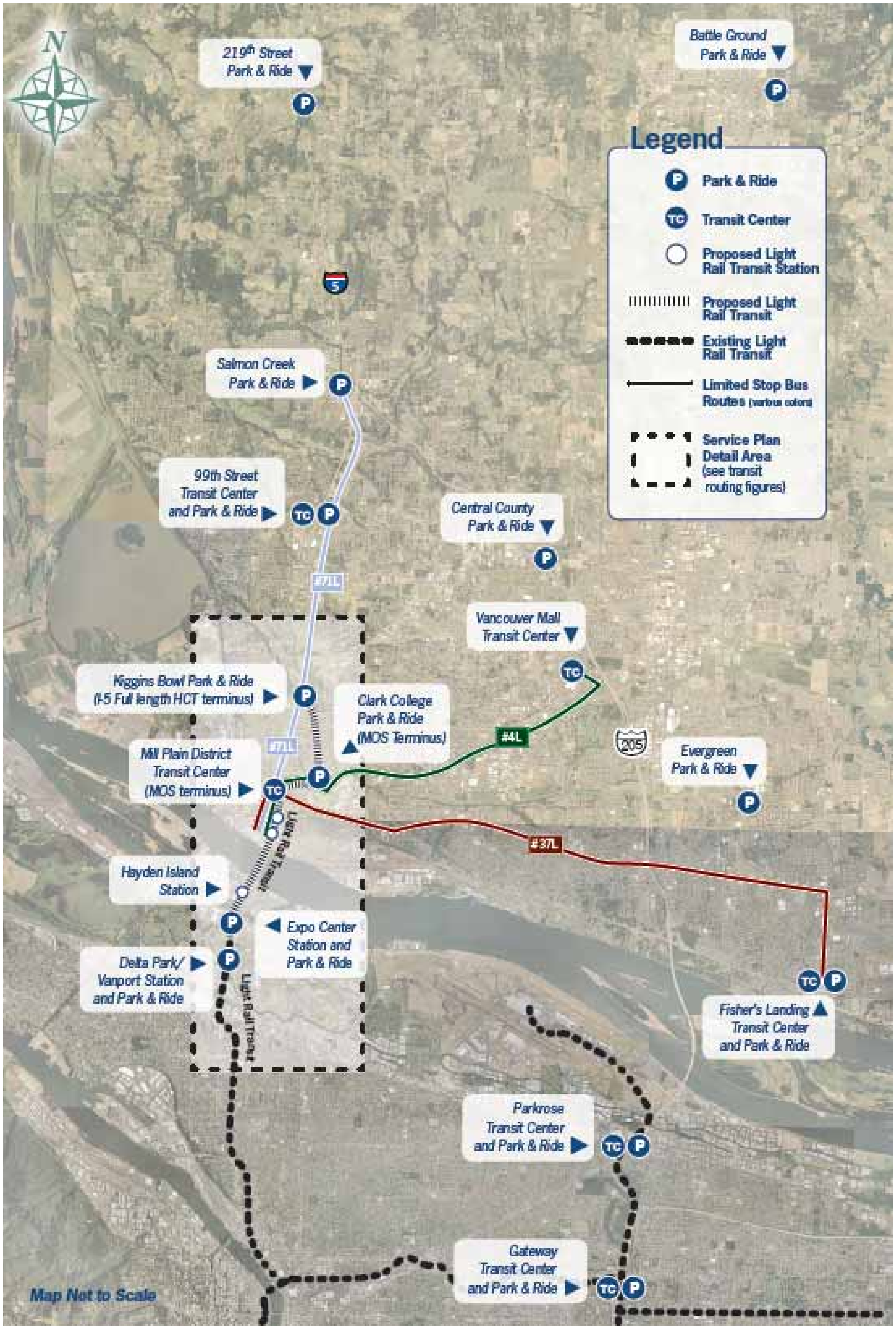

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Figure 1-13. Alternative 3 – LRT Vancouver Alignment Transit Routing: Includes Local, Express and Trunk Line Service

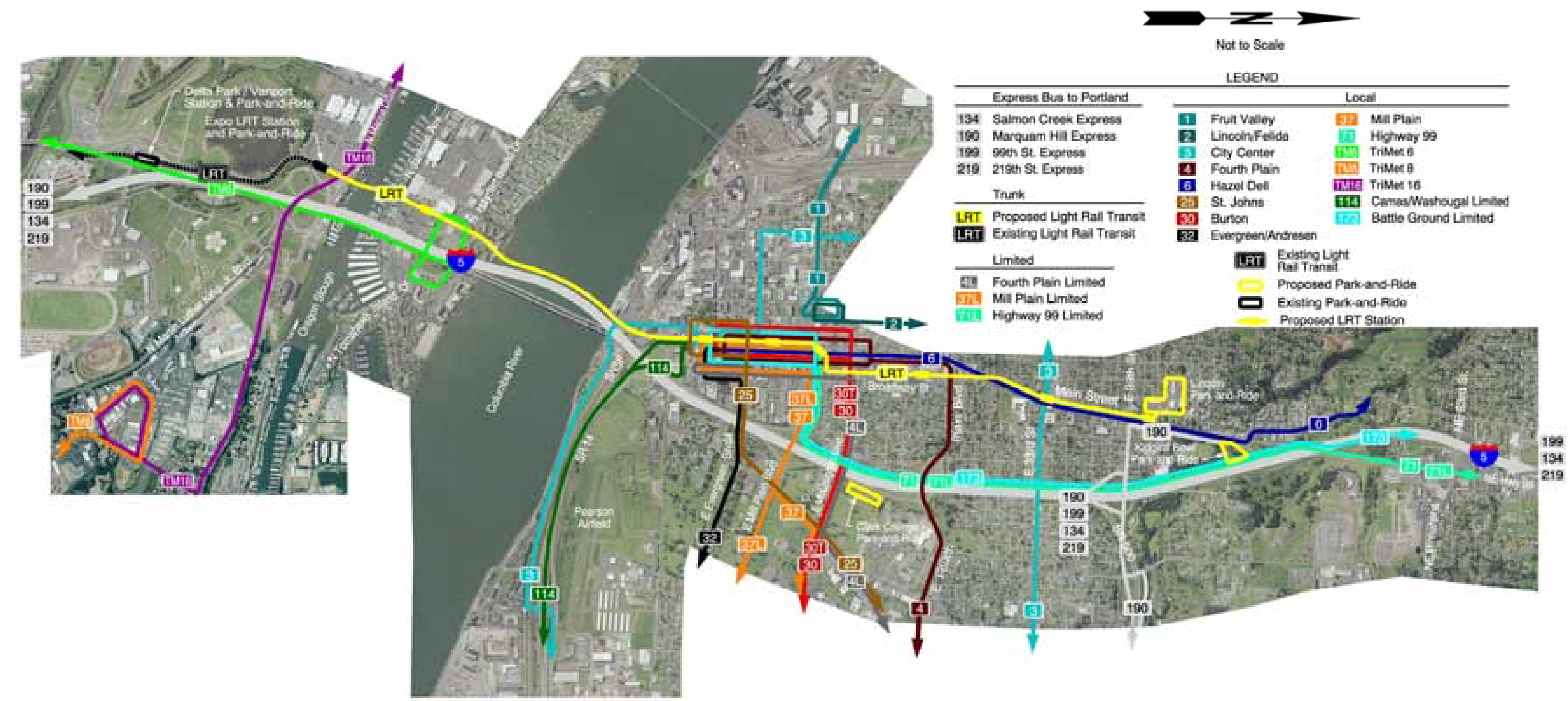

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Figure 1-14. Alternative 3 – LRT I-5 Full-Length Alignment Transit Routing: Includes Local, Express and Trunk Line Service

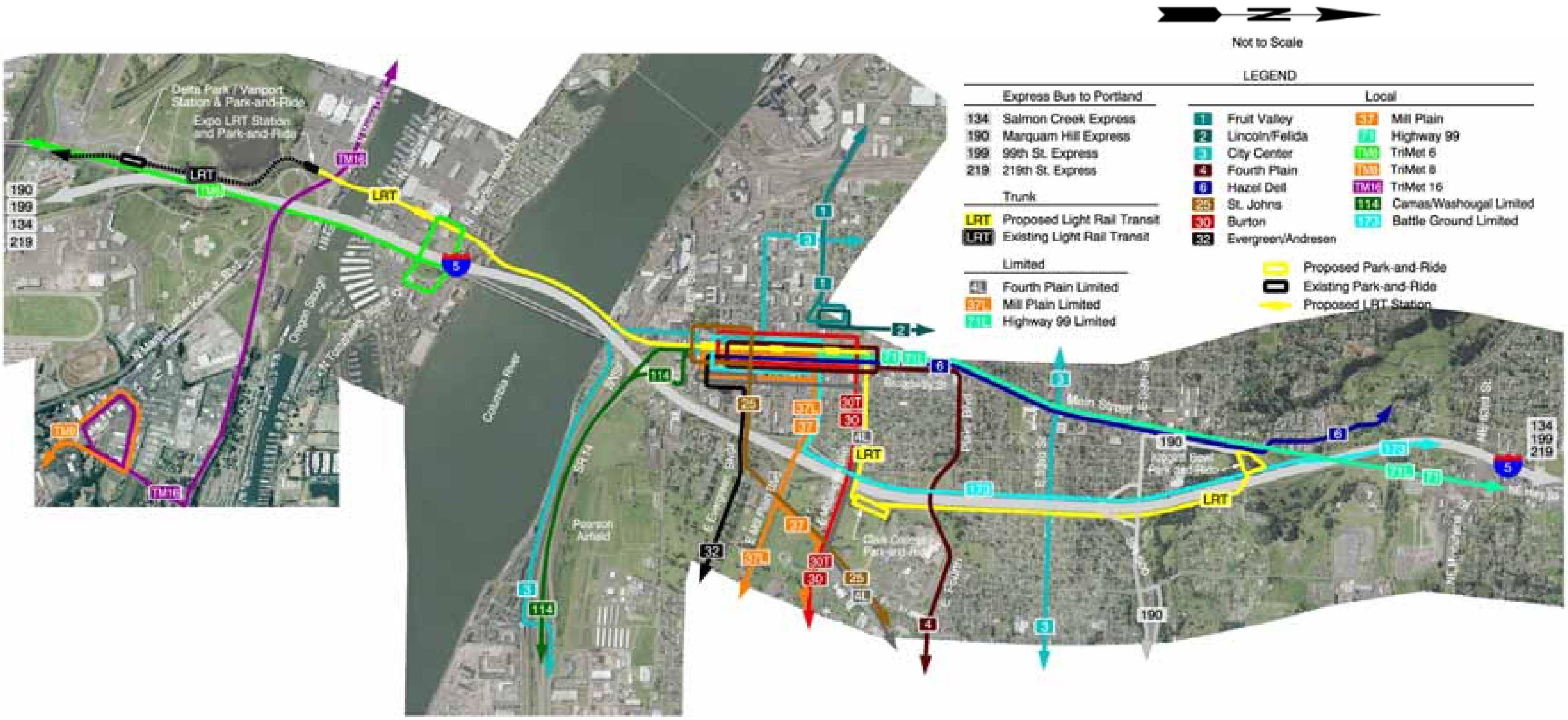

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Figure 1-15. Alternative 3 – LRT Mill Plain District MOS Transit Routing: Includes Local, Express and Trunk Line Service

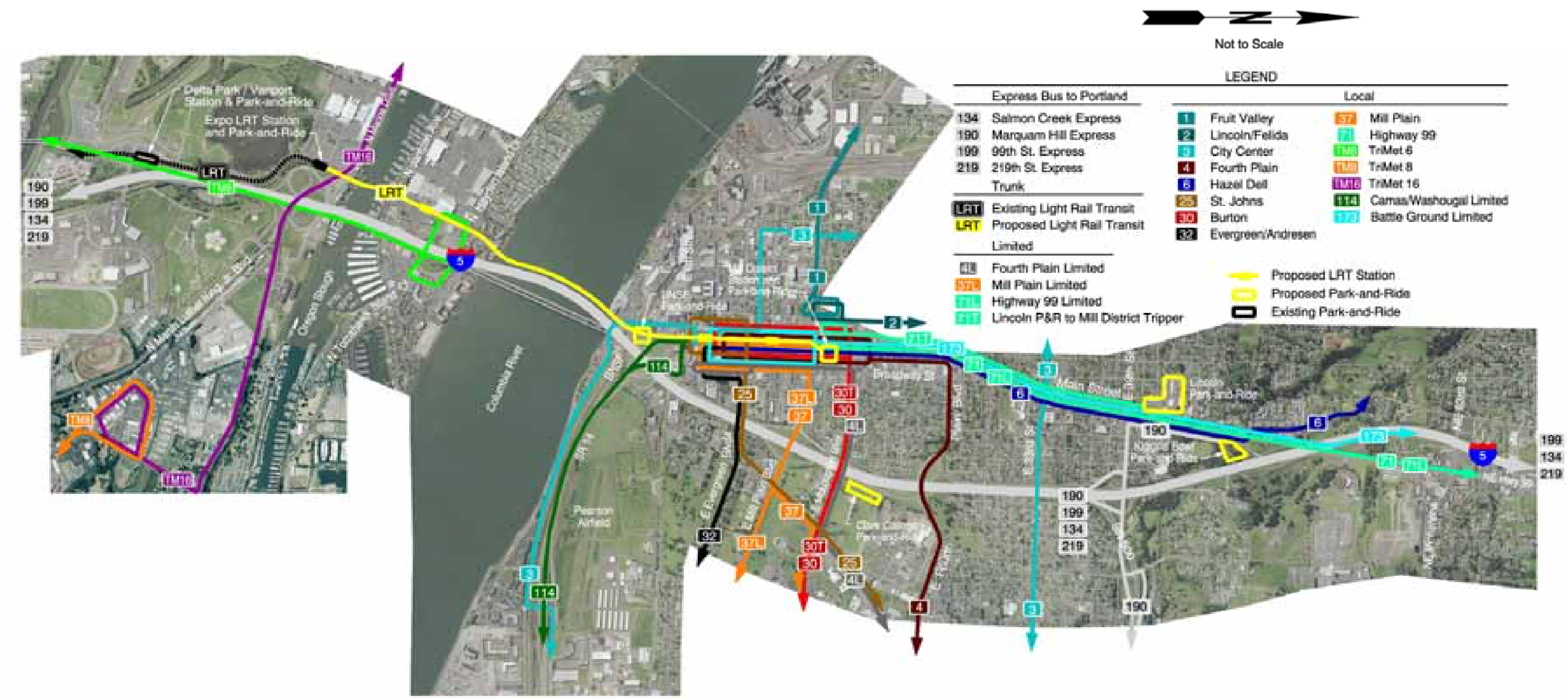

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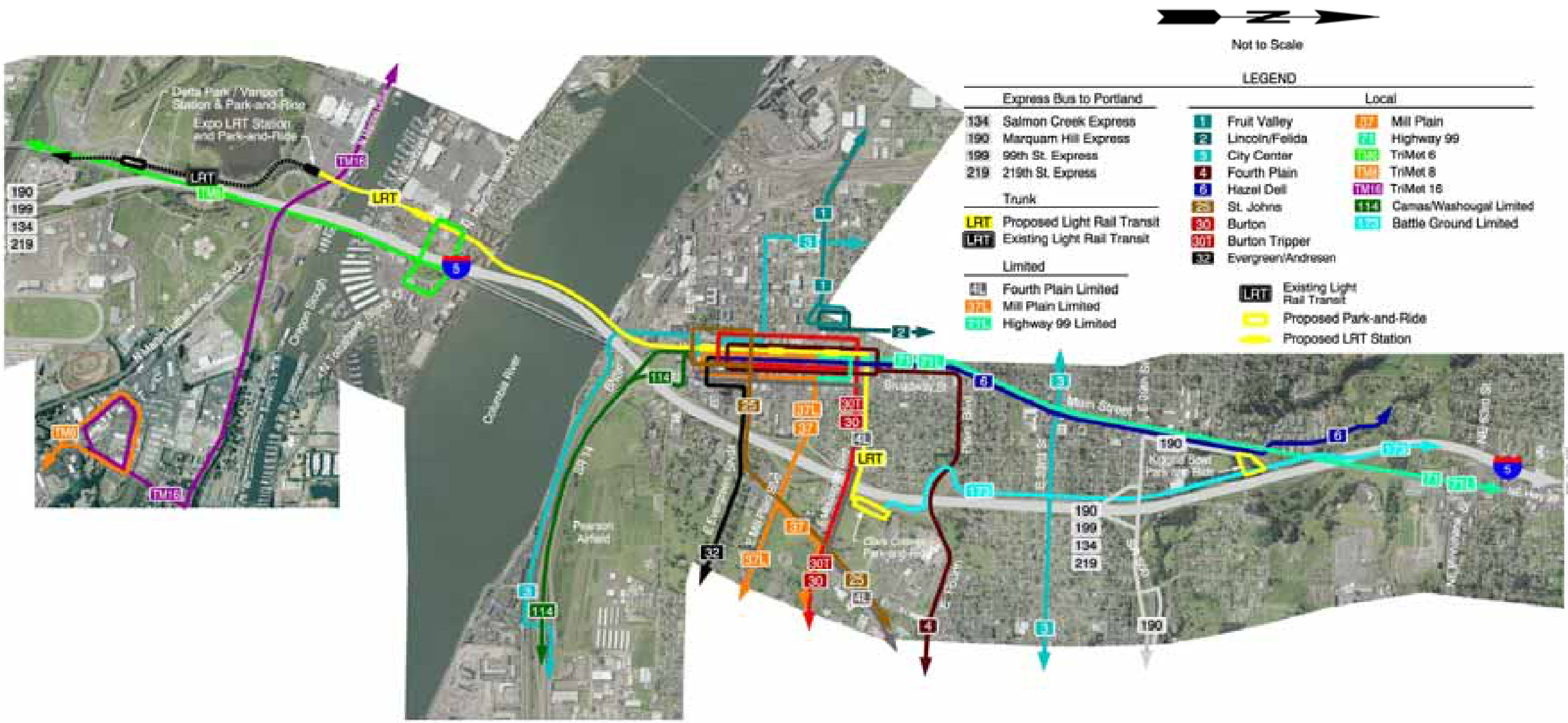
Figure 1-16. Alternative 3 – LRT Clark College MOS Transit Routing: Includes Local, Express and Trunk Line Service



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Additional local bus routes would stop at the proposed light rail stations in downtown Vancouver at two locations - the Mill Plain District Transit Center and the Seventh Street station. Express bus operations would be similar to Alternative 1, except that C-TRAN's express bus routes 105 and 157 would be eliminated as they would be redundant to the LRT service.

Table 1-6. Alternative 3 –LRT Transit Operating Characteristics in 2030

Characteristic		Alternative 3			
		Full-Length Alignment			**MOS Alignment**
		Vancouver	**I-5**	**Mill Plain District**	**Clark College**
LRVs		14	14	8	8
Standard 40' Buses		22	26	27	27
LRT Headways		7.5 min peak	7.5 min peak	7.5 min peak	7.5 min peak
		15 min off-peak	15 min off-peak	15 min off-peak	15 min off-peak
Limited Route Headways		4L and 37L: 10 min peak, 15 min off-peak	4L and 37L: 10 min peak, 15 min off-peak	4L and 37L: 10 min peak, 15 min off-peak	4L and 37L: 10 min peak, 15 min off-peak
		71L: 15 min peak	71L: 15 min peak	71L: 15 min peak	71L: 15 min peak
		and off-peak	and off-peak	and off-peak	and off-peak
Bus Connection s to HCT	**Limited**	4L, 37L, and 71L	4L, 37L, and 71L	4L, 37L, and 71L	4L, 37L, and 71L
	Other	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71
Span of Service		365 days per year, 19 hours per day	365 days per year, 19 hours per day	365 days per year, 19 hours per day	365 days per year, 19 hours per day
Annual Platform Hours	**C-TRAN Local Bus**	258,000	267,000	293,000	266,000
	C-TRAN Express Bus	79,000	77,000	76,000	78,000
	Limited Routes	24,000	27,000	15,000	29,000
	LRT	74,000	73,000	64,000	67,000
Annual Vehicle Miles Traveled	**C-TRAN Local Bus**	3,350,000	3,140,000	3,530,000	3,150,000
	C-TRAN Express Bus	1,200,000	1,620,000	1,610,000	1,200,000
	Limited Routes	154,000	354,000	200,000	180,000
	LRT	707,000	726,000	726,000	706,800

Transit Capital Improvements

Table 1-7 summarizes the existing and proposed (additional) capital facilities that would be included in Alternative 3 and would be used for bi-state travel, for the Vancouver alignment, the I-5 alignment, and both MOS alignments. Section 4.7 of this report describes the capital improvements in greater detail, including the design options and the specific Park and Ride lots and sizes.

Table 1-7. Alternative 3 – LRT Transit Capital Facilities in 2030

Characteristic		Alternative 3			
		Full-Length Alignments		MOS Alignments	
		Vancouver	I-5	Mill District	Clark College
Guideway Length		3.41 miles	4.22 miles	2.07	2.65 miles
New Stations (Expo Center Light Rail Station to Northern Terminus)		6*	6*	3*	4*
Park and Ride Lots	Existing / No-Build Alternative	12	12	12	12
	Additional	3	3	5	2
Park and Ride Spaces	Existing / No-Build Alternative	4,289	4,289	4,289	4,289
	Additional	2,410	2,500	3,218	2,500
Transit Centers	Existing / No-Build Alternative	5	5	5	5
	Additional	1	1	1	1
LRV Maintenance Facility		1	1	1	1

**The existing Expo Center Light Rail Station will be used for this alignment.*

1.5.4 Alternative 4: Supplemental Bridge and BRT with Express Bus Service and an Increased Level of Transit Service

Alternative 4, with a supplemental bridge, would be paired with Increased Transit Service, BRT, and the Vancouver Alignment as shown in Figure 1-17 and the transit routing is shown in Figure 1-18**.**

Alternative 4 would be similar to Alternative 2 with three major differences:

- The Highway$_3$ network which includes a supplemental bridge over the Columbia River, with fewer auxiliary lanes than with the proposed replacement bridge;
- A higher toll rate for private vehicles crossing I-5; and
- An Increased Transit Service.

Alternative 4 would include three BRT routes, a supplemental I-5 Columbia River bridge crossing, and the Vancouver full-length northern terminus transit alignment. This alternative would use the existing I-5 bridge for northbound Interstate traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and the HCT mode BRT. The existing I-5 bridges would be re-striped to provide two lanes on each bridge structure for northbound vehicular traffic and allow for an outside safety shoulder for disabled vehicles; three of the lanes would be for thru-traffic and the fourth, on the eastern bridge, would be an auxiliary lane. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing (eastern) bridge. Four southbound I-5 lanes (three through-lanes and one auxiliary lane) and BRT would be provided on a new downstream supplemental bridge. The southbound BRT and other guideway buses would turn around at the existing Expo Center light rail station in Portland, where riders could transfer to the MAX Yellow Line. BRT service would be more frequent compared to Alternative 2. Express bus service and local and feeder bus service would also be increased to meet demand. This alternative would also include a higher toll, about 20% higher during the peak period, than Alternatives 2 and 3 for vehicles crossing the Columbia River on the new I-5 bridge.

Alternative 4 follows the same transit guideway alignment as the Vancouver full-length alignment in Alternative 2. With this alignment, the exclusive guideway would consist of a length of approximately 3.41 miles. In the south, the guideway would begin at the existing Expo Center light rail station. From there the guideway would rise northward, over the Oregon Slough, to an elevated station on Hayden Island and then continue to rise to travel over the Columbia River. Once over the river the guideway would descend into downtown Vancouver to a touch down point near Sixth Street and Washington Street. Along Washington Street in downtown Vancouver, there would be BRT stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street. From the Mill Plain District Transit Center, both travel directions of the guideway would continue north along Broadway Street, with a station located at 24th Street, to 29th Street. From there, both travel directions of the guideway would continue north up Main Street, with a station located at 33rd Street, and to the terminus at the proposed Lincoln Park and Ride lot located at the intersection of Main Street and East 40th Street.

A structured park and ride lot would be provided at the Lincoln Park and Ride, and surface lots would be provided at Kiggins Bowl and the Clark College Park and Ride lots. The existing BPA/Ross Park and Ride lot would be eliminated.

Transit Operating Improvements

Table 1-8 summarizes the transit operating characteristics for Alternative 4. Alternative 4's BRT system would terminate at the Expo Center light rail station where riders would transfer onto the Interstate MAX Yellow Line for the remainder of their trip towards Portland's CBD. The Yellow LRT Line headways would be decreased from 7.5 minutes, in Alternative 2, to 6 minutes in the AM and PM peak period; the off-peak headways would remain as in Alternative 1 at 15 minutes.

The BRT bus lines would consist of three new limited routes, (4L, 37L, and 71L), which would be companion lines to C-TRAN's existing routes 4, 37, and 71. These lines would travel on the existing routing as their corresponding companion lines, from the Salmon Creek Park and Ride lot and the Vancouver Mall and Fisher's Landing Transit Centers, but they would operate with limited stops and within the BRT exclusive guideway to the Expo Center light rail station. The 71L would travel along Highway 99 and enter the guideway at the Lincoln Park and Ride lot**.** The 4L (which would replace C-TRAN's route 4X in the No-Build Alternative) would travel along East Fourth Plain Boulevard and enter the guideway at the Mill Plain District Transit Center. The 37L would travel along East Mill Plain Boulevard and then enter the guideway at the Mill Plain District Transit Center. Local versions of these lines would serve all existing stops, however they would terminate in downtown Vancouver. Three other existing C-TRAN local routes (30, 114, and 173), which have a high percentage of bi-state passengers, would also use the exclusive guideway to the Expo Center light rail station.

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Figure 1-17. Alternative 4 – BRT Increased Vancouver Alignment: Trunk Line and Limited Service (Local and Express Bus Network not Shown)

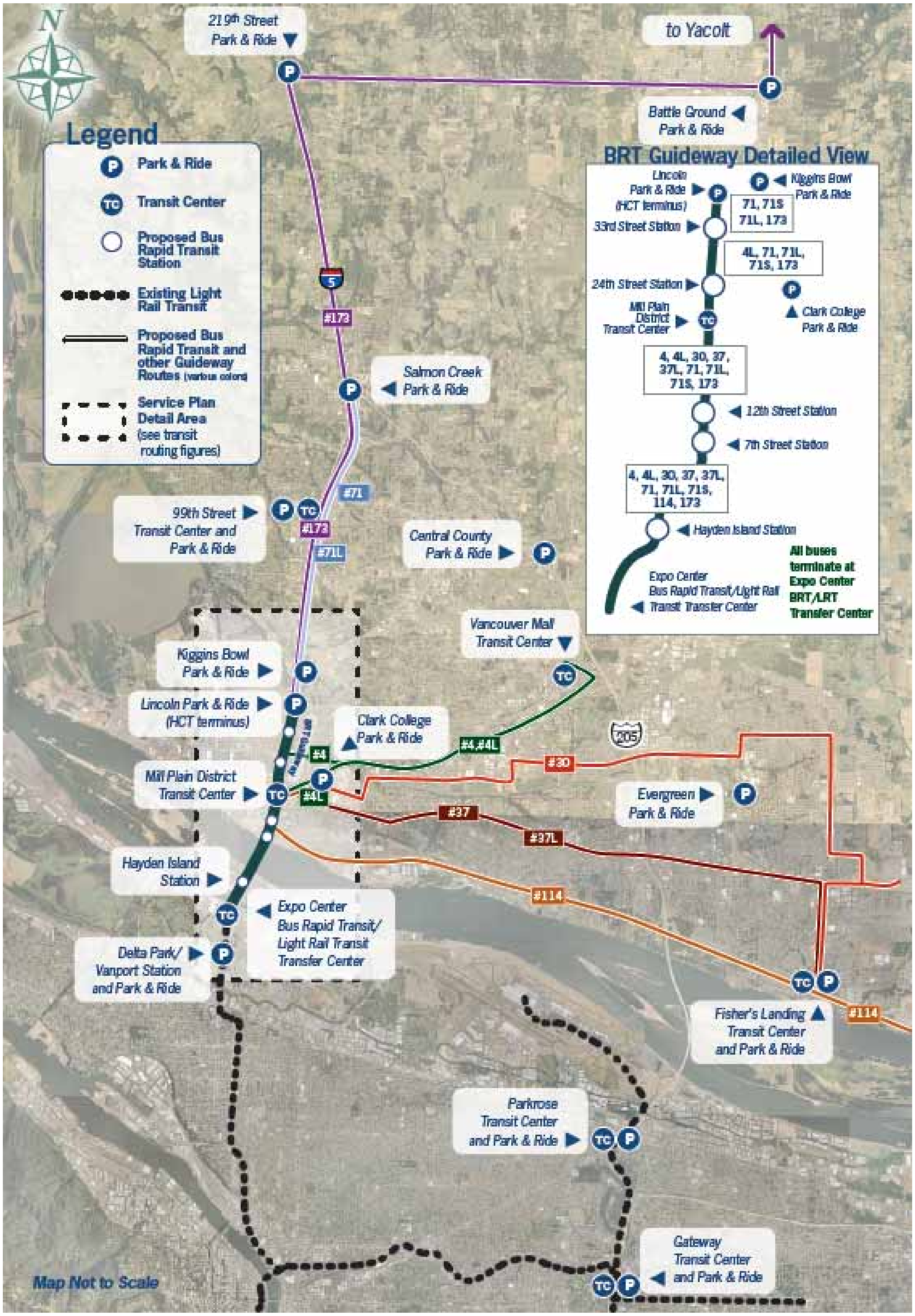

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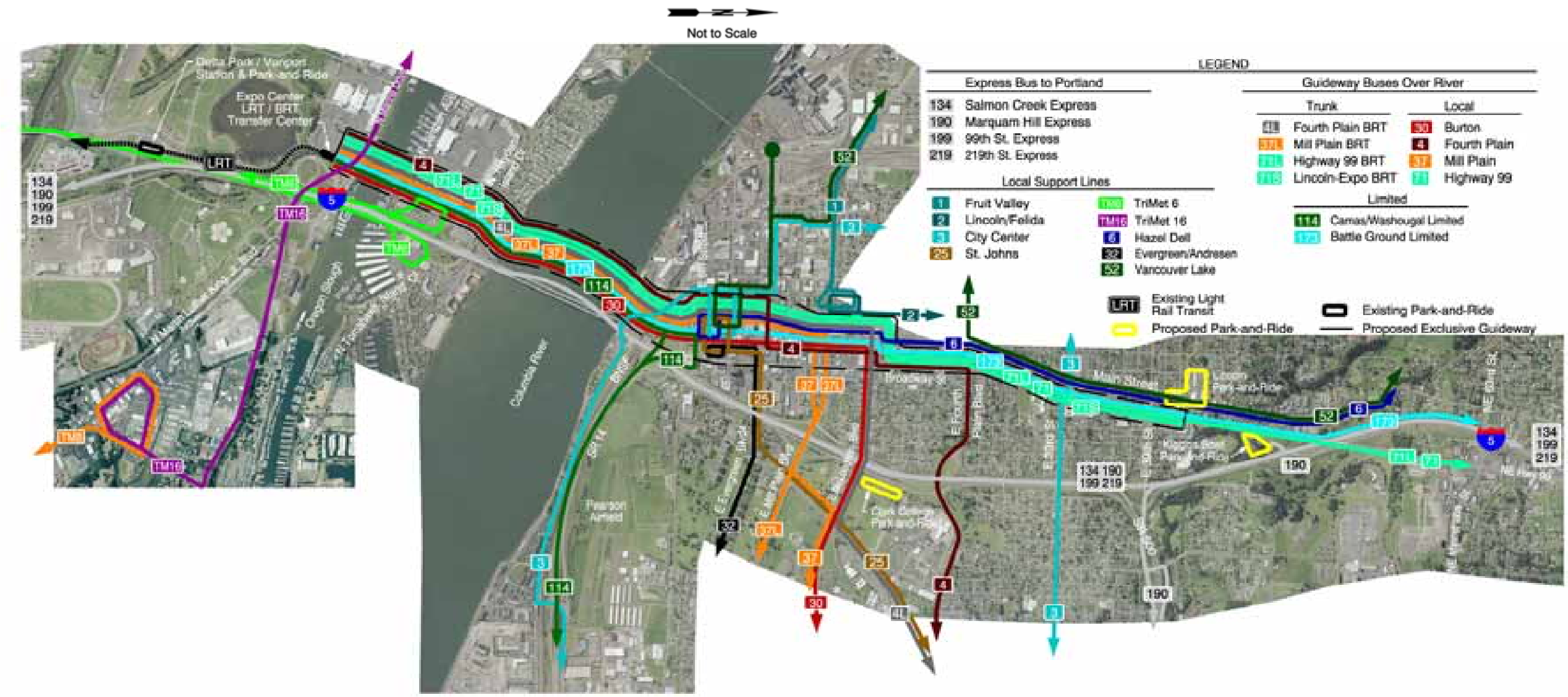
Figure 1-18. Alternative 4 – BRT Increased Vancouver Transit Routing: Includes Local, Express and Trunk Line Service



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Other local bus lines would operate on routes similar to Alternative 1, but would connect as feeder routes to BRT in downtown Vancouver at two locations - the Mill Plain District Transit Center and the Seventh Street station. Express bus operations would be similar to Alternative 1, except that C-TRAN's express bus routes 105 and 157 would be eliminated as they would be redundant to BRT service. To accommodate the transfer from BRT to light rail, the LRT Yellow Line headways would be decreased during the peak period from 10 minutes to 6 minutes; the off-peak period headways would remain at 15-minutes.

Table 1-8. Alternative 4 Transit Operating Characteristics Compared to Alternative 2 Vancouver Full-Length in 2030

Characteristic		Alternative 2 Vancouver Full-Length Alignment	Alternative 4 Vancouver Full-Length Alignment
BRT Lines		4L, 37L, and 71L	4L, 37L, and 71L
BRT Vehicles		24	38
BRT Headways	**4L**	10 peak, 0 off-peak	7.5 min peak, 0 min off-peak
	37L	12 peak, 0 off-peak	7.5 min peak, 0 min off-peak
	71L[1]	10 peak, 15 off-peak	7.5 min peak, 10 min off-peak
Yellow Line Headways		7.5 min peak, 15 min off-peak	6 min peak, 15 min off-peak
Routes Crossing in Guideway to Expo Center Light Rail Station		4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173	4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173
Total Vehicles in Guideway per Hour at the Washington and 11th Street Station (Two Directions, Peak Period)		48	92
Bus Connections to HCT	**Limited**	N/A	N/A
	Other	1, 2, 3, 6, TM6 25, 32	1, 2, 3, 6, TM6 25, 32
Span of Service		365 days per year, 19 hours per day	365 days per year, 19 hours per day
Annual Platform Hours	**C-TRAN Local Bus**	271,000	537,000
	C-TRAN Express Bus	90,000	150,000
	BRT	51,000	78,000
	LRT	50,000	52,000
Annual Vehicle Miles Traveled	**C-TRAN Local Bus**	3,400,000	6,480,000
	C-TRAN Express Bus	1,420,000	1,746,000
	BRT	387,000	664,000
	LRT	430,000	665,000

[1] *In the peak period, the combined headway for the BRT Routes would be 3 to 4 minutes and in the off-peak period the combined headway would be 5 minutes.*

Transit Capital Improvements

Table 1-9 summarizes the existing and proposed (additional) capital facilities that would be included in Alternative 4 and would be used for bi-state travel. Section 4.7 of this report describes the capital improvements and design options in greater detail.

Table 1-9. Alternative 4 Transit Capital Facilities Compared to Alternative 2 in 2030

Characteristic		Alternative 2 Vancouver Full-Length Alignment	Alternative 4 Vancouver Full-Length Alignment
Guideway Length		3.41 miles	3.41 miles
New Stations (Expo Center Light Rail Station to Northern Terminus)		8	8
Park and Ride Lots	**Existing/No-Build Alternative**	12	12
	Additional	3	3
Park and Ride Spaces	**Existing/ No-Build Alternative**	4,289	4,289
	Additional	2,410	2,410
Transfer Centers		1	1
Transit Centers	**Existing/ No-Build Alternative**	5	5
	Additional	1	1
LRV Maintenance Facility		1	1

1.5.5 Alternative 5: Supplemental Bridge and LRT with Express Bus Service and an Increased Level of Transit Service

Components of Alternative 5 would include a supplemental bridge, LRT, would have Increased Transit Service and would follow the full-length Vancouver transit alignment with a terminus at the Lincoln Park and Ride as shown in Figure 1-19. Figure 1-20 shows the transit routing for Alternative 5.

Alternative 5 would be similar to Alternative 3 with three major differences:

- It would be paired with the Highway$_3$ network which includes a supplemental bridge over the Columbia River, with fewer auxiliary lanes than with the proposed replacement bridge;
- It would have a higher toll rate for private vehicles crossing I-5; and
- It would have an Increased Transit Service.

Alternative 5 would include an extension of TriMet’s Interstate MAX LRT Yellow Line from the existing Expo Center light rail station to the Lincoln Park and Ride in Vancouver with characteristics similar to TriMet’s regional light rail system. This alternative would use the existing I-5 bridge for northbound Interstate traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and light rail. The existing I-5 bridge would be re-striped to provide two lanes on each bridge structure and allow for an outside safety shoulder for disabled vehicles; three of the lanes would be for through-traffic and the fourth, on the eastern bridge, would be an auxiliary lane. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (eastern) bridge. Four southbound I-5 lanes (three through-lanes and one auxiliary lane) and LRT would be provided on a new downstream supplemental bridge. The southbound LRT extension would be incorporated into TriMet's MAX Yellow Line providing a one seat ride for transit riders from Lincoln Park and Ride to downtown Portland. Headways on the LRT would be more frequent than in Alternative 3 and express bus service and local and feeder bus service frequencies would be increased to meet demand. This alternative would also include a higher toll than Alternatives 2 and 3 for vehicles crossing the Columbia River on the new I-5 bridge. Compared to Alternative 1, Alternative 5 would reduce transit travel time, improve transit system reliability, and increase service to transit markets.

The LRT guideway of Alternative 5 would follow the same alignment as the Vancouver full-length guideway under Alternative 3. With this alignment, the exclusive guideway would consist of a length of approximately 3.41 miles. In the south, the guideway would begin at the existing Expo Center light rail station. From there the guideway would rise in elevation as it headed northward, over the Oregon Slough, to an elevated station on Hayden Island. It would then continue to rise to travel over the Columbia River. Once over the river, the guideway would descend into downtown Vancouver to a touch down point near Sixth Street and Washington Street. Along Washington Street in downtown Vancouver, there would be LRT stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street. From the Mill Plain District Transit Center, both travel directions of the guideway would continue north along Broadway Street, with a station located at 24th Street, to 29th Street. From there, both travel directions of the guideway would continue north up Main Street, with a station located at 33rd Street, and to the terminus at the proposed Lincoln Park and Ride lot located at the intersection of Main Street and East 40th Street. Surface parking lots would be provided at Lincoln, Kiggins Bowl and the Clark College Park and Ride lots. The existing BPA/Ross Park and Ride lot would be eliminated.

Alternative 5 has the same design options as Alternative 3, but was evaluated with a supplemental bridge and the Vancouver full-length alignment.

Transit Operating Improvements

Table 1-10 summarizes the transit operating characteristics for Alternative 5. The extension of the MAX Yellow Line would be integrated into TriMet's regional light rail system operating plan. The MAX Yellow Line headways would be decreased from 7.5 minutes, in Alternative 3, to 6 minutes in the peak periods and from 15 minutes, in Alternatives 1 and 3, to 10 minutes in the off-peak.

The transit network would be very similar to the network for Alternative 3. However, service on the limited lines, local buses, and express buses would be far more frequent (service would be increased to meet demand).

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Figure 1-19. Alternative 5 Alignment: Trunk Line and Limited Service (Local and Express Bus Network not Shown)

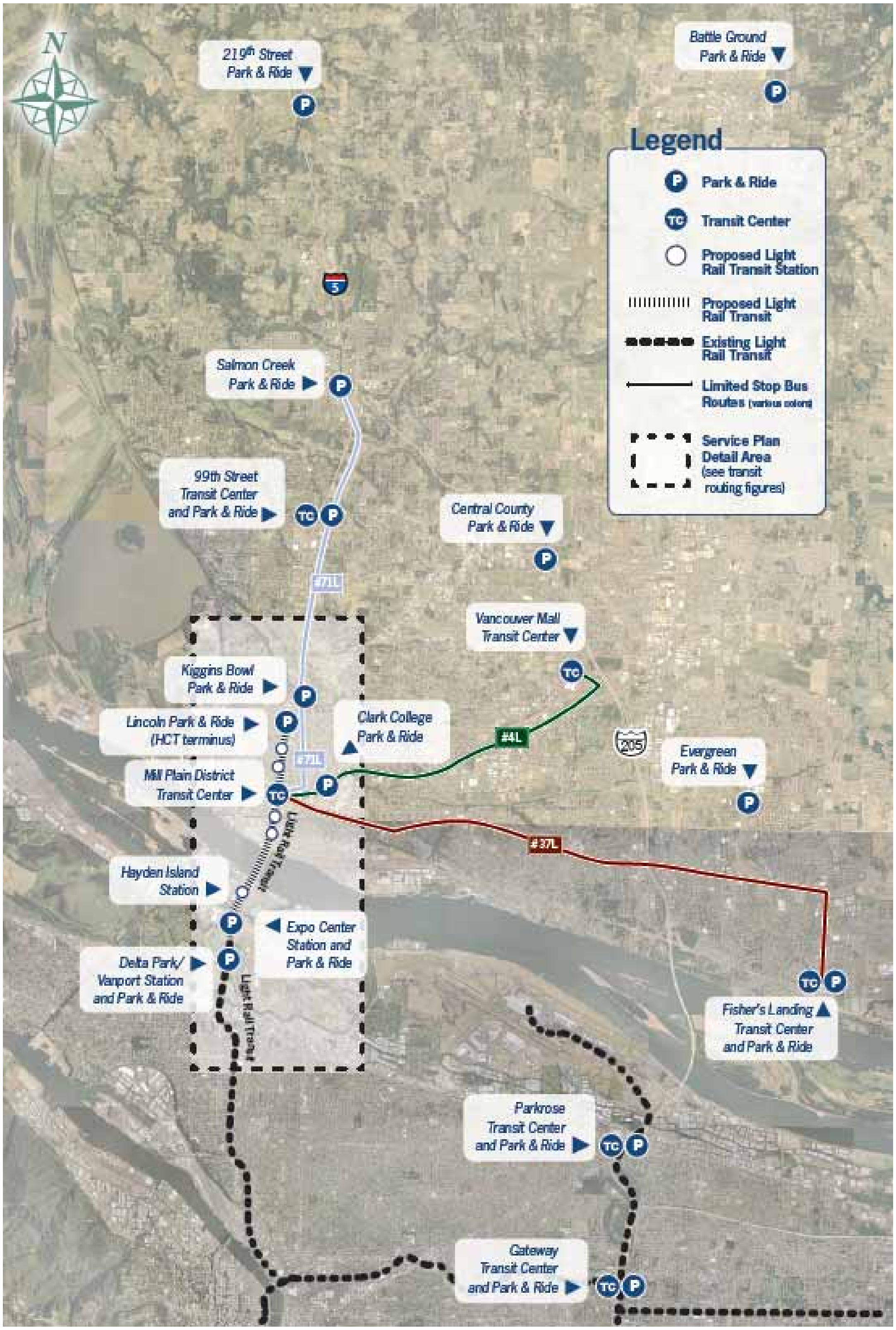

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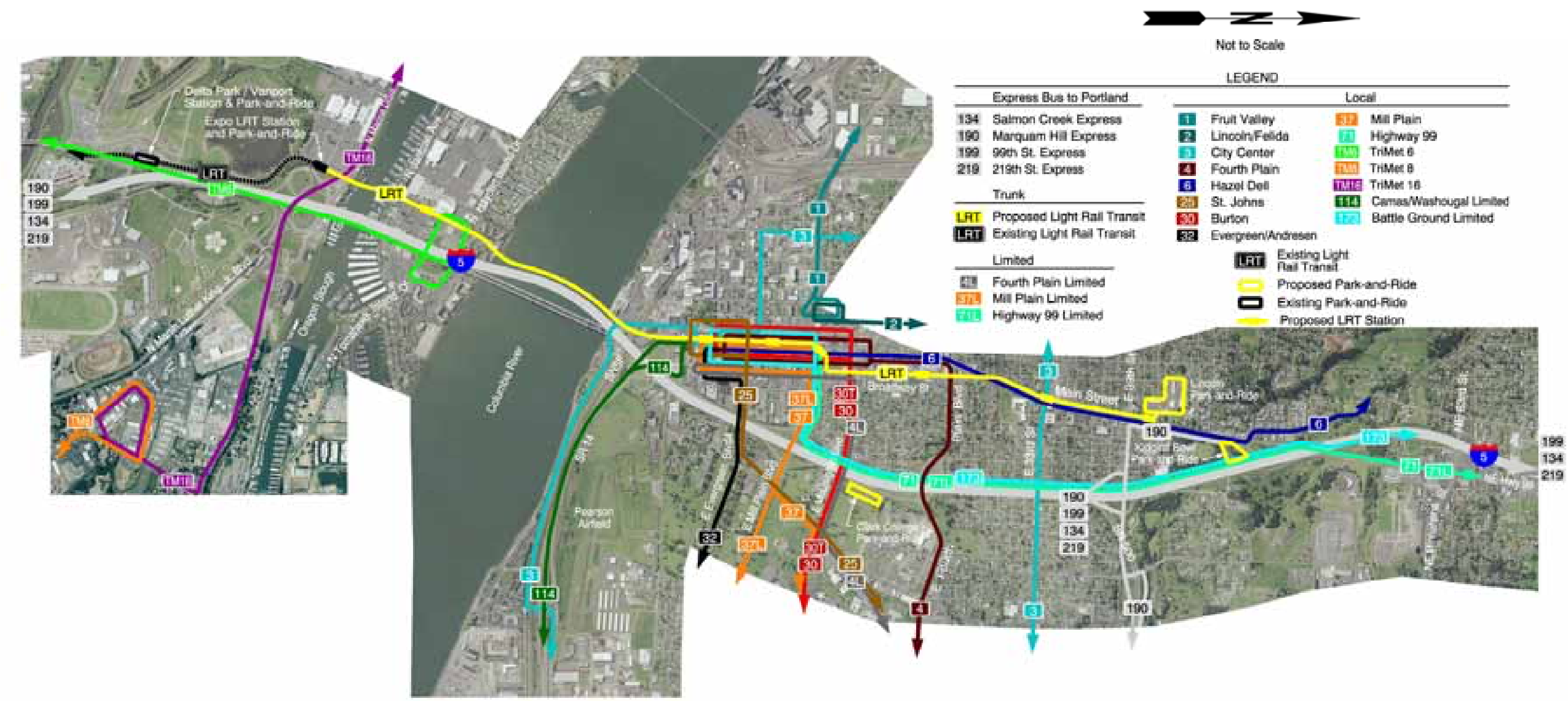
Figure 1-20. Alternative 5 Transit Routing: Includes Local, Express and Trunk Line Service



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Local bus routes would connect to the proposed light rail stations at the Lincoln Park and Ride, the Mill Plain District Transit Center, and the Seventh Street station. Many local routes would have twice the frequency as in Alternative 3. Express bus routing would be similar to Alternative 1, except that C-TRAN's express bus routes 105 and 157 would be eliminated as they would be redundant to the LRT service. In addition, frequency of service would be higher for express routes. Headways on route 199 would be decreased to 7.5 minutes from 10 minutes in the peak period, and route 134 would be decreased to 10 minutes from 12 minutes in the peak.

Table 1-10. 2030 Alternative 5 Transit Operating Characteristics

Characteristic		Alternative 3	Alternative 5
		Vancouver Full-Length Alignment	**Vancouver Full-Length Alignment**
LRVs		119	123
Standard 40' Buses		17	20
LRT Headways		7.5 min peak	6 min peak
		15 min off-peak	10 min off-peak
Limited Route Headways		4L and 37L: 10 min peak, 15 min off-peak	4L and 37L: 7.5 min peak, 0 min off-peak
		71L: 15 min peak, and off-peak	71L: 15 min peak, and 10 off-peak
Bus Connections to HCT	**Limited**	4L, 37L, and 71L	4L, 37L, and 71L
	Other	3, 4, 6, TM6, 25, 30, 32, 37, 71, and 173	3, 4, 6, TM6, 25, 30, 32, 37, 71, and 173
Span of Service		365 days per year, 19 hours per day	365 days per year, 19 hours per day
Annual Platform Hours	**C-TRAN Local Bus**	258,000	444,000
	C-TRAN Express Bus	79,000	132, 000
	Limited Routes	24,000	42,000
	LRT	74,000	75,000
Annual Vehicle Miles Traveled	**C-TRAN Local Bus**	3,360,000	6,130,000
	C-TRAN Express Bus	1,200,000	1,630,000
	Limited Routes	154,000	250,000
	LRT	707,000	1,000,000

Transit Capital Improvements

Table 1-11 summarizes the existing and proposed (additional) capital facilities that would be included in Alternatives 3 and 5 that would be used for bi-state travel, for the full-length Vancouver alignment. Section 4.7 of this report describes the capital improvements and design options in greater detail.

Table 1-11. Alternative 5 Transit Capital Facilities

Characteristic		Alternative 3 Vancouver Full-Length Alignment	Alternative 5 Vancouver Full-Length Alignment
Guideway Length		3.41 miles	3.41 miles
New Stations (Expo Center Light Rail Station to Northern Terminus)		7	7
Park and Ride Lots	**Existing/No-Build Alternative**	12	12
	Additional	3	2
Park and Ride Spaces	**Existing/No-Build Alternative**	4,289	4,289
	Additional	2,410	2,410
Transit Centers	**Existing/ No-Build Alternative**	5	5
	Additional	1	1
LRV Maintenance Facility		1	1

1.6 Common Elements of All DEIS Alternatives

This section outlines the key elements that would apply to all of the DEIS transit alternatives. These elements include policies regarding transit fares, parking, land use, and transit operations, such as owner and operator roles. This section also includes a description of the highway build configurations that would be paired with the transit alternatives.

1.6.1 Fare Policy

All the Alternatives in future-year conditions (i.e., 2030) would include an integrated fare policy[3] between C-TRAN's transit system and TriMet's transit system that would keep fares at constant levels adjusted for inflation. For example: both TriMet and C-TRAN would collect one fare and would allow for transfers within and between systems; passengers traveling from Clark County to downtown Portland using express bus service would be charged a premium fare of $3.00; travel from Clark County to downtown Portland via standard fixed route bus service, BRT service, and/or LRT service would be charged a C-TRAN all-zone fare of $2.25 – see Section 3.1.1 for more detail.

1.6.2 Highway Network

For the purpose of evaluating the transit alternatives, there are four configurations for the CRC highway network; the No-Build Highway, Highway_1, Highway_2 and Highway_3. The No-Build Highway is the DEIS Alternative 1, No-Build, highway configuration. Highway_1 and Highway_2 are the highway configurations with DEIS Alternatives 2 and 3, and Highway_3 is the highway configuration with DEIS Alternatives 4 and 5. The following is a brief description of the highway configurations. See Section 3.2 for more detail.

[3] Currently, TriMet and C-TRAN do not have an integrated fare policy.

1. The **No-Build Highway** consists of the existing I-5 highway system, including the existing lift span bridges and the existing mainline traffic capacity throughout the Bridge Influence Area. It also consists of the planned added southbound lane from north of Victory Boulevard to south of Columbia Boulevard and retaining the existing northbound managed lane from Going Street to Marine Drive.

2. The **Highway$_1$** build configuration consists of mainline and interchange improvements on I-5 in the Bridge Influence Area. A replacement bridge would be constructed over the Columbia River. The Highway$_1$ lane configuration across the Columbia River would consist of three through lanes in each direction with design options for two or three auxiliary lanes (depending on safety and operations), resulting in a five-lane or six-lane configuration in each direction with the final configurations to be determined based on the DEIS analysis. The Highway$_1$ configuration would also consist of the planned added southbound lane from north of Victory Boulevard to south of Columbia Boulevard and retaining the existing northbound managed lane from Going Street to Marine Drive. Under Highway$_1$, I-5 would be tolled in both the southbound and northbound directions.

3. **Highway$_2$** is similar to Highway$_1$ except that Highway$_2$ would not be tolled.

4. The **Highway$_3$** build configuration consists of mainline and interchange improvements on I-5 in the Bridge Influence Area. A supplemental bridge would be constructed over the Columbia River. The Highway$_3$ lane configuration across the Columbia River would consist of three through lanes in each direction with a design option for one auxiliary lane (depending on safety and operations), resulting in a three-lane or four-lane configuration in each direction with the final configurations to be determined based on the DEIS analysis. The Highway$_3$ configuration would also consist of the planned added southbound lane from north of Victory Boulevard to south of Columbia Boulevard and retaining the existing northbound managed lane from Going Street to Marine Drive. Under Highway$_3$, I-5 would be tolled (at a higher rate than Highway$_1$ in the AM and PM peak periods) in both the southbound and northbound directions.

Table 1-12 summarizes the main characteristics of these highway build configurations. With Highway$_1$, Highway$_2$, and Highway$_3$, nine transit queue jump lanes would be provided at on-ramps (southbound: 139th, 99th, 39th, C, and Hayden Island; northbound: Victory, Hayden Island, Fourth Plain Boulevard, and 99th). Figure 1-21 shows the existing northbound managed lane and the existing and proposed transit queue jumps that would be included in the Highway$_1$, Highway$_2$, and Highway$_3$ build configurations; Table 1-13 gives more detail about how each Alternative is paired with the transit queue jump shown on Figure 1-21.

Table 1-12. Comparison of Highway Build Characteristics

HIGHWAY CHARACTERISTIC		NO-BUILD	HIGHWAY$_1$	HIGHWAY$_2$	HIGHWAY$_3$
Replacement Bridge		N	Y	Y	N
Supplemental Bridge		N	N	N	Y
Lanes Over the Columbia River (one direction)	**Through Lanes**	3	3	3	3
	Auxiliary Lanes	0	2 or 3	2 or 3	0 or 1
Tolling of I-5		N	Y[1]	N	Y[2]
Transit queue jump lanes		1	9	9	9
Tolling of I-205 general purpose and auxiliary lanes		N	N	N	N

N = No, Y = Yes
[1] The assumed toll rate structure for Highway$_1$ is $2.00 to $2.25 in the peak period and $1.00 to $1.25 in the off-peak. Tolls are assumed on weekends.
[2] The assumed toll rate structure for Highway$_3$ has yet to be determined. Tolls are assumed on weekends.

Table 1-13. CRC Transit Queue Jump Ramp Location

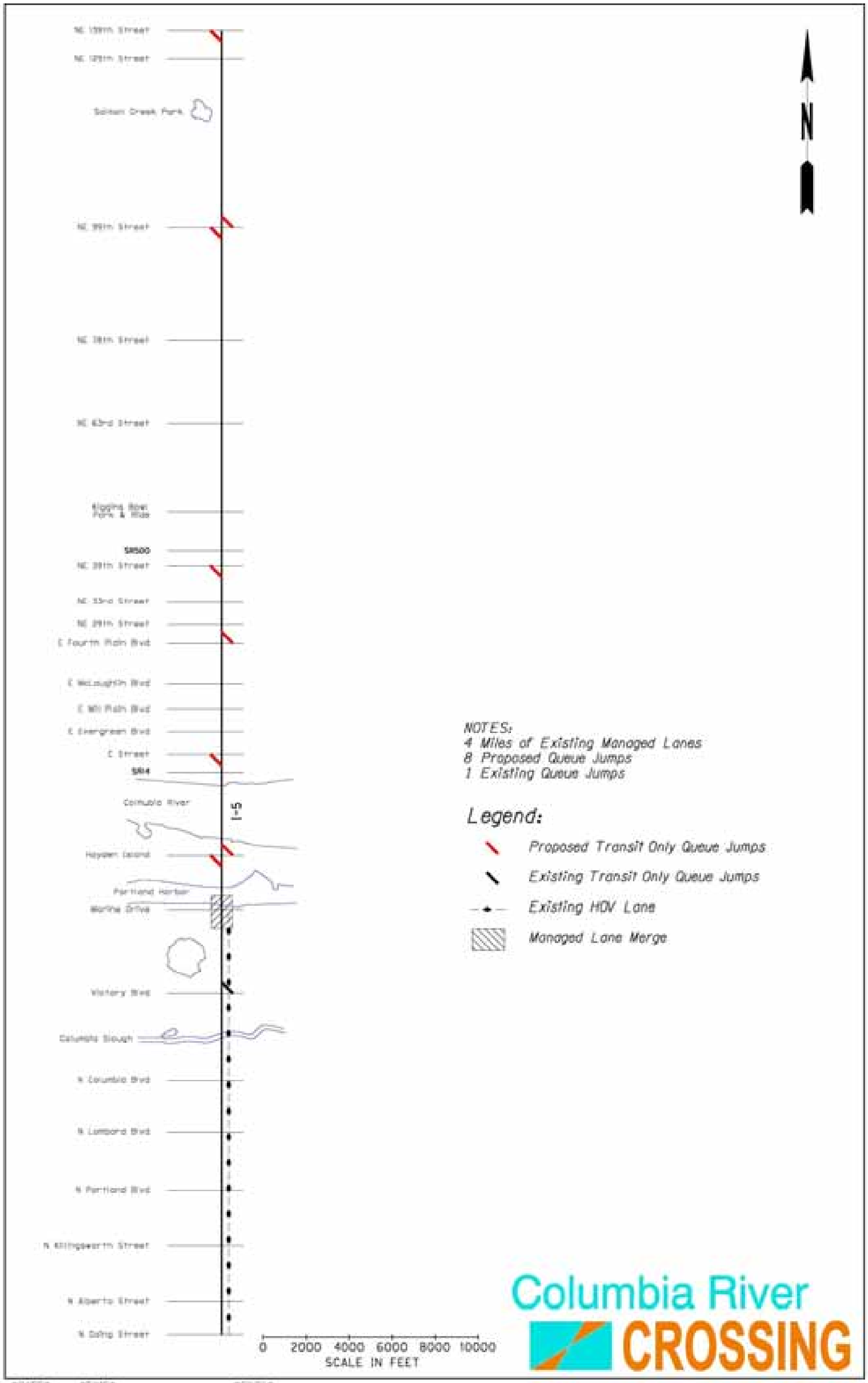
TRANSIT-ONLY QUEUE JUMP RAMP LOCATION	MODELED ALTERNATIVES UTILIZING THE FACILITY
139th Street to Southbound I-5	All modeled alternatives
99th Street to Southbound I-5	All modeled alternatives
99th Street to Northbound I-5	All modeled alternatives
39th Street to Southbound I-5	Build Alternatives Only
Fourth Plain Blvd to Northbound I-5	LRT Clark College MOS
‘C’ Street to Southbound I-5	All modeled alternatives
Hayden Island to Southbound I-5	All modeled alternatives
Hayden Island to Northbound I-5	No-Build Transit, Build Highway (Alternative 1)
Victory Blvd to Northbound I-5	No-Build Transit, Build Highway (Alternative1)

Table 1-14 shows how the transit alternatives have been combined with the highway configurations for modeling and analysis purposes. For the purposes of the DEIS, the Highway$_1$ network has been selected as the representative highway build configuration. All of the transit alignments evaluated in Alternatives 2 and 3 used Highway$_1$; the Vancouver full-length alignments were also evaluated with Highway$_2$. The Highway$_3$ network will be paired with only Alternatives 4 and 5 on the Vancouver Alignment, due to a focus on lower capital costs.

Table 1-14. CRC Transit Alternative Pairing with the Highway Configurations

TRANSIT ALTERNATIVE		HIGHWAY NETWORK			
		No-Build	**Highway$_1$**	**Highway$_2$**	**Highway$_3$**
Alternative 1	**No-Build**	√			
Alternative 2	**Vancouver Alignment**		√	√	
	I-5 Alignment		√		
	Mill Plain District MOS		√		
	Clark College MOS		√		
Alternative 3	**Vancouver Alignment**		√	√	
	I-5 Alignment		√		
	Mill Plain District MOS		√		
	Clark College MOS		√		
Alternative 4	**Vancouver Alignment**				√
Alternative 5	**Vancouver Alignment**				√

Figure 1-21. Highway$_1$, Highway$_2$ and Highway$_3$ Existing Managed Lane and Transit-Only Queue Jumps



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2. Introduction

The Columbia River Crossing (CRC) project is a bridge, transit, and highway improvement project to address the congestion and mobility problems on I-5 between SR 500 in Vancouver and Columbia Boulevard in Portland. The CRC project includes a build highway and a build transit system, which combine to form a multimodal alternative needed to address the complex existing transportation problems.

The purpose of this report is to provide a consistent and comprehensive definition of the transit alternatives, and design options, for undertaking the analyses that were used to complete the DEIS. The description of the alternatives in this report focuses on the transit operating and capital improvements that would be included. For this report, assumptions have been made regarding the highway build configurations, like transit fares, that would be constructed in the transit build alternatives. By defining the operating and physical characteristics for all of the transit alternatives and design options under consideration, this report provides the basis for all of the transportation, environmental, and fiscal analysis that will be prepared to support the DEIS.

This report provides a summary of the general background for the project (Section 2.1), a description of the CRC Corridor (Section 2.2), a description of the process used to select the range of alternatives to be studied within the DEIS (Section 2.4), and a description of the key assumptions that apply to all of the transit alternatives (Section **Error! Reference source not found.**). Section 4 provides a description of the transit alternatives that will be analyzed as part of the CRC DEIS.

This DRAFT *Final Definition of the Transit Alternatives Report* reflects the components of the transit alternatives evaluated in the DEIS and serves as an update to the DRAFT *Detailed Definition of the Transit Alternatives* published in August of 2007. Throughout the analysis of the DEIS alternatives, facts were revealed that led the CRC Project Team to recommend that some design options be removed from consideration or be altered slightly to avoid or mitigate impacts, to improve efficiencies, and/or to address unforeseen issues. Included within the Appendix (see Appendices F and G) are memos that detail the reasoning for the alteration or the removal of these design options. This report is a complete description of the components of the CRC project that were included in the DEIS Alternatives.

2.1 Background

I-5 is the only continuous north/south interstate highway on the West Coast, providing a commerce link for the United States, Canada, and Mexico. In the Vancouver-Portland region, I-5 is one of two major highways that provide interstate connectivity and mobility and one of only two roadway bridges that cross the Columbia River in the region. The I-5 crossing of the Columbia River is a major lifeline linking Portland, Oregon, and Vancouver, Washington, and carrying the freight, commuters, and traffic that support the economy and vitality of the region and the entire West Coast. I-5 directly connects the central cities of Vancouver and Portland. The existing I-5 crossing of the Columbia River consists of two side-by-side bridges that have lift spans. The eastern bridge (currently serving northbound traffic) opened in 1917 and the western bridge (currently serving southbound traffic) opened in 1958. The cost to build each bridge was financed with bridge tolls, which were removed once the capital cost of the bridges was paid. When the first span of the Interstate Bridge opened in 1917, 350,000 people lived in the Portland-Vancouver region with fewer than 20,000 cars and trucks. Now, the region contains approximately two million people and two million cars and trucks.

A second interstate highway river crossing, I-205, is located six miles east (upstream) of the I-5 crossing. I-205, a 37-mile-long highway that extends from its connection with I-5 at Salmon Creek in Washington State to its terminus with I-5 near Tualatin in Oregon, provides a more suburban connection between east Clark County, east Multnomah County, and Clackamas County, and was intended as a bypass. The I-205 Glenn Jackson Bridge, which opened in 1982, carries about 140,000 vehicles per day and is reaching its peak-hour period carrying capacity. This bridge has a fixed span with a significantly higher clearance than the existing I-5 bridges.

Between the metropolitan areas of the two states there are no other river crossing options for automobiles. The next closest bridges for automobile use are located at Longview, Washington, 46 miles to the west, and at Cascade Locks, Oregon, 40 miles east of the I-5 bridge crossing. A rail bridge is located about a mile west (downstream) of the I-5 crossing. The Burlington Northern-Santa Fe (BNSF) rail bridge was built in 1908 and features a swing span to accommodate river traffic. The I-5 bridges' lift spans were designed to align with the rail bridge's swing span.

The I-5 bridge has been stretched far beyond its vehicle throughput capacity and the highway and bridge fall short of current national design and safety standards. The two-bridge crossing, which served 30,000 vehicles per day in the 1960s, now carries more than 125,000 automobiles, buses, and trucks each weekday. While many of these trips are regionally-oriented (average trip length is 16 miles), it is estimated that 70 to 80 percent of trips using the I-5 crossing actually enter and/or exit I-5 within a five-mile-long segment, creating intense congestion-related problems. This five-mile segment of I-5, known as the Bridge Influence Area, is between SR 500 in Washington State and Columbia Boulevard in Oregon. Figure 2-1 generally shows the Bridge Influence Area depicted in red.

Over the last two decades, heavy traffic congestion has resulted from growth in regional population and employment, and in interstate commerce. The existing I-5 crossing provides three lanes of capacity in each direction with a combined one-way capacity of about 5,500 vehicles per hour. This is less than the same number of lanes would accommodate if built to current standards due to narrow lanes, no shoulders, and closely spaced interchanges. During peak periods, travel demand currently exceeds that capacity. The overcapacity conditions are aggravated by substandard design and safety problems which aggravate vehicle merges, traffic accidents, and vehicle breakdowns. Although the lift span of the I-5 bridge is only used in off-peak periods, it affects travel reliability across the river and creates extensive traffic delays. The span is opened 20 to 30 times a month, with the greatest number of lifts occurring during the winter when water levels are at their highest. Each lift takes approximately 10 minutes, which creates traffic delays that can last up to an hour and can extend into the peak period.

Figure 2-1. CRC Bridge Influence Area

In 1998, the Washington and Oregon Departments of Transportation (WSDOT and ODOT) formed a bi-state partnership to study transportation problems and possible solutions over a large stretch of the I-5 corridor from the Portland metropolitan area through southern Clark County, Washington. The studies showed that the highest congestion and the most unmet demand occur where I-5 crosses the Columbia River. The recommendations included adding more capacity over the Columbia River with a replacement or supplemental bridge and considering HCT improvements.

In January 2000, a 28-member bi-state committee appointed by the Governors of Oregon and Washington began the I-5 Transportation and Trade Partnership Task Force. The Task Force worked with the public and one another to determine what improvements to I-5 should be studied. The study resulted in a variety of corridor-wide improvement and traffic management recommendations which were drafted in January 2002. The final strategic plan in June 2002 called for improvements including new transit and vehicle capacity across the Columbia River in the I-5 Trade Corridor with more highway lanes at the crossing and with light rail transit across the river. These recommendations were subsequently handed over to the CRC project, which is conducting the National Environmental Policy Act (NEPA) process and eventual implementation, for more analysis.

2.1.1 Transit Problem Definition

For transit, the CRC Problem Definition has identified that the I-5 bridge is a critical bi-state transit link for transit patrons traveling between Vancouver and Portland. Bi-state transit service includes local fixed-route bus service between central Portland and downtown Vancouver, (using the I-5 bridge), commuter-oriented peak period express routes from Clark County Park and Ride lots, and transit centers to central Portland on both I-5 and I-205, and I-205 shuttle service between Fisher's Landing Transit Center and the Parkrose Transit Center.

Current congestion in the I-5 bridge Influence Area has an adverse impact on travel speed and service reliability. Between 1998 and 2005, local bus travel times between the Vancouver Transit Center and Hayden Island increased 50 percent during the peak period. Local buses crossing the I-5 bridge in the southbound direction currently take up to three times longer during parts of the morning peak period compared to off-peak periods. On average, local bus travel times are between 10 percent and 60 percent longer when traveling in the peak period direction.

Commuter buses also experience congestion and incident-related delays. Commuter buses traveling southbound during the morning peak period have travel times between 45 percent and 115 percent longer than commuter buses traveling during off-peak periods. Commuter buses traveling northbound during the afternoon peak period have the advantage of using the northbound High Occupancy Vehicle (HOV) lane. However, these buses still experience travel times between 35 percent and 60 percent longer than commuter buses traveling during the off-peak periods.

2.1.2 Columbia River Crossing Project's Purpose and Need

The following is the I-5 CRC Project's Statement of Purpose and Need.

Project Purpose

The purpose of the proposed action is to improve I-5 corridor mobility by addressing present and future travel demand and mobility needs in the Columbia River Crossing Bridge Influence Area. The Bridge Influence Area extends from approximately Columbia Boulevard in the south to SR 500 in the north. Relative to the No-Build Alternative, the proposed action is intended to achieve the following objectives: a) improve travel safety and traffic operations on the I-5 crossing's bridges and associated interchanges; b) improve connectivity, reliability, travel times, and operations of public transportation modal alternatives in the Bridge Influence Area; c) improve highway freight mobility and address interstate travel and commerce needs in the Bridge Influence Area; and d) improve the I-5 river crossing's structural integrity.

Project Need

The specific needs to be addressed by the proposed action include:

- **Growing Travel Demand and Congestion:** Existing travel demand exceeds capacity in the I-5 Columbia River Crossing and associated interchanges. This corridor experiences heavy congestion and delay lasting two to five hours during both the morning and afternoon peak travel periods and when traffic accidents, vehicle breakdowns, or bridge-lifts occur. Due to excess travel demand and congestion in the I-5 bridge corridor, many trips take the longer alternative I-205 route across the river. Spillover traffic from I-5 onto parallel arterials such as Martin Luther King Boulevard and Interstate Avenue increases local congestion. The two crossings currently carry over 260,000 trips across the Columbia River daily. Daily traffic demand over the I-5 crossing is projected to increase by 40 percent during the next 20 years, with stop-and-go conditions increasing to at least 10 to 12 hours each day if no improvements are made.

- **Impaired Freight Movement:** I-5 is part of the National Truck Network, and the most important freight highway on the West Coast linking international, national, and regional markets in Canada, Mexico, and the Pacific Rim with destinations throughout the western United States. In the center of the project area, I-5 intersects with the Columbia River's deep water shipping and barging as well as two river-level, transcontinental rail lines. The I-5 crossing provides direct and important highway connection to the Port of Vancouver and Port of Portland facilities located on the Columbia River as well as the majority of the area's freight consolidation facilities and distribution terminals. Freight volumes moved by truck to and from the area are projected to more than double over the next 25 years. Vehicle-hours of delay on truck routes in the Portland-Vancouver area are projected to increase by more than 90 percent over the next 20 years. Growing demand and congestion will result in increasing delay, costs, and uncertainty for all businesses that rely on this corridor for freight movement.
- **Limited Public Transportation Operation, Connectivity, and Reliability:** Due to limited public transportation options, a number of transportation markets are not well served. The key transit markets include trips between the Portland Central City and the City of Vancouver and Clark County, trips between North/Northeast Portland and the City of Vancouver and Clark County, and trips connecting the City of Vancouver and Clark County with the regional transit system in Oregon. Current congestion in the corridor adversely impacts public transportation service reliability and travel speed. Southbound bus travel times across the bridge are currently up to three times longer during parts of the AM peak compared to off-peak. Travel times for public transit using general purpose lanes on I-5 in the Bridge Influence Area are expected to increase substantially by 2030.
- **Safety and Vulnerability to Incidents:** The I-5 river crossing and its approach-sections experience crash rates nearly 2.5 times higher than statewide averages for comparable facilities. Incident evaluations generally attribute these crashes to traffic congestion and weaving movements associated with closely spaced interchanges. Without breakdown lanes or shoulders, even minor traffic accidents or stalls cause severe delay or more serious accidents.
- **Substandard Bicycle and Pedestrian Facilities:** The bike/pedestrian lanes on the I-5 Columbia River bridges are six to eight feet wide, narrower than the 10-foot standard, and are located extremely close to traffic lanes thus impacting safety for pedestrians and bicyclists. Direct pedestrian and bicycle connectivity are poor in the Bridge Influence Area.

- **Seismic Vulnerability:** The existing I-5 bridges are located in a seismically active zone. They do not meet current seismic standards and are vulnerable to failure in an earthquake.

2.2 Corridor Description

The following section describes the CRC project corridor. This includes three analysis areas, the transit agencies and transit capital facilites that are located within the study area.

2.2.1 Analysis Areas

Based on the previous work completed by the I-5 Partnership, the CRC project focuses on the Bridge Influence Area. Operation of the I-5 crossing over the Columbia River is directly influenced by the Bridge Influence Area. This segment of I-5 includes eight interchanges, including connections with four state highways (SR 14, SR 500, and SR 501 in Washington and OR 99E in Oregon) and several major arterial roadways (that serve a variety of land uses), and provides access to downtown Vancouver, two international ports, industrial centers, residential neighborhoods, retail centers, and recreation areas. The Bridge Influence Area is where transit capital improvements may occur.

The corridor area, shown in Figure 2-2, is larger than the Bridge Influence Area. The corridor area is the area where improvements to transit operations may occur. This area is also intended to identify potential transportation impacts and mitigation immediately upstream and downstream of the five-mile Bridge Influence Area. In addition, a regional study area encompasses a sub-area of the four-county Portland-Vancouver metropolitan area. This is the area where improvements to the larger regional transit system may occur.

Figure 2-2 illustrates the three analysis areas with the definitions as follows.

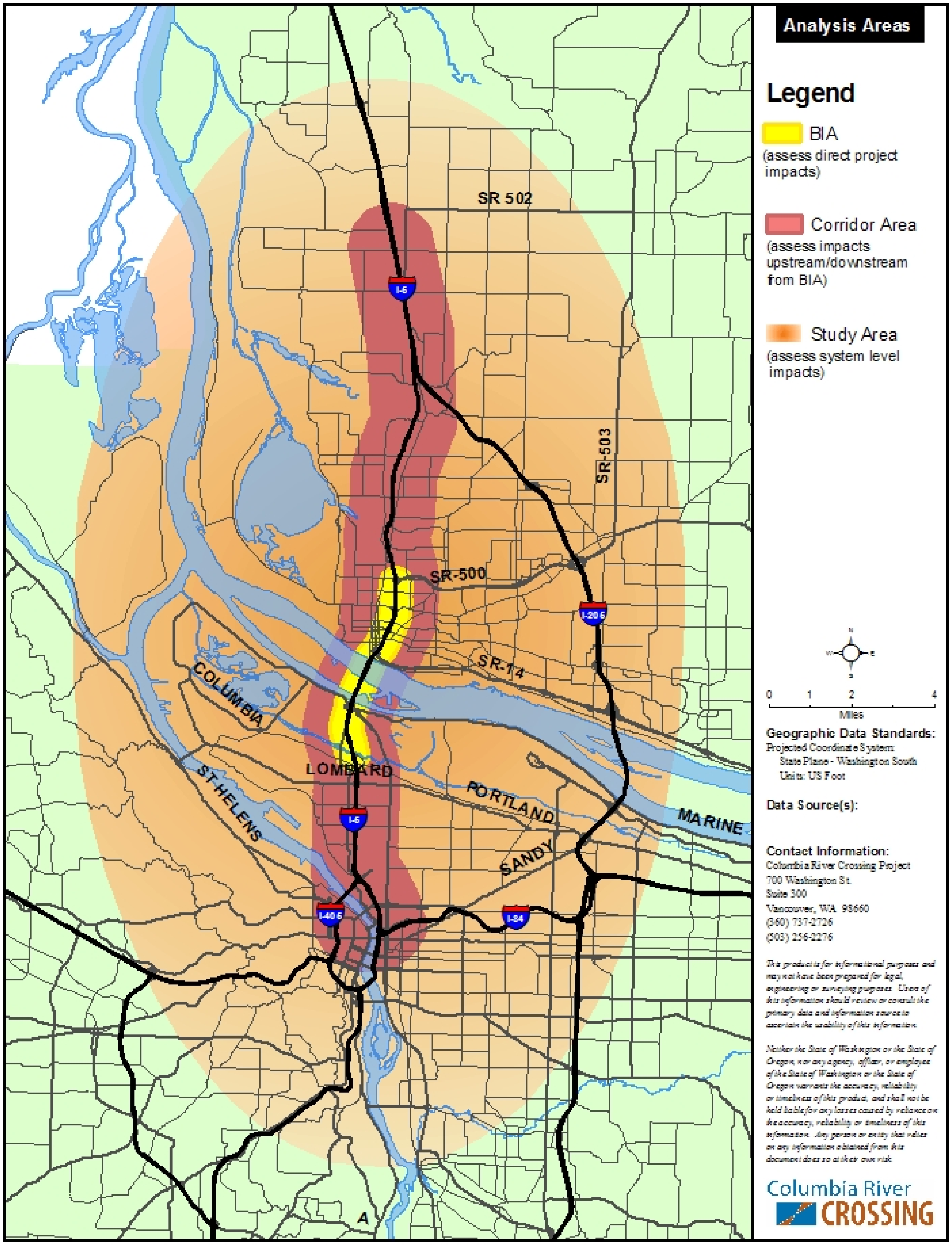
- **Bridge Influence Area:** An area approximately 1,000 feet east and west of I-5 and its ramp terminals, from immediately north of the SR 500 interchange to immediately south of the Columbia Boulevard interchange.
- **Corridor Area:** The corridor area is over 15 miles long, runs from a point approximately 1 mile north of the I-5/I-205 interchange all the way south to the I-5/I-84 interchange. It also extends approximately 1 mile on both the east and west sides of the I-5 right-of-way.
- **Study Area:** A sub-area of the four-county region that extends east of I-205.

2.2.2 Existing Transit Network

For the CRC project, the year 2005 serves as the base year for existing conditions. Table 2-1 summarizes the 2005 transit operating characteristics for TriMet and C-TRAN.

The I-5 bridge is a critical bi-state link for transit service between Vancouver and Portland. Transit service within the region is provided by two agencies: TriMet in Oregon and C-TRAN in Clark County. Existing bi-state transit service includes local fixed-route bus service between downtown Portland and downtown Vancouver and commuter-oriented peak period express routes from Clark County Park and Ride lots and transit centers to central Portland or to light rail stations in Portland.

Figure 2-2. Columbia River Crossing Analysis Areas



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TriMet's network consists of a 44-mile, 64-station, regional light-rail system with 105 light rail vehicles (LRVs). All LRV maintenance and repairs are carried out in two facilities — Ruby Junction on the east side of TriMet's service area and Elmonica on the west side. TriMet also operates a total of 641 buses grouped into 18 fleets on 93 bus lines, paratransit service for seniors and people with disabilities, and facilities with advanced amenities and passenger information. TriMet's buses are assigned to one of three garages — Center Street or Powell Garage on the east side or Merlo Garage on the west side — where they are serviced and receive maintenance. TriMet operates one bi-state bus route (Line 6) to downtown Vancouver via North Portland and Hayden Island (C-TRAN will take over the bi-state portion of the Line 6 before the end of 2007). TriMet also owns and operates the 5.8-mile Interstate MAX Yellow Line, which operates through North Portland and includes 10 stations between the Rose Quarter and its terminus at the Expo Center light rail station, approximately two miles south of downtown Vancouver. In 2005, according to data from the National Transit Database, for its fixed route bus and light-rail service, TriMet operated 2,727,571 annual revenue hours (1,873,568 fixed route bus, 438,290 paratransit and 415,713 light rail).

C-TRAN operates a fleet of 130 bus vehicles, with 26 total bus routes (17 local routes and nine commuter/express routes). Maintenance for C-TRAN's fleet occurs at the Administration Operations and Maintenance (AOM) Building in Vancouver. In the existing conditions transit network, the bi-state service provided by C-TRAN consists of five peak-period express routes (routes 105, 114, 134, 157, and 190) in the I-5 corridor and three peak-period express routes in the I-205 corridor (routes 164, 177, and 183). C-TRAN also operates an all-day shuttle between the Fisher's Landing Transit Center and the Parkrose Transit Center (Route 165). In 2005, according to data from the National Transit Database, C-TRAN logged approximately 303,195 annual revenue hours (231,191 fixed route bus; 72,004 paratransit).

Table 2-1. Summary of 2005 Transit Operating Characteristics

CHARACTERISTIC		TRIMET	C-TRAN
Vehicles	**Fixed Route Bus**	641	130
	LRV	105 LRVs	N/A
Annual Revenue Hours	**Fixed Route Bus**	1,873,568*	231,191*
	LRT	415,713*	N/A
maintenance Facilities	**Buses**	3	1
	LRT	2	N/A

**Source: 2005 National Transit Database*

Table 2-2 provides the frequency of the 2005 TriMet and C-TRAN bus routes that operate within the Bridge Influence Area during the weekdays and on the weekend.

Table 2-2. Frequency of 2005 Bi-State Bus Service within the Bridge Influence Area

ROUTE		FREQUENCY		
		WEEKDAY		WEEKEND
		Peak Period	**Off-Peak Period**	
TriMet	**6**	15 minutes	15 minutes	15 minutes
C-TRAN	**105**	15 – 20 minutes	60 minutes	N/A
	114	60 minutes	0	N/A
	134	10 – 15 minutes	0	N/A
	157	30 – 60 minutes	0	N/A
	190	30 minutes	0	N/A

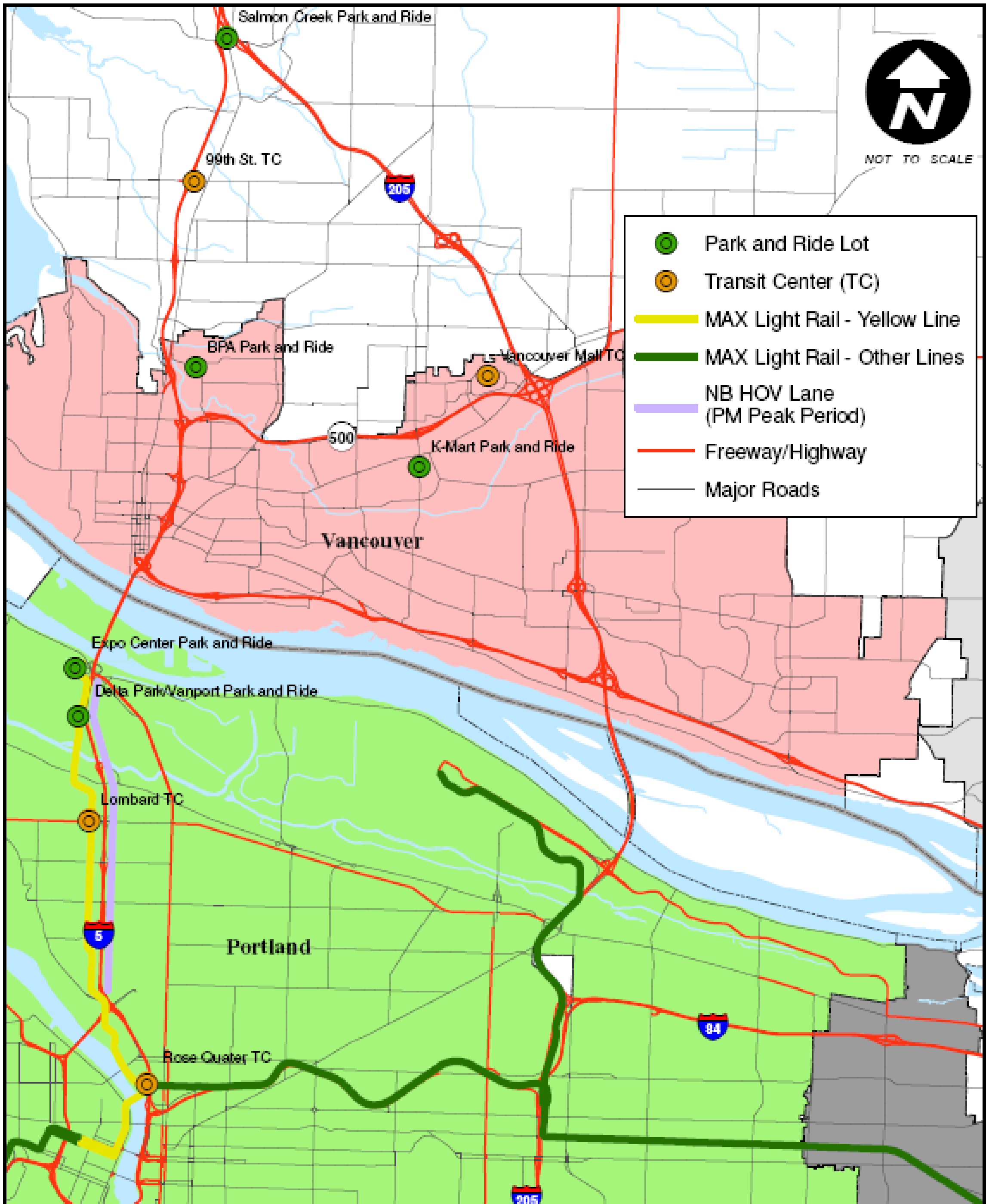
Table 2-3 lists the existing transit capital facilities within the CRC Study Area used for bi-state trips between Clark County and Portland. Figure 2-3 shows the locations of these facilities. Within the CRC Study Area there are currently three transit centers in Clark County and four transit centers in the Portland area that are used by people traveling between Clark County and central Portland. The Seventh Street Transit Center in downtown Vancouver has been relocated to 99th Street west of I-5. With the relocation, bus service still continues throughout downtown Vancouver, but layovers and other operational functions have moved to the new transit center located at 99th Street. In North Portland, the Lombard Transit Center is located at the intersection of Lombard Avenue and Interstate Avenue and is the main location for bus-light rail and bus-bus transfer activities.

Within the CRC Study Area, there are six Park and Ride lots in Clark County and two Park and Ride lots in Portland (within the I-5 corridor) that are used by people traveling between Clark County and central Portland. The total number of parking spaces at these Park and Ride lots, and including spaces provided at transit centers, is 3,484. Of these spaces, 1,875 are located within the I-5 corridor, 1,268 are located within three Park and Ride lots in Clark County (Salmon Creek, 99th Street, and BPA/Ross), and 607 are located at TriMet's Expo Center light rail station and the Delta Park/Vanport Interstate MAX light rail stations in North Portland.

Table 2-3. 2007 Transit Capital Facilities used for Bi-State Travel between Clark County and Portland

STATE	FACILITY NAME	LOCATION	TRANSIT CENTER	PARKING SPACES
Washington	99th Street Transit Center	99th Street and NE Seventh Ave	√	600
	Vancouver Mall Transit Center	NE Vancouver Mall Dr	√	N/A
	Fisher's Landing Transit Center	SE 34th St and SE 164th Ave	√	566
	Battle Ground Park and Ride	E Main St and NE Fairground Ave		20
	Salmon Creek Park and Ride	Adjacent to I-5 at NE 139th Street		493
	BPA/Ross Park and Ride	NE Ross and NE 15th Street		175
	K-Mart Park and Ride	Andresen and 25th St		100
	Evergreen Park and Ride	NE 138th Ave and NE 18th St		269
	Washougal Park and Ride	Second St and C St		20
Oregon	Expo Center Park and Ride	2060 N Marine Drive		300
	Delta Park/Vanport Park and Ride	1904 Victory Boulevard		304
	Lombard Transit Center	Lombard and Interstate Ave	√	N/A
	Rose Quarter Transit Center	Interstate and Holladay	√	N/A
	Parkrose Transit Center	NE Sandy Blvd and 95th	√	193
	Gateway Transit Center	NE 99th St and Pacific	√	444
			Total Spaces	**3,484**

Figure 2-3. 2005 Transit Facilities used for I-5 Corridor Bi-State Travel between Clark County and Portland



Analysis by J. Koloszar; Analysis Date: 05-Apr-2007; Plot Date: 05-Apr-2007; File Name: LKR_005.mxd

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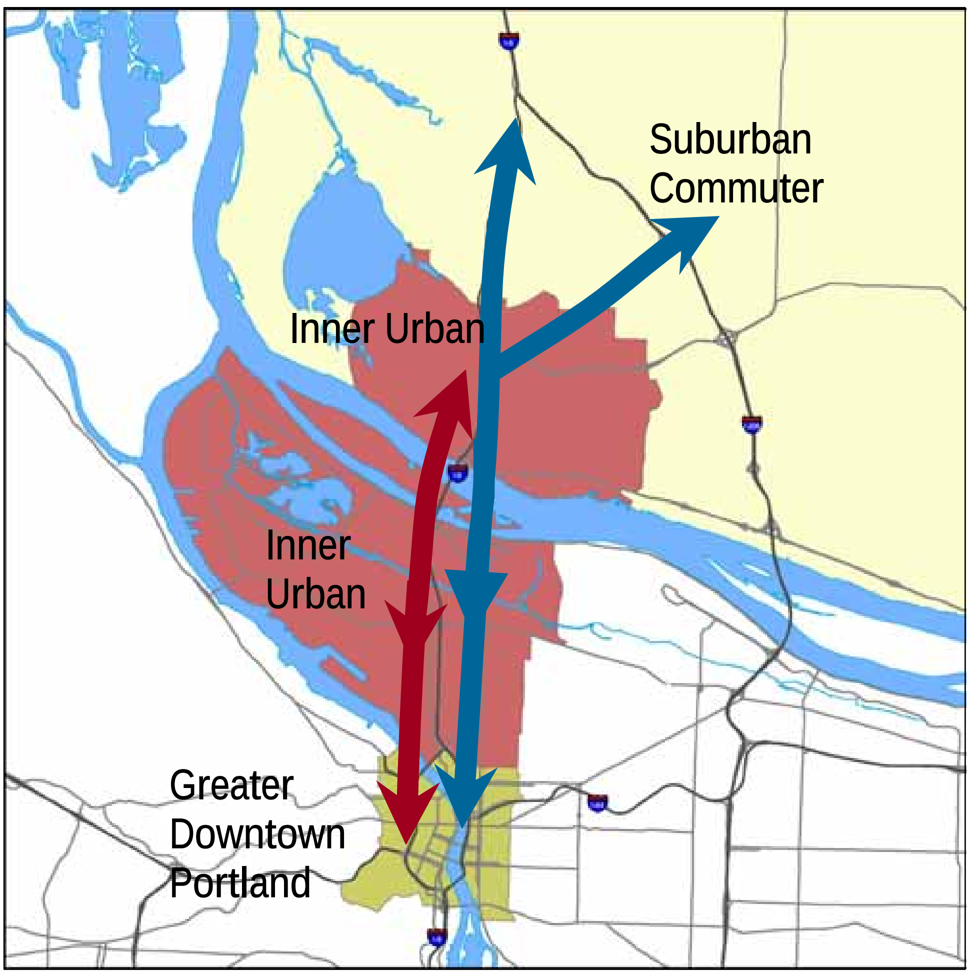
2.3 2006 and 2030 Transit Travel Markets

The 2006 transit travel market analysis was supported by field observations and passenger counts on the existing C-TRAN and TriMet service networks. For the 2030 transit travel markets, modeling forecasts have been prepared and the trip origin and destination patterns between 15 districts (seven districts in Washington State and eight in Oregon) within the regional study area have been analyzed. Generally, today and with future land use forecasts, Clark County consists of more housing than jobs, which results in bi-state commuting to employment in Portland across the Columbia River. From the 2006 field observations and the 2030 forecasts, two key transit markets (shown in Figure 2-4) have been identified for bi-state travel across the Columbia River:

- **Inner Urban Market**: Local and intermediate distance trips between downtown Vancouver and downtown Portland, with destinations in those locations and in North Portland, Delta Park, Rivergate, Hayden Island, and the inner urban areas in and around downtown Vancouver.
- **Suburban Commuter Market**: Long distance trips from Salmon Creek, East Clark County, and Outer Clark County to destinations in the inner urban market as well as downtown Portland.

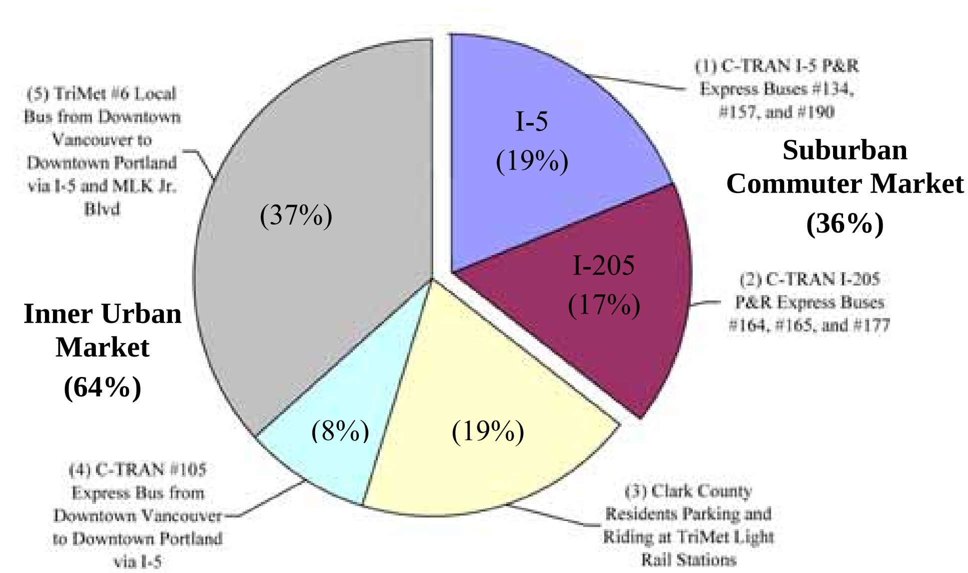
Figure 2-4. CRC Transit Travel Markets



The inner urban market consists of people making trips between downtown Vancouver, Fort Vancouver, SR 500, and West Vancouver (Hazel Dell) to intermediate destinations in Oregon, such as Hayden Island, Delta Park, Rivergate, North Portland, and downtown Portland, an average trip length of fewer than eight miles. The inner urban market is composed of workers, students, shoppers, homemakers, and retired persons, with trip purposes including work, school, medical appointments, and shopping. Travel for this market occurs throughout the day and is strongly bi-directional. Most of the inner urban trips are time-sensitive making reliability and on-time arrival important transit attributes. The suburban commuter market consists of workers traveling from Salmon Creek, east Clark County, and outer Clark County to downtown Portland, an average trip length of 14 miles. For the suburban commuter market the vast majority of trips are for work (which is a time sensitive trip) and occur during the AM and PM peak periods.

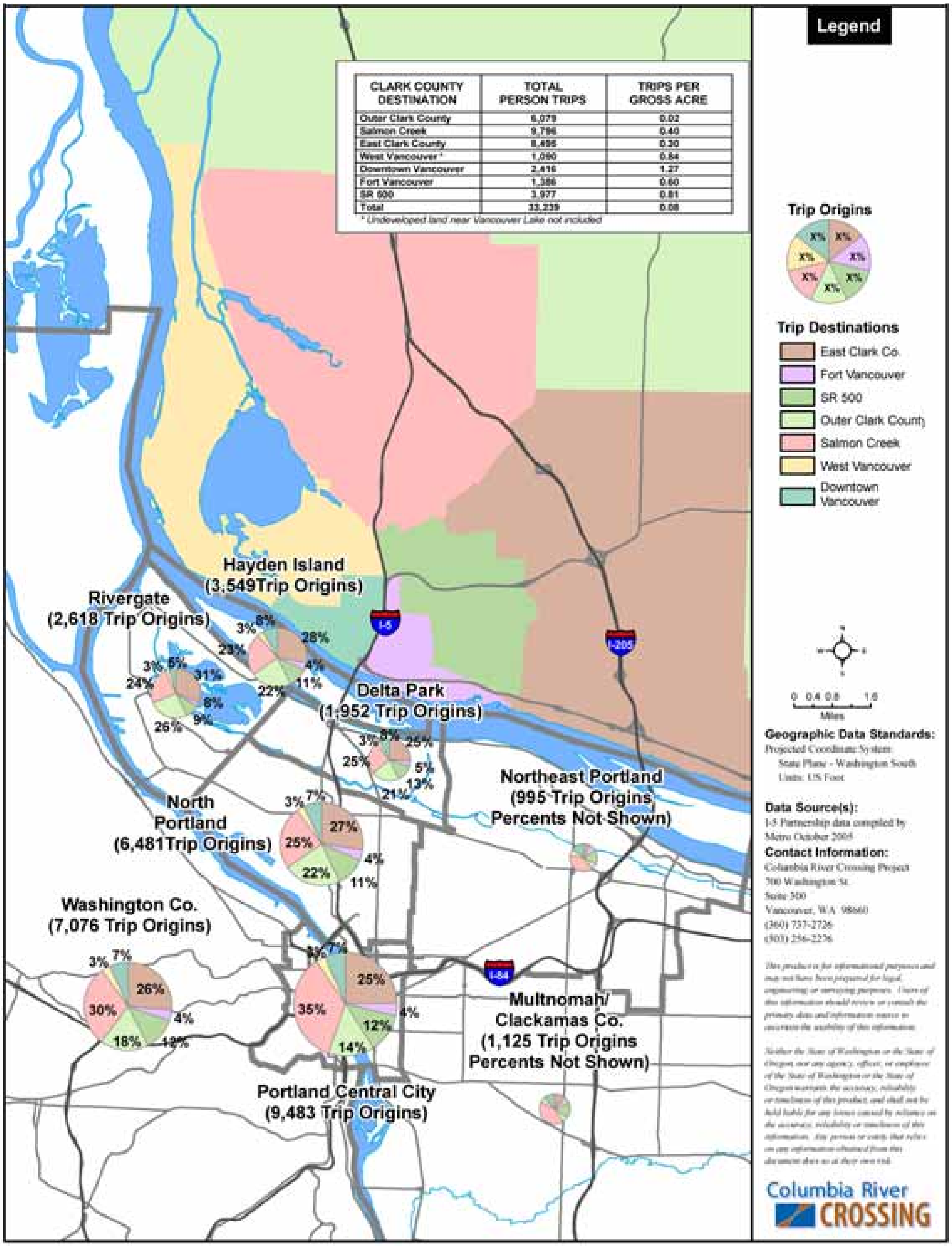
Figure 2-5 shows the observed composition of the 2006 daily transit trips from the *CRC Transit Rider Survey*. This figure shows that the inner urban transit market is 64 percent of today's bi-state transit patronage. It consists of passengers riding on TriMet's Route 6 (which would be replaced by C-TRAN's 4 and 4X in the 2007 Service Redesign), C-TRAN's Route 105 and Clark County residents parking and riding at Interstate MAX light-rail stations. The suburban commuter transit market constitutes the remaining 36 percent of the total transit travel market. It consists of passengers riding on C-TRAN's express bus routes.

Figure 2-5. 2005-06 Bi-State 24-hour Average Daily Transit Trips (Bi-Directional)



For the year 2030, Figure 2-6 shows the origins and destinations of PM peak period person-trips from Oregon to Clark County that use the I-5 bridge. In 2030, 72 percent of all PM peak period person-trips that cross the I-5 bridge are travel between the Portland inner urban market, from Hayden Island, Rivergate, North Portland, Delta Park and downtown Portland to the seven districts shown in Clark County. The remaining 28 percent of trips to Clark County in the PM are from other destinations in Multnomah County, Washington County, or Clackamas County.

Figure 2-6. 2030 PM Peak Period Person-Trips using the I-5 Bridge



CLARK COUNTY DESTINATION	TOTAL PERSON TRIPS	TRIPS PER GROSS ACRE
Outer Clark County	6,079	0.02
Salmon Creek	9,796	0.40
East Clark County	8,496	0.30
West Vancouver *	1,090	0.84
Downtown Vancouver	2,416	1.27
Fort Vancouver	1,386	0.60
SR 500	3,977	0.81
Total	33,239	0.08

* Undeveloped land near Vancouver Lake not included

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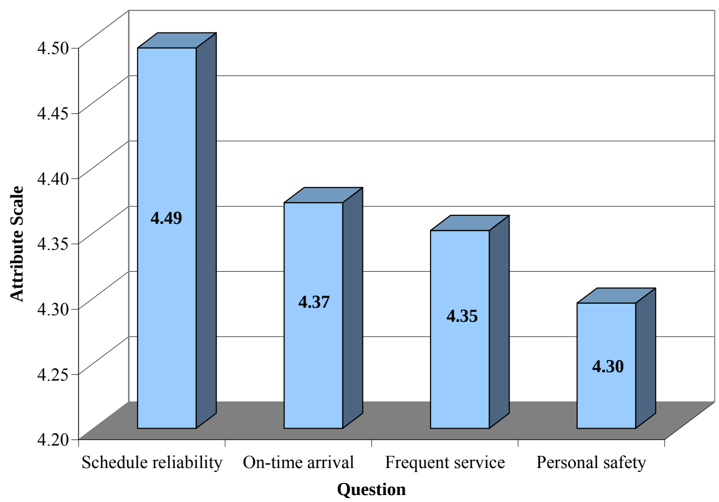
To determine what transit attributes are important to these markets, existing riders on TriMet's Route 6 and on C-TRAN's Route 105 were surveyed by the CRC project in October 2006. The survey asked riders to rate the relative importance of different public transit attributes, such as schedule reliability and having to transfer during their trip on a scale of 1 to 5, with 5 being the most important. The top four answers of nearly 860 persons surveyed are depicted in Figure 2-7. Schedule reliability tops the most important list, followed by on time arrival at destination, frequent service, and personal safety.

Figure 2-7. Top Four Transit Attributes for Existing Riders on TriMet's Route 6 and C-TRAN's Route 105



The complete list of transit attributes on the passenger survey included: 1) schedule reliability, 2) on-time arrival at destination, 3) frequent service, 4) personal safety on the train/bus and at stations/stops, 5) express service – limited stops after boarding, 6) short ride time, 7) do not need to transfer to new bus/train, 8) saves money on parking, 9) don't have to drive in traffic, 10) stops close to my job, 11) avoids traffic jams due to bridge lifts and traffic accidents, 12) better for the environment, 13) cost of driving a car, 14) having a seat on the bus/train, 15) short transfer times between buses/trains, and 16) no transfers to destination.

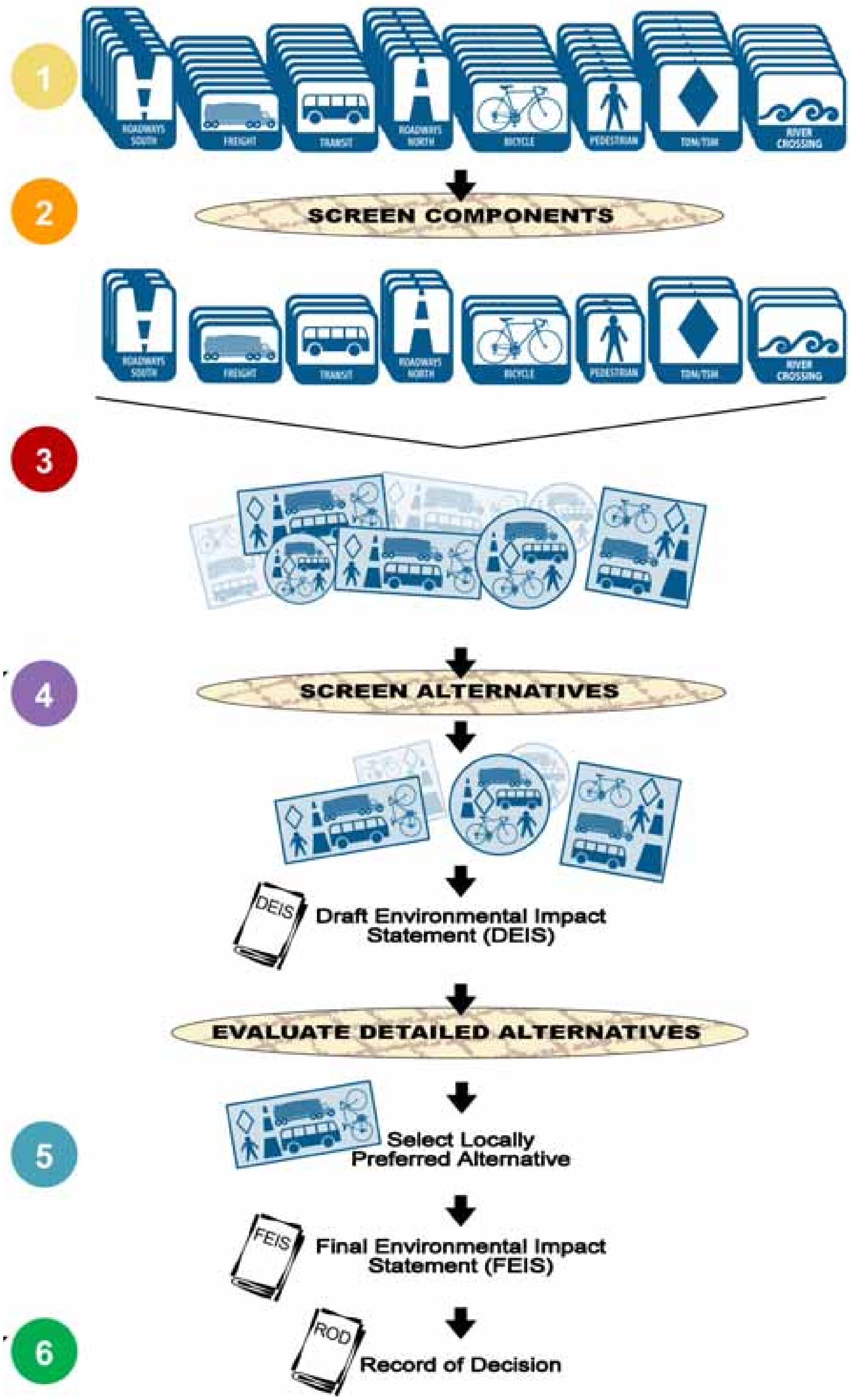
2.4 Development of the Transit Alternatives

In February 2006 the CRC Task Force, composed of 39 leaders from both Washington and Oregon, adopted the CRC *Screening and Evaluation Framework* that established a six-step formal process for screening a list of more than 75 transportation components (for transit, the river crossing, treatments for roadways north and south, freight and Transportation System/ Demand Management (TSM/TDM)), 12 multimodal alternative packages, and the DEIS Alternatives. In general, the framework establishes screening criteria and performance measures to evaluate the effectiveness in addressing:

- The I-5 Columbia River Crossing Project's Statement of Purpose and Need;
- Problems identified in the project's Problem Definition; and
- Values identified in the Task Force's Vision and Values Statement.

See Figure 2-8 for a diagram of the complete six step CRC evaluation framework. In addition to the formal evaluation process outlined in Figure 2-8, extensive public outreach is being conducted throughout the project.

Figure 2-8. Six Step CRC Evaluation Framework



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Step One

In step one, 14 transit components (including transit modes, such as Ferry Service, Heavy Rail, LRT, and BRT) and 23 river crossing components were identified as the range of alternatives for the project.

Step Two

In step two these components were screened against up to six pass/fail questions derived from the CRC problem definition. In their public hearings in May and June of 2006 the CRC Task Force completed step two of the evaluation framework and narrowed the range of river crossing components to three and the transit components to five. The three river crossing components were:

- Supplemental arterial bridge;
- Supplemental highway bridge; and
- Replacement highway bridge.

The five transit components were:

- Express buses in general purpose lanes;
- Express buses in managed lanes;
- LRT;
- BRT; and
- BRT-Lite (which did not include an exclusive transit guideway).

Step Three

In step three, the transit and river crossing components remaining after the step two screening process were packaged into 12 alternatives. The packaged alternatives also included designs for bicycle and pedestrian facilities, freight facilities, land use and TSM/TDM measures. For more detailed information on the 12 alternative packages and the results of the screening and evaluation process see the *Development of the Range of Alternatives Memorandum* dated June 8, 2007.

The 12 alternative packages were:

1. No-Build;
2. TSM/TDM (this package involved no new river crossings or bridge improvements but offered more aggressive TSM and TDM measures);
3. New Supplemental Arterial Bridge with LRT;
4. Supplemental Bridge for I-5 with LRT on the Existing Bridge;
5. Supplemental Bridge for I-5 with BRT on the Existing Bridge;

6. Supplemental Bridge for I-5 with BRT-Lite on the Existing Bridge;
7. Supplemental Bridge for I-5 with Express Bus;
8. Replacement Bridge for I-5 with LRT and Express Bus;
9. Replacement Bridge for I-5 with LRT;
10. Replacement Bridge for I-5 with BRT;
11. Replacement Bridge for I-5 with BRT-Lite; and
12. Replacement Bridge for I-5 with Express Bus.

Step Four

Using the adopted evaluation framework the 12 alternative packages were evaluated to see how they affected the following values:

- Community livability and human resources;
- The stewardship of natural resources;
- The distribution of benefits and impacts;
- Growth management and land use;
- Mobility, reliability, accessibility, congestion reduction, and efficiency;
- Safety; and
- Cost effectiveness.

Generally, it was found that while the No-Build and the TSM/TDM alternative packages would have little or no affect on values such as the stewardship of natural resources, they would not address values such as mobility, reliability, accessibility, congestion reduction and efficiency, or safety. The No-Build and the TSM/TDM alternative packages were found to have the highest hours of daily congestion, would have only a minor improvement in the person throughput from the existing conditions and would have the highest travel times of the 12 alternative packages. In addition, the No-Build and the TSM/TDM alternative packages would not address safety issues within the Bridge Influence Area and over the Columbia River. For example, they would not include seismically retrofitting the existing bridges, which would leave an important regional life line vulnerable to an earthquake event.

The alternative package with a supplemental arterial bridge was found to somewhat improve issues of mobility and congestion reduction for vehicles, and alternative packages with a supplemental bridge for I-5 further improved vehicular mobility and congestion reduction. However, the additional piers in the river would have a negative effect on marine navigation and would have a greater impact on the Columbia River's natural resources. The alternative packages with a supplemental bridge were also found to have a larger construction footprint, which would result in more impacts to community livability and human resources. In addition, a supplemental bridge for I-5 would have a higher capital cost than a supplemental arterial bridge.

Alternative packages with a replacement bridge for I-5 would have the most benefits on values such as mobility and safety. Negative impacts of a replacement bridge on values, such as stewardship of natural resources and community livability, would be less than the packages with a supplemental bridge. Therefore, CRC staff recommended a replacement bridge for I-5 over the Columbia River.

In particular, the transit components of these alternative packages were evaluated for how well each could reduce congestion on I-5, meet current and forecasted transit demand for the year 2030, and address the public transit issues identified in the CRC project's Purpose and Need statement, which are:

- Markets;
- Reliability;
- Operations; and
- Connectivity.

During the step four evaluation, extensive data gathering of the existing conditions, public review, a survey of existing passengers, and travel demand forecasting conducted by the CRC project staff determined that the diversity of transit needs in the project area and the Vancouver-Portland metropolitan area cannot be served by one form of transit alone. Therefore, to effectively serve current and forecasted travel demand in the year 2030, and in and beyond the Bridge Influence Area, the CRC project staff recommended two transit alternatives with a combination of two components: 1) Express Bus service combined with BRT, and 2) Express Bus service combined with LRT. When combined, the HCT mode of BRT or LRT would improve service to the inner urban market and serve the suburban commuter market, while the express bus service would continue to serve the suburban commuter market; preserving the direct service currently provided to and from Clark County to central Portland during morning and evening peak commute hours.

In January 2007, staff launched an intensive public involvement campaign to present the results of the screening analysis and receive comments on the recommendation. The public generally agreed with the recommendations but some felt they did not include a wide enough range of options. At the February 2007 CRC Task Force meeting, the No-Build, BRT, and LRT Alternatives were approved for DEIS analysis and a subcommittee was formed to explore how the existing I-5 bridges could be reused and still meet the goals of this project. The subcommittee found that the best option for reusing the existing bridges is to place northbound I-5 traffic, and bicycles and pedestrians, on the existing bridges and include HCT and southbound I-5 traffic on a new supplemental crossing.

In March 2007 the CRC Task Force adopted two additional BRT and LRT Alternatives for DEIS analysis in conjunction with the three original Alternatives. Compared to the initially approved BRT and LRT alternatives, the two additional BRT and LRT alternatives were created with much higher levels of transit service at the urging of some Task Force Members. The terms "Efficient" and "Increased" refer to the level of transit service provided with each build alternative. The Efficient alternatives are Alternatives 2 and 3; in most instances, they are not referred to as the Efficient Alternatives except when making a direct comparison of the level of service (as is done in the *Transit Technical Report February 2008*). The Increased alternatives are Alternatives 4 and 5; these alternatives include more TSM/TDM measures, higher tolls, and more frequent HCT, local and express bus service (for more information, please refer to Appendix F).

The transit alternatives considered in the CRC DEIS are:

- **Alternative 1** – No-Build
- **Alternative 2** – Replacement Bridge and BRT with Express Bus Service
- **Alternative 3** – Replacement Bridge and LRT with Express Bus Service
- **Alternative 4** – Supplemental Bridge and BRT with Express Bus Service and an Increased Level of Transit Service
- **Alternative 5** – Supplemental Bridge and LRT with Express Bus Service and an Increased Level of Transit Service

Step Five and Six

In step five, based upon the DEIS analysis, and with involvement from the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA), the Locally Preferred Alternative (LPA) will be selected. FTA's approval to undertake Preliminary Engineering (PE) will be sought after the LPA is selected. In step six the project's record of decision will be created.

2.4.1 Transit Alternatives Defined

The following sections provide a brief summary of the transit alternatives that were recommended to be carried forward into the DEIS based on the lessons learned from work, including forecasting, that was done in step four prior to December 2006. The transit alternatives described in Section 4 of this report have been further defined and optimized from the following descriptions.

2.4.1.1 Alternative 1: No-Build

Under NEPA, one of the alternatives considered must be a No-Build Alternative. Although this alternative does not meet the project's Purpose and Need, it establishes a point of comparison with other alternatives. This alternative would only include existing facilities and projects that can be reasonably anticipated for funding and construction in the Metro and Southwest Washington regional transportation plans.

2.4.1.2 Alternative 2: Bus Rapid Transit with Express Bus Service

The following is a brief summary of the findings from the work done in step four prior to December 2006 and a description of Alternative 2 that was recommended to be carried forward into the DEIS. Alternative 2 described in Section 4 of this report has been further defined and optimized.

Prior to the step four screening, Alternative 2 was proposed to travel to the Expo Center light rail station in an exclusive guideway and then continue south to downtown Portland on I-5 general purpose lanes. Due to travel delays south of Delta Park, Alternative 2 that was recommended to be carried forward would connect directly to the Interstate MAX line at the Expo Center light rail station and avoid traveling further on I-5 south.

Alternative 2 would provide fast and frequent service connecting Hayden Island and downtown Vancouver directly to the existing TriMet Interstate MAX Yellow Line at the Expo Center light rail station. BRT would significantly increase transit use while reducing the number of buses subject to congestion downstream of the Bridge Influence Area. Optimized Alternative 2 would take advantage of the existing Interstate MAX light rail line instead of traveling on I-5 to and from downtown Portland during morning and evening peak commute hours. The BRT guideway would be used by both BRT lines and local buses with a high percentage of bi-state passengers. Optimized Alternative 2 would address the four transit issues identified in the CRC project's Purpose and Need by being part of an integrated transit system that connects transit users on both sides of the Columbia River.

Alternative 2 would improve service in the inner urban market and serve the suburban commuter market, and the express bus service would maintain the existing connection to the suburban commuter market directly to central Portland. Because BRT would work in conjunction with the existing transit system on both sides of the river, it would provide for an HCT alternative at a lower capital cost but at a higher operating cost (when compared to light rail).

The following are the lessons learned from the work done in step four prior to December 2006, such as the development and analysis of transit modes, alignments, operations and includes some preliminary modeling work.

Lessons Learned

- Operating BRT to downtown Portland on I-5 general purpose lanes would have higher operational costs than other alternatives.
- Operating BRT to downtown Portland on I-5 general purpose lanes would have less travel time reliability than alternatives that use the existing Interstate MAX Yellow Line due to congestion on I-5 downstream of the Bridge Influence Area.

- Operating in an exclusive guideway to the Expo Center light rail station and avoiding travel on I-5 south of the Expo Center station would help manage congestion on I-5 general purpose lanes.
- In lieu of operating BRT to downtown Portland, the optimized BRT alternative should travel in an exclusive guideway and connect to the Interstate MAX Yellow Line.

2.4.1.3 Alternative 3: Light Rail Transit with Express Bus Service

The following is a brief summary of the findings from the work done in step four prior to December 2006 and a description of Alternative 3 that was recommended to be carried forward into the DEIS. Alternative 3 described in Section 4 of this report has been further defined and optimized.

Alternative 2 would be an extension of TriMet's Yellow Line MAX service from the Expo Center light rail station to Hayden Island and across the Columbia River to Vancouver. This alternative takes advantage of the existing TriMet light rail infrastructure already built and operating. Because LRT would operate in an exclusive guideway, separate from vehicle traffic, transit reliability and consistency would be ensured, while also helping to reduce conflicts and congestion on I-5 general purpose lanes. Alternative 2 would improve service in the inner urban market and serve the suburban commuter market, and the express bus service would maintain the existing connection to the suburban commuter market directly to central Portland. Extending the existing LRT system would have a comparatively high capital cost but a lower operating cost per passenger than other alternatives considered.

The following are the lessons learned from the work done in step four prior to December 2006, such as the development and analysis of transit modes, alignments, operations, and including some preliminary modeling work.

Lessons Learned

- The Yellow Line LRT has a high degree of travel time reliability now and in the future.
- A cross-river LRT extension would provide transfer-free access between proposed light rail stations in Vancouver to a larger light rail system in Oregon, which may be expanded in the future.
- LRT would help manage congestion on I-5 general purpose lanes.
- The existing Interstate MAX Yellow line has capacity to serve additional transit riders south of Expo Center. Alternatives that make use of this existing capacity could serve additional riders with minimal additional operating costs.

2.4.1.4 Alternatives 4 & 5: Increased Transit Service

Although Alternatives 4 and 5 were not evaluated prior to December 2006, they were included in the DEIS at the recommendation of a Columbia River Crossing Task Force subcommittee, established at the February 2007 Task Force Meeting. This group, the Fourth Alternative Subcommittee, recommended that an option included the use of the existing I-5 bridges for northbound traffic, a supplemental bridge for southbound traffic and transit, increased transit service, and tolling should be analyzed as part of the DEIS. Alternatives 4 and 5 include these characteristics.

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3. Common Elements of All DEIS Alternatives

This section outlines the key elements that would apply to all of the DEIS transit alternatives. These elements include policies regarding transit fares, parking, land use, and transit operations, such as owner and operator roles. This section also includes a description of the highway build configurations that would be paired with the transit alternatives.

3.1 Policies

Sections 3.1.1 and 3.1.2 summarize the applicable policy assumptions regarding transit fares and land use for all of the transit alternatives.

3.1.1 Fare Structure

The CRC Project Area is served by two public transportation providers: TriMet and C-TRAN. Table 3-1 summarizes the current-year and 2030 forecast-year transit fare structure for TriMet and C-TRAN. Consistent with adopted TriMet and C-TRAN policy, fares are projected to keep pace with inflation—therefore, current dollar costs of fares in 2030 would be identical to current fares. Further, TriMet and C-TRAN expect to adjust their transfer fare policies before 2030, so that free transfers would be issued and accepted by C-TRAN and so that both TriMet and C-TRAN would accept transfers from the other system. Appendix A of this report is a memorandum that includes the fare estimation methodology used in the project's travel demand model, which is based on the 2030 fare structure outlined in Table 3-1, including the change in the fare transfer policy. The fare estimation methodology will be applied consistently across alternatives.

Table 3-1. TriMet and C-TRAN Transit Fare Structure[1]

FARE CATEGORY		TRIMET (ALL-ZONE FARE)		C-TRAN (C-ZONE FARE)	
		Current	**2030**	**Current**	**2030**
Cash	**All-Zone**[2,5]	$2.05	$2.05	$2.25[3]	$2.25[3]
	TriMet One/Two Zone[2,5]	$1.75	$1.75	N/A	N/A
	C-TRAN C-Zone[2,5]	N/A	N/A	$1.25	$1.25
	Premium Express Bus [2, 4]	N/A	N/A	$3.00	$3.00
Senior/ Disabled	**All-Zone**[5]	$0.85	$0.85	$1.10[3]	$1.10[3]
	TriMet One/Two Zone[5]	$0.85	$0.85	N/A	N/A
	C-TRAN C-Zone[5]	N/A	N/A	$0.60	$0.60
	Premium Express Bus[4]	N/A	N/A	$3.00	$3.00
Youth	**All-Zone**[5]	$1.40	$1.40	$1.10[3]	$1.10[3]
	TriMet One/Two Zone[5]	$1.40	$1.40	N/A	N/A
	C-TRAN C-Zone[5]	N/A	N/A	$0.60	$0.60
	Premium Express Bus[4]	N/A	N/A	$3.00	$3.00
Adult Monthly Pass	**All-Zone**[5]	$76.00	$76.00	$78.00[3]	$78.00[3]
	TriMet One/Two Zone[5]	$65.00	$65.00	N/A	N/A
	C-TRAN C-Zone[5]	N/A	N/A	$44.00	$44.00
	Premium Express Bus[4]	N/A	N/A	$105.00	$105.00
Transfers within System[6]		Free for 1 or 2 hours	Free for 1 or 2 hours	New fare required	Free for 1 or 2 hours
Transfers between Systems[7]		New fare required	Free for 1 or 2 hours	New fare required	Free for 1 or 2 hours

Source: TriMet and C-TRAN; January 2008.

[1] *All costs are in constant dollars – all fares are projected to be indexed to inflation.*

[2] *Children six and under ride free on both C-TRAN and TriMet. Transit fares within the Portland Central City "Fareless Square" are free.*

[3] *Trips between Clark County and Portland that would use the possible extension of the Yellow Line light rail service into Vancouver, Washington, or that would use fixed route bus service (requiring a transfer between C-TRAN and TriMet buses) that would not include C-TRAN's premium express bus service (see note 4) would require a C-TRAN all zone fare (e.g. cash fare of $2.25 in constant dollars).*

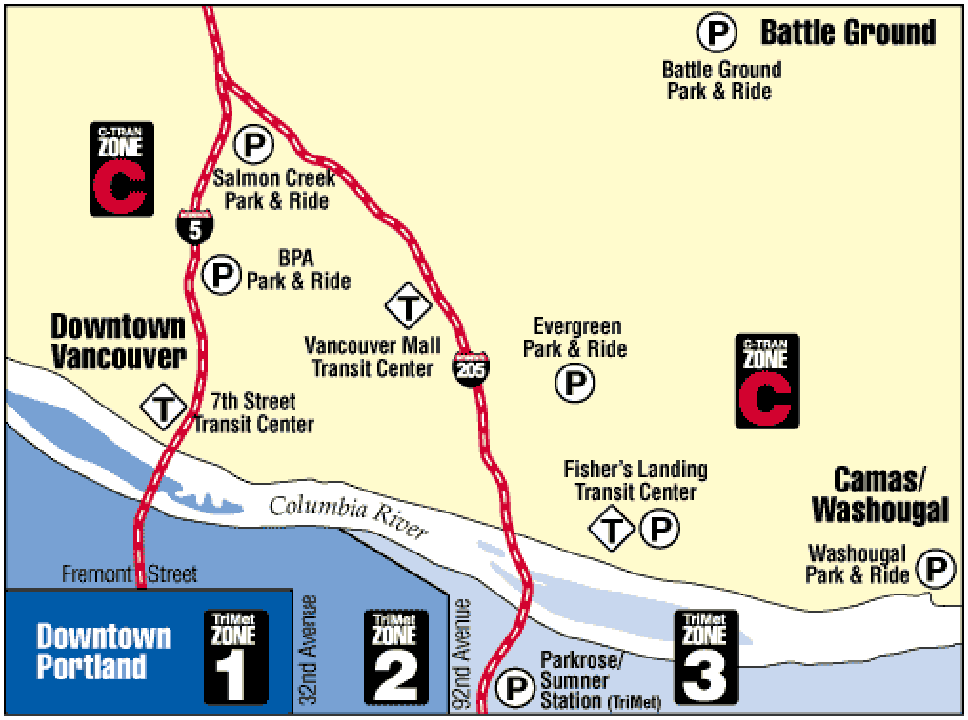
[4] *C-TRAN's premium express bus fares apply to non-stop fixed route bus service between select Park and Ride lots in Clark County and downtown Portland, Oregon Health Sciences University and the Lloyd District.*

[5] *See Figure 3-1 for an illustration of the C-TRAN and TriMet fare zone boundaries.*

[6] *i.e., TriMet to TriMet transfers and C-TRAN to C-TRAN transfers.*

[7] *i.e., TriMet to C-TRAN and C-TRAN to TriMet transfers.*

Figure 3-1. TriMet and C-TRAN Fare Zone Boundaries



3.1.2 Land Use

Within the CRC Bridge Influence Area five planning documents provide land use policies regarding future transit services and form the basis of land uses within the Bridge Influence Area. Those plans are:

1. Clark County's Comprehensive Growth Management Plan;
2. Vancouver City Center Vision (VCCV) Plan;
3. City of Vancouver Transportation Plan;
4. Metro's 2040 Growth Concept; and
5. City of Portland's Transportation System Plan (TSP).

Chapter 5 of Clark County's 2004 Comprehensive Growth Management Plan is a long-range transportation plan. This chapter identifies a future needs for transit services and facilities, including HCT.

The VCCV Plan (August 2006) recommends implementing an HCT mode in downtown Vancouver. The plan also calls for changes to the existing land uses in downtown Vancouver, such as increasing the number of parcels with City Center Mixed Use (CX) zoning, and increasing residential densities. The VCCV also eliminates minimum parking requirements in some areas and encourages pedestrian friendly development.

Vancouver's Transportation Plan identifies LRT as a strategic transportation option, which should be considered during the development of a regional HCT system. Fundamental goals of Vancouver's Transportation Plan are to support all travel modes and to continue building a walkable community.

In Metro's 2040 Growth Concept Hayden Island is identified as a Station Community, which are areas of development, centered on an LRT or HCT station, that feature a variety of shops and services that are accessible to bicyclists, pedestrians, transit users, and cars.

Portland's TSP is the long-range plan that guides transportation investments in Portland. A goal of the TSP is to develop a balanced, equitable, and efficient transportation system that provides a range of transportation choices. The TSP includes policies and objectives regarding the development of a public transportation system that conveniently serves City residents and provides travel to major destinations including station communities.

3.2 Highway Network

For the purpose of evaluating the transit alternatives, there are four possible highway build configurations for the CRC highway network; the No-Build Highway, Highway_1, Highway_2 and Highway_3. Following is a brief description of the highway configurations. All possible build configurations include the addition of peak hour peak direction ramp metering in Washington.

1. **No-Build Highway** consists of the existing I-5 highway system, including the existing lift span bridges and the existing mainline traffic capacity throughout the Bridge Influence Area. It also consists of the planned added southbound lane from north of Victory Boulevard to south of Columbia Boulevard and retaining the existing northbound managed lane from Going Street to Marine Drive.

2. The **Highway_1** build configuration consists of mainline and interchange improvements on I-5 in the Bridge Influence Area. A replacement bridge would be constructed over the Columbia River. The Highway_1 lane configuration across the Columbia River would consist of, in each direction, three through lanes, with design options for two or three auxiliary lanes (depending on safety and operations) resulting in a five-lane or six-lane configuration at the bridge in each direction, with final configurations to be determined based on the DEIS analysis. In addition, the Marine Drive, Hayden Island, SR14, and Mill Plain interchanges would be reconstructed to improve interchange operations. The Highway_1 build configuration would also consist of the planned added southbound lane from north of Victory Boulevard to south of Columbia Boulevard and retaining the existing northbound managed lane from Going Street to Marine Drive. Under Highway_1, I-5 would be tolled in both the southbound and northbound directions.

3. **Highway_2** is the same as Highway_1 except that Highway_2 would not be tolled.

4. The **Highway_3** build configuration consists of mainline and interchange improvements on I-5 in the Bridge Influence Area. A supplemental bridge would be constructed over the Columbia River. The Highway_3 lane configuration across the Columbia River would consist of, in each direction, three through lanes and one auxiliary lane resulting in four-lane configuration in each direction at the bridge. In addition, the Marine Drive, Hayden

Island, SR14, and Mill Plain interchanges would be reconstructed to improve interchange operations. The $Highway_3$ configuration would also consist of the planned added southbound lane from north of Victory Boulevard to south of Columbia Boulevard and retaining the existing northbound managed lane from Going Street to Marine Drive. Under $Highway_3$ I-5 would be tolled in both the southbound and northbound directions, at a higher rate than $Highway_1$ in the AM and PM peak periods.

Additional features of I-5, such as the location of transit only queue jumps, are described in Section 3.2.2. Table 3-2 provides a summary comparison of the significant features of these three highway build configurations.

Table 3-2. Comparison of Highway Build Characteristics

HIGHWAY CHARACTERISTIC		NO-BUILD	$HIGHWAY_1$	$HIGHWAY_2$	$HIGHWAY_3$
Replacement Bridge		N	Y	Y	N
Supplemental Bridge		N	N	N	Y
Lanes Over the Columbia River (one direction)	**Through Lanes**	3	3	3	3
	Auxiliary Lanes	0	2 or 3	2 or 3	1
Tolling of I-5		N	Y[1]	N	Y
Transit queue jump lanes		1	9	9	9
Tolling of I-205 general purpose and auxiliary lanes		N	N	N	N

N = No, Y = Yes
[1] *The assumed toll rate structure for $Highway_1$ is $2.00 to $2.25 in the peak period and $1.00 to $1.25 in the off-peak. Tolls are assumed on weekends.*

3.2.1 Tolling

Under the $Highway_1$ build configuration I-5 would be tolled at the Columbia River. In the $Highway_1$ build configuration only the I-5 bridge would be tolled (not the I-205 bridge, six miles to the east). All I-5 lanes, in both the northbound and southbound directions of travel, would be tolled equally. Under $Highway_1$, the toll rate would be structured so that it would vary by type of vehicle and throughout the day, with a higher rate in the AM and PM peak periods and a lower cost in the off-peak periods of travel. The assumed toll rate structure for $Highway_1$ is $2.00 to $2.25 in the peak period and $1.00 to $1.25 in the off-peak. Tolls are assumed on weekends. In the $Highway_2$ build configuration there would be no tolling.

With the $Highway_3$ build configuration I-5 would be tolled as well. Similar to the $Highway_1$ build configuration, only the I-5 bridge would be tolled (not the I-205 bridge, six miles to the east) and all I-5 lanes, in both the northbound and southbound directions of travel, would be tolled equally. With the $Highway_3$ build configuration the toll rate would be structured so that, similar to $Highway_1$, the toll would be higher during the AM and PM peak periods and lower in the off-peak. The higher toll scenario assumed a $0.50 increase over the standard toll in the peak periods. The assumed toll rate structure for $Highway_3$ is $2.50 to $2.75 in the peak period and $1.00 to $1.25 in the off-peak; tolls are assumed on weekends.

3.2.2 Highway Capital Improvements

The following is a description of the capital improvements included in the $Highway_1$, $Highway_2$, and $Highway_3$ build configurations. The capital improvements for the $Highway_1$ and $Highway_2$ configurations would be identical—the only difference between the two highway configurations would be that the I-5 span over the Columbia River would be tolled under $Highway_1$ and under $Highway_2$ it would not be tolled. With $Highway_3$ the I-5 bridge crossing of the Columbia River would be different than Highway $_1$ and $Highway_2$. North and south of the bridge influence area, all three highway build configurations would be the same.

The highway network improvements are summarized by the following areas: the I-5 bridge over the Columbia River; I-5 roadway improvements in Washington, and I-5 roadway improvements in Oregon. In addition to the description below, the highway networks would include all of the transportation improvements included within the No-Build Alternative described in Section 4.2.

Figure 3-4 depicts the I-5 existing managed lane that would be included in the $Highway_1$, $Highway_2$, and $Highway_3$ build configurations and shows the interchanges where transit-only queue jumps would be located. The locations of transit-only queue jumps are also summarized in Table 3-3.

3.2.2.1 I-5 Bridge over the Columbia River Improvements

$Highway_1$ and $Highway_2$

Over the Columbia River, the existing I-5 bridges would be replaced with a new, mid-level fixed-span bridge that would consist of three through lanes, and either two or three auxiliary lanes, in each direction. As shown in Figure 3-2, over the Columbia River, the I-5 crossing would consist of three bridges separated by two openings; one for the northbound direction of travel, one for the southbound direction of travel, and one for the transit and bicycle/pedestrian path that would be located on the west side (the downstream side) of the new highway bridges. Below the water line, these three bridges would be on a common foundation.

$Highway_3$

Over the Columbia River, the existing I-5 bridges would be modified so that they would both serve northbound I-5 traffic. One bridge would include two through lanes and full width shoulders and the other would include one through lane and one auxiliary lane and full width shoulders. A retrofitted bicycle and pedestrian lane would be on the east side of the eastern most bridge. Southbound I-5 traffic would be carried on a new mid-level fixed-span bridge that would consist of three through lanes and one auxiliary lane. The HCT guideway would be located on the western side of the new bridge. See Figure 3-3 for a representative cross section of $Highway_3$ over the Columbia River.

Figure 3-2. Representative I-5 Cross Section over the Columbia River for Highway$_1$ and Highway$_2$

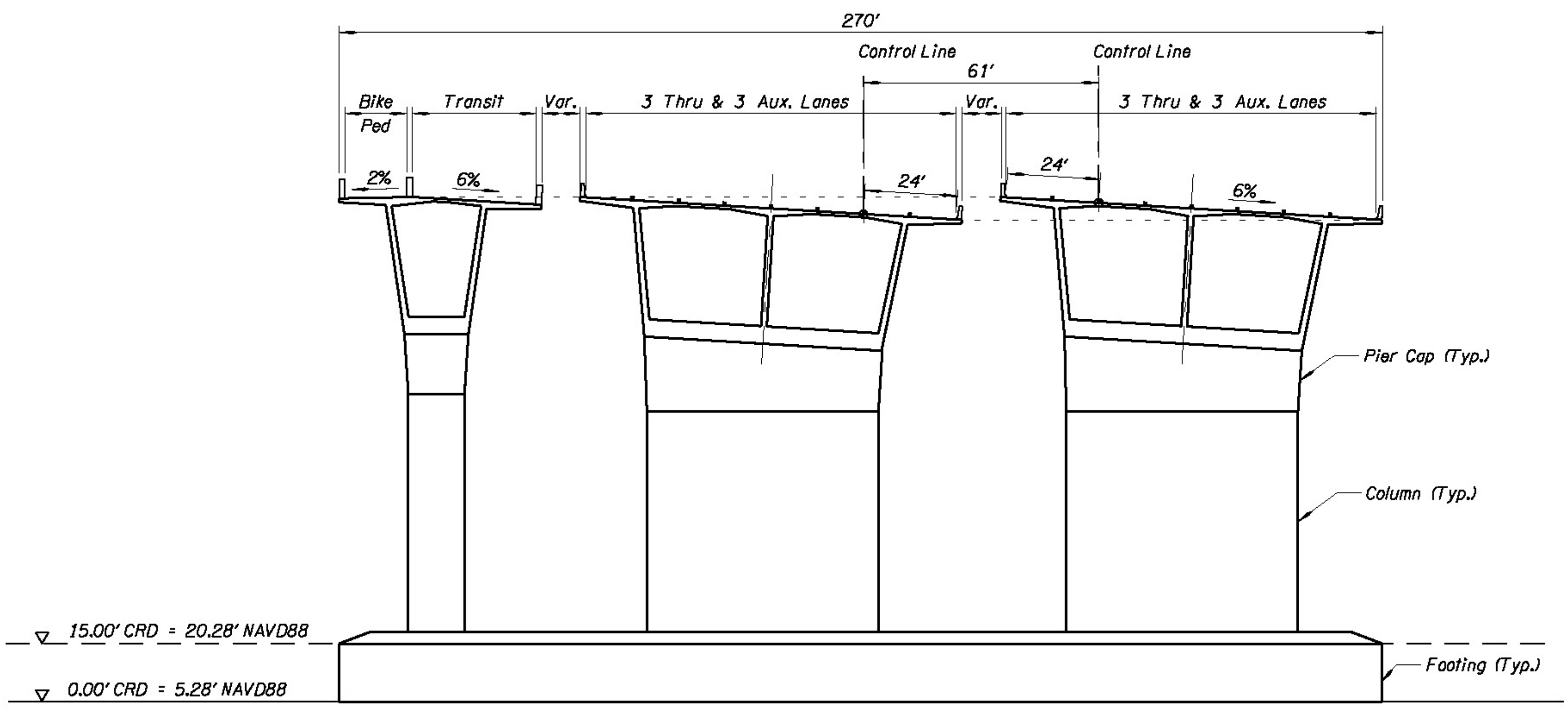
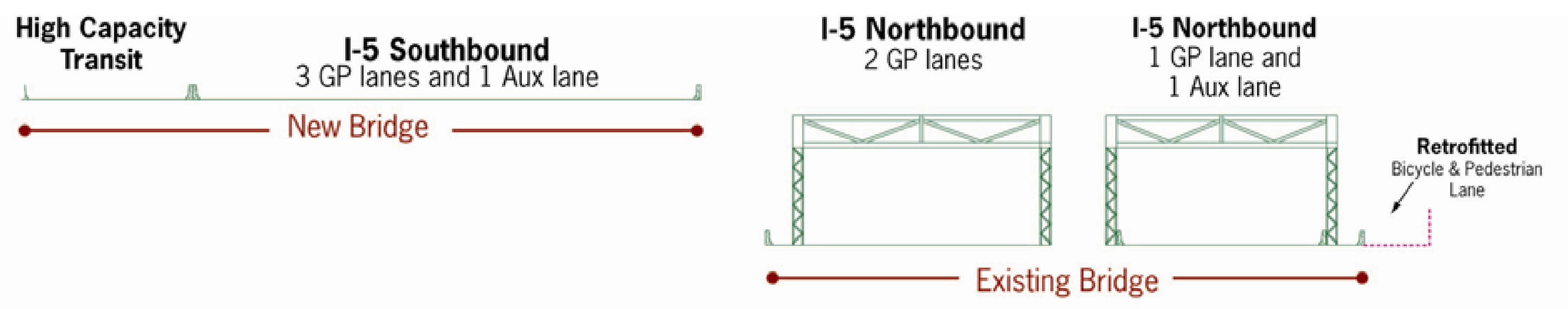


Figure 3-3. Representative I-5 bridge Cross Section over the Columbia River for Highway$_3$



3.2.2.2 I-5 Improvements – Washington

Between 139th Street and SR 500, I-5 transit-only queue jump lanes are proposed at the southbound on-ramps at NE 139th Street and NE 99th Street. At NE 99th Street a transit-only queue jump lane would be located at the northbound on-ramp to I-5. Between SR 500 and SR 14, I-5 would include three through lanes plus auxiliary lane(s) in each direction. The SR 14 interchange would be reconfigured to accommodate changes in the highway geometry. The Mill Plain interchange would be reconstructed as a single point urban interchange. Transit-only queue jumps would be on the southbound on-ramps to I-5 at NE 39th Street, and C Street in downtown Vancouver and on the northbound on-ramp to I-5 at E Fourth Plain Boulevard.

3.2.2.3 I-5 Improvements – Oregon

Between Marine Drive and Victory Boulevard, I-5 would include three through lanes plus auxiliary lane(s) in each direction. The Mill District interchange would be reconstructed as a single point urban interchange with a flyover. The Hayden Island interchange would be reconstructed as a split single point urban interchange. At the Hayden Island interchange, transit-only queue jumps would be provided at the southbound on-ramp and the northbound on-ramp to I-5. At Victory Boulevard, the northbound on ramp to I-5 would include a transit-only queue jump. The existing northbound managed lane, from Going Street to Marine Drive, would remain.

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Table 3-3. Highway$_1$, Highway$_2$ and Highway$_3$ Transit-Only Queue Jumps

LOCATION	TRANSIT-ONLY QUEUE JUMP	
	Southbound I-5 On-Ramp	**Northbound I-5 On-Ramp**
NE 139th Street to I-5	√	
NE 99th Street to I-5	√	√
NE 39th Street	√	
E Fourth Plain Boulevard		√
C Street to I-5	√	
Hayden Island to I-5	√	√
Victory Boulevard to I-5		√

3.2.3 Transit Priority Intersections Signals

Table 3-4 itemizes the intersections where transit would receive priority treatment at existing and new signals for both the I-5 and Vancouver Alignment.

Table 3-4. CRC Transit Priority Intersection Signals

Inside/Outside Guideway	Street	Cross Street	Intersection Existing or New Signal
Outside	E Fourth Plain Blvd	Fort Vancouver Way	Existing
	Fort Vancouver Way	E McLoughlin Street	Existing
Inside	Washington Street	15th Street	Existing
	Washington Street	Mill Plain Blvd	Existing
	Washington Street	13th Street	Existing
	Washington Street	12th Street	New signal
	Washington Street	11th Street	New signal
	Washington Street	Evergreen	Existing
	Washington Street	Ninth Street	New signal
	Washington Street	Eighth Street	Existing
	Washington Street	Seventh Street	Existing
	Washington Street	Sixth Street	Existing
	I-5 Alignment		
	E McLoughlin Street	C Street	Existing
	E McLoughlin Street	Broadway Street	Existing
	E McLoughlin Street	Main Street	Existing
	Vancouver Alignment		
	Main Street	39th Street	Existing
	Main Street	37th Street	New signal
	Main Street	33rd Street	Existing
	Main Street	32nd Street	New signal
	Main Street	29th Street	New signal
	Broadway Street	28th Street	New signal
	Broadway Street	27th Street	New signal
	Broadway Street	Fourth Plain Blvd	Existing
	Broadway Street	25th Street	New signal
	Broadway Street	24th Street	New signal
	Broadway Street	22nd Street	New signal
	Broadway Street	20th Street	New signal
	Broadway Street	19th Street	New signal
	Broadway Street	17th Street	New signal
	Broadway Street	16th Street	New signal
	Main Street	16th Street	New signal

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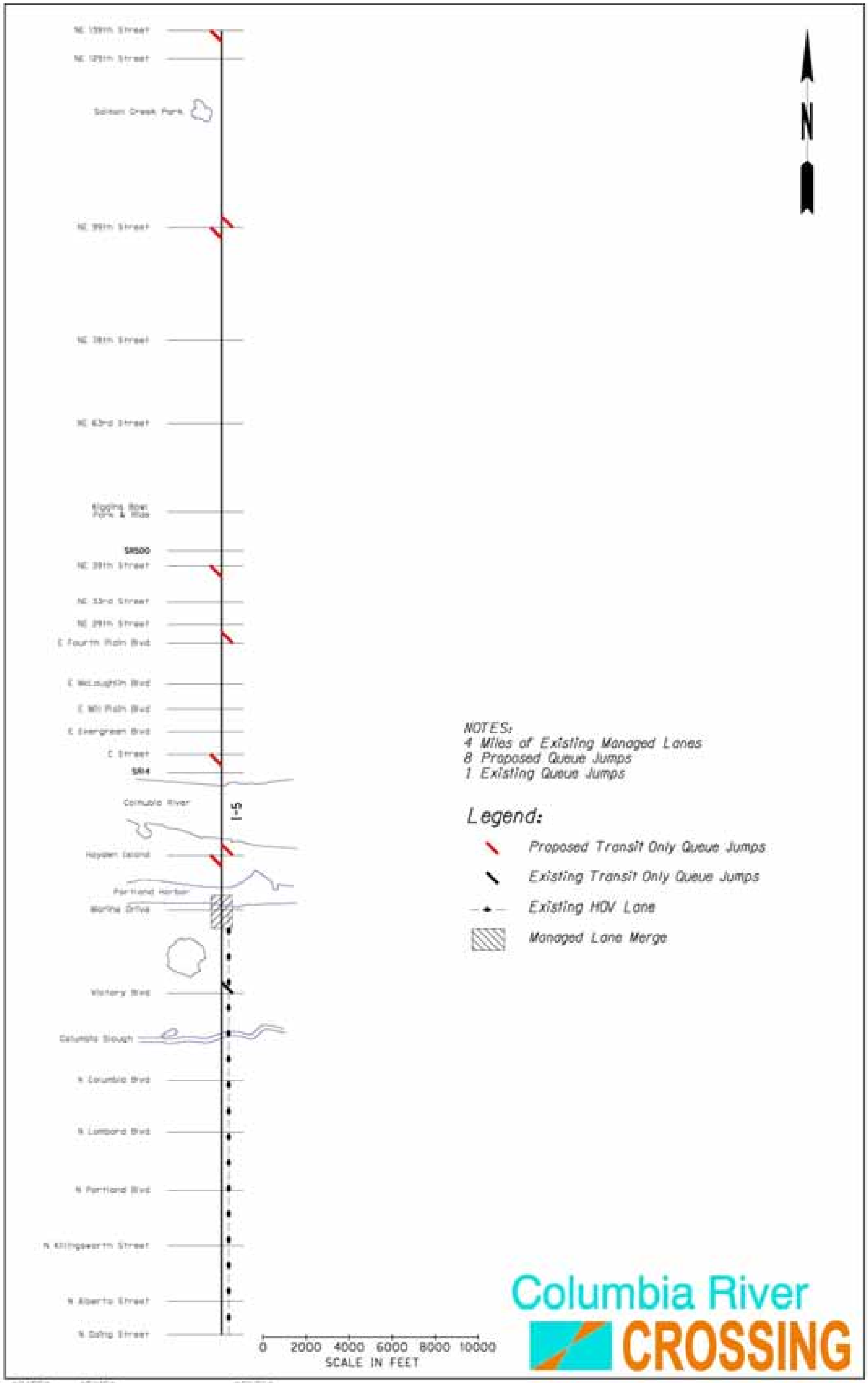
Figure 3-4. Highway$_1$, Highway$_2$, and Highway$_3$ Existing Managed Lane and Transit-Only Queue Jumps



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3.2.4 TSM/TDM Measures

The $Highway_1$, $Highway_2$, and $Highway_3$ build configurations all include TSM/TDM measures to reduce congestion during the peak travel period and provide alternative transportation options to commuters such as carpools, flexible work hours, and telecommuting. The $Highway_3$ network would include an aggressive TSM/TDM package that would include all of the measures proposed with the $Highway_1$ and $Highway_2$ configurations plus additional measures such as increased parking charges. Appendix D of this report provides a list of the measures that would be included with each of the highway configurations.

3.3 Transit Operations

3.3.1 Potential Owner/Operator

The roles in providing regional transit service along I-5 include: sponsor, the owner of the guideway and stations, the owner of the vehicles, and the operator. These roles, as defined below, may be distributed across several agencies and/or jurisdictions.

- **Sponsor Role**: The agency, entity, or group of individuals who champion the transit elements of the project and take a lead in “making it happen.” They would also become the lead for working with FTA to manage the delivery of the project.
- **Owner Role**: The agency or entity that owns the capital assets (guideway, stations, vehicles) that are part of the transit project. More than one owner is possible—for example, one agency could own the guideway and stations while a second could own the vehicles. The owner is responsible for maintaining the assets under their control.
- **Operator Role**: The agency that takes responsibility for operating the transit vehicles or, in the event of contract operation, for causing the vehicles to be operated. The designated operator may contract with a third-party to actually drive the vehicles, collect fares, etc.

3.3.2 Transit Vehicle Type and Capacity

Table 3-5 lists the vehicle type, length, the number of seats and the total passenger capacity (seated passengers and standees) that will be assumed for the transit alternatives. Although the FTA recommended standard is three persons per square meter, the TriMet light rail train capacity is estimated using the “achievable capacity” standard of 2.7 persons per square meter. All other vehicle capacities are measured with the FTA standard. The transit vehicle for the BRT and LRT alternatives will be selected from the table below based on the passenger demand at the peak load point.

Table 3-5. Transit Vehicle Characteristics

Vehicle	Length	Seats	Floor area for standees in square meters	Floor area for standees in square feet	Resulting number of standees at 3 per square meter	Total seats plus standees at 3 persons per square meter[1]	Total seats plus standees at 2.7 persons per square meter	Maximum Passenger Capacity per Vehicle
C-TRAN Express bus	40 feet	43	6.14	65.9	18	61	N/A	61
C-TRAN Local bus	40 feet	43	6.14	65.9	18	61	N/A	61
TriMet Light Rail Train (1-car train)[2]	90 feet	64	25.5	274.5	77	141	133	133
TriMet Light Rail Train (2-car train)	180 feet	128	51	549.0	153	281	266	266
TriMet Local Bus	40 feet	39	6.7	71.9	20	59	N/A	59
BRT vehicle[3]	60 feet	47	14.7	158	44	91	N/A	91

[1] *Three persons per square meter is the FTA recommended standard.*

[2] *LRT vehicle capacities based on TriMet system standard of 2.7 persons per square meter (TriMet's "achievable capacity").*

[3] *BRT vehicle capacities based on LTD's EmX seating-floor design specifications*

3.3.3 Downtown Portland Transit Mall Routing in 2030

In downtown Portland, buses primarily operate along the Portland Transit Mall. The Portland Transit Mall, beginning at NW Irving Street in the north and continuing south to SW Jackson Street, is a couplet with southbound travel along Fifth Avenue and northbound travel along Sixth Avenue. In 2030, the street section along the Transit Mall will include two transit lanes (one for LRT and one for buses) as well as one continuous through-lane for autos and bikes. In 2030, the Interstate MAX Green Line (Clackamas Town Center-City Center) and existing MAX Yellow Line (Expo Center-City Center) will run north-south on new tracks being built on Fifth and Sixth Avenues between Union Station and Portland State University (PSU). On the Transit Mall, LRT will run every five minutes or fewer throughout the day. LRT stations will be located every four to five blocks on the right side of the street; the same side as bus stops but not on the same blocks. Light rail and bus movements will be in separate lanes and controlled by signals.

In 2030, C-TRAN's express bus routes would operate along the Portland Transit Mall in the opposite direction of the peak number of TriMet buses. This allows C-TRAN buses to operate in the desired peak direction, because TriMet bus service peak is oriented to the south while C-TRAN's peak is oriented to the North.

3.3.4 Transit Operating Strategy

For DEIS Alternatives 2 through 5, a consistent operating strategy will be applied. This operating strategy consists of three types of transit service:

- Local bus service (fixed route local service with comparatively frequent stops);
- Express bus service (point-to-point bus service across the Columbia River); and
- Trunk line service (primary cross-river service, provided by standard bus, Bus Rapid Transit and/or light rail, depending on the alternative).

For the CRC Project, local bus service is defined as traditional fixed routes that would provide radial service to and from the central business district. Local bus service would have frequent stops and headways, depending on demand.

Express bus service is defined as point-to-point service from Clark County Park and Ride lots, such as 99th Street, Salmon Creek, and Fisher's Landing, to downtown Portland, the Lloyd District, or Oregon Health and Sciences University (OHSU) with no intermediate stops. Express buses would travel in general purpose lanes along I-5, except when operating in the existing northbound managed lane from Going Street to Marine Drive in the PM peak period. Except for C-TRAN's route 105, express bus service would operate at 15- to 120-minute headways in the AM and PM peak periods only and only on weekdays.

Trunk line service is defined as those routes that would provide the HCT bi-state transit service. The trunk line service would be the most frequent, have a high capacity, and a long span of service including weekends. Additional characteristics of the trunk line service would be exclusive lanes separated from general traffic within the CRC Bridge Influence Area, a stop spacing of ½ to 1 mile, larger stations with passenger amenities, higher operating speeds, and it would receive signal priority. With BRT (DEIS Alternatives 2 and 4), the trunk line service would be provided by the addition of three BRT lines originating from points in Vancouver to the existing Expo Center light rail station. With LRT (DEIS Alternatives 3 and 5), the trunk line service would be provided by an extension of the Interstate MAX Yellow Line from the Expo Center light rail station to Vancouver.

The transit networks and operating characteristics developed for the transit alternatives were intended to serve the two transit travel markets (inner urban and suburban commuter defined in detail in Section 2.3 of this report) identified for the CRC project. Generally, the Build Alternatives (Alternatives 2 through 5) were designed to minimize the number of transfers for travel from points in Vancouver to downtown Portland. In Alternatives 2 and 4, a transfer would occur to the Yellow Line at the Expo Center light rail station. In Alternatives 3 and 5, a transfer would occur from the limited or local bus lines to one of the new LRT stations that would be located in Vancouver.

There are two ways to access the HCT system; either direct access from walk-ons, drop-offs, bicycles, and Park and Ride lots, or a transfer from the local bus network. With Alternatives 2 and 4, direct access to the bus routes that would use the guideway would have one transfer for travel to downtown Portland from the guideway bus to the MAX Yellow Line. Access from the local bus network that does not cross the Columbia River would have two transfers for travel to downtown Portland. Two transfers are unavoidable for those riders utilizing the local bus system to gain access to the guideway with the BRT Alternatives because of the existing LRT guideway terminus at the Expo Center light rail station. The only way to ensure zero to one transfer with Alternatives 2 and 4 would be if BRT guideway continued south of Expo Center to downtown Portland allowing transit riders to transfer from local and limited buses to the BRT guideway for their trip to downtown Portland. With Alternatives 3 and 5, direct access to the light rail line would have no transfers for travel to downtown Portland, and access from the local bus network to LRT would have one transfer.

Overall, the transit networks and operating characteristics developed for the Alternatives have been based on serving the inner urban and suburban commuter transit travel markets, optimized for the two different modes. The transit coverage factors for population and employment, (i.e., within a half-mile from a transit line) are the same, approximately 8 percent of the population and 12 percent of the employment in Clark County would be within a half-mile of a proposed BRT or LRT station.

3.3.5 Span of Service

The span of service, hours of daily operation and the annual days of operation, has been consistently applied for the CRC transit alternatives as summarized in Table 3-6.

For TriMet, their current hours of service have been applied. TriMet currently operates its local bus service between 4:30 a.m. to 1:00 a.m. on weekdays and weekends. Generally, C-TRAN's local bus routes currently operate between 5:30 a.m. to 9:00 p.m. on weekdays and between 7:30 a.m. to 8:30 p.m. on weekends. C-TRAN's express bus service generally operates between 5:30 a.m. to 6:30 p.m. on weekdays only. These are the operating hours that are assumed for C-TRAN's local bus and express bus service. The trunk line service, which would provide the main bi-state transit service, would operate between 5:00 a.m. to midnight on weekdays and weekends.

Table 3-6. Transit Span of Service

TRANSIT SERVICE		WEEKDAY HOURS	WEEKEND HOURS	ANNUAL DAYS OF OPERATION
Local Bus	**TriMet**	4:30 a.m. – 1:00 a.m.	4:30 a.m. – 1:00 a.m.	365
	C-TRAN	5:30 a.m. – 9:00 p.m.	7:30 a.m. – 8:30 p.m.	365
Express Bus		5:30 a.m. – 6:30 p.m.[1]	None	255
Trunk Lines		5:00 a.m. – Midnight	5:00 a.m. – Midnight	365

[1] *Except for C-TRAN's Route 105, all express bus service is peak period only.*

Detailed Description of Transit Alternatives

Analysis of the CRC transit alternatives relied on a variety of existing and future data; the forecasted data was developed by the two Metropolitan Planning Organizations (MPOs) involved with the project – Southwest Washington's Regional Transportation Council, and Portland's Metro Regional Government. This section describes the five transit alternatives, in terms of their operations and capital facilities that were studied in the CRC DEIS. They are:

- **Alternative 1**: No-Build Alternative;
- **Alternative 2**: Replacement Bridge and BRT with Express Bus Service;
- **Alternative 3**: Replacement Bridge and LRT with Express Bus Service;
- **Alternative 4**: Supplemental Bridge and BRT with Express Bus Service and an Increased Level of Transit Service; and
- **Alternative 5**: Supplemental Bridge and LRT with Express Bus Service and an Increased Level of Transit Service.

4.1 Transit Components of the DEIS Alternatives

As introduced above, there are five transit alternatives evaluated in the DEIS. These transit alternatives are comprised of four main components, called system-level choices, and numerous design options, called segment-level choices; they are organized as such because of the degree of impact the choice would have on the project as a whole. The components are strategically combined in each transit alternative and were evaluated in the DEIS to reveal the impact and effect of each system- and segment-level choice. The components are detailed in Table 4-1 and Figure 4-1 and described below in Sections 4.1.1 and 4.1.2. This table and figure sequence helps to illustrate how the components are organized within the four build Alternatives and reveals how this chapter is organized.

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Table 4-1. System and Segment Level Choices by Transit Alternative

Level	Choice[1]	Full-Length Alternative System- and Segment-Level Choices: Alternative 1: No-Build	Alternative 2: Replacement Crossing with BRT and I-5 Standard Toll	Alternative 3: Replacement Crossing with LRT and I-5 Standard Toll	Alternative 4: Supplemental Crossing with BRT, Increased Transit System and I-5 Higher Toll	Alternative 5: Supplemental Crossing with LRT, Increased Transit System, and I-5 Higher Toll
System	**HCT Mode**	None	BRT	LRT	BRT	LRT
	Level of Transit Operation	Existing	Efficient	Efficient	Increased	Increased
	Toll Rate[2]	None	Standard Rate	Standard Rate[3]	Higher Rate	Higher Rate
	Location of Northern Terminus	N/A	Lincoln Park and Ride/Kiggins Bowl/Mill Plain District Transit Center/Clark College Park and Ride	Lincoln Park and Ride/Kiggins Bowl/Mill Plain District Transit Center/Clark College Park and Ride	Lincoln Park and Ride	Lincoln Park and Ride
Segment	**Segment A1** ***River Crossing***[4]	Existing	Replacement/Stacked Transit-Highway Bridge[5]	Replacement/ Stacked Transit-Highway Bridge	Supplemental	Supplemental
	Segment A1 ***Bridge Crossing Transit Alignment***	N/A	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset	Hayden Island Adjacent/Offset
	Segment A2 ***Two-way or Couplet Transit Alignment***	N/A	Two-Way on Washington/Couplet on Broadway and Washington	Two-Way on Washington/Couplet on Broadway and Washington	Two-Way on Washington/Couplet on Broadway and Washington	Two-Way on Washington/Couplet on Broadway and Washington
	Segment B ***Northern Transit Alignment***	N/A	Vancouver/I-5	Vancouver/I-5	Vancouver	Vancouver

1 Modeling software used to assess each alternative's performance does not distinguish between smaller details, such as most segment-level transit choices.
2 In addition to standard and high toll rates, this report evaluates options that would toll only the I-5 river crossing and options that would toll both the I-5 and the I-205 crossings.
3 Alternative 3 was evaluated with the standard rate, but was also tested with three different tolling scenarios: non-tolling, standard toll I-5, high toll I-5, and standard toll I-5 and I-205. For more information on the tolling methodology see the Traffic Technical Report.
4 River Crossing is reported and analyzed within the Transit Technical Report as a segment-level choice because of the limited effect this choice has upon the transit performance.
5 Stacked Transit/Highway Bridge (STHB) is defined and discussed in Section 4.1.2: Segment-Level Transit Choices.

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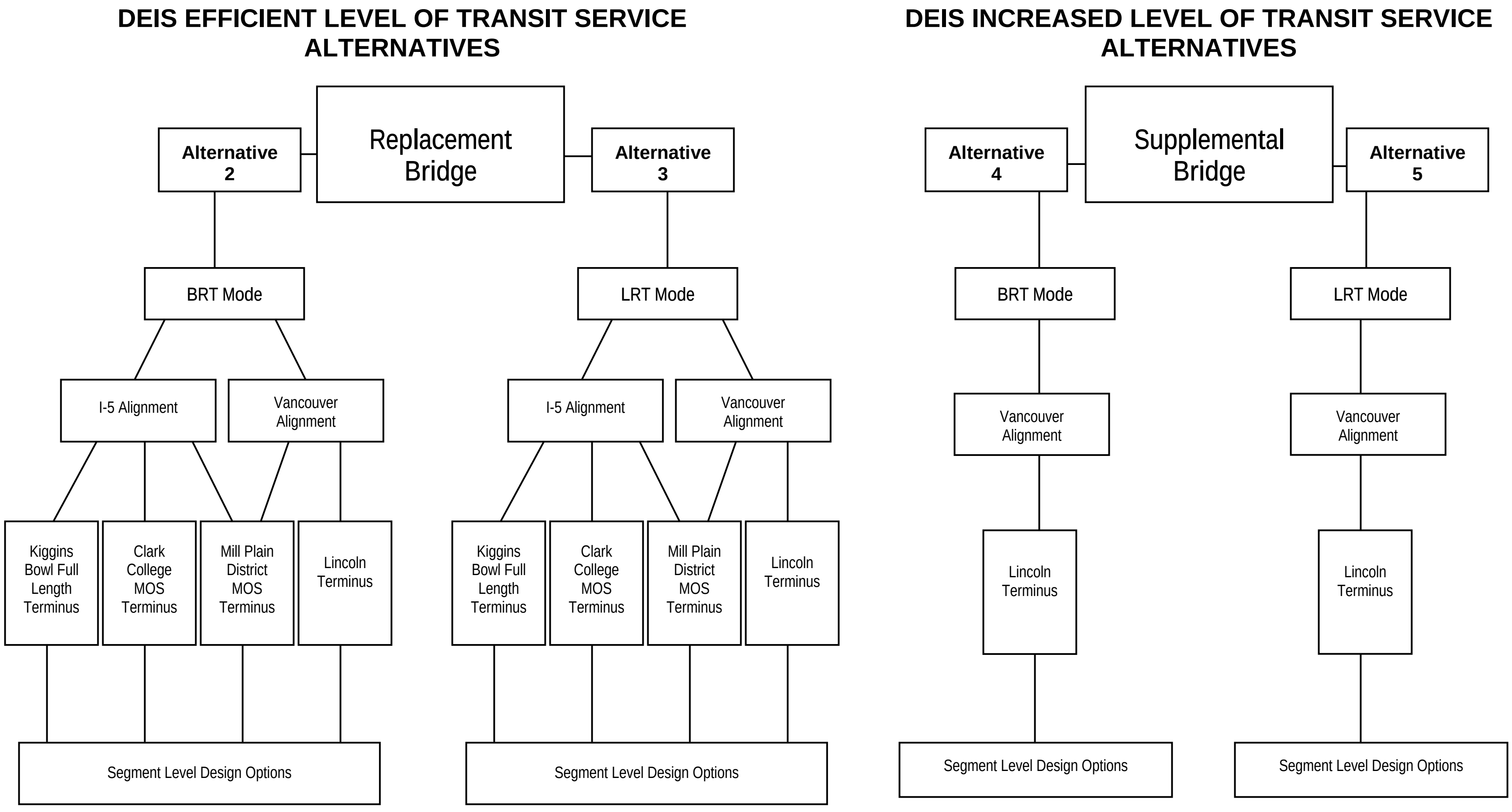
Figure 4-1. CRC DEIS Alternatives and Transit Alignments



DEIS Alternatives 4 and 5, with a supplemental bridge over the Columbia River, could also be paired with the I-5 alignment.

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4.1.1 System-Level Transit Choices

System-level choices have a potentially broad influence on the magnitude and type of benefits and impacts produced by this project. These choices may impact and influence transportation operations throughout the defined CRC project area. In addition, they could affect regional transportation and other elements outside the project corridor. The system-level choices include:

- **HCT Mode:** Mode is defined as the high capacity transit (HCT) proposed in each alternative. The CRC project has two build HCT transit alternatives: BRT and LRT. Both BRT and LRT would operate in an exclusive right-of-way through the project area, and are being evaluated for the same alignments and station locations. Both HCT modes have multiple alignment options and station locations that are segment-level choices and are discussed within Section 4.7.

  BRT. In general, the BRT guideway would extend from the existing Expo Center light rail station in North Portland into Vancouver, terminating at, depending on the Vancouver or I-5 alignment, Kiggins Bowl or a new Lincoln Park and Ride located at the existing WSDOT maintenance facility at 40th and Main Street. Forty-foot and 60-foot articulated buses, depending on alternative, would operate in exclusive lanes, called the guideway, separated from other traffic. Crossing the Columbia River on a new bridge, the BRT guideway right-of-way width would be about 35 feet to accommodate transit vehicles operating in both directions, as well as a lane for potential break-downs. The right-of-way width along the remainder of the guideway in each direction would be about 33 feet, the same as LRT.

  LRT. In general, the LRT guideway would extend the existing MAX LRT Yellow line that operates between downtown Portland and the Expo Center light rail station in North Portland across the Columbia River and into Vancouver, terminating at either Kiggins Bowl or Lincoln Park and Ride depending on the northern transit alignment. One- and two-car LRT trains would operate within an exclusive guideway (33 feet of right-of-way width along entire length) as a continuation of the TriMet Yellow Line between Vancouver and downtown Portland.

- **Level of Transit Service**: Efficient and Increased levels of transit service for both the BRT and LRT HCT mode, and for some of their supportive local bus lines, are analyzed. The level of service chosen may differ from either of these choices in the build project. The Increased level of transit operation was created as a system-level choice to distinguish the effect that more transit capacity and operations would have upon the transit alternatives.

  Efficient Level of Transit Service. In general, Alternatives 2 and 3 have an equilibrated level of service that would accommodate the demand projected for 2030 while meeting policy-level headways, and service levels are somewhat higher than in the No-Build.

  Increased Level of Transit Service. In general, under the Increased level of service operation associated with Alternatives 4 and 5, transit service levels would be substantially higher than the No-Build Alternative and would increase the number of

BRT vehicles or the number of LRT trains operating during the peak periods to reduce transit passenger wait times and increase transit ridership.

- **Toll Rate:** Three toll rates were examined: no toll; a standard toll; and a higher toll, as detailed in Table 4-2, (see the Traffic Technical Report for a more detailed explaination of thes toll categories). To determine appropriate tolling levels for the alternatives, a sensitivity analysis was preformed with no toll, I-5 only toll, and tolls on both I-5 and I-205.

Table 4-2. Toll Rates

	Peak Period		Offpeak Period	
	Transponder	**No Transponder**	**Transponder**	**No Transponder**
No Toll	None	None	None	None
Standard Toll	$2.00	$2.25	$1.00	$1.25
Higher Toll	$2.50	$2.75	$1.00	$1.25

- **Location of Northern Terminus:** Terminus is the location along the alignment where the exclusive transit guideway would end. Both the I-5 and Vancouver alignments consist of a full-length terminus and a Minimum Operable Segment (MOS) terminus.

4.1.2 Segment-Level Transit Choices

Segment-level transit choices are a series of design options or choices that would have little impacts to the CRC corridor. The impacts of segment-level choices are localized and, typically, have impacts only within about a block or two radius of the choice. For instance, a segment-level choice discussed in this report is whether to place LRT or BRT guideway two-way on Broadway Street in uptown Vancouver, or in a couplet on uptown Main Street and Broadway Street. Although these decisions would have significant impacts locally, they would not impact transit ridership or travel time once constructed. There are two types of segment-level choices: transit alignment choices and highway configurations.

- **Transit Alignment Choice.** The transit alignment choices are organized into three segments of the corridor: A1, A2, and B, which are detailed in Figure 4-2. Within each segment the alignment choices can be selected relatively independently of the choices in the other segments. These alignment variations generally would not affect overall system performance but could have important differences in the impacts and benefits that would occur in each segment. These transit alignment choices will allow decision makers to specially package the Locally Preferred Alternative. Following is a description of the three segments and the choices that are under study within each segment.

  Segment A1. Delta Park to South Downtown

  River Crossing Type. There are two types of river crossings: replacement and supplemental; in addition, there is a design option for the replacement bridge option. The **replacement bridge option** would remove the existing highway bridge structures across the Columbia River and replace them with three new parallel structures – one for I-5 northbound traffic, another for I-5 southbound traffic, and a third for HCT, bicycles, and pedestrians. The replacement crossing would include three through-lanes and two auxiliary lanes for I-5 traffic in each direction. There is an option for the replacement bridge to avoid building the third bridge, thereby reducing the total width of the structures and the number of piers that would be required in the Columbia River. This option is called **Stacked Transit/Highway Bridge (STHB)**. STHB is a design developed by the CRC project team that would place the HCT inside the structure supporting the highway lanes for the southbound replacement bridge. (More details on STHB is located below, within Section 4.7). The multi-use path that would be alongside transit on the third bridge under the replacement and supplemental bridge scenarios would instead be placed under the deck of the northbound bridge on the east side and HCT would be placed under the deck of the southbound bridge. The **supplemental bridge option** would build a new bridge downstream of the existing I-5 bridges, while retaining the existing I-5 bridges. The new supplemental bridge would carry southbound I-5 traffic and HCT, while the existing I-5 bridges would carry northbound I-5 traffic, bicycles, and pedestrians. The supplemental river crossing alternative would include three through-lanes and one auxiliary lane for I-5 traffic in each direction.

Hayden Island Transit Alignment. This design option is a decision between an alignment that would place the transit adjacent to, or offset from I-5. An offset HCT guideway would place HCT approximately 450 feet west of I-5 on Hayden Island, while an adjacent HCT guideway across Hayden Island would locate HCT immediately west of I-5. The final station design would be coordinated with the upcoming Hayden Island Master Plan to be conducted by the City of Portland.

Segment A2. South Vancouver to Mill Plain District

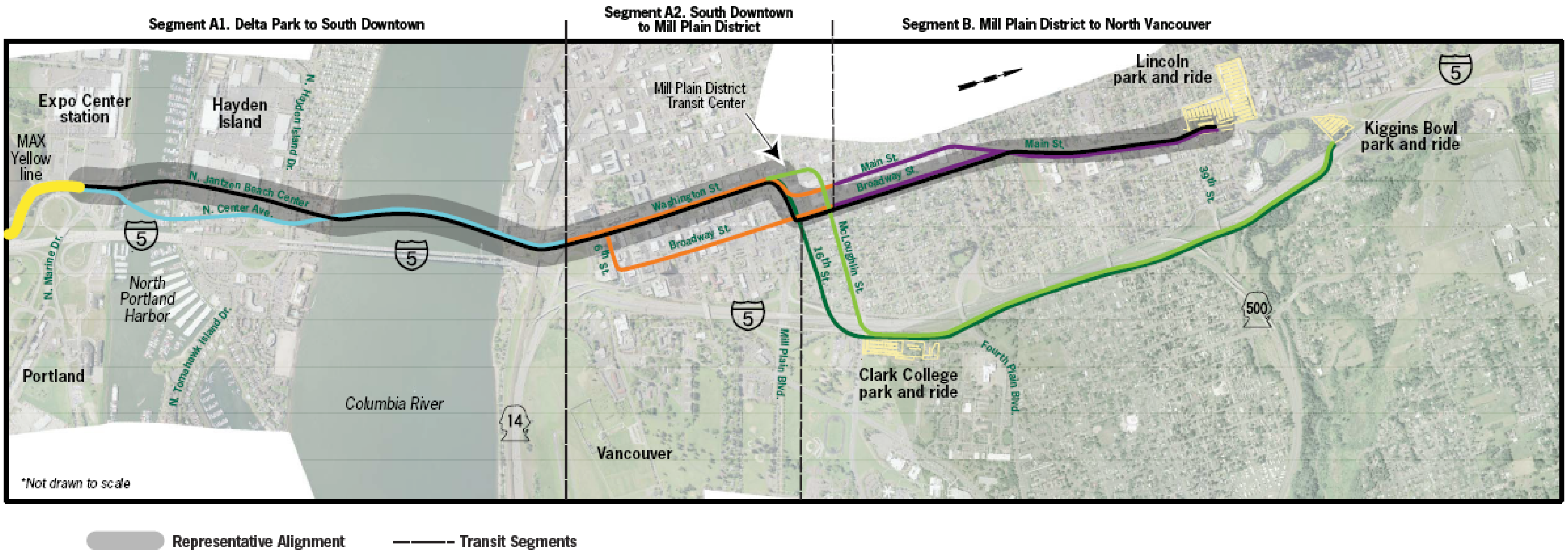
Two-way on Washington or Couplet on Broadway and Washington. In Segment A2, HCT would touch down in downtown Vancouver just south of the intersection at Sixth Street and Washington Street with a replacement river crossing; with STHB , transit would touch down around Fifth Street. A supplemental crossing would push the touchdown location north to Seventh Street. Once in downtown Vancouver, there are two alignment options for HCT – a two-way guideway on Washington Street or a couplet design that would place southbound HCT on Washington Street and northbound HCT on Broadway Street. Both options would have stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street.

Segment B. Mill Plain District to North Vancouver. As discussed above in the system-level choices, there are two northern alignment full-length termini: Lincoln Park and Ride with the Vancouver alignment or Kiggins Bowl Park and Ride with the I-5 alignment. Segment B has design options for both the Vancouver and I-5 alignment options.

Vancouver Northern Transit Alignment Options. Continuing north on local streets with the Vancouver alignment, HCT could either use a two-way guideway on Broadway Street or a couplet on Main Street and Broadway Street. At 29th Street, both of these options would merge to a two-way guideway on Main Street and end at the Lincoln Park and Ride located at the current WSDOT maintenance facility at 41st Street.

I-5 Northern Transit Alignment Options. The I-5 alignment has two routing options from downtown Vancouver's Mill Plain District Transit Station: travel east on 16th Street and through a new tunnel under I-5, or travel east on McLoughlin Boulevard and under I-5 at the existing viaduct. With either option, HCT would connect with the Clark College Park and Ride on the east side of I-5, then travel north along I-5 to about SR 500 where it would cross back over I-5 to end at the Kiggins Bowl Park and Ride.

Figure 4-2. Transit Segments and Design Options



DESIGN OPTIONS

HAYDEN ISLAND TO DOWNTOWN VANCOUVER

N. Jantzen Beach Center, Replacement Downstream Bridge (Representative Alignment)
Travel beside Jantzen Beach SuperCenter to connect with new bridge west of existing bridge.

Along I-5, Replacement Downstream Bridge
Travel along I-5 near N. Center Avenue to connect with new bridge west of existing bridge.

DOWNTOWN VANCOUVER TO 16TH STREET/MCLOUGHLIN

Washington Two-way (Representative Alignment)
Northbound and southbound transit on Washington Street.

Broadway-Washington
Northbound transit on Broadway and southbound transit on Washington.

NORTH OF DOWNTOWN VANCOUVER

Vancouver High Capacity Transit Alignment

Broadway Two-way North (Representative Alignment)
On Broadway Street from McLoughlin to Main Street. Continues on Main Street to park and ride at 39th Street.

Broadway-Main
Northbound transit on Broadway Street and southbound transit on Main Street from McLoughlin to 29th Street. Two-way on Main Street from 29th Street to park and ride at 39th Street.

I-5 High Capacity Transit Alignment

16th St., Along I-5
Two-way transit travels on 16th Street to east side of I-5. Travels from Clark College, along I-5, to park and ride near Kiggins Bowl.

McLoughlin, Along I-5
Two-way transit travels on McLoughlin to east side of I-5. Travels from Clark College along I-5 to park and ride near Kiggins Bowl.

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- **Highway Configurations**. Figure 4-2 demonstrates how the transit alternatives and alignments were paired with the four highway build configurations described in Section 3. The No-Build Alternative (Section 4.2) is for both highway and transit. (In addition, an alternative pairing $Highway_1$ with no-build transit was studied.) Further, both Alternatives 2 and 3 were evaluated with a tolled highway and a replacement bridge ($Highway_1$) as well as a non-tolled highway and a replacement bridge ($Highway_2$) networks; Alternatives 4 and 5 were evaluated with a higher tolled highway and a supplemental bridge ($Highway_3$).

  For the purposes of this report, the $Highway_1$ network was selected as the highway build configuration for Alternatives 2 and 3 - the efficient build transit alternatives. In addition, Alternatives 2 and 3, with the Vancouver alignment, were modeled with the $Highway_2$ network which revealed the sensitivity of tolling on transit. Due to a focus on lower capital costs, increased transit Alternatives 4 and 5 were paired with $Highway_3$ (supplemental bridge with higher toll). Figure 4-2 below lists the pairings of highway and transit configurations that were modeled.

Table 4-3. Modeled CRC Transit Alternative Pairing with the Highway Configurations

TRANSIT ALTERNATIVE		HIGHWAY NETWORK			
		No-Build	**$Highway_1$**	**$Highway_2$**	**$Highway_3$**
Alternative 1	**No-Build**	√			
Alternative 2	**Vancouver Alignment**		√	√	
	Mill Plain District MOS		√		
	I-5 Alignment		√		
	Clark College MOS		√		
Alternative 3	**Vancouver Alignment**		√	√	
	Mill Plain District MOS		√		
	I-5 Alignment		√		
	Clark College MOS		√		
Alternative 4	**Vancouver Alignment**				√
Alternative 5	**Vancouver Alignment**				√

In more detail, the CRC transit alternatives that were studied in the DEIS include:

- **Alternative 1**: Alternative 1, the No-Build Alternative, would include only those transit services and facilities that can be reasonably anticipated for funding and construction by the transit service providers and in Metro's and Southwest Washington Regional Transportation Council's (RTC's) regional transportation plans.
- **Alternative 2**: Alternative 2 would include an all-day BRT system that, within the CRC Bridge Influence Area, would operate in an exclusive guideway from Vancouver to the existing Expo Center light rail station where the service would provide a transfer opportunity to the existing Interstate MAX Yellow Line. The BRT system would have supplemental Express Bus service from locations within Clark County to the Portland CBD, Lloyd Center, and OHSU. Alternative 2 is evaluated with a replacement bridge paired with both the I-5 and Vancouver Alignments. In addition to the two full-length termini, there are two MOS associated with this alternative for analysis purposes.

- **Alternative 3**: Alternative 3 would include an extension of TriMet's all-day Interstate MAX Yellow Line that would operate in an exclusive guideway from the Expo Center light rail station to Vancouver, within the CRC Bridge Influence Area. The LRT system would have supplemental Express Bus, local and feeder service from locations within Clark County to the Portland CBD and OHSU. Alternative 3 is evaluated with a replacement bridge paired with both the I-5 and Vancouver Alignments. In addition to the two full-length termini, there are two MOS associated with this alternative for analysis purposes.
- **Alternative 4**: Alternative 4 would include the same components as Alternative 2 where the BRT system, within the CRC Bridge Influence Area, would operate within an exclusive guideway from Vancouver to the existing Expo Center light rail station but at higher frequencies of service, referred to as an Increased Level of Transit Service. The Express Bus, local, and feeder bus service would also have a higher level of service. Alternative 4 is evaluated with a supplemental bridge and the Vancouver Alignment with only one full-length terminus.
- **Alternative 5**: Alternative 5 would include the same components as Alternative 3 where the LRT system, within the CRC Bridge Influence Area, would operate within an exclusive guideway from Vancouver to the existing Expo Center light rail station but at higher frequencies of service, also referred to as an Increased Level of Transit Service. The Express Bus, local, and feeder bus service would also have a higher level of service. Alternative 5 is evaluated with a supplemental bridge and the Vancouver Alignment with only one full-length terminus.

Table 4-4 summarizes the transit operating and capital improvements for the alternatives and Table 4-5 summarizes the transit vehicles and service characteristics. Table 4-6 summarizes the primary transit facilities that would be included with each alternative. Appendix B includes the transit line listing for each alternative.

Table 4-4. Summary of Transit Improvements by Alternative

TRANSIT ALTERNATIVE	ALIGNMENT	TRANSIT IMPROVEMENTS
ALTERNATIVE 1 NO-BUILD		**Local Bus Service** ***TriMet***: Existing service with approximately 1% annual growth in fixed route service hours. ***C-TRAN***: Existing service with approximately 1% annual growth in service hours until 2011, after which the annual service hours would remain constant. New C-TRAN route 4X providing service from Vancouver to the Delta Park/Vanport light rail station.
		Express Bus Service Maintain the existing service and routing (as off January 2008) with the addition of two new C-TRAN routes: 199 and 219.
		Trunk Line and HCT Service Existing TriMet LRT operations with additional service on the Portland Transit Mall and from the Gateway Transit Center to the Clackamas Transit Center. Yellow Line peak period headways of 10 minutes.
		Capital Facilities 10 existing and three planned/programmed park and ride lots with a combined capacity of 4,464 spaces. Extension of LRT from Gateway Transit Center to Clackamas Transit Center. Portland Transit Mall Restoration. Washington County Commuter Rail. Streetcar extension to the south waterfront and Eastside Streetcar to OMSI. 3.5-acre addition onto TriMet's Ruby Junction maintenance facility.
ALTERNATIVE 2 BRT	**Vancouver Full-Length**	**Local Bus Service** Adjustments to the No-Build Alternative local bus network would include: 1) equilibrated service to better match demand on all transit routes serving the Bridge Influence Area, 2) five local and limited routes would use the guideway to Expo Center, 3) new shuttle service from Clark County park and ride lots to the BRT terminus, 4) other routes serving downtown Vancouver would connect to the BRT guideway and/or stations.
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated.
		Trunk Line and HCT Service ***BRT****:* New *R*outes 4L, 37L, and 71L would provide service to the Expo Center LRT Station using Vancouver arterial streets and the BRT exclusive guideway. ***LRT****:* Yellow Line peak period headways of 10 minutes.
		Capital Facilities 3.4 miles of exclusive guideway from Expo Center to Lincoln Park and Ride lot. Eight new BRT stations (including Expo Center). Three new park and ride lots with an additional capacity of 4,210 spaces over the No-Build Alternative. One new transit center in the Mill District. Expo Center gains a new Transfer Center. Expansion of the C-TRAN Administration, Operations and Maintenance (AOM) facility sufficient to accommodate new vehicles.
	I-5 Full-Length	**Local Bus Service** Adjustments to the No-Build Alternative local bus network would include: 1) equilibrated service to better match demand on all transit routes serving the Bridge Influence Area, 2) five local and limited routes would use the guideway to Expo Center, 3) new shuttle service from Clark County park and ride lots to the BRT terminus, 4) other routes serving downtown Vancouver would connect to the BRT guideway and/or stations.
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated.

TRANSIT ALTERNATIVE	ALIGNMENT	TRANSIT IMPROVEMENTS
		Trunk Line and HCT Service ***BRT****:* New Routes 4L, 37L, and 71L would provide service to the Expo Center LRT Station using Vancouver arterial streets and the BRT exclusive guideway. ***LRT****:* Yellow Line peak period headways of 10 minutes.
		Capital Facilities 4.22 miles of exclusive guideway from Expo Center to Kiggins Bowl Park and Ride. Eight new BRT stations (including the Expo Center). Three new park and ride lots with an additional capacity of 2,500 spaces over the No-Build Alternative. One new transit center in the Mill District. Expo Center gains a new Transfer Center. Expansion of the C-TRAN AOM bus maintenance facility sufficient to accommodate new vehicles.
	Mill Plain District MOS	**Local Bus Service** Adjustments to the No-Build Alternative local bus network would include: 1) equilibrated service to better match demand on all transit routes serving the Bridge Influence Area, 2) five local and limited routes would use the guideway to Expo Center, 3) new shuttle service from Clark County park and ride lots to the BRT terminus, 4) other routes serving downtown Vancouver would connect to the BRT guideway and/or stations.
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated.
		Trunk Line and HCT Service ***BRT****:* New *R*outes 4L, 37L, and 71L would provide service to the Expo Center LRT Station using Vancouver arterial streets and the BRT exclusive guideway. ***LRT****:* Yellow Line peak period headways of 10 minutes.
		Capital Facilities 2.07 miles of exclusive guideway from Expo Center to Mill Plain District Park and Ride lot. Four new BRT stations (including Expo Center). Five new park and ride lots with an additional capacity of 3,218 spaces over the No-Build Alternative. One new transit center in the Mill Plain District. Expo Center gains a new Transfer Center. Expansion of the C-TRAN Administration, Operations and Maintenance (AOM) facility sufficient to accommodate new vehicles.
	Clark College MOS	**Local Bus Service** Adjustments to the No-Build Alternative local bus network would include: 1) equilibrated service to better match demand on all transit routes serving the Bridge Influence Area, 2) five local and limited routes would use the guideway to Expo Center, 3) new shuttle service from Clark County park and ride lots to the BRT terminus, 4) other routes serving downtown Vancouver would connect to the BRT guideway and/or stations.
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated.
		Trunk Line and HCT Service ***BRT****:* New *R*outes 4L, 37L and 71L would provide service to the Expo Center LRT Station using Vancouver arterial streets and the BRT exclusive guideway. ***LRT****:* Yellow Line peak period headways of 10 minutes.

TRANSIT ALTERNATIVE	ALIGNMENT	TRANSIT IMPROVEMENTS
		Capital Facilities 2.65 miles of exclusive guideway from Expo Center to Clark College Park and Ride lot. Six new BRT stations (including Expo Center). Three new park and ride lots with an additional capacity of 2,500 spaces over the No-Build Alternative. One new transit center in the Mill District. Expo Center gains a new Transfer Center. Expansion of the C-TRAN AOM bus maintenance facility sufficient to accommodate new vehicles.
ALTERNATIVE 3 LRT	**Vancouver Full-Length**	**Local Bus Service** Adjustments to the No-Build Alternative local bus network would include: 1) equilibrated service to better match demand on all transit routes serving the Bridge Influence Area, 2) three new limited routes providing the main feeder service to LRT, 3) new shuttle service from Clark County park and ride lots to the LRT terminus, 4) other routes serving downtown Vancouver would connect to the LRT guideway and/or stations.
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated.
		Trunk Line and HCT Service ***LRT***: Extension of TriMet's Interstate MAX Yellow Line from Expo Center to the new Lincoln Park and Ride lot. Peak period headway of 7.5 minutes.
		Capital Facilities 3.41 miles of exclusive guideway. Six new LRT stations. Three new park and ride lots with an additional capacity of 2,410 spaces over the No-Build Alternative. One new Transit Center in the Mill District. Expansion of TriMet's Ruby Junction facility sufficient to accommodate new vehicles.
	I-5 Full-Length	**Local Bus Service** Adjustments to the No-Build Alternative local bus network would include: 1) equilibrated service to better match demand on all transit routes serving the Bridge Influence Area, 2) three new limited routes providing the main feeder service to LRT, 3) new shuttle service from Clark County park and ride lots to the LRT terminus, 4) other routes serving downtown Vancouver would connect to the LRT guideway and/or stations.
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated.
		Trunk Line and HCT Service ***LRT***: Extension of TriMet's Interstate MAX Yellow Line from Expo Center to Kiggins Bowl Park and Ride lot. Peak period headway of 7.5 minutes.
		Capital Facilities 4.22 miles of exclusive guideway. Six new LRT stations. Three new park and ride lots with an additional capacity of 2,500 spaces above the No-Build Alternative. One new Transit Center in the Mill District. Expansion of TriMet's Ruby Junction facility sufficient to accommodate new vehicles.
	Mill Plain District MOS	**Local Bus Service** Adjustments to the No-Build Alternative local bus network would include: 1) equilibrated service to better match demand on all transit routes serving the Bridge Influence Area, 2) three new limited routes providing the main feeder service to LRT, 3) new shuttle service from Clark County park and ride lots to the LRT terminus, 4) other routes serving downtown Vancouver would connect to the LRT guideway and/or stations.

TRANSIT ALTERNATIVE	ALIGNMENT	TRANSIT IMPROVEMENTS
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated.
		Trunk Line and HCT Service ***LRT***: Extension of TriMet's Interstate MAX Yellow Line from Expo Center to Mill Plain District Transit Center. Peak period headway of 7.5 minutes.
		Capital Facilities 2.07 miles of exclusive guideway. Three new LRT stations. Three new park and ride lots with an additional capacity of 3,218 spaces above the No-Build Alternative. One new Transit Center in the Mill District. Expansion of TriMet's Ruby Junction facility sufficient to accommodate new vehicles.
	Clark College MOS	**Local Bus Service** Adjustments to the No-Build Alternative local bus network would include: 1) equilibrated service to better match demand on all transit routes serving the Bridge Influence Area, 2) three new limited routes providing the main feeder service to LRT, 3) new shuttle service from Clark County park and ride lots to the LRT terminus, 4) other routes serving downtown Vancouver would connect to the LRT guideway and/or stations.
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated.
		Trunk Line and HCT Service ***LRT***: Extension of TriMet's Interstate MAX Yellow Line from Expo Center to Clark College park and ride lot. Peak period headway of 7.5 minutes.
		Capital Facilities 2.65 miles of exclusive guideway. Four new LRT stations. Three new park and ride lots with an additional capacity of 1,750 spaces over the No-Build Alternative. One new Transit Center in the Mill District. Expansion of TriMet's Ruby Junction facility sufficient to accommodate new vehicles.
Alternative 4 BRT	**Vancouver Full-Length**	**Local Bus Service** Adjustments to Alternative 2 local bus network would include: 1) equilibrated service to meet demand on all transit routes serving the Bridge Influence Area, 2) five local and limited routes would use the guideway to Expo Center, 3) new shuttle service from Clark County park and ride lots to the BRT terminus, 4) other routes serving downtown Vancouver would connect to the BRT guideway and/or stations, 5) replace three routes with four new routs in Clark County
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated. Substantial service increases on the Bridge Influence Area Express Routes (199 in particular).
		Trunk Line and HCT Service ***BRT:*** New *R*outes 4L, 37L, and 71L would provide service to the Expo Center LRT Station using Vancouver arterial streets and the BRT exclusive guideway. Headways would be much more frequent than in Alternative 2. ***LRT:*** Yellow Line peak period headways of 6 minutes.

TRANSIT ALTERNATIVE	ALIGNMENT	TRANSIT IMPROVEMENTS
		Capital Facilities 3.4 miles of exclusive guideway from Expo Center to Lincoln Park and Ride lot. Eight new BRT stations (including Expo Center). Three new park and ride lots with an additional capacity of 4,210 spaces over the No-Build Alternative. One new transit center in the Mill District. Expo Center gains a new Transfer Center. Expansion of the C-TRAN Administration, Operations and Maintenance (AOM) facility sufficient to accommodate new vehicles.
Alternative 5 LRT	**Vancouver Full-Length**	**Local Bus Service** Adjustments to Alternative 3 local bus network would include: 1) equilibrated service to meet demand on all transit routes serving the Bridge Influence Area, 2) three new limited routes providing the main feeder service to LRT, 3) new shuttle service from Clark County park and ride lots to the LRT terminus, 4) other routes serving downtown Vancouver would connect to the LRT guideway and/or stations, 5) Replace three routes with four new routes in Clark County.
		Express Bus Service Similar to the No-Build Alternative, except that routes 105 and 157 would be eliminated. Substantial service increases on the Bridge Influence Area Express Routes (199 in particular).
		Trunk Line and HCT Service ***LRT***: Extension of TriMet's Interstate MAX Yellow Line from Expo Center to the new Lincoln Park and Ride lot. Peak period headway of 6 minutes. Headways would be much more frequent than in Alternative 3.
		Capital Facilities 3.41 miles of exclusive guideway. Six new LRT stations. Three new park and ride lots with an additional capacity of 2,410 spaces over the No-Build Alternative. One new Transit Center in the Mill District. Expansion of TriMet's Ruby Junction facility sufficient to accommodate new vehicles.

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Table 4-5. Transit Vehicle and Service Characteristics by Alternative in 2030

Characteristic			Alternative 1 No-Build	BRT Alternatives					LRT Alternatives				
				Full-Length Alignments			**MOS Alignments**		**Full-Length Alignments**			**MOS Alignments**	
				Alternative 2		**Alternative 4**	**Alternative 2**		**Alternative 3**		**Alternative 5**	**Alternative 3**	
				Vancouver	**I-5**	**Vancouver**	**Mill District**	**Clark College**	**Vancouver**	**I-5**	**Vancouver**	**Mill District**	**Clark College**
Number of Transit Vehicles – Systemwide													
Standard Buses – TriMet	**In Service w/Spares**		641	641	641	693	641	641	641	641	694	641	641
Standard Buses – C-TRAN	**In Service w/Spares**		126	150	152	221	152	152	108	104	201	103	103
BRT Vehicles	**In Service w/Spares**		N/A	24	24	38	26	26	N/A	N/A	N/A	N/A	N/A
Limited Stop Vehicles	**In Service w/Spares**		4	N/A	N/A	N/A	N/A	N/A	22	26	23	27	27
Light Rail Vehicles (LRV)	**In Service w/Spares**		105	105	105	105	105	105	119	119	123	117	117
Place Miles – Annual													
CRC Corridor	**Local, Express, and Limited Bus**		282,580,000	293,750,000	293,750,000	237,410,000	293,750,000	293,750,000	287,220,000	312,170,000	488,340,000	312,370,000	276,500,000
	BRT Vehicle		N/A	35,200,000	42,120,000	60,440,000	35,200,000	35,160,000	N/A	N/A	N/A	N/A	N/A
	LRV		114,400,000	114,420,000	114,420,000	176,960,000	114,420,000	114,420,000	188,010,000	193,070,000	266,010,000	193,070,000	193,070,000
Annual Vehicle Miles Traveled (VMT)													
CRC Corridor	**Local, Express, and Limited Bus**		8,750,000	8,980,000	8,980,000	13,700,000	8,980,000	8,980,000	8,870,000	9,500,000	13,360,000	9,500,000	8,920,000
	BRT Vehicle		N/A	387,000	463,000	664,000	387,000	387,000	N/A	N/A	N/A	N/A	N/A
	LRV		430,000	430,000	430,000	665,000	430,000	430,000	707,000	726,000	1,000,000	726,000	726,000
Annual Platform Hours													
CRC Corridor	**Local, Express, and Limited Bus**	**TriMet**	390,000	389,000	389,000	504,000	389,000	389,000	389,000	389,000	493,000	389,000	389,000
		C-TRAN	358,000	361,000	364,000	688,000	364,000	364,000	337,000	343,000	617,000	369,000	373,000
	BRT Vehicle		N/A	51,000	51,000	78,000	53,000	53,000	N/A	N/A	N/A	N/A	N/A
	LRV		48,000	48,000	48,000	52,000	50,000	50,000	74,000	74,000	75,000	74,000	74,000

The 2006 National Transit Database reports that TriMet has 640 buses and 116 light rail vehicles in reporting year 2006. The information displayed above are based upon TriMet's 2008 number of vehicles.

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Table 4-6. Primary Transit Facilities in the CRC Study Area

Characteristic		Alternative 1 No-Build	BRT Alternatives					LRT Alternatives				
			Full-Length Alignments			**MOS Alignments**		**Full-Length Alignments**			**MOS Alignments**	
			Alternative 2		**Alternative 4**	**Alternative 2**		**Alternative 3**		**Alternative 5**	**Alternative 3**	
			Vancouver	**I-5**	**Vancouver**	**Mill District**	**Clark College**	**Vancouver**	**I-5**	**Vancouver**	**Mill District**	**Clark College**
Exclusive Guideway Proposed (One-way)		N/A	3.41 miles	4.22 miles	3.41 miles	2.07	2.65	3.41 miles	4.22 miles	3.41 miles	2.07	2.65 miles
New HCT Stations*		N/A	8	8	8	5	6	7	7	7	4	5
Transit Priority Intersections in Guideway		N/A	5	2	5	4	4	4	2	4	4	4
Park and Ride Lots	**Existing/ No-Build Alternative**	12	12	12	12	12	12	12	12	12	12	12
	Additional	5	3	3	2	5	2	3	3	2	5	2
Park and Ride Spaces	**Existing/ No-Build Alternative**	2,884	4,289	4,289	4,289	4,289	4,289	4,289	4,289	4,289	4,289	4,289
	Additional	1,580	2,410	2,500	2,410	3,218	2,500	2,410	2,500	2,410	3,218	2,500
Transit Center	**Existing/ No-Build Alternative**	5	5	5	5	5	5	5	5	5	5	5
	Additional	1	1	1	1	1	1	1	1	1	1	1
Transfer Center		N/A	1	1	1	1	1	N/A	N/A	N/A	N/A	N/A
Maintenance Facilities	**Existing**	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM	TriMet Ruby Junction AOM
	Expansion	TriMet Ruby Junction by 3.5 acres	C-TRAN AOM to accommo-date BRT vehicles	C-TRAN AOM to accommo-date BRT vehicles	C-TRAN AOM to accommo-date BRT vehicles	C-TRAN AOM to accommo-date BRT vehicles	C-TRAN AOM to accommo-date BRT vehicles	TriMet Ruby Junction to accommo-date additional LRVs	TriMet Ruby Junction to accommo-date additional LRVs	TriMet Ruby Junction to accommo-date additional LRVs	C-TRAN AOM to accommo-date BRT vehicles	TriMet Ruby Junction to accommo-date additional LRVs

* *The BRT Alternatives require the construction of a new BRT transit station at Expo Center and the LRT Alternatives would use the existing station.*
AOM – Administration, Operations and Maintenance

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4.2 Alternative 1: No-Build

This section provides a description of the No-Build Alternative transit operations and capital facilities. Figure 4-3 shows the No-Build Alternative transit operations and capital facilities within the CRC Study Area that would be used for trips between Clark County and Portland.

The No-Build Alternative transit operations are based on TriMet's 2030 financially constrained transit network and C-TRAN's 2007 Service Redesign adopted in January 2007. The No-Build highway and transit capital improvements are those projects listed in Metro's *2004 Regional Transportation Plan* (RTP) *Financially Constrained Project List* (with a 2030 horizon) and RTC's *2030 Metropolitan Transportation Plan* (MTP) *Financially Constrained Project List*, except for the Milwaukie light rail project and including the Eastside Portland Streetcar with OMSI terminus.

The following description of the No-Build Alternative includes only those operations and capital projects within the I-5 corridor that have a measurable impact on RTC's and Metro's regional travel demand models. These include new transit routes, modifications to transit line routing, modifications to transit route headways, and roadway projects that impact capacity, speed, and that establish a new connection or remove an existing connection. The complete No-Build Alternative project list is included as Appendix C of this report.

4.2.1 Transit Operations

Transit operations in the No-Build Alternative are a combination of the existing transit system and planned/programmed improvements. Figure 4-4 shows the No-Build Alternative local bus, express bus, and light rail operations within the CRC Corridor. See Section 3 of this report for information on span of service, vehicle characteristics, and fares. See Appendix B for a complete transit line listing, including headways.

4.2.1.1 Corridor Local Bus Operations

The TriMet local bus operations would be consistent with their 2030 Financially Constrained Transit Network, which assumes a systemwide annual growth of approximately one percent in fixed route service hours. C-TRAN's local bus operations would be consistent with their 2007 Service Redesign adopted in January 2007. C-TRAN's annual service is expected to grow at approximately one percent to the year 2011, after which service would remain constant in terms of revenue hours delivered.

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Figure 4-3. Alternative 1 – No-Build Alternative: Local, Express, and Trunk Line Service

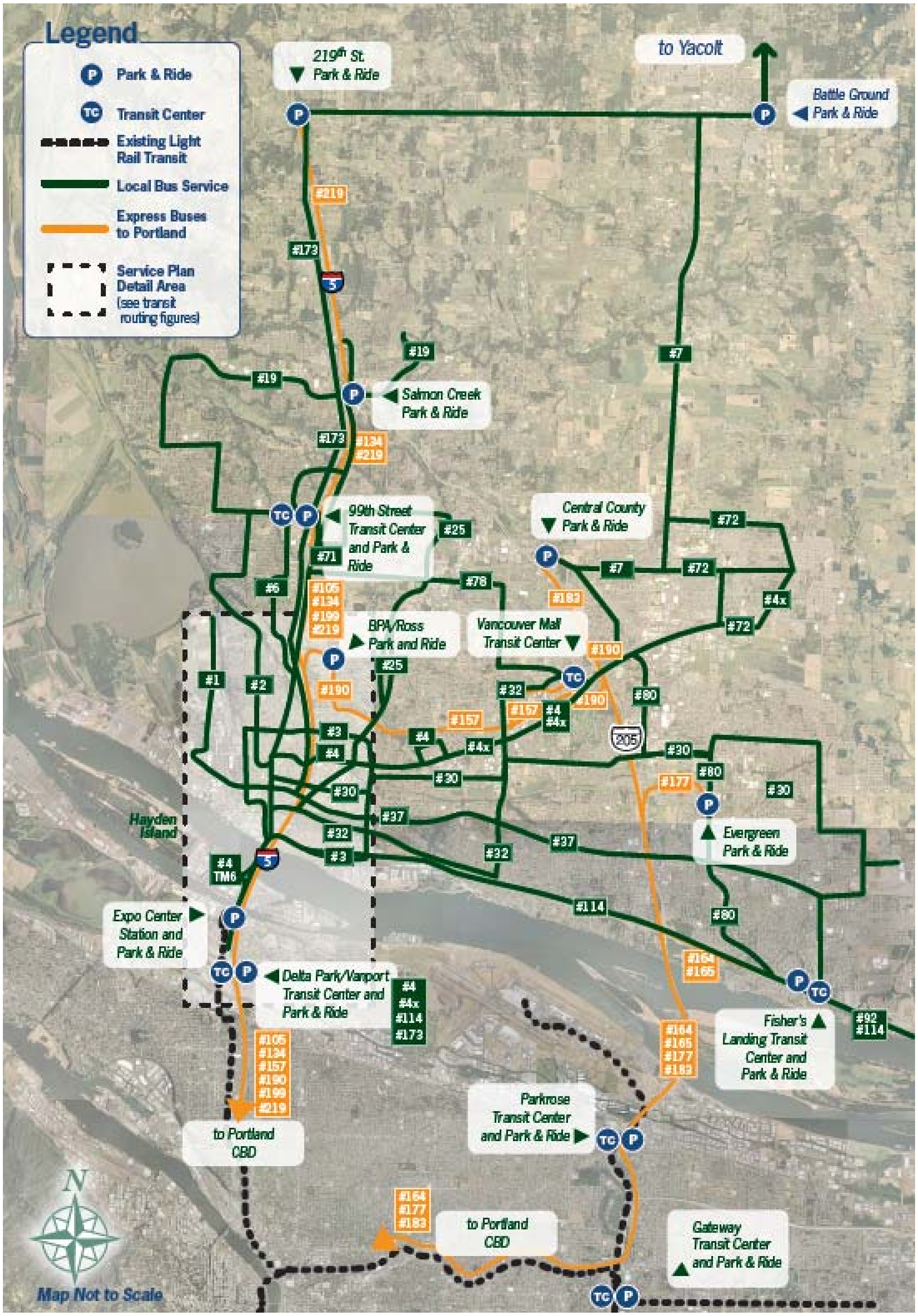

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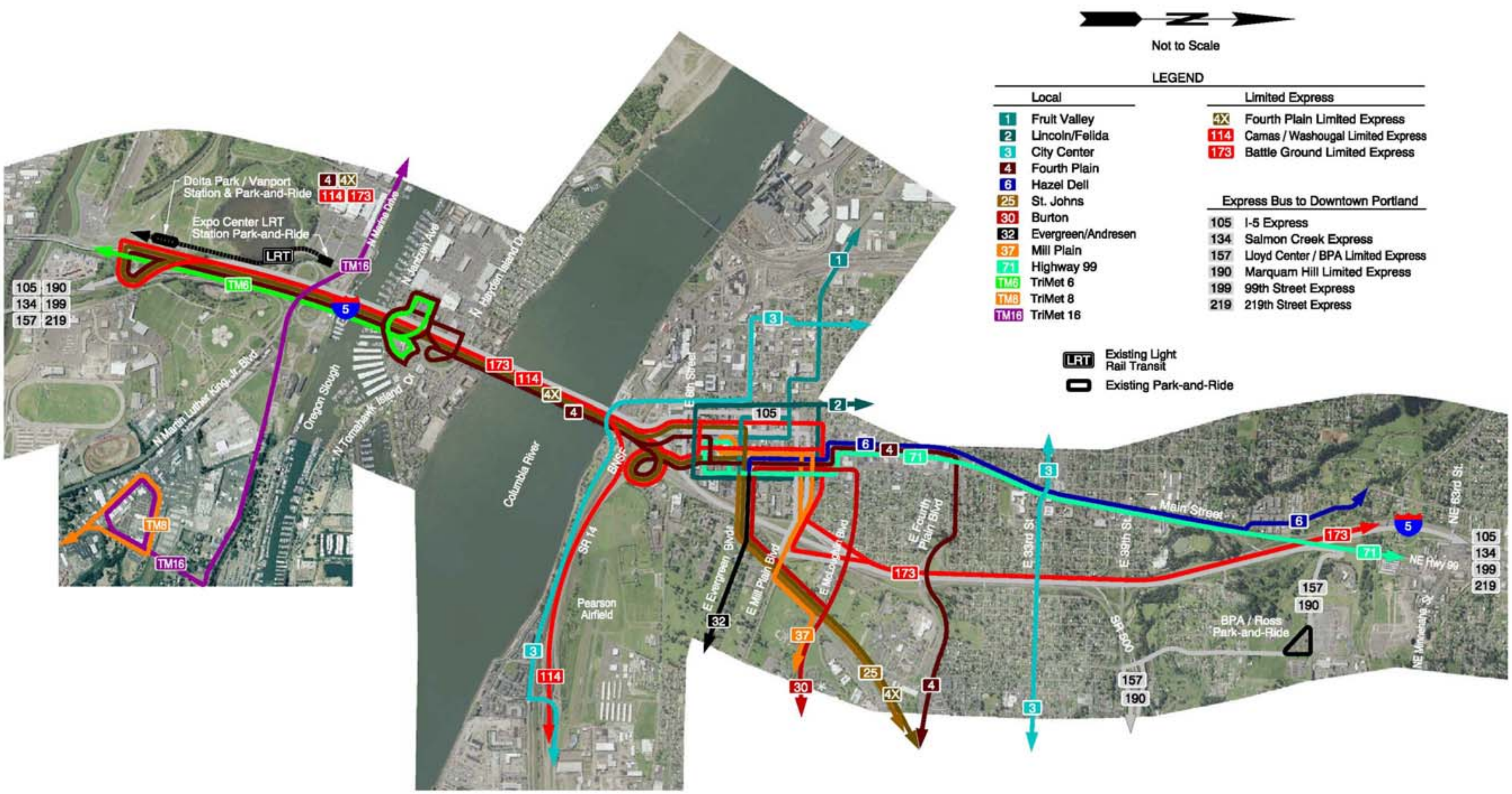
Figure 4-4. Alternative 1 – No-Build Alternative Transit Routing: Includes Local, Express, and Trunk Line Service



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The No-Build Transit Service Plan is based on C-TRAN's 2007 Service Redesign. It includes the following local routes that affect the I-5 corridor:

- 1 Fruit Valley: Connects Fruit Valley Road with downtown Vancouver interlining with Route 25 St. Johns;
- 2 Lincoln/Felida: Connects 99th Street Park and Ride with downtown Vancouver via local streets;
- 3 City Center: Provides a downtown circulator at 30-minute headways;
- 4 Fourth Plain: Provides service between Vancouver Mall, downtown, Jantzen Beach and Delta Park/Vanport Light Rail Station using Fourth Plain Boulevard and the I-5 bridge;
- 6 Hazel Dell: Provides a connection between the Hazel Dell Neighborhood and downtown Vancouver running from the 99th Street Transit Center, down Main Street to Evergreen and C Street where it interlines with the #32;
- 19 Salmon Creek Shuttle: Provides a loop between the Salmon Creek Park and Ride, the Washington State University campus, the Felida Loop, and the 99th Street Transit Center;
- 25 St. Johns: Connects downtown Vancouver, Clark College, and the 99th Street Transit Center;
- 37 Mill Plain: Provides a connection between Fishers Landing Transit Center, Clark College, and downtown Vancouver via Mill Plain; and
- 71 Highway 99: Serves 99th Street Transit Center and the Salmon Creek Park and Ride, and travels down Main Street to Seventh Street.

C-TRAN's network includes three limited routes with a stop spacing of every ½ mile to 1 mile (and therefore do not meet the CRC definition of a point-to-point express bus) that only operate on weekdays during the peak period. C-TRAN's 2007 Service Redesign included the following new and modified limited routes:

- 44 Fourth Plain Limited Express: New bi-directional limited express service during weekday peak periods connecting Orchards, Vancouver Mall, Clark College, Vancouver Central Business District (CBD) and Delta Park/Vanport light rail station, no Jantzen Beach service;
- 114 Camas/Washougal Limited: Connects Camas and Washougal, to Fishers Landing Transit Center, to downtown Vancouver, and then crosses the I-5 bridge to Delta Park/Vanport light rail station in Portland; and
- 173 Battle Ground Limited: Connects Battle Ground to downtown Vancouver via I-5 and Main Street, then to Delta Park/Vanport light rail station via the I-5 bridge.

4.2.1.2 Corridor Express Bus Operations

Within the I-5 corridor the No-Build Alternative would include the following express bus operations in accordance with C-TRAN's 2007 Service Redesign:

- 105 I-5 Express: Connection between the 99th Street Transit Center, downtown Vancouver, and downtown Portland with non-stop service between downtown Vancouver and downtown Portland using I-5;
- 134 Salmon Creek Express: Provides non-stop, point-to-point service between the Salmon Creek Park and Ride and downtown Portland;
- 157 Lloyd Center/BPA Express: Provides point-to-point service between the 99th Street Transit Center and the Lloyd District in NE Portland; and
- 190 Marquam Hill Express: Provides point-to-point service between Vancouver and Marquam Hill (Oregon Health Science University Hospital) with stops in Vancouver at Central County Park and Ride, Vancouver Mall, and the BPA/Ross Park and Ride.

New C-TRAN express bus routes include:

- 199 99th Street Express: Direct service from 99th Street Transit Center to downtown Portland; and
- 219 219th Street Express: Direct service from 219th Street Park and Ride lot to downtown Portland.

All express bus routes would operate on I-5 and would use the existing northbound managed lane from Going Street to the Oregon Slough. As shown in Figure 4-3 there would also be four express bus routes that would operate in the I-205 corridor.

4.2.1.3 Corridor LRT Operations

Under the No-Build Alternative TriMet would continue to operate the Interstate MAX Yellow Line through downtown Portland to the Expo Center light rail station in north Portland. Peak period headways on the Yellow Line would improve from 10 minutes only during the heart of the peak with up to 15 minutes during the shoulders to 10 minutes during the entire peak.

4.2.1.4 Transit Operating Characteristics

Table 4-7 summarizes the transit operating characteristics of the No-Build Alternative. Table 4-8 provides a comparison of the existing and No-Build Alternative bus routing.

C-TRAN would continue to operate 130 buses and TriMet would continue to operate 645 buses systemwide, in service and spares. TriMet would also operate 119 LRVs (existing plus Green Line (I-205/Mall)), an increase of 14 LRVs over existing conditions.

For TriMet, the No-Build Alternative would include an annual increase in fixed route service hours of approximately one percent systemwide; from 1,953,420 annual service hours in FY2005 to about 2,350,000 annual service hours in 2030. Some of this increase in fixed route service hours would be simply to respond to increased congestion, but the remainder represents actual growth in service. TriMet’s annual service hours for LRT would increase from 238,704 in FY2005 to about 385,000 in 2030. C-TRAN’s fixed route annual service hours would increase until 2011 at slightly less than one percent from 231,000 in FY2005 to approximately 239,000 annual service hours, after which service would remain constant in terms of revenue hours delivered.

In 2030 the annual vehicle miles traveled (VMT) for TriMet's fixed route buses would be about 3,400,000 and for C-TRAN's fixed route buses the annual VMT would be about 4,780,000. The annual VMT for TriMet's light rail system would be about 399,000.

Table 4-7. Alternative 1: Transit Operating Characteristics in 2030

CHARACTERISTIC		TRIMET	C-TRAN
Vehicles	**Local and Express Bus**	641	130
	LRT	105 LRVs	N/A
Annual Platform Hours	**Fixed Route Bus**	2,350,000	239,000
	LRT	385,000	N/A
Annual Vehicle Miles Traveled	**Fixed Route Bus**	3,400,000	4,780,000
	LRT	399,000	N/A

Table 4-8. Comparison of Existing Conditions and Alternative 1 Bus Routing

TRANSFER LOCATION	EXISTING CONDITIONS			ALTERNATIVE 1		
	Connections		**Buses per Hour (PM peak)**	**Connections**		**Buses per Hour (PM peak)**
	Bus Routes	**Number of Bus Routes**		**Bus Routes**	**Number of Bus Routes**	
Delta Park/Vanport Station	C-TRAN: 4, 4X, 114, 173	4	8	C-TRAN: 4, 4X, 114, 173	4	8
Expo Center Light Rail Station	TriMet: 16	1	2	TriMet: 16	1	2
Hayden Island	TriMet: 6 C-TRAN: 4	2	8	TriMet: 6 C-TRAN: 4	2	8
Downtown Vancouver	C-TRAN: 1, 2, 3, 4, 4X, 6, 25, 30, 32, 37, 71, 105, 114, 173	14	31	C-TRAN: 1, 2, 3, 4, 4X, 6, 25, 30, 32, 37, 71, 105, 114, 173	14	31

4.2.2 Capital Improvements

This section provides a summary of the highway and transit capital improvements for the CRC Bridge Influence Area that would be included with the No-Build Alternative. The No-Build Alternative would include roadway and transit capital improvements included in the financially constrained RTP and MTP, except for the Milwaukie LRT project and including the Eastside Portland Streetcar with OMSI terminus project (see Appendix C, which includes estimated program years for each project).

4.2.2.1 Highway Capital Improvements

No-Build (Financially Constrained) Highway

The following capital improvement projects within the CRC Bridge Influence Area would be included in the No-Build Highway:

- I-5 Delta Park to Lombard Avenue: Widen I-5 southbound between Victory Boulevard and Lombard Street in North Portland, adding a third southbound through lane and standard emergency lanes in each direction;

- I-5 at the Columbia Boulevard Interchange: Construct full direction access interchange based on recommendations from the I-5 North Trade Corridor Study;
- North Lombard Improvements: Widen Lombard Street to three lanes from Rivergate Boulevard to south of the Columbia Slough bridge;
- North Lombard Overcrossing: Construct overpass from the Columbia/Lombard intersection into the South Rivergate entrance to separate rail and vehicular traffic;
- Main Street in Vancouver: Convert Main Street for two-way vehicular travel from Sixth Street to 15th Street;
- Broadway Street in Vancouver: Convert Broadway Street in downtown Vancouver for two-way vehicular travel from Sixth Street to 15th Street;
- St. Johns Interchange Project: This project will replace the current signalized intersection at SR 500 and St. Johns Boulevard in Vancouver with a freeway-style interchange; and
- Salmon Creek Interchange Project: Construct NE 139th Street from NE 20th Ave to NE 10th Ave, reconstruct interchange, improve access to I-205 with flyover from 134th Street to I-205 southbound NE 10th Ave, relocate the Salmon Creek Park and Ride lot to NW 10th Avenue and 139th Street.

The No-Build Highway does not include a replacement I-5 bridge over the Columbia River.

4.2.2.2 Transit Capital Improvements

This section provides a summary of the transit capital improvements that would be included with the No-Build Alternative.

Park and Ride Lots and Transit Centers

The No-Build Alternative would include ten existing and three new park and ride lots, for a total of 13 park and ride lots consisting of 4,464 spaces (see Table 4-9), that would be used by people traveling between Clark County and downtown Portland. The existing park and ride lot at K-Mart would be eliminated. Of these park and ride lots, five also include a transit center function for transfers. In the No-Build Alternative, the Delta Park/Vanport park and ride would gain a transit center to accommodate the transfer from C-TRAN buses to light rail. The Vancouver Mall Transit Center, which does not have an associated park and ride lot, is also included in the No-Build Alternative. Table 4-9 lists the number of bus bays at these transit centers.

Table 4-9. Alternative 1 – No-Build Alternative Transit Facilities Used for Bi-State Travel

TRANSIT FACILITY	LOCATION	EXISTING OR NEW	PARKING SPACES	BUS BAYS
Park and Ride Lots				
219th Street	Adjacent to I-5 at 219th Street	New	600	N/A
Battle Ground	E Main Street and NE Fairground Avenue	Existing	20	N/A
Salmon Creek	Adjacent to I-5 at NE 139th Street	Existing but Relocated	493	N/A
Central County	Andresen and Padden Parkway	New	480	N/A
BPA/Ross	NE Ross Street and NE 15th Ave	Existing	175	N/A
Evergreen	NE 138th Avenue and NE 18th Street	Existing	269	N/A
Washougal	Second Street and C Street	Existing	20	N/A
Expo Center light rail station	2060 N Marine Dr	Existing	300	N/A
Transit Centers				
99th Street	Adjacent to I-5 at 99th Street	New	600	9
Vancouver Mall	NE Vancouver Mall Drive	Existing	N/A	5
Fisher's Landing	SE 34th Street and 164th Avenue SE	Existing	566	9
Delta Park/Vanport	1904 N Victory Blvd	Existing	300	4
Gateway	NE 99th & Pacific	Existing	444	12
Parkrose	NE Sandy Blvd & 95th	Existing	300*	9
	Total	**13**	**4,567**	**48**

**The actual existing parking spaces at Parkrose is 193, however it was modeled with 300 parking spaces.*

High Capacity Transit

The No-Build Alternative would include construction of the following improvements to the existing regional HCT system:

- Extension of the Central City streetcar line to Portland's South Waterfront area (expected completion 2007);
- Portland Streetcar Loop to OMSI;
- I-205/Portland Mall MAX light rail project, including construction of the I-205 light rail line from the Gateway Transit Center to the Clackamas Transit Center and adding light rail to the Portland Mall (expected completion 2009); and
- Construction of the Washington County Commuter Rail line (expected completion September 2008).

Operations and Maintenance Facility

The No-Build Alternative includes a 3.5-acre expansion of TriMet's existing Ruby Junction operations and maintenance facility, as identified in TriMet's facility master plan, to accommodate the additional LRVs associated with the I-205/Portland Mall light rail system expansion.

4.3 Alternative 2: Bus Rapid Transit

This section provides a description of the Alternative 2. Figure 4-5 illustrates the Alternative 2 with the Vancouver alignment and Figure 4-6 illustrates the Alternative 2 with the I-5 alignment. Alternative 2 includes a BRT system extending from the existing Expo Center light rail station to downtown Vancouver paired with replacement bridge structures. BRT is a term used to describe a variety of capital and operational improvements to a bus transit system that are designed to reduce bus travel time, improve transit system reliability, improve the passenger amenities and experience, and increase service to transit markets.

Alternative 2 would include elements of the following:

- An exclusive transit guideway in downtown Vancouver and across the Columbia River;
- Intelligent transportation system (ITS) treatments;
- Highway$_1$ capital improvements;
- Ticket vending machines at the BRT stations to facilitate simplified, faster boarding;
- 60-foot articulated vehicles with a unique "branded identity;"
- Passenger stations with increased amenities, similar in size and scale to existing light rail stations in Portland;
- Queue jump lanes for buses accessing I-5;
- Additional park and ride lots;
- Express bus service from outer Clark County park and rides to Portland CBD, the Lloyd District and OHSU; and
- A standard toll for river crossing.

Alternative 2 would include the addition of three limited bus lines. Compared to the No-Build Alternative, Alternative 2 would reduce transit travel time, improve transit schedule reliability, and increase service to transit markets. To provide a one-transfer ride from points in Vancouver to central Portland, these three BRT bus lines would operate beyond the Bridge Influence Area and outside of the exclusive guideway to the existing Salmon Creek Park and Ride lot, and the Vancouver Mall and Fisher's Landing Transit Centers.

For Alternative 2, the Vancouver full-length alignment is the representative alignment. With this alignment, the exclusive guideway would consist of a length of approximately 3.41 miles. At the south end, the alignment would begin at the existing Expo Center light rail station. From there, the alignment would rise northward, over the Oregon Slough, to an elevated station on Hayden Island and then continue to rise to travel over the Columbia River. Once over the river, the alignment would descend into downtown Vancouver to a touchdown point near Sixth Street and Washington Street. Along Washington Street in downtown Vancouver, there would be BRT stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street. From the Mill Plain District Transit Center, both travel directions of the guideway would continue north along Broadway Street, with a station located at 24th Street, to 29th Street. From there, both travel directions of the guideway would continue north up Main Street, with a station located at 33rd Street, and to the terminus at the proposed Lincoln Park and

Ride lot located at the intersection of Main Street and East 40th Street. A structured park and ride lot would be provided at Clark College, and surface lots would be provided at the Kiggins Bowl and the Ross Road Park and Ride lots. The existing BPA/Ross Park and Ride lot would be eliminated.

The I-5 Alignment, which includes a 4.22-mile exclusive guideway, would be the same as the Vancouver Alignment from Expo Center light rail station to the proposed Mill Plain District Transit Center. From the Mill Plain District Transit Center the alignment would turn east onto McLoughlin Boulevard and then pass under I-5 to the proposed Clark College Park and Ride lot, located near East McLoughlin Street and East K Street. From the Clark College Park and Ride lot, the alignment would travel along the east side of I-5, with a station located at 33rd Street, and to the terminus in Vancouver at the proposed Kiggins Bowl Park and Ride lot located at the intersection of Highway 99 and Main Street, to the west of I-5. The existing BPA/Ross Park and Ride lot would be eliminated.

In addition to the full-length alignments, there are two BRT MOS's associated with Alternative 2. Figure 4-9 details the Mill Plain District MOS alignment associated with this alternative. In the Mill Plain District MOS, the alignment of the 2.07-mile exclusive guideway would be the same as the full-length alignment but would terminate sooner at the proposed Mill Plain District Transit Center between 15th and 16th Street. New park and ride lots would be provided at the Mill Plain District Transit Center, BNSF and loop park and rides, Clark College Park and Ride, Lincoln Park and Ride, and at the Kiggins Bowl Park and Ride.

Figure 4-10 details the BRT Clark College MOS alignment. In the BRT Clark College MOS, the alignment of the 2.65-mile exclusive guideway would be the same as the I-5 full-length alignment, but it would end at the proposed Clark College Park and Ride lot. A surface lot would be provided at the Kiggins Bowl Park and Ride lot. The existing BPA/ Ross Park and Ride lot would be eliminated.

In addition, Alternative 2 includes several design options for segments of the alignment, station locations and for the guideway cross section which are described in Section 4.7.1.

With the connection to the Interstate MAX Yellow Line at the Expo Center, the Alternative 2 would provide a one transfer trip between points in Vancouver and central Portland. Alternative 2 would also include point-to-point express bus service from Clark County park and ride lots to central Portland. The express bus service would complement the BRT service with a direct service to the suburban commuter transit market, while BRT would serve both the inner urban transit market and portions of the suburban commuter transit market through park and ride lots and transfers from local service.

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Figure 4-5. Alternative 2 – BRT Vancouver Alignment: Transit Crossing the Columbia River (Local Network not Shown)

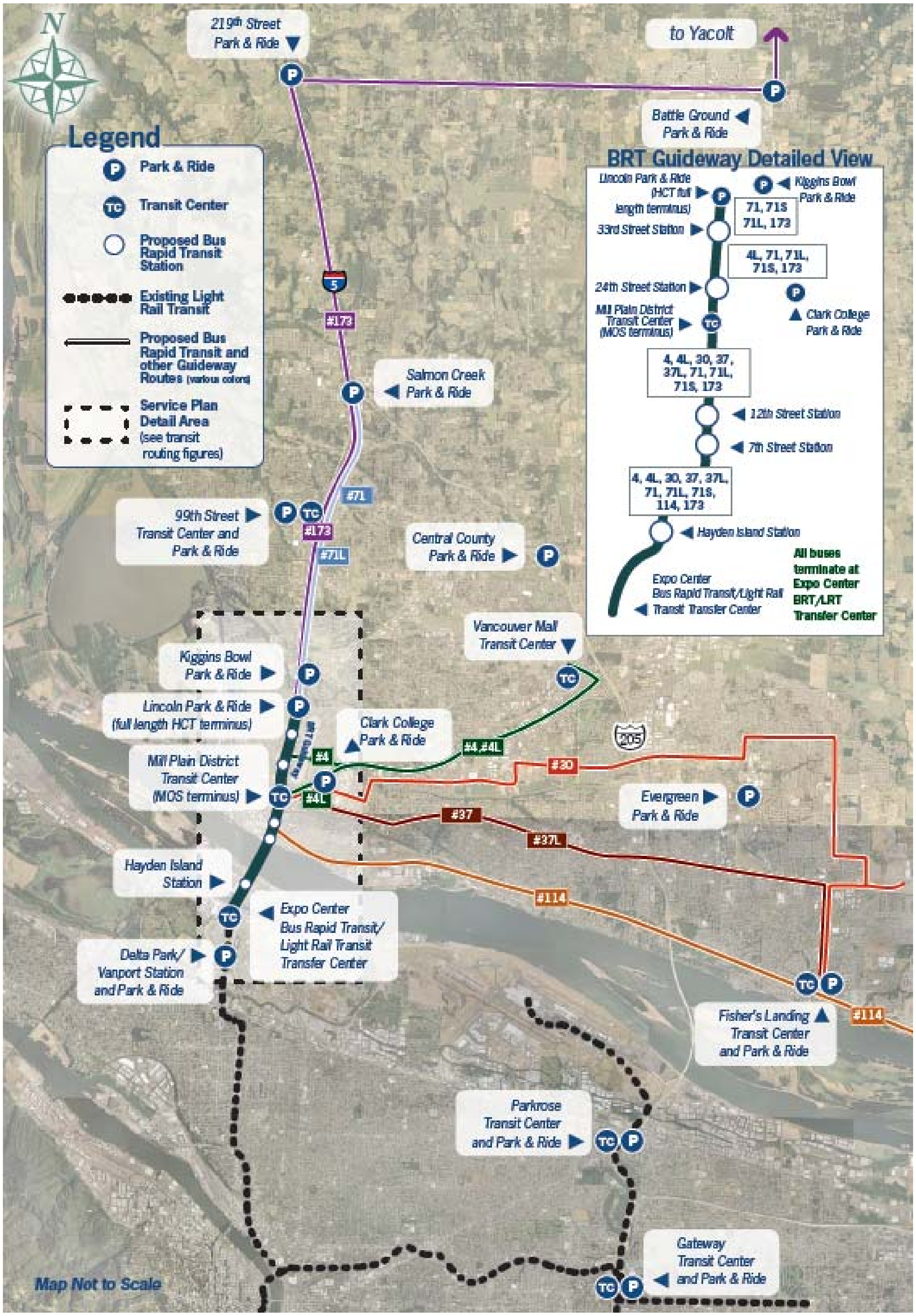

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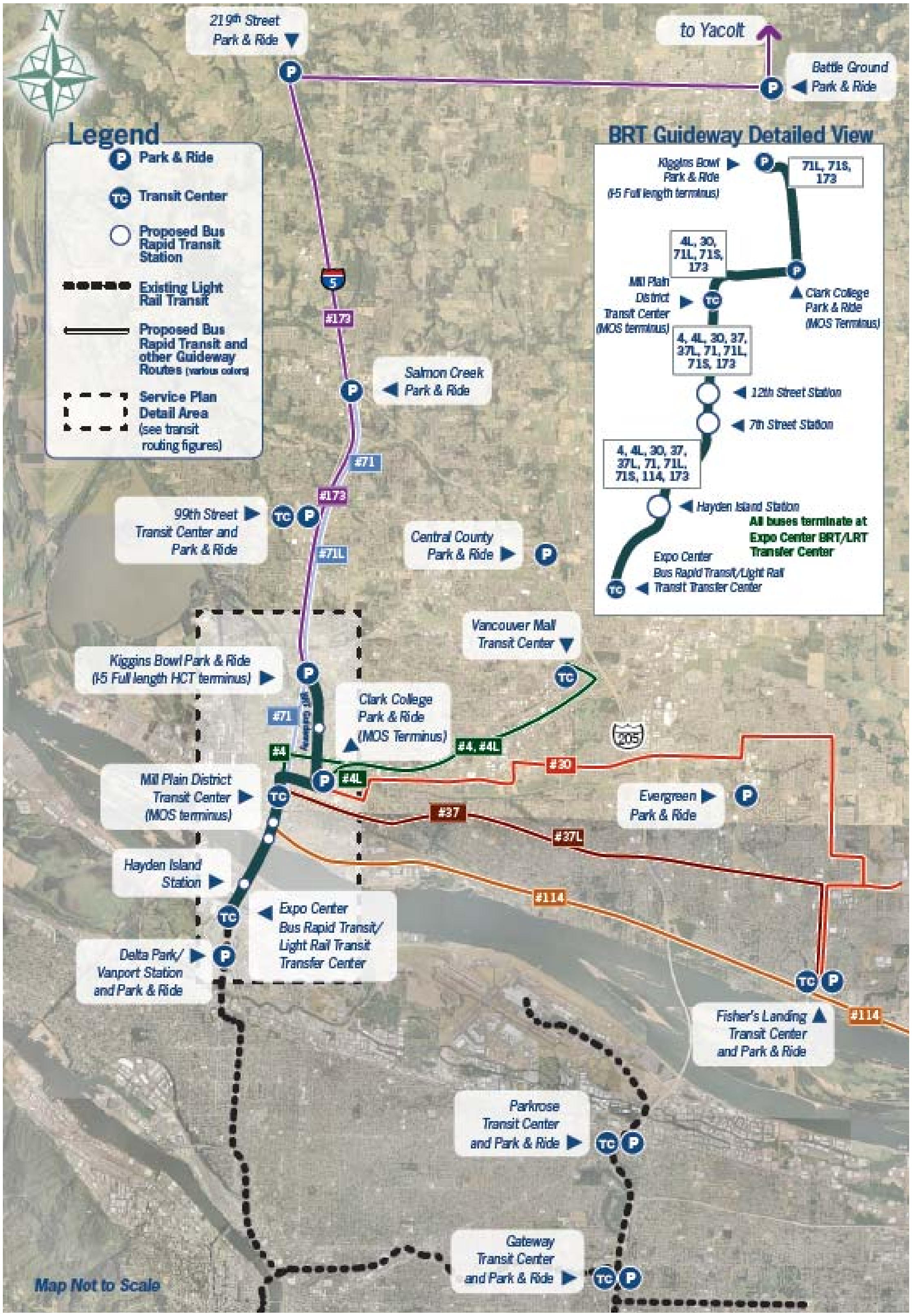
Figure 4-6. Alternative 2 – BRT I-5 Alignment: Transit Crossing the Columbia River (Local Network not Shown)



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4.3.1 Transit Operations

Figure 4-7 shows the transit routing for the Vancouver full-length alignment (including local bus, express bus, and trunk service operations), which is the representative alignment for this alternative, and Figure 4-8 shows the transit routing for the I-5 full-length alignment. Figure 4-9 shows the transit routing for the BRT Mill Plain District MOS and Figure 4-10 shows the transit routing for the BRT Clark College MOS. See Section 3 of this report for information on the BRT span of service, vehicle characteristics, and fares. See Appendix B for a complete transit line listing for the BRT Alternative, including headways.

4.3.1.1 Corridor BRT Operations

In Alternative 2, the trunk line service would be provided by the addition of three BRT lines. The BRT lines would have unique signage and line identity, and vehicles that would identify the BRT system and promote the service. See Figure 3-5 for the BRT vehicle characteristics. The BRT lines would be new limited lines of C-TRAN's Routes 4, 37, and 71 which are currently C-TRAN's most used routes. These new routes would be the:

- 4L Fourth Plain Limited (which would replace the 4X in the No-Build Alternative);
- 37L Mill Plain Limited; and
- 71L Highway 99 Limited.

These three routes would each have peak-period headways of ten minutes and off-peak headways of 15 minutes. The combined headway for the BRT routes in the peak period would be 3 to 4 minutes and in the off-peak period the combined headway would be 5 minutes.

The three BRT lines would travel along the same routing as their corresponding companion route, but they would operate with limited stops that would be ½ to 1 mile apart. The BRT lines would then travel through downtown Vancouver and across the Columbia River in an exclusive guideway to the Expo Center light rail station (which would gain a new transfer center). The following is a brief description of the BRT operations for the Vancouver and I-5 alignments.

Vancouver Full-Length Alignment

With the Vancouver full-length alignment, which is the representative alignment for the BRT Alternative, the 71L would travel down Highway 99 and Main Street and enter the exclusive guideway at its northern end at the proposed Lincoln Park and Ride lot. The 4L would travel along its existing routing and enter the guideway at the Mill Plain District Transit Center, as would the 37L. Once in the guideway, the BRT lines would continue across the Columbia River to Expo Center stopping only at designated BRT stations.

I-5 Full-Length Alignment

In the I-5 full-length alignment the 71L would enter the guideway at its northern end at the proposed Kiggins Bowl Park and Ride lot. The 4L would enter the guideway at the proposed Clark College Park and Ride lot and the 37L would enter the guideway at the Mill Plain District Transit Center. Once in the guideway, the BRT lines would continue across the Columbia River to Expo Center stopping only at designated BRT stations.

MOS Alignments

In both the Mill Plain District MOS and the BRT Clark College MOS, the 71L would continue to travel down Main Street in mixed traffic and would enter the exclusive guideway at the proposed Mill Plain District Transit Center. In both MOS' the 71S would provide a short trip from the Lincoln Park and Ride to the Mill District Transit Center. The 4L and the 37L would enter the exclusive guideway at the same locations as the corresponding full-length alignment. Once in the guideway, the BRT lines would continue across the Columbia River to Expo Center stopping only at designated BRT stations.

4.3.1.2 Corridor Local Bus Operations

For both the Vancouver and the I-5 alignments the local versions of the BRT lines (C-TRAN's 4, 37, and 71) would continue to serve all existing stops along the route and cross the river to provide a one-seat transit ride for passengers to the Expo Center light rail station. Three other C-TRAN local and limited routes that currently have a large number of transfers to the TriMet 6 and the C-TRAN 105 (the existing bi-state service from downtown Vancouver to Hayden Island and Portland) would also use the exclusive guideway to the Expo Center light rail. The following three are the C-TRAN local and limited routes:

- 30-Burton;
- 114-Camas/Washougal Limited Express; and
- 173-Battle Ground Limited Express.

With these three routes also using the exclusive guideway, the number of riders who would have a one-transfer trip with a very short wait to central Portland would increase and it would approximate the number of buses that would connect to light rail in Alternative 2 without substantially raising operating costs. The total number of vehicles in the guideway at Washington and Seventh Street per hour, two-way, would be 50.

With the exception of the above three local and limited routes that would travel on the exclusive guideway across the Columbia River to the Expo Center light rail station the local bus network in Alternative 2 would be similar to the No-Build local bus network. The peak period headways for Route 114 would be decreased from 120 minutes to 60 minutes. For Route 173, the peak period headway would stay the same as the No-Build Alternative, but an off-peak route would be added with a headway of 120 minutes. In addition, C-TRAN's Route 4X would be eliminated as this service would be provided with the BRT line 4L. In downtown Vancouver other local bus lines would connect with the BRT guideway buses at designated stations for transfer opportunities.

4.3.1.3 Corridor Express Bus Operations

The corridor express bus operations to downtown Portland, OHSU, or the Lloyd District would be similar to the No-Build Alternative. Express bus routes 105 and 157 would be eliminated as they would be redundant to the BRT service. In addition, because with Alternative 2 the BPA/Ross Park and Ride lot would be eliminated, Route 190 would be modified to stop at the Kiggins Bowl Park and Ride lot. Express bus route 190 is a direct point-to-point premium fare route to Marquam Hill, which is an area that would not be served directly by the Alternative 2.

All I-5 express bus routes would operate in general purpose lanes southbound. Northbound, the express bus routes would use the existing I-5 managed lane from Going Street to the Oregon Slough.

4.3.1.4 Corridor LRT Operations

To accommodate the connection from BRT to light rail, the Yellow Line headways to the Expo Center would be decreased during the peak period from 10 minutes in the No-Build Alternative to 7.5 minutes; headways in the off-peak period would remain at 15 minutes.

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Figure 4-7. Alternative 2 – BRT Vancouver Alignment Transit Routing: Includes Local, Express, and Trunk Line Service

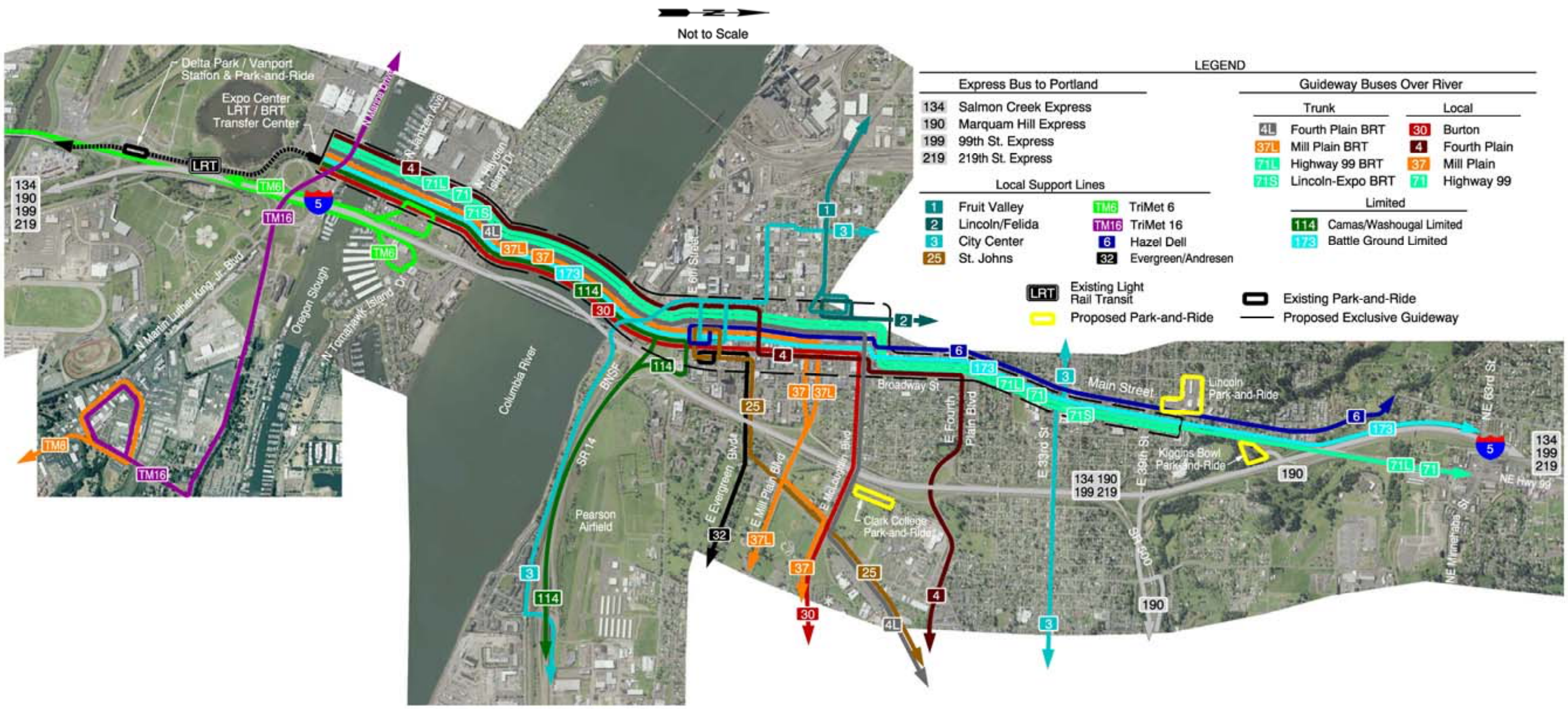

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Figure 4-8. Alternative 2 – BRT I-5 Full-Length Alignment Transit Routing: Includes Local, Express, and Trunk Line Service

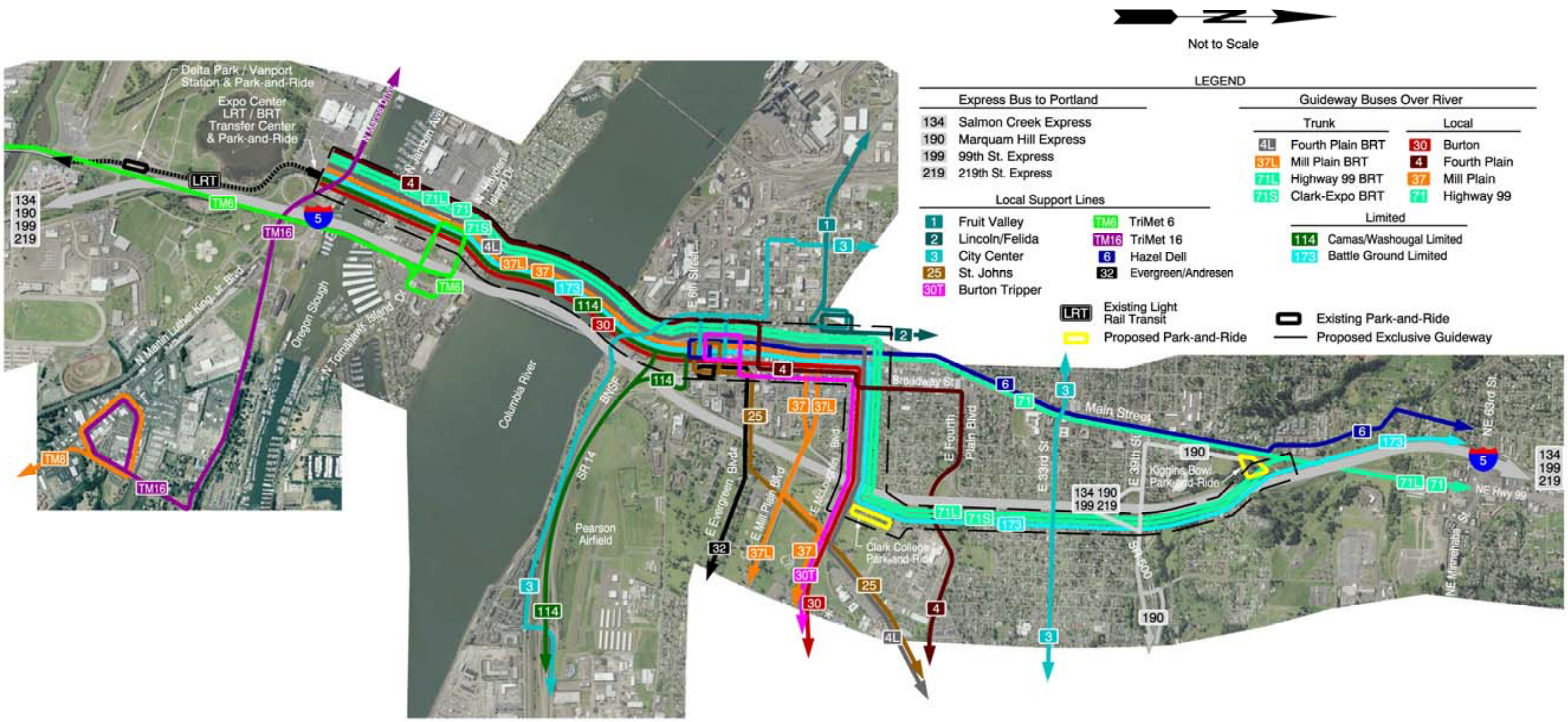

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Figure 4-9. Alternative 2 – BRT Mill Plain District MOS Transit Routing: Includes Local, Express, and Trunk Line Service

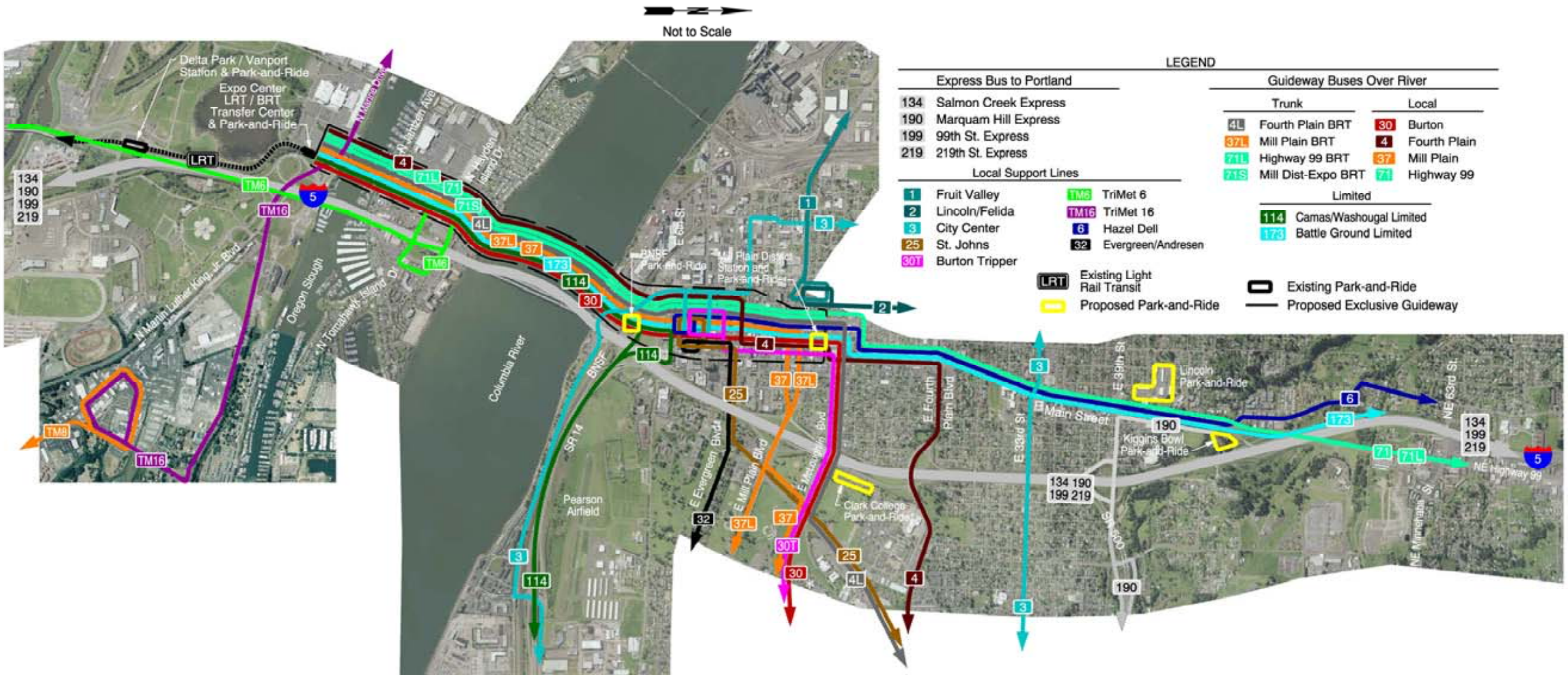

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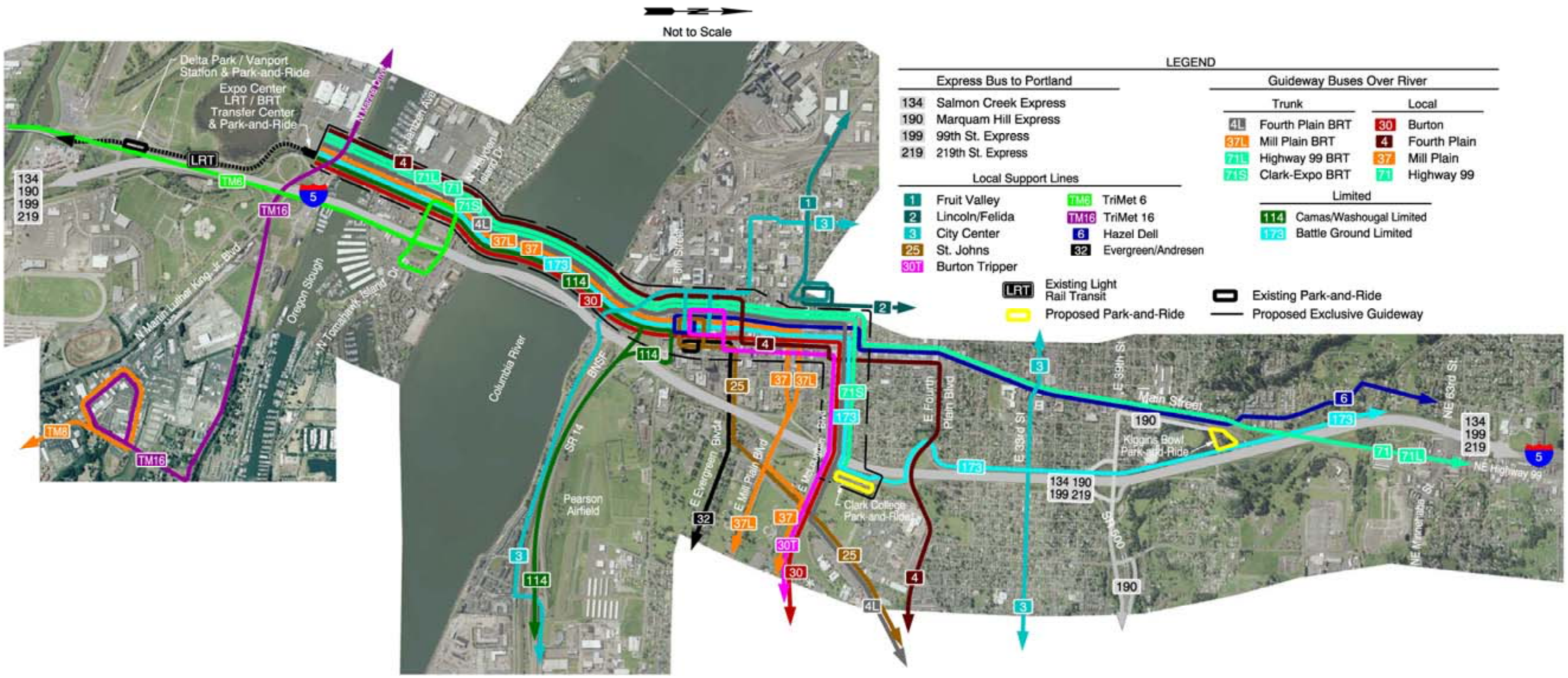
Figure 4-10. Alternative 2 – BRT Clark College MOS Transit Routing: Includes Local, Express, and Trunk Line Service



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4.3.1.5 Transit Operating Characteristics

Table 4-10 summarizes the transit operating characteristics of Alternative 2 and Table 4-11 provides a comparison of the bus routing for the BRT Vancouver and I-5 full-length alignments, as well as for the Mill Plain District and Clark College MOS.

C-TRAN would continue to operate 130 buses for their local and express bus service and TriMet would continue to operate 641 buses for their fixed route service (in service and spares). Alternative 2 would require 24 new BRT vehicles (see Figure 3-5 for vehicle characteristics). The number of LRVs in the Interstate MAX system would remain as in the No-Build Alternative at 105 (in service and spares).

The three BRT routes (4L, 37L, and 71L) would each have peak period headways of 10 minutes and off-peak headways of 15 minutes. For BRT, the Vancouver alignment would result in annual platform hours of about 51,000, and about 387,000 annual VMT. For the BRT service the I-5 full-length alignment would result in about the same annual platform hours and about 463,000 annual VMT. The BRT Mill Plain District and Clarck College MOS alignmentw would both result in annual platform hours of about 53,000, and an annual VMT of about 387,000. For C-TRAN's fixed route buses, with the Vancouver full-length alignment, the annual platform hours would be about 271,000 and the annual VMT would be about 3,400,000. The increase of about 6,900 fixed route service hours over the No-Build Alternative would be due to the three local buses that would have extended service across the Columbia River to Expo Center.

4.3.1.6 Highway Capital Improvements

The Alternative 2 Vancouver and I-5 full-length alignments and the Mill Plain District and Clark College MOS alignments were paired with the Highway_1 network as described in Section 3.2. Vancouver full-length alignment would also be paired with the Highway_2 network. The difference between highway networks is that in Highway_1 all I-5 lanes would be tolled, and in Highway_2 I-5 would not be tolled. There would be no difference in the transit operations or transit capital improvements.

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Table 4-10. Alternative 2 – Summary of BRT Transit Operating Characteristics

Characteristic		Alternative 2			
		Full-Length Alignments		**MOS Alignments**	
		Vancouver	**I-5**	**Mill Plain District**	**Clark College**
Vehicles	**C-TRAN Standard Buses**	150	152	152	152
	BRT	24	24	26	26
	LRVs	105	105	105	105
BRT Headways (Route 4L, 37L, 71L)[1]	**4L**	10 peak, 0 off-peak	10 peak, 0 off-peak	10 peak, 0 off-peak	10 peak, 0 off-peak
	37L	12 peak, 0 off-peak	12 peak, 0 off-peak	12 peak, 0 off-peak	12 peak, 0 off-peak
	71L	10 peak, 15 off-peak	10 peak, 15 off-peak	10 peak, 15 off-peak	10 peak, 15 off-peak
Yellow Line Headways		10 min peak, 15 min off-peak	10 min peak, 15 min off-peak	7.5 min peak, 15 min off-peak	10 min peak, 15 min off-peak
Routes Crossing in Guideway to Expo Center light rail station		4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173	4, 30, 4L, 37, 37L, 71, 71L, 71S, 114, and 173	4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173	4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173
Total Vehicles at Washington and Seventh Street in Guideway per hour (two-way)		50	50	50	50
Local Bus Connections to Guideway	**Limited**	N/A	N/A	N/A	N/A
	Other	1, 2, 3, 4, 25, 37, and 71	1, 2, 3, 4, 25, 37, and 71	1, 2, 3, 4, 25, 37, and 71	1, 2, 3, 4, 25, 37, and 71
Annual Platform Hours[2]	**C-TRAN Local Bus**	270,000	274,000	274,000	274,000
	C-TRAN Express Bus	90,000	90,000	90,000	90,000
	BRT	51,000	51,000	53,000	53,000
	LRT	50,000	50,000	50,000	50,000
Annual Vehicle Miles Traveled	**C-TRAN Local Bus**	3,400,000	3,400,000	3,400,000	3,400,000
	C-TRAN Express Bus	1,420,000	1,420,000	1,420,000	1,420,000
	BRT	387,000	463,000	387,000	387,000
	LRT	430,000	430,000	430,000	430,000

[1] *In the peak period the combined headways for the BRT Routes would be 3 to 4 minutes and in the off-peak period the combined headways would be 5 minutes.*
[2] *Platform Hours are revenue and deadhead hours.*

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Table 4-11. Alternative 2 – Comparison of BRT Bus Routing in the HCT Guideway

Transfer Location	Alternative 2											
	Full-Length Alignments						MOS Alignments					
	Vancouver			I-5			Mill Plain District			Clark College		
	Connections		Peak Period Buses per Hour per Direction	Connections		Peak Period Buses per Hour per Direction	Connections		Peak Period Buses per Hour per Direction	Connections		Peak Period Buses per Hour per Direction
	Bus Routes (BRT routes in bold)	Number of Bus Routes		Bus Routes (BRT routes in bold)	Number of Bus Routes		Bus Routes (BRT routes in bold)	Number of Bus Routes		Bus Routes (BRT routes in bold)	Number of Bus Routes	
Expo Center Transfer Center	**4L, 37L, 71L,** 4, 6, 30, 32, 37, 71, 114, 173, & TriMet 16	12	26 (not including TriMet)	**4L, 37L, 71L,** 6, 30, 32, 114, 173, TriMet 6 & 16	10	21 (not including TriMet)	**4L, 37L, 71L,** 4, 6, 30, 32, 37, 71, 114, 173, & TriMet 16	12	26 (not including TriMet)	**4L, 37L, 71L,** 6, 30, 32, 114, 173, TriMet 6 & 16	10	21 (not including TriMet)
Hayden Island Station	**4L, 37L, 71L,** 4, 30, 37, 71, 114, 173, TriMet 6	10	22 (not including TriMet)	**4L, 37L, 71L,** 6, 30, 32, 114, 173, TriMet 6	9	21 (not including TriMet)	**4L, 37L, 71L,** 4, 30, 37, 71, 114, 173, TriMet 6	10	22 (not including TriMet)	**4L, 37L, 71L,** 6, 30, 32, 114, 173, TriMet 6	9	21 (not including TriMet)
Seventh St. Station	**4L, 37L, 71L,** 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	25	**4L, 37L, 71L,** 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	32	**4L, 37L, 71L,** 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	25	**4L, 37L, 71L,** 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	32
12th St. Station	**4L, 37L, 71L,** 25, 30, 32, 37, 71, 173	9	24	**4L, 37L, 71L,** 4, 6, 25, 30, 37, 71, 173	10	27	**4L, 37L, 71L,** 25, 30, 32, 37, 71, 173	9	24	**4L, 37L, 71L,** 4, 6, 25, 30, 37, 71, 173	10	27
Mill Plain District Transit Center	**4L, 37L, 71L,** 1, 2, 4, 6, 30, 37, 71	10	24	**4L, 37L, 71L,** 1, 2, 4, 6, 30, 37, 71, 173	11	24	**4L, 37L, 71L,** 1, 2, 4, 6, 30, 37, 71	10	24	**4L, 37L, 71L,** 1, 2, 4, 6, 30, 37, 71, 173	11	24
Clark College Park and Ride Lot	**4L,** 30	2	6	**4L, 71L,** 30, 173	4	13	**4L,** 30	2	6	**4L, 71L,** 30, 173	4	13
25th St. Station	**71L, 4,** 6, 71, 173	5	17	N/A	N/A	N/A	**71L, 4,** 6, 71, 173	5	17	N/A	N/A	N/A
33rd St. Station	**4L, 71L,** 3, 4 6, 71, 173	7	11	N/A	N/A	N/A	**4L, 71L,** 3, 4 6, 71, 173	7	11	N/A	N/A	N/A
Rosemere Station	N/A	N/A	N/A	**71L,** 3, 173	3	7	N/A	N/A	N/A	**71L,** 3, 173	3	7
Lincoln Park and Ride Lot	**71L,** 6, 71, 173	4	8	N/A	N/A	N/A	**71L,** 6, 71, 173	4	8	N/A	N/A	N/A
Kiggins Bowl Park and Ride	**71L,** 6, 71	3	8	**71L,** 6, 71, 173	4	9	**71L,** 6, 71	3	8	**71L,** 6, 71, 173	4	9

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BRT Stations

Table 4-12 summarizes the BRT stations for the Vancouver and the I-5 alignments that would be located within the CRC Study Corridor. Table 4-12 details each station name, location, and access. Including the Expo Center light rail station, which would gain a new transfer center, the Vancouver and I-5 full-length alignments would include eight stations, the Mill Plain District MOS alignment would have five new stations, and the Clark College MOS alignment would include six stations.

Within the guideway, the three BRT routes would stop only at designated BRT stations. C-TRAN local and limited express bus routes 6, 30, 32, 114, and 173 that would also travel across the river in the guideway would stop at these stations in addition to their regular local stops. Smaller stations, such as the Seventh Street and 12th Street station, would be constructed to accommodated only one BRT vehicle, however, with headways of approximately 2 minutes (and with an average boarding and alighting time of 20 seconds) there should be little or no delay to buses at these locations. Major stations, such as the Mill Plain District Transit Center and the Expo Center light rail staion, would have multiple designated bus bays.

Table 4-12. Alternative 2 – BRT Stations on both the Vancouver and I-5 Alignments

STATION NAME	LOCATION	ACCESS
COMMON STATIONS TO BOTH ALIGNMENTS		
Expo Center light rail station	2060 N Marine Drive	Drive, walk, bike, local bus transfer, park and ride, 3 BRT lines, LRT transfer
Hayden Island	West side of I-5, offset	Drive, walk, bike, local bus transfer, 3 BRT lines
Seventh Street Station	Washington Street between Sixth and Seventh Street	Drive, walk, bike, local bus transfer, 3 BRT lines
12th Street	Washington Street between Evergreen and 12th Street	Drive, walk, bike, local bus transfer, 3 BRT lines
Mill Plain District Transit Center[1]	Between 15th Street and 16th Street	Drive, walk, bike, local bus transfer, 3 BRT lines
I-5 Alignment		
Clark College Park and Ride Lot[2]	McLoughlin Boulevard, east of I-5 and near the VA Hospital and Clark College	Drive, walk, bike, local bus transfer, park and ride, 2 BRT lines
Rosemere	33rd Street and I-5	Drive, walk, bike, local bus transfer, 1 BRT line
Kiggins Bowl Park and Ride Lot[1]	The intersection of Hwy 99 and Main Street, to the west of I-5	Drive, walk, bike, local bus transfer, park and ride, 1 BRT line
Vancouver Alignment		
24th Street	On Broadway between 23rd and 24th Street	Drive, walk, bike, local bus transfer, 1 BRT line
33rd Street	Main Street and 33rd Street	Drive, walk, bike, local bus transfer, 1 BRT line
Lincoln Park and Ride Lot	Main Street and 40th Street	Drive, walk, bike, local bus transfer, park and ride, 1 BRT line

[1] *Mill Plain District MOS Terminus*
[2] *Clark College MOS Terminus*

Table 4-13. Alternative 2 – Park and Ride Lots and Transit Center Facilities

Transit Facility	Location	New or in No-Build Alternative	Alternatives 2 and 4				
			Full-Length Alignments		**MOS Alignments**		
			Vancouver spaces[1]	**I-5 Spaces**	**Mill Plain District Spaces**	**Clark College Spaces**	**Bus Bays**
Park and Ride Lots							
219th Street	I-5 & 219th Street Interchange	No-Build	600	600	600	600	N/A
Battle Ground	E Main Street and NE Fairground Avenue	No-Build	20	20	20	20	N/A
Salmon Creek	Adjacent to I-5 at NE 139th St	No-Build	493	493	493	493	N/A
Central County	NE Andresen Road and Padden Parkway	No-Build	480	480	480	480	N/A
BPA/Ross	NE Ross Street and NE 15th Ave	No-Build	N/A	N/A	N/A	N/A	N/A
Kiggins Bowl	Highway 99 and NE Hazel Dell Ave	New	150	1,400	150	150	N/A
Lincoln	Main Street and E 40th Ave	New	1,800	N/A	900	N/A	N/A
Clark College	E McLoughlin Street and E K St	New	460	1,100	460	1,100	N/A
BNSF & Loop	Adjacent to I-5 south of Sixth Street	New	N/A	N/A	1,148	N/A	N/A
Evergreen	NE 138th Avenue and NE 18th St	No-Build	269	269	269	269	N/A
Washougal	Second Street & C Street	No-Build	20	20	20	20	N/A
Delta Park/ Vanport	1904 N Victory Boulevard	No-Build	304	304	304	304	4
Transit Centers							
99th Street	Adjacent to I-5 at 99th Street	No-Build	600	600	600	600	9
Vancouver Mall	NE Vancouver Mall Dr	No-Build	N/A	N/A	N/A	N/A	5
Mill Plain District	W 15th Street and W Washington Street	New	N/A	N/A	560	N/A	9
Fisher's Landing	SE 34th Street and SE 164th Ave	No-Build	566	566	566	566	9
Expo Center Light Rail Station	2060 N Marine Drive	No-Build	300	300	300	300	9
Gateway	NE 99th & Pacific	No-Build	444	444	444	444	12
Parkrose	NE Sandy Blvd & 95th	No-Build	300[2]	300[2]	300[2]	300[2]	9
		Total	**6,806**	**6,896**	**7,614**	**4,598**	**66**

[1] *Details are reported for both DEIS Alternatives 2 and 4.*
[2] *The actual existing parking spaces at Parkrose is 193, however it was modeled with 300 parking spaces.*

Park and Ride Lots and Transit Center Facilities

Table 4-13 lists the park and ride lots and the transit centers within the CRC Study Area that would be used by persons traveling between Clark County and Portland. The number of parking spaces and/or bus bays at each facility is also listed.

The BRT Vancouver alignment would include 12 existing/No-Build Alternative park and ride lots and three new lots for a total of 6,806 spaces. The BRT I-5 full-length alignment would include 12 park and ride lots that are either existing or part of the No-Build Alternative and three new park and ride lots for a total of 6,896 spaces. The Mill Plain District MOS would include 12 existing/No-Build Alternative park and ride lots and five new lots for a total of 7,164 spaces. The Clark College MOS would include 12 existing/No-Build Alternative and three new park and ride lots for a total of 4,598 spaces.

Four of the existing park and ride lots (99th Street, Fisher's Landing, Gateway, and Parkrose) also serve as a transit center for transfers. A new transit center would be constructed in the Mill Plain District and the Expo Center Park and Ride would gain a new Transfer Center to accommodate the transfer from BRT to LRT. The existing Vancouver Mall Transit Center would remain.

Operations and Maintenance Facility

The BRT Alternatives would include an expansion onto C-TRAN's existing AOM facility sufficient in size to accommodate the 36 new, larger sized BRT vehicles and additional local buses. At the AOM facility, no additional land would need to be acquired to accommodate the facility expansion.

Rail Convertible BRT

The definition of BRT convertible assumes only costs associated with designing the BRT system to a level that does not preclude future light rail operation. These include the horizontal and vertical clearances, grades, and turning radii required for LRT operation. In addition, for the purposes of this CRC project, the BRT convertible definition will include the requirement that structural foundations be designed for the ultimate static and dynamic loads required for LRT operations. It does not include additional efforts that some projects have attempted, such as relocating utilities or installing equipment specific to rail.

4.4 Alternative 3: Light Rail Transit

This section provides a description of Alternative 3. Figure 4-11 illustrates Alternative 3 with the Vancouver alignment and Figure 4-12 illustrates Alternative 3 with the I-5 alignment. Alternative 3 includes a light rail transit extension from the existing terminus of TriMet's Interstate MAX LRT Yellow Line at the Expo Center to downtown Vancouver with characteristics similar to TriMet's regional light rail system. Compared to the No-Build Alternative, Alternative 3 would reduce transit travel time, improve transit system reliability, and increase service to transit markets.

Alternative 3 would include elements of the following:

- An exclusive transit guideway in downtown Vancouver and across the Columbia River;
- Intelligent transportation system (ITS) treatments;
- Highway[1] capital improvements;
- Ticket vending machines at LRT stations to facilitate simplified, faster boarding;
- 14 new light rail vehicles;

- Passenger stations with increased amenities, similar in size and scale to existing light rail stations in Portland;
- Queue jump lanes for buses accessing I-5;
- Additional park and ride lots;
- Express bus service from outer Clark County park and rides to Portland CBD, the Lloyd District, and OHSU; and
- A standard toll for river crossing.

Alternative 3 would include an extension of the Interstate MAX Yellow LRT Line to downtown Vancouver. Compared to the No-Build Alternative, Alternative 3 would reduce transit travel time, improve transit schedule reliability, and increase service to transit markets. To provide a one-transfer ride from points in Vancouver to central Portland, local buses would be routed to connect to the LRT guideway.

For Alternative 3, the Vancouver full-length terminus is the representative alignment. With this alignment, the exclusive guideway would consist of a length of approximately 3.41 miles. In the south, the alignment would begin at the existing Expo Center light rail station. From there, the alignment would rise northward, over the Oregon Slough, to an elevated station on Hayden Island and then continue to rise to travel over the Columbia River. Once over the river, the alignment would descend into downtown Vancouver to a touch down point near Sixth Street and Washington Street. Along Washington Street in downtown Vancouver, there would be LRT stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street. From the Mill Plain District Transit Center, both travel directions of the guideway would continue north along Broadway Street, with a station located at 24th Street, to 29th Street. From there, both travel directions of the guideway would continue north up Main Street, with a station at 33rd Street, and to the terminus at the proposed Lincoln Park and Ride lot at the intersection of Main Street and E 40th Street. Surface park and ride lots would be provided at the Lincoln, Clark College, and Kiggins Bowl Park and Ride lots. The existing BPA/Ross Park and Ride lot would be eliminated.

The I-5 alignment, which includes a 4.22 mile exclusive guideway, would be the same as the LRT Vancouver alignment from Expo Center light rail station to the proposed Mill Plain District Transit Center. From the Mill Plain District Transit Center, the alignment would turn east onto McLoughlin Boulevard and then pass under I-5 to the proposed Clark College Park and Ride lot. From the Clark College Park and Ride lot, the alignment would travel north along the east side of I-5, with a station located at 33rd Street, and to the terminus in Vancouver at the proposed Kiggins Bowl Park and Ride lot located at the intersection of Highway 99 and Main Street, to the west of I-5.

In addition to the full-length alignments, there are two LRT MOS alignments, the Mill Plain District and Clark College MOS, as detailed on Figure 4-11 and in Figure 4-12. For the LRT Mill Plain District MOS, the 2.07-mile exclusive guideway would be configured the same as either full-length alignment, but would terminate at the proposed Mill Plain District Transit Center. New surface park and ride lots would be provided at Kiggins Bowl, Lincoln, BNSF and Loop, Clark College, and Mill Plain. For the LRT Clark College MOS, the alignment of the

2.65-mile exclusive guideway would be the same as the I-5 alignment, but it would terminate at the proposed Clark College Park and Ride lot.

In addition, Alternative 3 includes several design options. The locations and names of these design options are the same as for the BRT Alternative, which are shown in Figure 4-2 on page 4-11.

As an extension of the Interstate MAX LRT Yellow Line, the proposed LRT service from Vancouver would continue south from the existing Expo Center light rail station to downtown Portland. Therefore, Alternative 3 would provide a one seat ride (from the local bus network) between Clark County and downtown Portland. Alternative 3 would include point-to-point express bus service from suburban park and ride lots to central Portland. This service would complement LRT by directly serving the suburban commuter transit market, while LRT would serve both the inner urban transit market and portions of the suburban commuter transit market through park and ride lots and transfers from local service.

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Figure 4-11. Alternative 3 – LRT Vancouver Alignment: Trunk Line and Limited Service (Local and Express Bus Network not Shown)

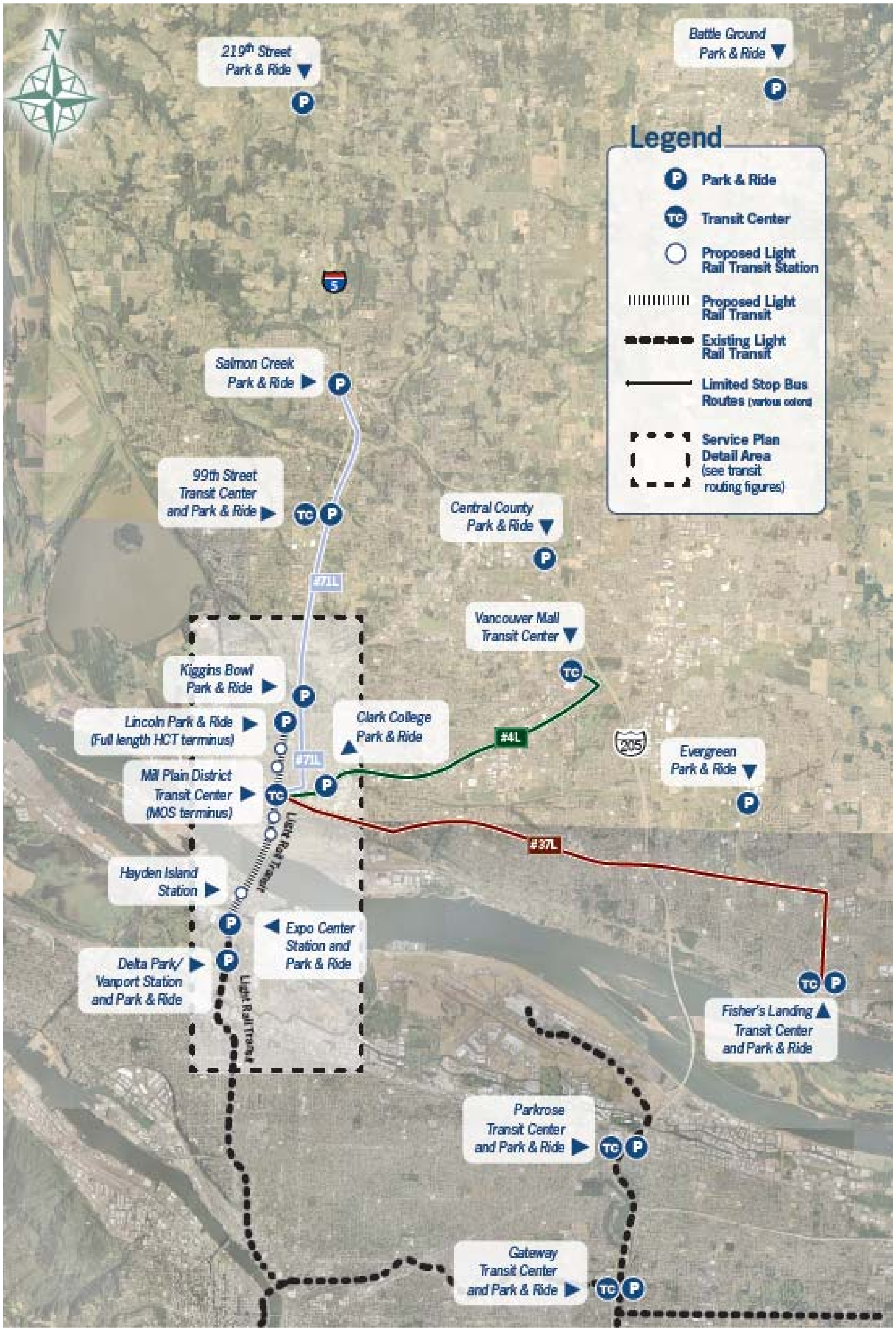

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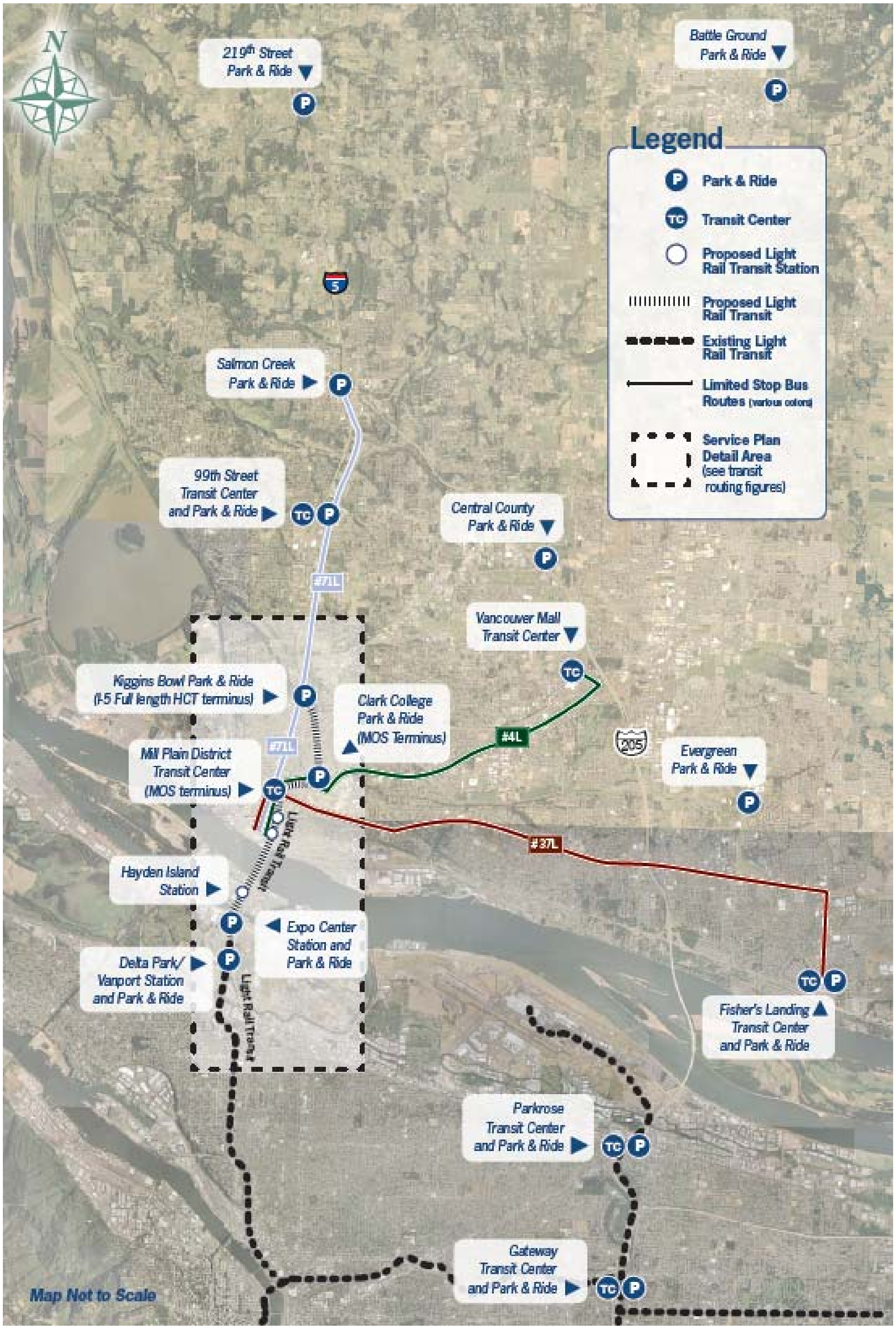
Figure 4-12. Alternative 3 – LRT I-5 Alignment: Trunk Line and Limited Service (Local and Express Bus Network not Shown)



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4.4.1 Transit Operations

Figure 4-13 shows the transit routing for the Vancouver full-length Alignment (including local bus, express bus and light rail operations), which is the representative alignment for this alternative and Figure 4-15 shows the transit routing for the LRT Mill Plain District MOS. Figure 4-14 shows the transit routing for the I-5 full-length terminus and Figure 4-16 shows the transit routing for the LRT Clark College MOS. See Section 3 of this report for information on the LRT span of service, vehicle characteristics, and fares. See Appendix B for a complete transit line listing for the LRT Alternative, including headways.

4.4.1.1 Corridor Local Bus Operations

The local bus network in Alternative 3 would be similar to the No-Build Alternative local bus network. The transit network would include three new limited lines of C-TRAN's Routes 4, 37, and 71. These new routes would be the:

- 4L Fourth Plain Limited;
- 37L Mill Plain Limited; and
- 71L Highway 99 Limited.

The three limited lines would travel along the same routing as their corresponding companion route, but they would operate with limited stops that would be ½ to 1 mile apart. The local versions of the three limited lines would continue to serve all existing stops along the route. The 4L and 37L would operate on 10-minute headways in the peak period and 15-minute headways in the off-peak. The 71L would operate at 15 minute headways in both the peak and off-peak period. In the peak period the combined headway for these limited routes would be 3 to 4 minutes and in the off-peak period the combined headway would be 5 minutes.

Vancouver Full-Length Alignment

With the Vancouver alignment, the 71L would travel down Highway 99 and facilitate transfers to LRT at the proposed Lincoln Park and Ride lot. The 4L would travel along its existing routing and facilitate transfers to LRT at the Mill Plain District Transit Center, as would the 37L. The shuttle service would provide a transfer to the LRT line at the Lincoln Park and Ride lot.

In Alternative 3, other modifications to the local bus network would include truncating the limited route 114 at the proposed Seventh Street station (with a connection to LRT) instead of traveling across the Columbia River. The peak period headway for Route 114 would be decreased from 120 minutes to 60 minutes. The limited route 173 would be truncated at the proposed Kiggins Bowl Park and Ride lot in the LRT I-5 full-length alignment, at the Clark College Park and Ride lot in the LRT Clark College MOS, and at the Lincoln Park and Ride lot with the Vancouver alignment. For Route 173, the peak period headway would stay the same as the No-Build Alternative but an off-peak route would be added with a headway of 120 minutes. In addition, C-TRAN's Route 4X would be eliminated as this service would be provided with the 4L limited line and its connection to LRT. In downtown Vancouver other local bus lines would interface with LRT at stations for transfer opportunities.

I-5 Full-Length Alignment

With the I-5 full-length alignment, the route 71L would facilitate transfers with the LRT line at the proposed Kiggins Bowl Park and Ride lot, the 4L would facilitate transfers to LRT at the proposed Clark College Park and Ride lot and the 37L would facilitate transfers to LRT at the proposed Mill Plain District Transit Center.

MOS Alignments

In the Mill Plain District MOS, the 71L would continue to travel down Main Street and would facilitate a transfer at the Mill Plain District Transit Center to LRT, and the 71T would provide a short trip from the Lincoln Park and Ride to the Mill Plain District Transit Center. The 4L and the 37L would facilitate transfers to LRT at the same locations as the Vancouver full-length alignment. In the Clark College MOS, the 71L would continue to travel down Main Street and would facilitate transfers to LRT at the proposed Mill Plain District Transit Center. The 4L and the 37L would facilitate transfers to LRT at the same locations as the full-length alignment.

4.4.1.2 Corridor Express Bus Operations

The corridor express bus operations to downtown Portland, OHSU, or the Lloyd District would be similar to the No-Build Alternative. Express bus routes 105 and 157 would be eliminated as they would be redundant to the LRT service. In addition, because the BPA/Ross Park and Ride lot is not included with Alternative 3, Route 190 would be modified to stop at the Kiggins Bowl Park and Ride. Express bus route 190 is a direct point-to-point premium fare route to Marquam Hill, which is an area that would not be served directly by Alternative 3.

All I-5 express bus routes would operate in general purpose lanes southbound. Northbound, the express bus routes would use the existing I-5 managed lane from Going Street to the Oregon Slough.

4.4.1.3 Corridor LRT Operations

The I-5 full-length alignment terminus would be a 4.22-mile extension of the Interstate MAX Yellow Line from its current terminus at the Expo Center Park and Ride lot to the proposed Kiggins Bowl Park and Ride lot in Vancouver. The LRT Clark College MOS would be a 2.65-mile extension of the Yellow Line to the proposed Clark College Park and Ride lot in Vancouver. The Vancouver alignment would be a 3.41-mile extension of the Yellow Line to the Lincoln Park and Ride lot. In Alternative 2, the Yellow Line peak period headway would be decreased from 10 minutes to 7.5 minutes; the off-peak period headway would remain at 15 minutes. In general, the new extension of the Yellow Line would have the same operating characteristics as TriMet’s regional light rail system and would operate according to adopted policies.

Figure 4-13. Alternative 3 – LRT Vancouver Alignment Transit Routing: Includes Local, Express, and Trunk Line Service

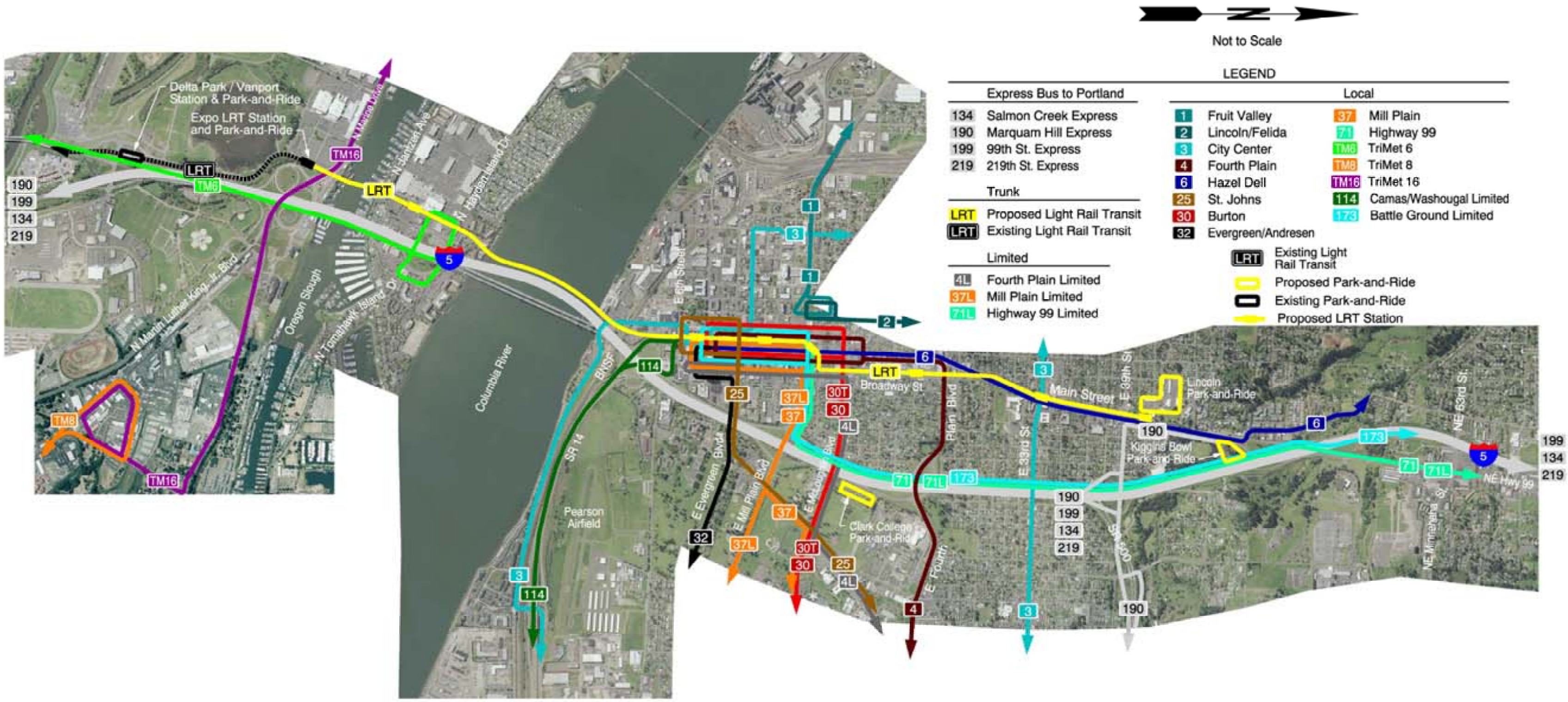

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Figure 4-14. Alternative 3 – LRT I-5 Full-Length alignment Transit Routing: Includes Local, Express, and Trunk Line Service

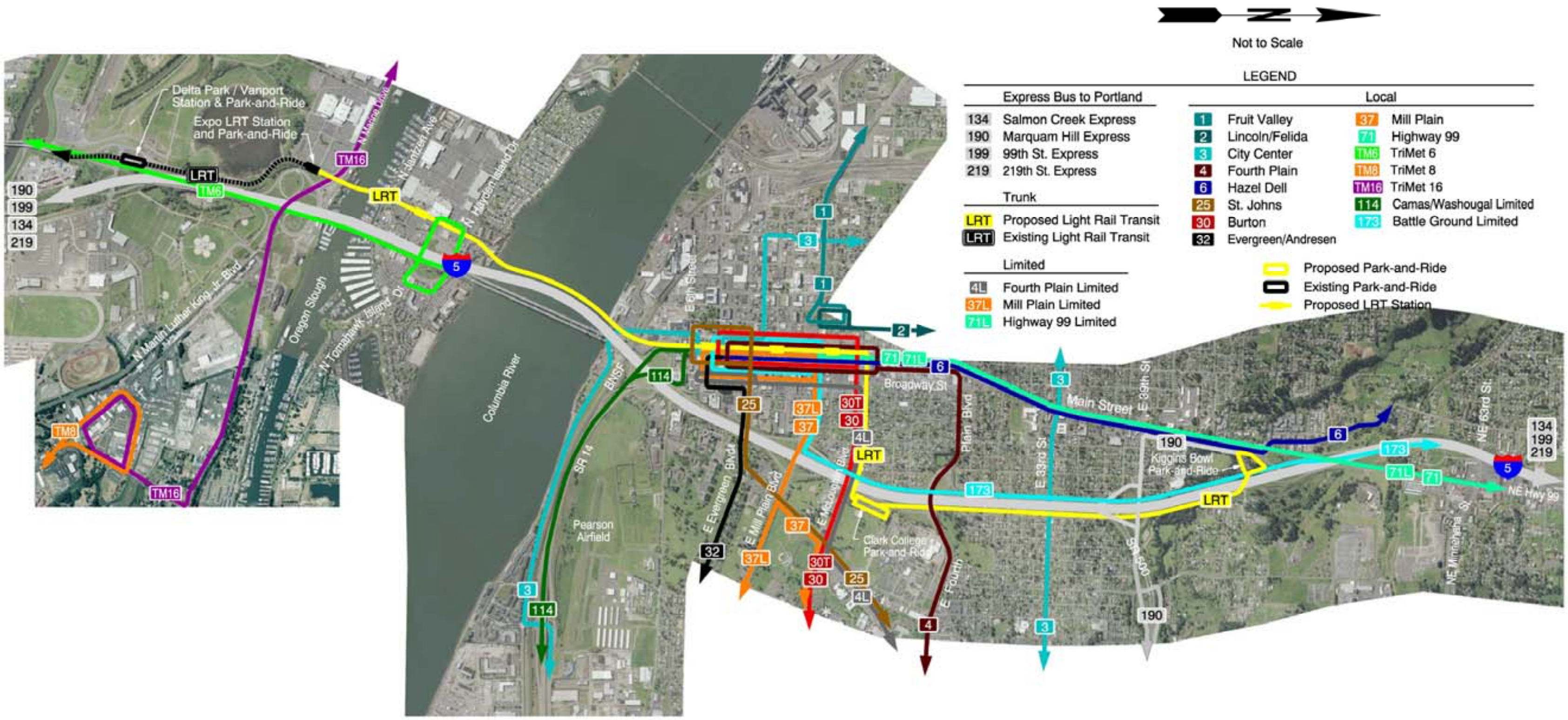

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Figure 4-15. Alternative 3 – LRT Mill Plain District MOS Terminus Transit Routing: Includes Local, Express, and Trunk Line Service

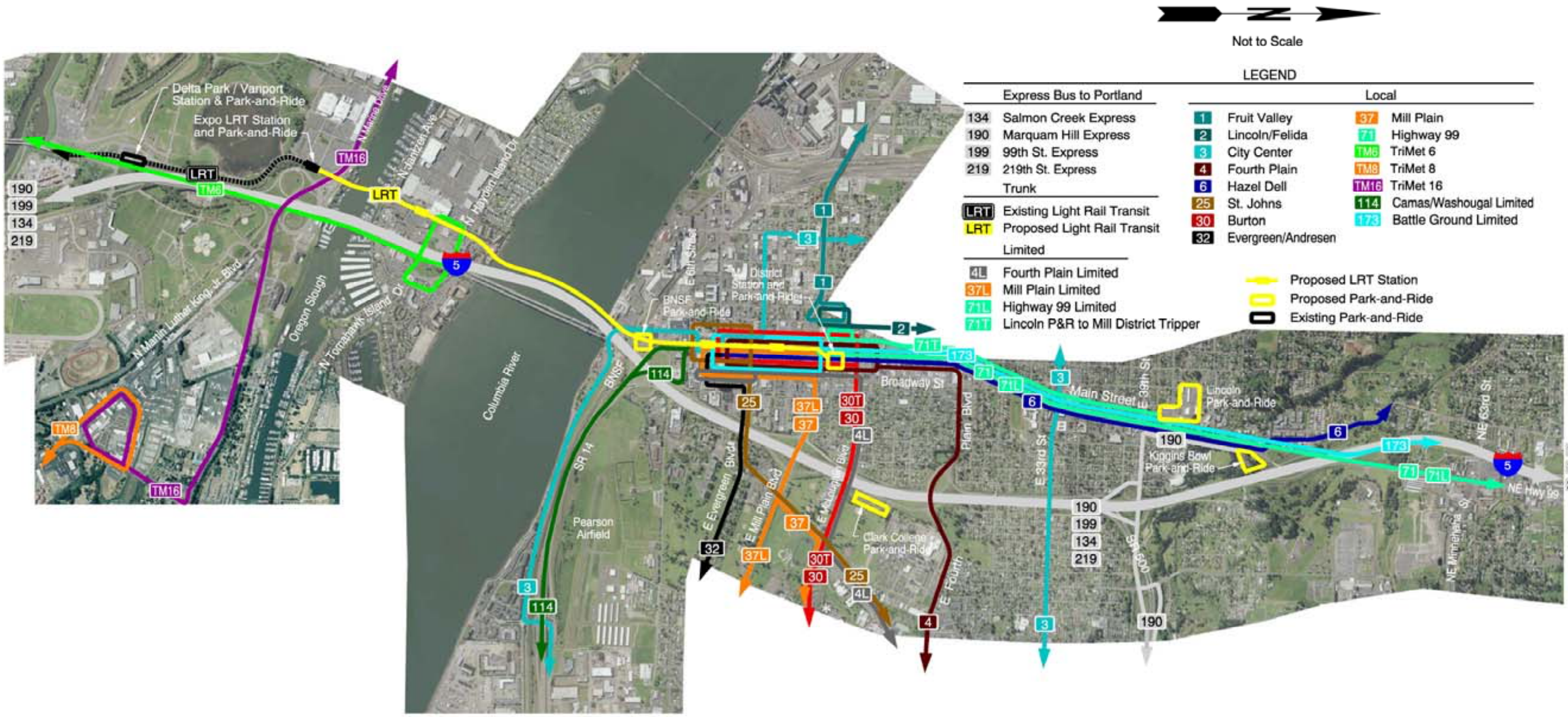

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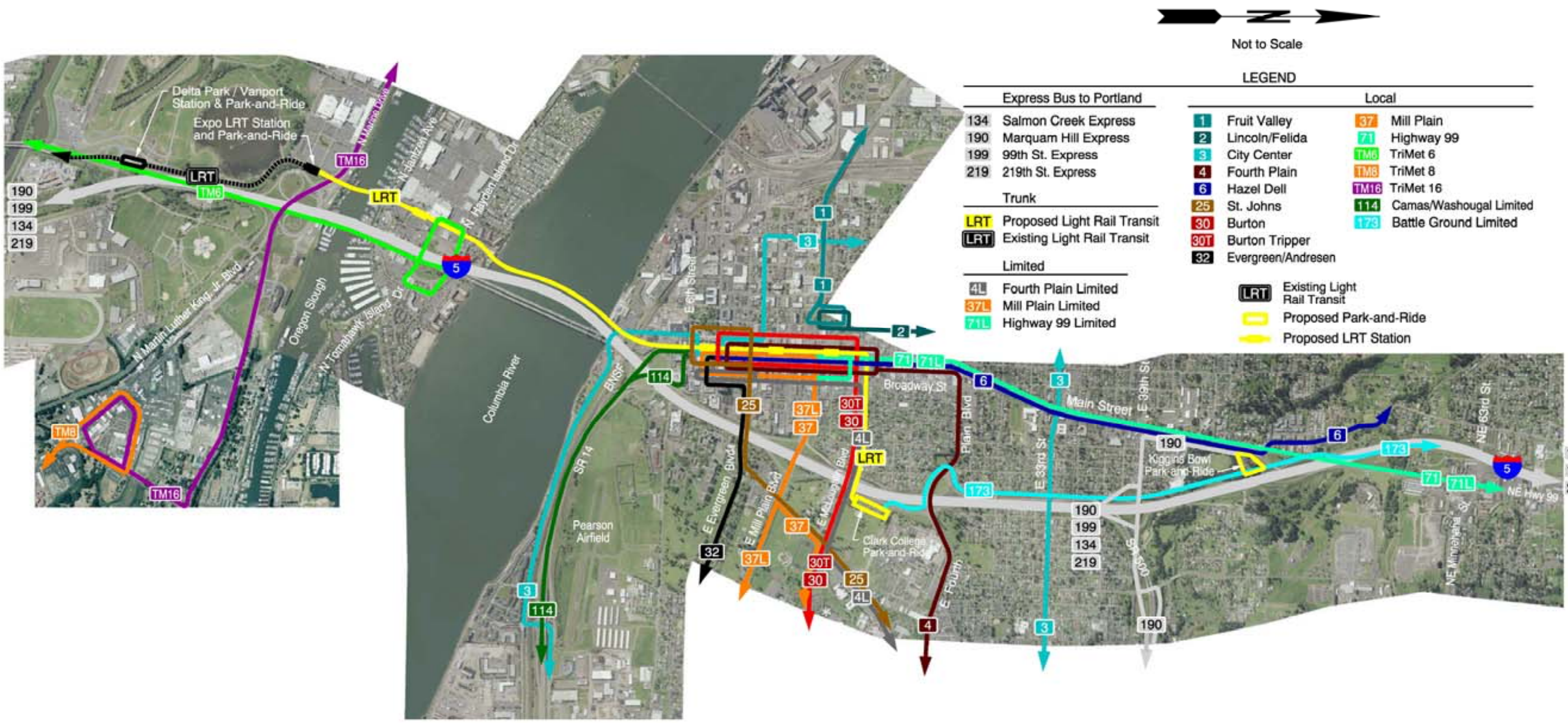
Figure 4-16. Alternative 3 – LRT Clark College MOS Terminus Transit Routing: Includes Local, Express, and Trunk Line Service



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Transit Operating Characteristics

Table 4-14 summarizes the transit operating characteristics of Alternative 3 and Table 4-15 provides a comparison of the bus routing for the LRT Vancouver and I-5 full-length alignments, as well as for the Mill Plain District and Clark College MOS.

C-TRAN would continue to operate 130 buses for their local and express bus service and TriMet would continue to operate 641 buses in service and spares. Depending on the service that would be implemented, the three new limited routes would require approximately 20 new vehicles to operate. The 4L and the 37L would have peak period headways of 15 minutes and off-peak headways of 15 to 30 minutes. The 71L would have 15-minute headways in the peak and off-peak periods. Fourteen additional LRVs would be required for the Vancouver and I-5 full-length alignments, increasing the total number in the Interstate MAX system to 119 (in service and spares). The Mill Plain District and Clark College MOS's would require 12 additional LRVs, increasing the total number in the Interstate MAX system to 117 (in service and spares). The extension of the Yellow Line LRT into Vancouver would have peak headways of 7.5 minutes and off-peak headways of 15 minutes.

The LRT Vancouver full-length alignment would result in annual platform hours of about 74,000, and about 707,000 annual VMT for light rail and the three limited routes would have about 24,000 annual platform hours and about 154,000 annual VMT. The LRT I-5 full-length alignment would result in annual platform hours of about 74,000, and about 726,000 annual VMT for light rail and the three new limited routes would result in about 27,000 annual platform hours and about 354,000 annual VMT with the LRT I-5 full-length alignment.

The Mill Plain District MOS would result in annual platform hours of about 74,000, and about 726,000 annual VMT for light rail and the three limited routes would have about 29,000 annual platform hours and about 403,000 annual VMT. The LRT Clark College MOS would result in annual platform hours of about 67,000, and about 726,000 annual VMT and the three limited routes would have about 29,000 annual platform hours and about 180,000 annual VMT.

The Vancouver full-length alignment would result in about 337,000 annual platform hours for C-TRAN's local and express bus operations, and an annual VMT of about 4,560,000. With the LRT I-5 full-length alignment C-TRAN's local and express bus operations would have about 343,000 annual platform hours, and would have an annual VMT of about 1,940,000. With the Mill Plain District MOS, C-TRAN's local and express bus operations would have about 340,000 annual platform hours and about 4,720,000 annual VMT. With the Clark College MOS, C-TRAN's local and express bus operations would have about 344,000 annual platform hours and about 4,350,000 annual VMT.

4.4.1.4 Highway Capital Improvements

Alternative 3 Vancouver full-length alignment and Mill Plain District MOS alignment and the I-5 full-length alignment and Clark College MOS alignment were paired with the $Highway_1$ network as described in Section 3.2. Vancouver full-length alignment would also be paired with the $Highway_2$ network. The difference between highway networks is that in $Highway_1$ all I-5 lanes would be tolled, and in $Highway_2$ I-5 would not be tolled. There would be no difference in the transit operations or transit capital improvements.

Table 4-14. Alternative 3 – Summary of the LRT Transit Operating Characteristics

Characteristic		Alternative 3			
		Full-Length Alignments		MOS Alignments	
		Vancouver	I-5	Mill District	Clark College
Vehicles	**C-TRAN Standard Buses**	108	104	103	103
	LRVs	119	119	117	117
	Limited Stop Vehicles	22	26	23	27
LRT Headways		7.5 min peak, 15 min off-peak	7.5 min peak, 15 min off-peak	7.5 min peak, 15 min off-peak	7.5 min peak, 15 min off-peak
Limited Route Headways		4L and 37L: 10 min peak, 15 min off-peak 71L: 15 min peak and off-peak	4L and 37L: 10 min peak, 15 min off-peak 71L: 15 min peak and off-peak	4L and 37L: 10 min peak, 15 min off-peak 71L: 15 min peak and off-peak	4L and 37L: 10 min peak, 15 min off-peak 71L: 15 min peak and off-peak
Local Bus Connections to Guideway	**Limited**	4L, 37L, 71L	4L, 37L, 71L	4L, 37L, 71L	4L, 37L, 71L
	Other	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71
Annual Platform Hours	**C-TRAN Local Bus**	258,000	267,000	266,000	266,000
	C-TRAN Express Bus	79,000	77,000	75,000	78,000
	Limited Routes	24,000	27,000	29,000	29,000
	LRT	74,000	74,000	74,000	74,000
Annual Vehicle Miles Traveled	**C-TRAN Local Bus**	3,350,000	3,140,000	3,140,000	3,150,000
	C-TRAN Express Bus	1,200,000	1,620,000	1,580,000	1,200,000
	Limited Routes	154,000	354,000	403,000	180,000
	LRT	707,000	726,000	726,000	726,000

Table 4-15. Alternative 3 – Comparison of LRT Bus Routing within the Guideway

Transfer Location	LRT Alternatives											
	Full-Length Alignments						MOS Alignments					
	Vancouver			I-5			Mill District			Clark College		
	Connections		Peak Period Buses per Hour per Direction	Connections		Peak Period Buses per Hour per Direction	Connections		Peak Period Buses per Hour per Direction	Connections		Peak Period Buses per Hour per Direction
	Bus Routes (BRT routes in bold)	Number of Bus Routes		Bus Routes (BRT routes in bold)	Number of Bus Routes		Bus Routes (BRT routes in bold)	Number of Bus Routes		Bus Routes (BRT routes in bold)	Number of Bus Routes	
Expo Center Transfer Center	TriMet 16	1	0 (not including TriMet)	TriMet 16	1	0 (not including TriMet)	TriMet 16	1	0 (not including TriMet)	TriMet 16	1	0 (not including TriMet)
Hayden Island Station	TriMet 6	1	0 (not including TriMet)	TriMet 6	1	0 (not including TriMet)	TriMet 6	1	0 (not including TriMet)	TriMet 6	1	0 (not including TriMet)
Seventh St. Station	4L, 37L, 71L, 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	20	4L, 3, 4, 25, 32, 114	6	12	4L, 37L, 71L, 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	33	4L, 3, 4, 25, 32, 114	6	14
12th St. Station	4L, 37L, 71L, 4, 6, 25, 30, 37, 71	9	20	4L, 4, 25	3	8	4L, 37L, 71L, 4, 6, 25, 30, 32, 37, 71, 173	11	27	4L, 4, 25	3	10
Mill Plain District Transit Center	4L, 37L, 71L, 1, 2, 4, 6, 30, 37, 71	10	22	4L, 37L, 71L, 1, 2, 4, 6, 30, 37, 71	10	22	4L, 37L, 71L, 1, 2, 4, 6, 30, 37, 71, 173	11	30	4L, 37L, 71L, 1, 2, 4, 6, 30, 37, 71	10	24
Clark College Park and Ride Lot	4L, 30	2	8	4L, 30	2	6	4L, 30	2	8	4L, 30,	2	8
25th St. Station	4L, 4, 6	3	8	N/A	N/A	N/A	N/A	N/A	N/A	71L, 4, 6, 71	4	8
33rd St. Station	3, 6	2	4	N/A	N/A	N/A	N/A	N/A	N/A	71L, 3, 6, 71	4	8
Rosemere Station	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lincoln Park and Ride Lot	6	1	2	N/A	N/A	N/A	71L, 6, 71, 173	4	6	71L, 6, 71,	3	6
Kiggins Bowl Park and Ride	6	1	2	71L, 6, 71, 173	4	6	71L, 6, 71, 173	4	6	71L, 6, 71	3	6

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LRT Stations

Table 4-16 below summarizes the new LRT stations for the full-length LRT Vancouver and I-5 alignments, for the design options that are part of the representative alignment or that are part of the representative alignment that would be located within the CRC Bridge Influence Area. Table 4-16 details each station name, location, and access. For the Alternative 2, the Expo Center light rail station has not been included because it is existing. The LRT Vancouver full-length alignment would include seven stations, as would the LRT I-5 full-length alignment. The Mill Plain District MOS would include four stations and the Clark College MOS would include five stations.

Table 4-16. Alternative 3 – LRT Stations on both the Vancouver and I-5 Alignment

STATION NAME	LOCATION	ACCESS
COMMON STATIONS TO BOTH ALIGNMENTS		
Hayden Island	West side of I-5, offset	Drive, walk, bike, local bus transfer, LRT
Seventh Street	Washington Street between Sixth and Seventh Street	Drive, walk, bike, local bus transfer, LRT
12th Street	Washington Street between Evergreen and 12th	Drive, walk, bike, local bus transfer, LRT
Mill Plain District Transit Center[1]	Between 15th Street and 16th Street	Drive, walk, bike, local bus transfer, LRT
I-5 ALIGNMENT		
Clark College Park and Ride Lot[2]	McLoughlin Boulevard, east of I-5 and near the VA Hospital and Clark College	Drive, walk, bike, local bus transfer, park and ride, LRT
Rosemere	33rd Street and I-5	Drive, walk, bike, local bus transfer, LRT
Kiggins Bowl Park and Ride Lot[1]	The intersection of Hwy 99 and Main Street, to the west of I-5	Drive, walk, bike, local bus transfer, park and ride, LRT
VANCOUVER ALIGNMENT		
24th Street	On Broadway between 23rd and 24th Street Couplet:	Drive, walk, bike, local bus transfer, LRT
33rd Street	Main Street and 33rd Street	Drive, walk, bike, local bus transfer, LRT
Lincoln Park and Ride Lot	The intersection of Hwy 99 and Main Street, to the west of I-5	Drive, walk, bike, local bus transfer, park and ride, LRT

[1] *Mill Plain District MOS Terminus*
[2] *Clark College MOS Terminus*

Park and Ride and Transit Center Facilities

Table 4-17 lists the park and ride lots and the transit centers that would be used by persons traveling between Clark County and Portland. The number of parking spaces and/or bus bays at each facility is also listed.

The Vancouver full-length alignment would include 12 existing/No-Build Alternative park and ride lots and three new lots for a total of 6,806 spaces. Four of these park and ride lots (99th Street, Fisher's Landing, Gateway, and Parkrose) also serve as a transit center for transfers. A new transit center would be constructed in the Mill District; the existing Vancouver Mall Transit Center would remain. The LRT I-5 full-length alignment would include 12 park and ride lots that are either existing or part of the No-Build Alternative and two new park and ride lots for a total of 6,866 spaces. The Mill Plain District MOS would include 13 existing/No-Build park and ride lots and five new lots for a total of 7,614 spaces. The LRT Clark College MOS would include 12 existing/No-Build Alternative and two new park and ride lots for a total of 5,646 spaces.

Table 4-17. Alternative 3 – LRT Park and Ride and Transit Center Facilities

Transit Facility	Location	New or in No-Build Alternative	LRT Alternative: Full-Length Alignments: Vancouver spaces[1]	LRT Alternative: Full-Length Alignments: I-5 Spaces	LRT Alternative: MOS Alignments: Mill Plain District Spaces	LRT Alternative: MOS Alignments: Clark College Spaces	LRT Alternative: Bus Bays
Park and Ride Lots							
219th Street	I-5 & 219th Street Interchange	No-Build	600	600	600	600	N/A
Battle Ground	E Main St and NE Fairground Ave	No-Build	20	20	20	20	N/A
Salmon Creek	Adjacent to I-5 at NE 139th St	No-Build	493	493	493	493	N/A
Central County	NE Andresen Road and Padden Parkway	No-Build	480	480	480	480	N/A
BPA/Ross	NE Ross St and NE 15th Ave	No-Build	N/A	N/A	N/A	N/A	N/A
Kiggins Bowl	Highway 99 and NE Hazel Dell Ave	New	150	1,400	150	150	N/A
Lincoln	Main St and E 40th Ave	New	1,800	N/A	900	N/A	N/A
Clark College	E McLoughlin St and E K St	New	460	1,100	460	1,100	N/A
BNSF & Loop	Adjacent to I-5 south of Sixth Street	New	N/A	N/A	1,148	N/A	N/A
Evergreen	NE 138th Ave and NE 18th St	No-Build	269	269	269	269	N/A
Washougal	Second St & C St	No-Build	20	20	20	20	N/A
Expo Center Light Rail Station	2060 N Marine Dr	No-Build	300	300	300	300	N/A
Delta Park/Vanport	1904 N Victory Blvd	No-Build	304	304	304	304	4
Transit Centers							
99th Street	Adjacent to I-5 at 99th St	No-Build	600	600	600	600	9
Vancouver Mall	NE Vancouver Mall Dr	No-Build	N/A	N/A	N/A	N/A	5
Mill Plain District	W 15th St and W Washington St	New	N/A	N/A	560	N/A	9
Fisher's Landing	SE 34th St and SE 164th Ave	No-Build	566	566	566	566	9
Gateway	NE 99th & Pacific	No-Build	444	444	444	444	12
Parkrose	NE Sandy Blvd & 95th	No-Build	300[2]	300[2]	300[2]	300[2]	9
		Total	**6,806**	**6,866**	**7,614**	**5,646**	**57**

[1] Details are reported for both DEIS Alternatives 3 and 5.
[2] The actual existing parking spaces at Parkrose is 193, however it was modeled with 300 parking spaces.

Operations and Maintenance Facility

The LRT Alternatives would require an expansion to TriMet's existing maintenance facility at Ruby Junction sufficient in size to accommodate the additional 12 or 14 LRVs. Additional land would not need to be acquired for the facility expansion.

4.5 Alternative 4: Bus Rapid Transit

Alternative 4 would be similar to Alternative 2 Vancouver full-length with three major differences: Alternative 4 would be paired with the Highway$_3$ network which includes a supplemental bridge over the Columbia River, with fewer auxiliary lanes than the proposed replacement bridge; it would have a higher toll rate for private vehicles crossing I-5; and it would have increased transit service. Figure 4-17 details the Alternative 4 transit alignment and Figure 4-18 details the transit routing.

Alternative 4 would include three BRT routes, a supplemental I-5 Columbia River bridge crossing, and the Vancouver full-length northern terminus transit alignment. This alternative would use both existing I-5 bridge structures for northbound Interstate traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and the HCT mode BRT. The existing I-5 bridge would be re-striped to provide two lanes on each bridge structure for northbound traffic and allow for an outside safety shoulder for disabled vehicles; three of the lanes would be for thru-traffic and the fourth, on the eastern bridge, would be an auxiliary lane. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (upstream) bridge. Four southbound I-5 lanes (three through-lanes and one auxiliary lane) and BRT would be provided on a new downstream supplemental bridge. The southbound BRT and other guideway buses would turn around at the existing Expo Center light rail station in Portland, where riders could transfer to the MAX Yellow Line. BRT service would be more frequent compared to Alternative 2. Express bus service and local and feeder bus service would also be increased to meet demand. This alternative would also include a higher toll, about 20 percent higher during the peak period, than Alternatives 2 and 3 for vehicles crossing the Columbia River on the new I-5 bridge.

As detailed in Figure 4-17, Alternative 4 follows the same transit guideway alignment as the Vancouver full-length alignment in Alternative 2. With this alignment, the exclusive guideway would consist of a length of approximately 3.41 miles. In the south, the guideway would begin at the existing Expo Center light rail station. From there, the guideway would rise northward, over the Oregon Slough, to an elevated station on Hayden Island and then continue to rise to travel over the Columbia River. Once over the river, the guideway would descend into downtown Vancouver to a touchdown point near Sixth Street and Washington Street. Along Washington Street in downtown Vancouver, there would be BRT stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street. From the Mill Plain District Transit Center, both travel directions of the guideway would continue north along Broadway Street, with a station located at 24th Street, to 29th Street. From there, both travel directions of the guideway would continue north up Main Street, with a station located at 33rd Street, and to the terminus at the proposed Lincoln Park and Ride lot located at the intersection of Main Street and East 40th Street. A park and ride lot would be provided at Lincoln Park and Ride, Kiggins Bowl and the Clark College Park and Ride lots. The existing BPA/Ross Park and Ride lot would be eliminated.

Alternative 4 has the same design options as Alternative 2, but was evaluated with a supplemental bridge and the Vancouver full-length alignment.

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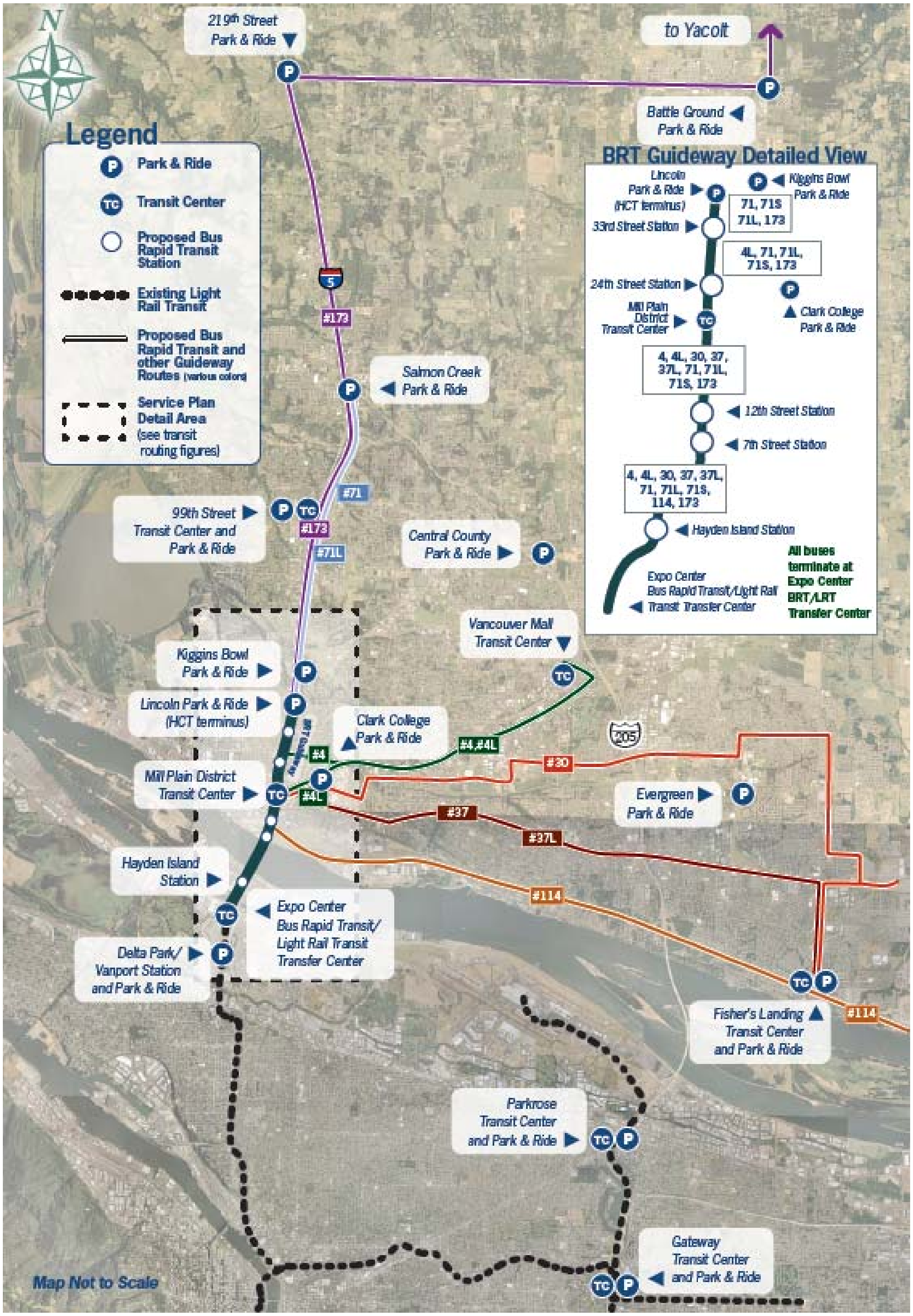
Figure 4-17. Alternative 4 – BRT Increased Vancouver Alignment: Transit Crossing the Columbia River (Local Network not Shown)



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4.5.1 Transit Operations

Figure 4-18 shows the transit routing for the Alternative 4 which follows the same guideway alignment as Alternative 2's Vancouver full-length alignment. The figure shows the guideway, the BRT routes and other guideway routes, local bus, express bus, and trunk service operations. The transit routing would be similar to that in Alternative 2, however, the frequency of service would be much higher (service would be increased to meet demand). See Section 3 of this report for information on the BRT span of service, vehicle characteristics, and fares. See Appendix B for a complete transit line listing for the Alternatives, including headways.

4.5.1.1 Corridor BRT Operations

In Alternative 4, the trunk line service would be provided by the addition of three BRT lines. As in Alternative 2, the BRT lines would have unique signage, and line identity, and vehicles that would identify the BRT system and promote the service. See Figure 3-5 for the BRT vehicle characteristics. The BRT lines would be new limited lines of C-TRAN's Routes 4, 37, and 71 which are currently C-TRAN's most used routes. These new routes would be the:

- 4L Fourth Plain Limited (which would replace the 4X in the No-Build Alternative);
- 37L Mill Plain Limited; and
- 71L Highway 99 Limited.

Local service on these routes would continue, but would be extended across the river to the Expo Center light rail station. The combined headways of the local and limited (BRT) service for the routes would be improved over Alternative 2. For the 71L BRT and local 71 peak-period headways and off-peak headways would be 7.5 minutes. For the 37L BRT and 37 routes the combined peak and off-peak headways would be 12 and 15 minutes, respectively. For the 4L, BRT, and 4 local the combined peak and off-peak headways would be 10 and 15 minutes. The combined headway for the BRT routes in the peak period would be 3 minutes and in the off-peak period the combined headway would be 4 minutes. The combined headways for routes using the guideway to cross to the Expo Center light rail station would be even shorter.

The three BRT lines would travel along the same routing as their corresponding companion route, but they would operate with limited stops that would be ½ to 1 mile apart. The BRT lines would then travel through downtown Vancouver and across the Columbia River in an exclusive guideway to the Expo Center light rail station (which would gain a new transfer center).

The 71L would travel down Highway 99 and Main Street and enter the exclusive guideway at its northern end at the proposed Lincoln Park and Ride lot. The 4L would travel along its existing routing and enter the guideway at the Mill Plain District Transit Center, as would the 37L. Once in the guideway, the BRT lines would continue across the Columbia River to Expo Center light rail station stopping only at designated BRT stations.

4.5.1.2 Corridor Local Bus Operations

As in Alternative 2, the local versions of the BRT lines (C-TRAN's 4, 37, and 71) would continue to serve all existing stops along the route in Vancouver and cross the river to provide a one-seat transit ride for passengers to the Expo Center light rail station. Three other C-TRAN local and limited routes that currently have a large number of transfers to the TriMet 6 and the C-TRAN 105 (the existing bi-state service from downtown Vancouver to Hayden Island and Portland) would also use the exclusive guideway to Expo Center. As in Alternative 2, these are C-TRAN Routes:

- 30-Burton;
- 114-Camas/Washougal Limited Express; and
- 173-Battle Ground Limited Express.

With these three routes also using the exclusive guideway, the number of riders who would have a one-transfer trip to Portland would increase. The total number of vehicles in the guideway per hour, two-way, would be 94 at Washington Street and Seventh Street.

The Increased Transit Service System would include six new routes that would provide better coverage to areas served by routes 301, 302, and 304 in the No-Build Alternative. (Routes 50, 51, 52, 53, 54, and 93 are described in the T-Net.)

4.5.1.3 Corridor Express Bus Operations

The corridor express bus operations to downtown Portland, OHSU, or the Lloyd District would be similar to the No-Build Alternative and Alternative 2. Express bus routes 105 and 157 would be eliminated as they would be redundant to the BRT service. In addition, Route 190 would be modified to stop at the Kiggins Bowl Park and Ride lot because, as with Alternative 2, the BPA/Ross Park and Ride lot would be eliminated. Express bus route 190 is a direct point-to-point premium fare route to Marquam Hill, which is an area that would not be served directly by BRT.

All I-5 express bus routes would operate in general purpose lanes southbound. Northbound, the express bus routes would use the existing I-5 managed lane from Going Street to the Oregon Slough.

4.5.1.4 Corridor LRT Operations

To accommodate the connection of the Increased Transit Service to light rail at the Expo Center light station, the MAX Yellow Line headways would be decreased during the peak period from 10 minutes in the No-Build Alternative to 6 minutes, (Alternative 2 peak period headways are 7.5 minutes); headways in the off-peak period would remain at 15 minutes.

Figure 4-18. Alternative 4 – BRT Increased Transit System: Transit Crossing the Columbia River (Local Network not Shown)

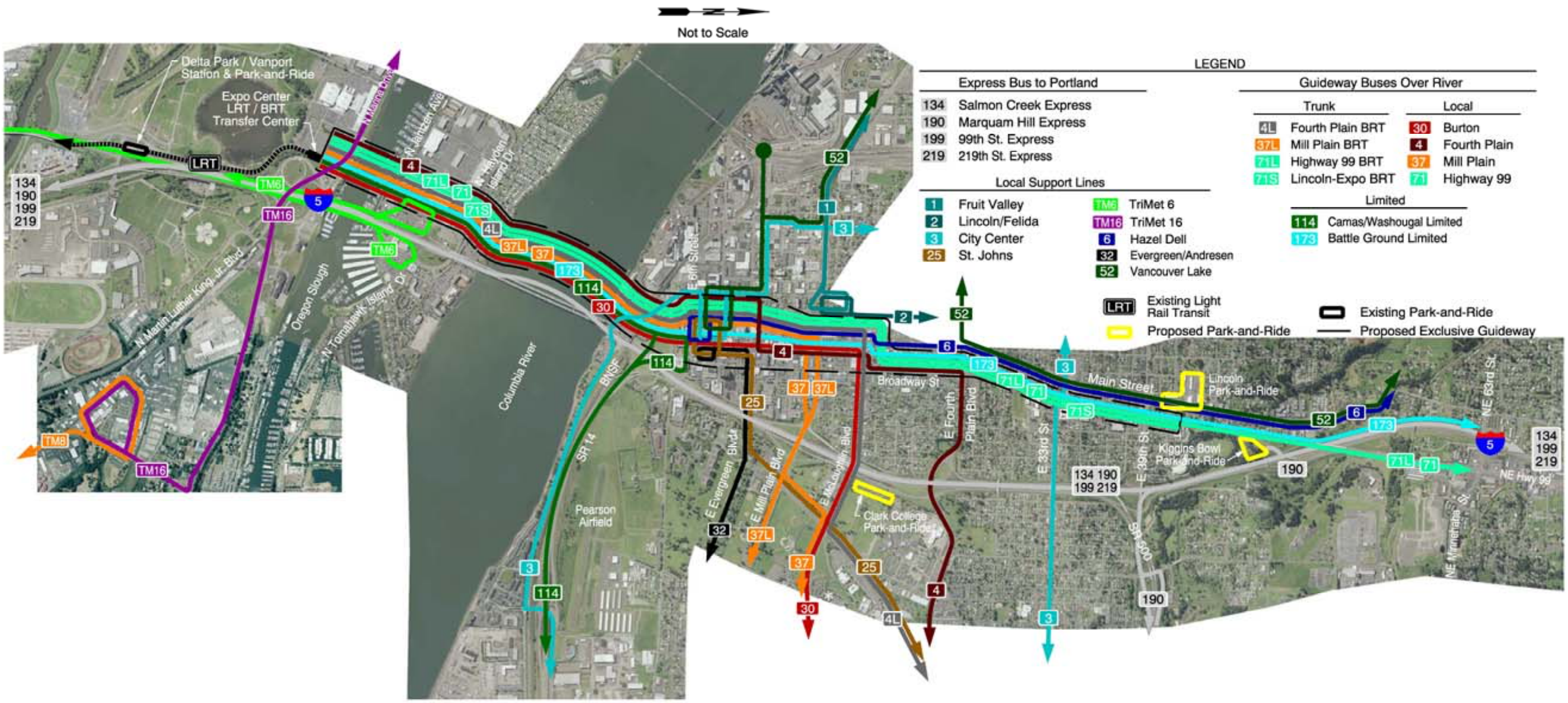

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Table 4-18. Alternative 4 Transit Operating Characteristics Compared to the Representative Alignment of Alternative 2 in 2030

Characteristic		Alternative 2 Vancouver Full-Length Alignment	Alternative 4 Vancouver Full-Length Alignment
Vehicles	C-TRAN Standard Buses	150	221
	BRT	24	38
	LRVs	105	105
BRT Lines		4L, 37L, and 71L	4L, 37L, and 71L
BRT Headways (4L, 37L, and 71L)[1]	4L	10 peak, 0 off-peak	7.5 peak, 0 off-peak
	37L	12 peak, 0 off-peak	7.5 peak, 0 off-peak
	71L	10 peak, 15 off-peak	15 peak, 10 off-peak
Yellow Line Headways		10 min peak, 15 min off-peak	6 min peak, 15 min off-peak
Routes Crossing in Guideway to Expo Center Light Rail Station		4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173	4, 4L, 30, 37, 37L, 71, 71L, 71S, 114, and 173
Total Vehicles in Guideway per Hour at the Washington and 11th Street Station (Two Directions)		50	94
Local Bus Connections to Guideway	Limited	N/A	N/A
	Other	1, 2, 3, 4, 25, 37, and 71	1, 2, 3, 4, 25, 37, and 71
Span of Service		365 days per year, 19 hours per day	365 days per year, 19 hours per day
Annual Platform Hours	C-TRAN Local Bus	271,200	537,300
	C-TRAN Express Bus	90,058	150,282
	BRT	50,922	78,450
	LRT	49,801	52,096
Annual Vehicle Miles Traveled	C-TRAN Local Bus	3,398,100	6,474,600
	C-TRAN Express Bus	1,417,458	1,746,459
	BRT	386,760	664,202
	LRT	430,144	665,280

1 In the peak period, the combined headway for the BRT Routes would be 3 to 4 minutes and in the off-peak period the combined headway would be 5 minutes.

4.5.1.5 Transit Operating Characteristics

Table 4-18 summarizes the transit operating characteristics of Alternatives 2 and 4 for comparison between the Alternatives and Table 4-19 provides a comparison of the bus routing between Alternative 4 and Alternative 2 Vancouver full-length alignment, the representative alignment for that alternative.

In Alternative 4, C-TRAN would increase their number of buses from Alternative 2 from 130 to 221 buses for their local and express bus service and TriMet would continue to operate 641 buses for their fixed route service (in service and spares). Alternative 4 would require an increase of 38 new BRT vehicles, 14 more than in Alternative 2. The number of LRVs in the Interstate MAX system would remain as in the No-Build Alternative at 105 (in service and spares).

As detailed in Table 4-18, BRT routes 4L and 37L would each have peak period headways of 7.5 minutes and off-peak headways of 0 minutes; BRT route 71L would have a peak period headway of 15 minutes and an off-peak headway of 10 minutes. Alternative 4 would result in annual platform hours of about 78,000, and about 664,000 annual VMT. For C-TRAN's fixed route buses, the annual platform hours would be about 537,000 and the annual VMT would be about 6,470,000. Due to the increased transit service provided with Alternative 4, the number of fixed route platform hours would be nearly double over Alternative 2.

Table 4-19. Alternative 4 BRT Bus Routing Compared to the Representative Alignment of Alternative 2 in 2030

	Full-Length Alignments					
	Alternative 2 Vancouver			Alternative 4		
	Connections			**Connections**		
Transfer Location	Bus Routes (BRT routes in bold)	Number of Bus Routes	**Peak Period Buses per Hour per Direction**	Bus Routes (BRT routes in bold)	Number of Bus Routes	**Peak Period Buses per Hour per Direction**
Expo Center Light Rail Station	**4L, 37L, 71L,** 4, 6, 30, 32, 37, 71, 114, 173, TriMet 16	12	26 (not including TriMet)	**4L, 37L, 71L,** 4, 6, 30, 37, 71, 114, 173, TriMet 16	11	40 (not including TriMet)
Hayden Island Station	**4L, 37L, 71L,** 4, 30, 37, 71, 114, 173, TriMet 6	10	22 (not including TriMet)	**4L, 37L, 71L,** 4, 30, 37, 71, 114, 173, TriMet 6	10	55 (not including TriMet)
Seventh St. Station	**4L, 37L, 71L,** 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	25	**4L,71L, 37L,** 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	47
12th St. Station	**4L, 37L, 71L,** 25, 30, 32, 37, 71, 173	9	24	**37L, 71L**, 25, 30, 32, 37, 71, 173	8	46
Mill Plain District Transit Center	**4L, 37L, 71L,** 1, 2, 4, 6, 30, 37, 71	10	24	**4L, 37L, 71L,** 1, 2, 6, 30, 37, 71, 173	10	46
Clark College Park and Ride Lot	**4L,** 30	2	6	**4L, 30**	2	13
25th St. Station	**71L, 4,** 6, 71, 173	5	17	**71L,** 4, 6, 71, 173	5	31
33rd St. Station	**4L, 71L,** 3, 4 6, 71, 173	7	11	**4L, 71L,** 3, 4, 6, 71, 173	6	19
Rosemere Station	N/A	N/A	N/A	N/A	N/A	N/A
Lincoln Park and Ride Lot	**71L,** 6, 71, 173	4	8	**71L**, 6, 71, 173	4	15
Kiggins Bowl Park and Ride	**71L,** 6, 71	3	8	**71L**, 6	2	10

Table 4-20 summarizes the BRT stations for Alternative 4 that would be located within the CRC study corridor. This table details each station name, location, and access. Including the Expo Center light rail station, which would gain a new transfer center, Alternative 4 would have five new stations. Within the guideway, the three BRT routes would stop only at designated BRT stations. C-TRAN local and limited express bus routes 6, 30, 32, 114, and 173 that would also travel across the river in the guideway would stop at these stations in addition to their regular local stops. Smaller stations, such as the Seventh Street and 12th Street station, would be constructed to accommodate only one BRT vehicle. However, with headways of approximately 2 minutes (and with an average boarding and alighting time of 20 seconds) there should be little or no delay to buses at these locations. Major stations, such as the Mill Plain District Transit Center and the Expo Center light rail station, would have multiple designated bus bays.

For Alternative 4 park and ride lots, please refer to Table 4-13. As stated in note 1 below the table, Alternative 4 has the same park and ride structure as the Vancouver full-length alignment of Alternative 2.

Table 4-20. Alternative 4 – BRT Stations

STATION NAME	LOCATION	ACCESS
Expo Center Light Rail Station	2060 N Marine Drive	Drive, walk, bike, local bus transfer, park and ride, 3 BRT lines, LRT transfer
Hayden Island	West side of I-5, offset	Drive, walk, bike, local bus transfer, 3 BRT lines
Seventh Street Station	Washington Street between Sixth and Seventh Streets	Drive, walk, bike, local bus transfer, 3 BRT lines
12th Street	Washington Street between Evergreen and 12th Streets	Drive, walk, bike, local bus transfer, 3 BRT lines
Mill Plain District Transit Center	Between 15th Street and 16th Street	Drive, walk, bike, local bus transfer, 3 BRT lines
24th Street	On Broadway between 23rd and 24th Streets	Drive, walk, bike, local bus transfer, 1 BRT line
33rd Street	Main Street and 33rd Street	Drive, walk, bike, local bus transfer, 1 BRT line
Lincoln Park and Ride Lot	Main Street and 40th Street	Drive, walk, bike, local bus transfer, park and ride, 1 BRT line

Operations and Maintenance Facility

The Alternative 4 would include an expansion onto C-TRAN's existing AOM facility sufficient in size to accommodate the 36 new, larger sized BRT vehicles and additional local buses. At the AOM facility, no additional land would need to be acquired to accommodate the facility expansion.

Rail Convertible BRT

The definition of BRT convertible assumes only costs associated with designing the BRT system to a level that does not preclude future light rail operation. These include the horizontal and vertical clearances, grades, and turning radii required for LRT operation. In addition, for the purposes of this CRC project, the BRT convertible definition will include the requirement that structural foundations be designed for the ultimate static and dynamic loads required for LRT operations. It does not include additional efforts that some projects have attempted, such as relocating utilities or installing equipment specific to rail.

4.6 Alternative 5: Light Rail Transit

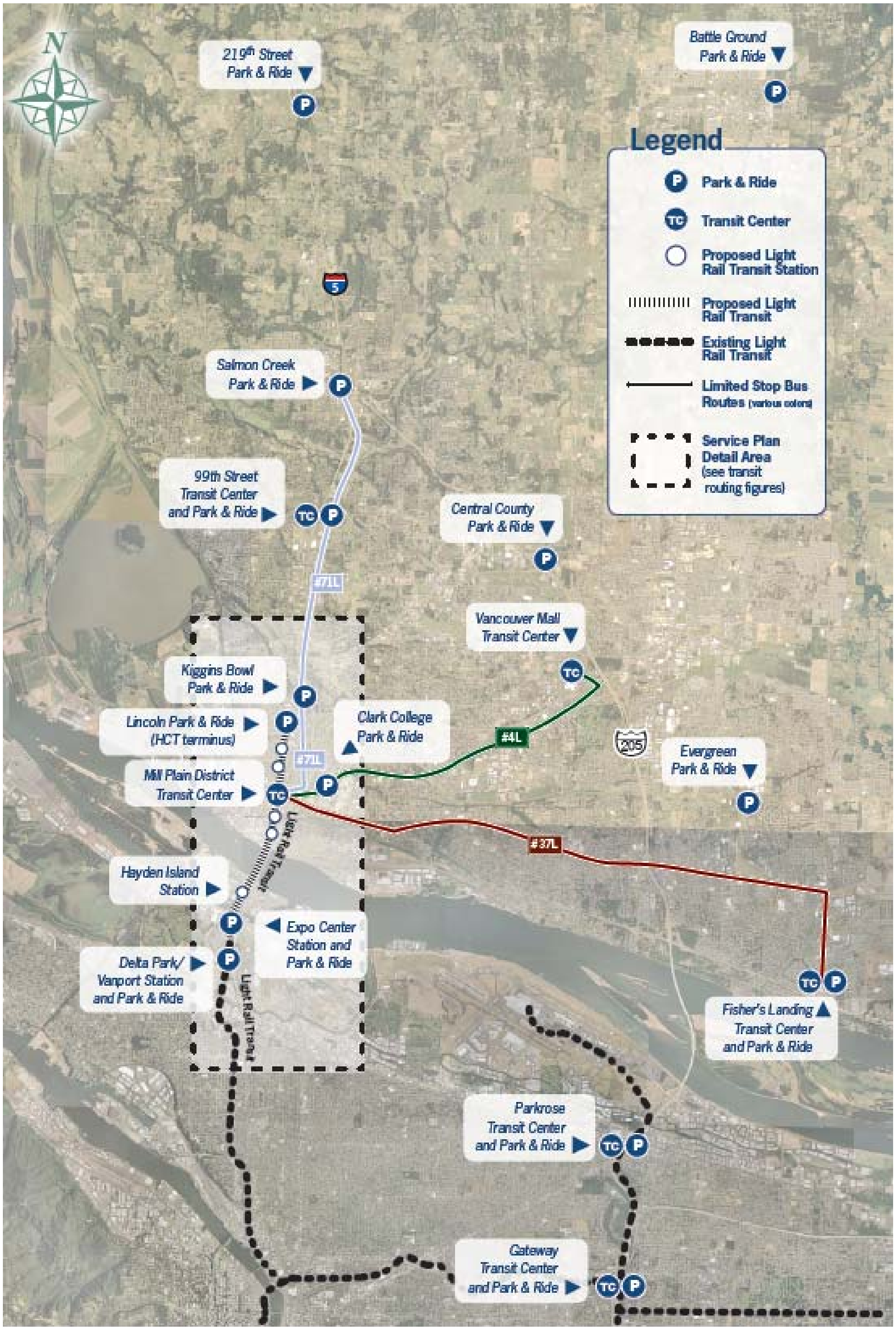
Alternative 5 would be similar to Alternative 3 – Vancouver full-length with three major differences: Alternative 5 would be paired with the Highway$_3$ network which includes a supplemental bridge over the Columbia River, with fewer lanes than the proposed replacement bridge; it would have a higher toll rate for private vehicles crossing I-5; and it would have increased transit service. Figure 4-19 details the Alternative 5 transit alignment and Figure 4-20 details the transit routing.

Alternative 5 would include an extension of TriMet's Interstate MAX LRT Yellow Line from the existing Expo Center light rail station to the Lincoln Park and Ride in Vancouver with characteristics similar to TriMet's regional light rail system. This alternative would use both existing I-5 bridge structures for northbound Interstate traffic, bicycles, and pedestrians. A new crossing would carry southbound Interstate traffic and light rail. The existing I-5 bridge would be re-striped to provide two lanes on each bridge structure and allow for an outside safety shoulder for disabled vehicles. A new, wider bicycle and pedestrian facility would be cantilevered from the eastern side of the existing northbound (upstream) bridge. Four southbound I-5 lanes (three through-lanes and one auxiliary lane) and LRT would be provided on a new downstream supplemental bridge. The southbound LRT extension would be incorporated into TriMet's MAX Yellow Line providing a one-seat ride for transit riders from Lincoln Park and Ride to downtown Portland. Headways on the LRT would be more frequent than in Alternative 3 and express bus service and local and feeder bus service frequencies would be increased to meet demand. This alternative would also include a higher toll than Alternatives 2 and 3 for vehicles crossing the Columbia River on the new I-5 bridge. Compared to Alternative 1, Alternative 5 would reduce transit travel time, improve transit system reliability, and increase service to transit markets.

As detailed in Figure 4-19, Alternative 5 follows the same alignment as the Vancouver full-length alignment in Alternative 3. With this alignment, the exclusive guideway would consist of a length of approximately 3.41 miles. In the south, the alignment would begin at the existing Expo Center light rail station. From there the alignment would rise in elevation as it headed northward, over the Oregon Slough, to an elevated station on Hayden Island. It would then continue to rise over the Columbia River and descend into downtown Vancouver to a touch down point near Sixth Street and Washington Street. Along Washington Street in downtown Vancouver, there would be LRT stations at Seventh Street, 12th Street, and at the Mill Plain District Transit Center between 15th Street and 16th Street. From the Mill Plain District Transit Center, both travel directions of the guideway would continue north along Broadway Street, with a station located at 24th Street, to 29th Street. From there, both travel directions of the guideway would continue north up Main Street, with a station located at 33rd Street, and to the terminus at the proposed Lincoln Park and Ride lot located at the intersection of Main Street and East 40th Street. Surface parking lots would be provided at Lincoln, Kiggins Bowl, and the Clark College Park and Ride lots. The existing BPA/Ross Park and Ride lot would be eliminated.

Alternative 5 has the same design options as Alternative 3, but was evaluated with a supplemental bridge and the Vancouver full-length alignment.

Figure 4-19. Alternative 5 Alignment: Trunk Line and Limited Service (Local and Express Bus Network not Shown)



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4.6.1 Transit Operations

Figure 4-20 shows the transit routing for the Alternative 5 which follows the same guideway alignment as Alternative 3’s Vancouver full-length alignment. The figure shows the LRT guideway, and the local, limited, and express bus routing. The transit routing would be similar to that in Alternative 3; however, the frequency of service would be much higher (service would be increased to meet demand). See Section 3 of this report for information on the BRT span of service, vehicle characteristics, and fares. See Appendix B for a complete transit line listing for the Alternatives, including headways.

4.6.1.1 Corridor LRT Operations

The LRT guideway would connect to the Expo Center light rail station and terminate at the Lincoln Park and Ride. To accommodate the increased demand to LRT created by the Increased Transit Service, the LRT line headways would be decreased to 6 minutes during the peak period and 10 minutes during the off-peak.

4.6.1.2 Corridor Local Bus Operations

Local bus routes would connect to the proposed light rail stations at the Lincoln Park and Ride, the Mill Plain District Transit Center, and the Seventh Street station. Many local routes would have twice the frequency as in Alternative 3.

4.6.1.3 Corridor Express Bus Operations

Express bus routing would be similar to the Alternative 1, except that C-TRAN’s express bus routes 105 and 157 would be eliminated as they would be redundant to the LRT service. In addition, frequency of service would be higher for express routes. Headways on route 199 would be decreased to 7.5 minutes from 10 minutes in the peak period, and route 134 would be decreased to 10 minutes from 12 minutes in the peak.

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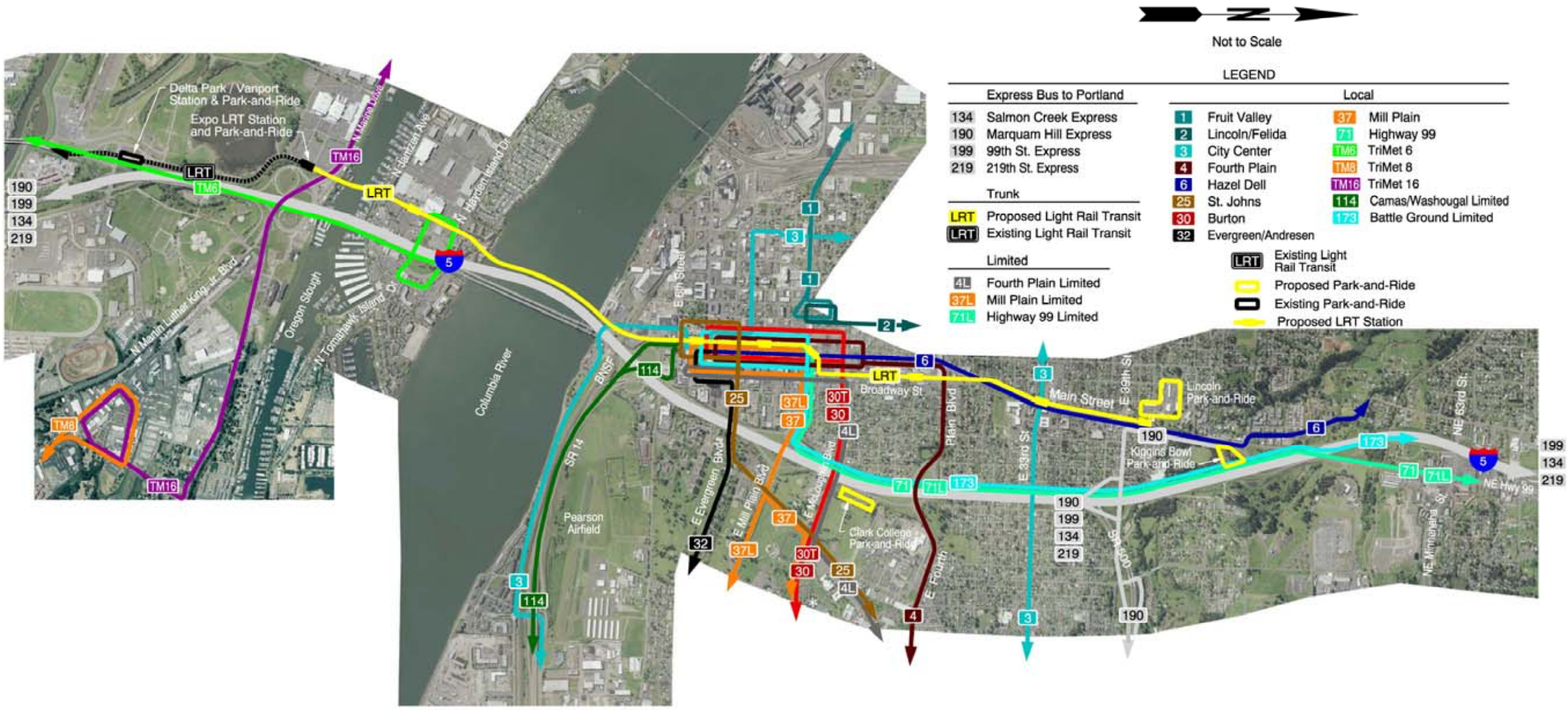
Figure 4-20. Alternative 5 Transit Routing: Includes Local, Express, and Trunk Line Service



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4.6.1.4 Transit Operating Characteristics

Table 4-21 summarizes the transit operating characteristics of Alternatives 3 and 5 for comparison between the Alternatives and Table 4-22 provides a comparison of the bus routing between Alternative 5 and Alternative 3 Vancouver full-length alignment, the representative alignment for that alternative.

In Alternative 5, C-TRAN would increase their number of buses from Alternative 2 from 130 to 224 buses for their local and express bus service and TriMet would continue to operate 641 buses for their fixed route service (in service and spares). Alternative 5 would require an increase of 18 new LRV vehicles, five more than in Alternative 3.

The Limited route headways for 4L and 37L would each have peak period headways of 10 minutes and no off-peak service; the 71L would have a peak period headway of 15 minutes and an off-peak headway of 10 minutes. Alternative 5 would result in annual platform hours of about 75,000, and about 1,000,000 annual VMT for light rail. For C-TRAN's fixed route buses, the annual platform hours would be 444,000 and the annual VMT would be 6,130,000. Due to the increased transit service provided with Alternative 5, the number of fixed route platform hours would be nearly double over Alternative 3.

Table 4-21. Alternative 5 Transit Operating Characteristics Compared to the Representative Alignment of Alternative 3 in 2030

Characteristic		Alternative 3	Alternative 5
		Vancouver Full-Length Alignment	**Vancouver Full-Length Alignment**
Vehicles	**C-TRAN Standard Buses**	108	201
	Limited Stop Buses	22	23
	LRVs	119	123
LRT Headways		7.5 min peak, 15 min off-peak	6 min peak, 10 min off-peak
Limited Route Headways		4L and 37L: 10 min peak, 15 min off-peak	4L and 37L: 10 min peak, 0 min off-peak
		71L: 15 min peak and off-peak	71L: 15 min peak and 10 off-peak
Local Bus Connections to Guideway	**Limited**	4L, 37L, and 71L	4L, 37L, and 71L
	Other	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71	1, 2, 3, 4, 6, 25, 30, 32, 37, 39, and 71
Span of Service		365 days per year, 19 hours per day	365 days per year, 19 hours per day
Annual Platform Hours	**C-TRAN Local Bus**	258,000	444,000
	C-TRAN Express Bus	79,000	130,000
	Limited Routes	24,000	41,000
	LRT	74,000	75,000
Annual Vehicle Miles Traveled	**C-TRAN Local Bus**	3,350,000	6,130,000
	C-TRAN Express Bus	1,200,000	1,600,000
	Limited Routes	154,000	250,000
	LRT	707,000	1,000,000

Table 4-22. Alternative 5 LRT Bus Routing Compared to the Representative Alignment of Alternative 3 in 2030

Transfer Location	Full-Length Alignments					
	Alternative 3			Alternative 5		
	Connections		Peak Period Buses per Hour per Direction	Connections		Peak Period Buses per Hour per Direction
	Bus Routes (BRT routes in bold)	Number of Bus Routes		Bus Routes (BRT routes in bold)	Number of Bus Routes	
Expo Center Light Rail Station	TriMet 16	1	0 (not including TriMet)	TriMet 16	1	0 (not including TriMet)
Hayden Island Station	TriMet 6	1	0 (not including TriMet)	TriMet 6	1	0 (not including TriMet)
Seventh St. Station	4L, 37L, 71L, 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	20	4L, 37L, 71L, 3, 4, 6, 25, 30, 32, 37, 71, 114, 173	13	47
12th St. Station	4L, 37L, 71L, 4, 6, 25, 30, 37, 71	9	20	4L, 37L, 71L, 4, 6, 25, 30, 37, 71	9	46
Mill Plain District Transit Center	4L, 37L, 71L, 1, 2, 4, 6, 30, 37, 71	10	22	4L, 37L, 71L, 1, 2, 4, 6, 30, 37, 71	10	46
Clark College Park and Ride Lot	4L, 30	2	8	4L, 30	2	12
25th St. Station	4L, 4, 6	3	8	4L, 4, 6	3	31
33rd St. Station	3, 6	2	4	3, 6	2	19
Rosemere Station	N/A	N/A	N/A	N/A	N/A	N/A
Lincoln Park and Ride Lot	6	1	2	6	1	2
Kiggins Bowl Park and Ride	6	1	2	6	1	2

Table 4-23 summarizes the LRT stations for Alternative 5 that would be located within the CRC study Corridor. This table details each station name, location, and access. Alternative 5 would have seven new stations. C-TRAN local and limited express bus routes 6, 30, 32, 114, and 173 would enter the guideway stop at specific along the guideway stations in addition to their regular local stops but they would not cross the Columbia River.

For specific information about the park and ride allocation of Alternative 5, please refer to Table 4-17 on page 4-86. As stated in note 1 below Table 4-16, Alternative 5 has the same park and ride structure as the Vancouver full-length alignment of Alternative 3.

Table 4-23. Alternative 5 – LRT Stations

STATION NAME	LOCATION	ACCESS
Hayden Island	West side of I-5, offset	Drive, walk, bike, local bus transfer, LRT
Seventh Street	Washington Street between Sixth and Seventh Streets	Drive, walk, bike, local bus transfer, LRT
12th Street	Washington Street between Evergreen and 12th	Drive, walk, bike, local bus transfer, LRT
Mill District	Between 15th Street and 16th Street	Drive, walk, bike, local bus transfer, LRT
24th Street	On Broadway between 23rd and 24th Street Couplet:	Drive, walk, bike, local bus transfer, LRT
33rd Street	Main Street and 33rd Street	Drive, walk, bike, local bus transfer, LRT
Lincoln Park and Ride Lot	The intersection of Hwy 99 and Main Street, to the west of I-5	Drive, walk, bike, local bus transfer, park and ride, LRT

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BRT and LRT Design Options by Segment

This section discusses the BRT and LRT design options. The discussion is organized around the segments of the transit alignments. The full-length transit alignments are broken into three segments: A1; A2; and B. They are segmented as illustrated in Figure 4-2 because these three parts have design options that are specific to the segment. The segments are:

- **Segment A1** includes the portion of the alignment from Delta Park to South Downtown Vancouver. This segment includes the transit alignment and options from the existing Expo Center Station to the transit bridge landing at Sixth Street and Washington Street in downtown Vancouver.
- **Segment A2** includes the portion of the alignment from South Downtown Vancouver to Mill Plain District (as shown in Figure 4-2). This segment includes the transit alignment and options from the transit bridge landing at Sixth Street and Washington Street in downtown Vancouver to the proposed Mill Plain District Transit Center located between 15^{th} and 16^{th} Street on the alignment. In addition, this segment includes the Mill Plain District MOS alignment that terminates at the Mill Plain District Transit Center.
- **Segment B** includes the portion of the alignment from Mill Plain District to North Vancouver. This segment includes the alignment from the Mill Plain District Transit Center to the northern terminus of the Vancouver and I-5 full-length alignments. This segment includes the Clark College MOS alignment that terminates at the Clark College Park and Ride.

Further, Section 4.7 is divided into two subsections. Section 4.7.1 discusses the BRT design options. The items detailed within this section are the design options that would be decided between when considering the BRT Alternatives 2 and 4. Section 4.7.2 discusses the LRT design options. The options discussed within this section would pertain to the LRT Alternatives 3 and 5.

4.7.1 Alternatives 2 and 4: BRT Design Options by Segment

This section describes the transit capital improvements that would occur within the CRC Corridor that would be included in the two BRT alternatives. From the Expo Center to the proposed Mill Plain District Transit Center, the I-5 alignment and the Vancouver alignment would be the same (combined Segments A1 & A2), and they are therefore described together. North of the proposed Mill Plain District Transit Center (Segment B) the two alignments diverge and are therefore described separately.

4.7.1.1 BRT Vancouver and I-5 Alignments Segment A1: Expo Center to Sixth Street

Within Segment A1 with the BRT Alternatives 2 and 4, from the Expo Center to Sixth Street, the capital improvements would include constructing additional bus bays and other modifications to add a transfer center to the facility at Expo Center to accommodate the transfer from BRT to the Interstate MAX light rail line. The capital improvements would also include the construction of an exclusive guideway for BRT from Expo Center to Hayden Island. A BRT station would be constructed on Hayden Island on the west side of I-5. There are two design options for the location of the BRT guideway across Hayden Island and for the BRT station. In addition, the new I-5 crossing of the Columbia River, if paired with a replacement bridge option, would have a design option variation that would place HCT inside the structure supporting the highway lanes for the southbound replacement bridge called a Stacked Transit/Highway Bridge. This design option could be paired with either BRT or LRT HCT mode.

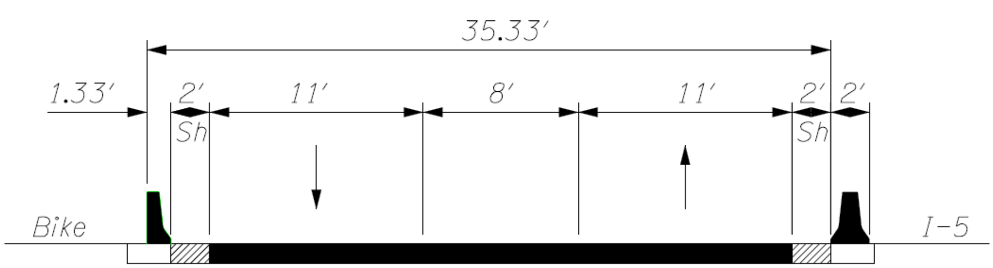
Hayden Island and Bridge Design Options

- **Adjacent to I-5 with Downstream I-5 Bridge**: In this option, the BRT guideway across Hayden Island and the BRT station would again be located immediately adjacent to the west side of a new replacement bridge for I-5, however, the bridge would be located slightly downstream (west) of the existing I-5 bridges. The alignment of the BRT guideway and the Hayden Island station would be located over N Center Avenue. See Figure 4-22.
- **Offset from I-5**: This design option for the guideway and station location on Hayden Island is included in the representative alignment. In this option, the BRT guideway across Hayden Island and the BRT station would be separated from I-5, located over N Jantzen Beach Center. When this design option is paired with a downstream I-5 bridge the BRT alignment and station would be separated from the highway by approximately 450 feet. When this option is paired with an upstream I-5 bridge the BRT alignment and station would be approximately 650 feet from the highway. See Figure 4-23.

With these two design options, the Hayden Island station would also have the option of being located in the center or on the south side towards N Jantzen Avenue. The station would also have a range in the elevation it could be constructed at, which would be between 25 and 38 feet above grade. The station for the adjacent option can be built lower, 16 to 20 feet above grade, since there will be no traffic under the guideway. This lower station can only be placed between Jantzen Drive and the Tomahawk Drive extension due to clearance issues. The final station design would be coordinated with the upcoming Hayden Island Master Plan to be conducted by the City of Portland.

From Hayden Island the transit capital improvements would include the construction of an exclusive transit guideway over the Columbia River along the west side of the highway for a length of approximately 1.4 miles. The location of the guideway over the river would vary somewhat depending on whether the highway bridge would be upstream (east) or downstream (west) of the existing I-5 bridges. The cross section of the highway and transit guideway would be similar to what is shown in Figure 3-2. Figure 4-21 shows the recommended BRT guideway section over the Columbia River in greater detail.

Figure 4-21. Recommended BRT Guideway Cross Section over the Columbia River



The recommended guideway section would include two, 11-foot-wide lanes for BRT vehicles and an 8-foot-wide median buffer that would allow for passing of broken down vehicles without needing to encroach into the oncoming lane. With a total width of just over 35 feet (to the outside of the half jersey barrier) this guideway section would provide safe operations at high speeds for the volume of transit vehicles that would use the guideway.

Replacement Crossing with a Stacked Transit/Highway Bridge

$Highway_1$ and $Highway_2$ (replacement bridge options) can be constructed with a Stacked Transit/Highway Bridge (STHB). STHB is an option to bring transit across the Columbia River by constructing it inside the structure supporting the highway lanes for the southbound replacement bridge. This option would remove the need for a third bridge and the accompanying piers and footings. The multi-use path would be placed under the deck of the northbound bridge on the east side.

The STHB design has not been finalized but the concept is a concrete segmental bridge as shown in Figure 4-24. In effect, this would put transit in a pair of tunnels with the accompanying Fire, Life, and Safety considerations, such as an air exchange system, fire suppression equipment and fire doors between the two box sections. STHB would be more open to the air and so not have all of the Fire, Life, and Safety issues associated with transit in a tunnel. One concern associated with STHB is that if an accident or incident that stopped or closed the transit system occurred within the STHB system, it could stop general traffic on the I-5 lanes above or close the bridge span altogether. With transit on a third bridge, it would be located 50 feet west of the highway bridges and so would most likely not create a safety issue with the general purpose lanes of I-5.

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Figure 4-22. Hayden Island Station Design Option – Adjacent to I-5 with a Downstream Highway

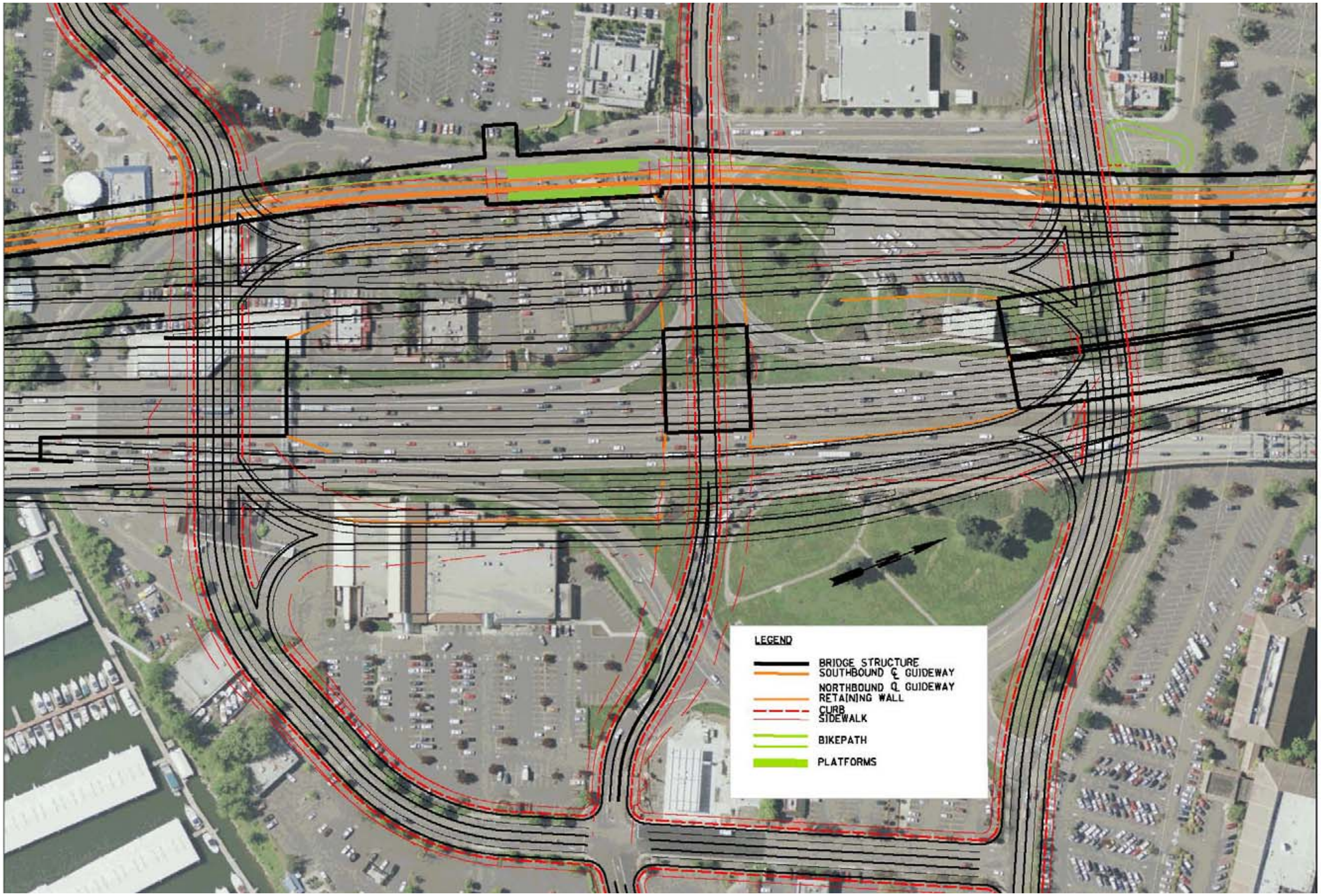

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Figure 4-23. Hayden Island Station Design Option – Offset from I-5 with an Upstream or Downstream Highway

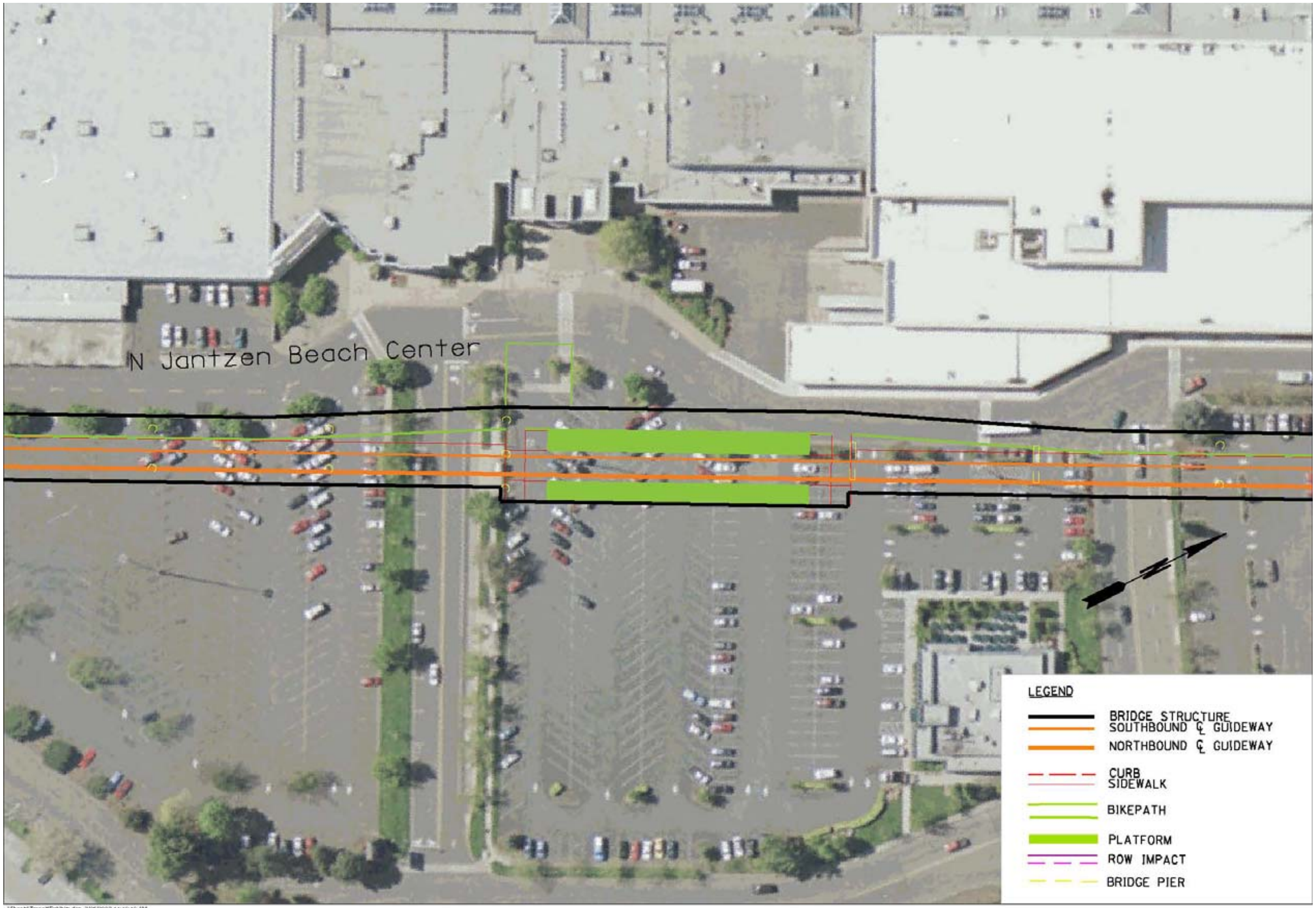

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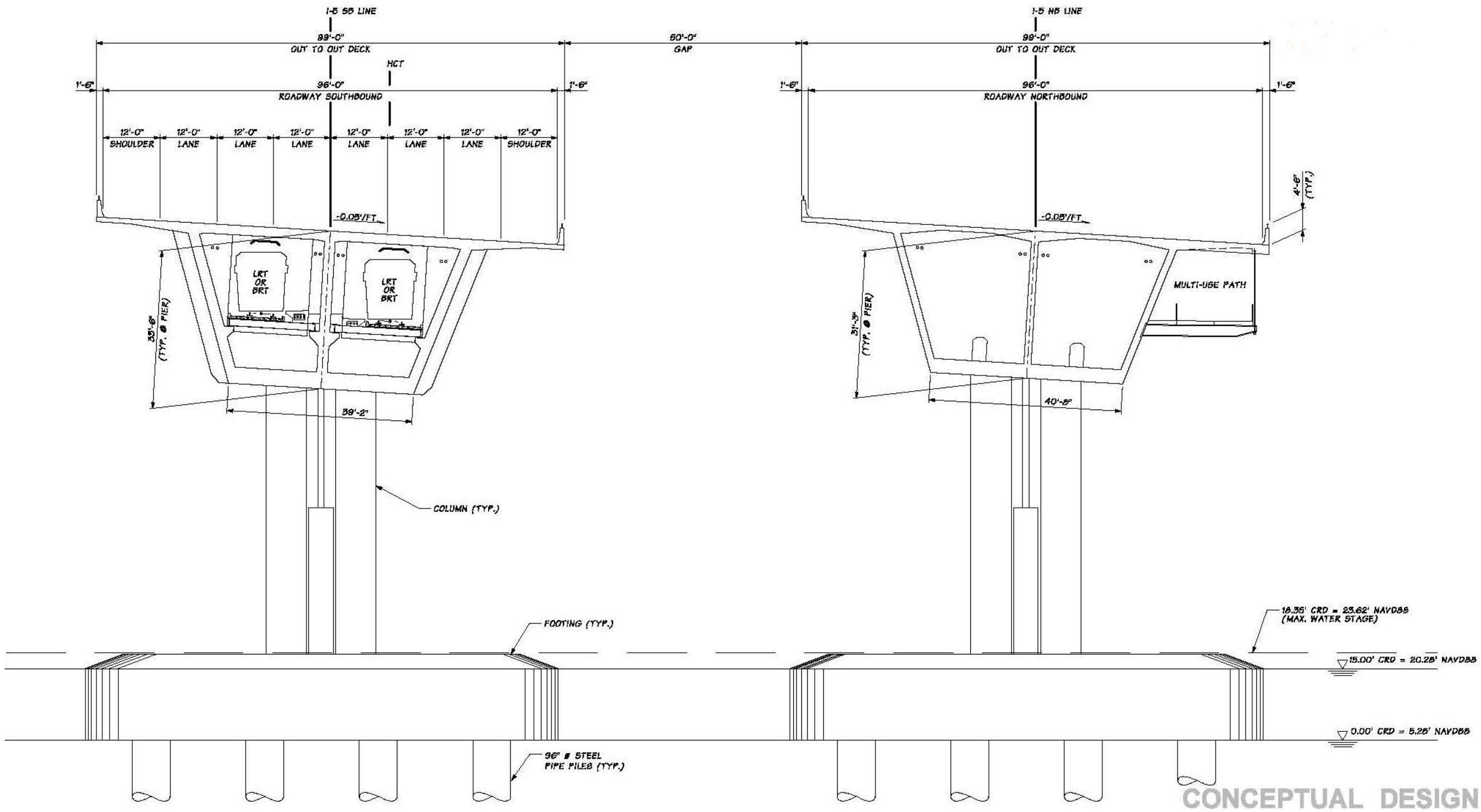
Figure 4-24. Stacked Transit/Highway Bridge – Concrete Segmental Bridge Configuration – Looking Northward



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4.7.1.2 BRT Vancouver and I-5 Alignments Segment A2: Sixth Street to Mill Plain District

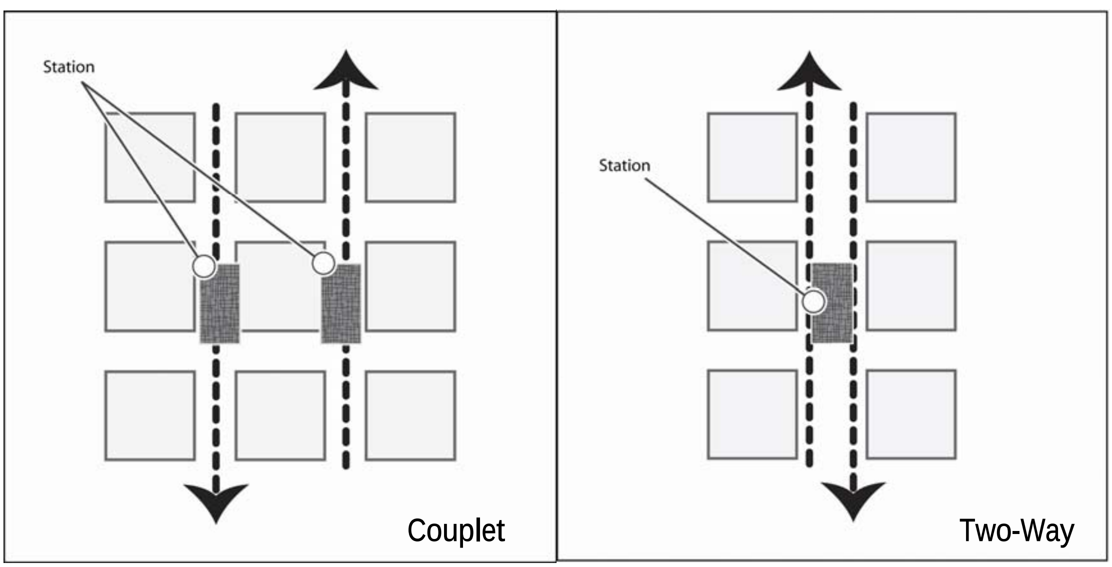
Once over the Columbia River the BRT guideway would separate from the I-5 bridge and descend into downtown Vancouver at a touch down point by Sixth Street. Within downtown Vancouver, from Seventh Street to the Mill Plain District Transit Center, there are three design options for variations in the BRT alignment and guideway cross section. In addition to the full-length alignments, Segment A2 includes the terminus for the Mill Plain District MOS, which will also be discussed in this section.

Downtown Vancouver Design Options

The three design options for downtown Vancouver are representative. For each design option, the location of the guideway and the platforms within the right-of-way, such as being in the center, east side, or west side, may change as further analysis is conducted. The right-of-way width in downtown Vancouver presents a design challenge and the traffic circulation impacts of the design options still need to be evaluated. The potential design options range from more auto-oriented to more transit and pedestrian oriented.

The three design options proposed for downtown Vancouver include options where the guideway would operate as a couplet, with one direction of travel on two streets, and options where the guideway would have a two-way operation with both directions of travel on one street. Figure 4-25 is a representative illustration of a couplet and a two-way operation for BRT.

Figure 4-25 BRT Representative Couplet and Two-Way Operation

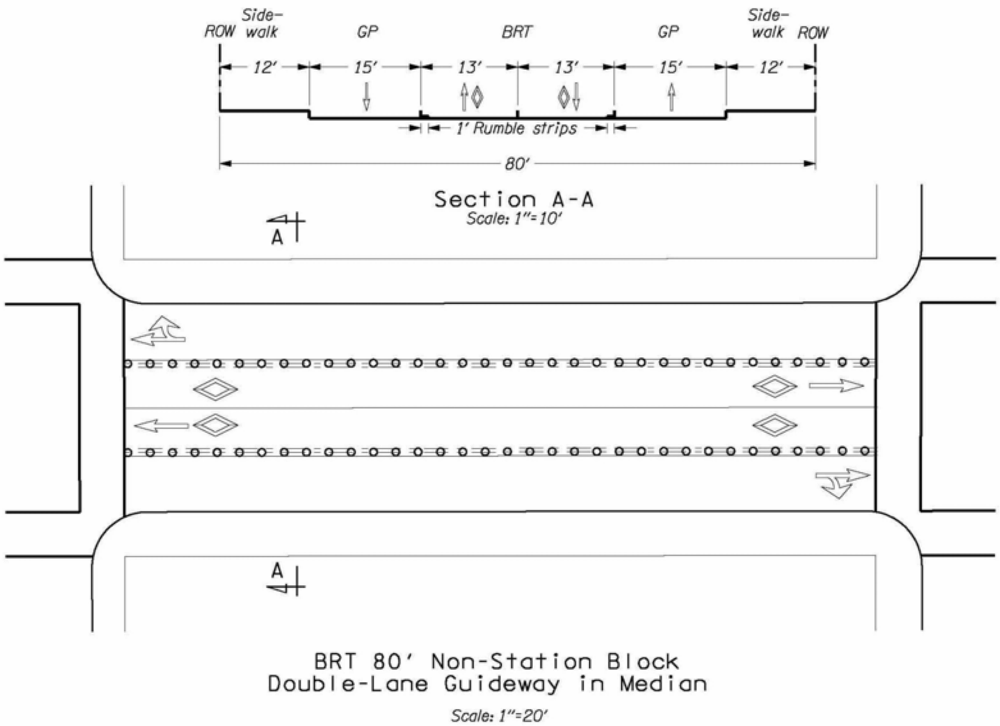


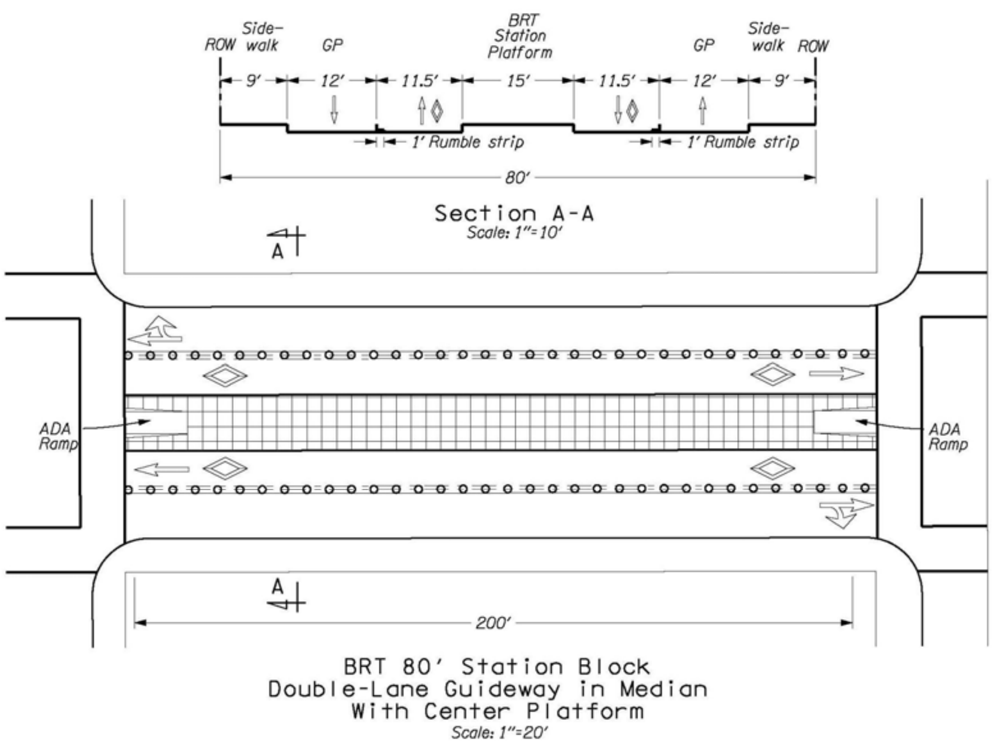
- **Washington Street Two-Way Median Design Option***:* This design option is included in the representative alignment. In this design option, the BRT guideway would be two-way in the median of Washington Street. On a station block, a single platform would be located in the center of the guideway. The BRT exclusive guideway would be separated from general purpose traffic with a physical barrier such as a rumble strip. On a non-station block the total guideway width, including the barriers between general purpose traffic, would be 26 feet. On a station block, the total width of the guideway would be 38 feet. See Figure 4-26 for a typical cross section of this design option on a non-station block and a station block.

○ This option has been selected to be part of the representative alignment because it would allow for two-way traffic along Washington Street. The center platforms would also be the best option for rail-convertibility because this configuration would be similar to a two-way median design option for LRT. However, LRT trains have doors on both sides of the car while not all of the buses that would use the guideway would be special vehicles with doors on both sides of the vehicle. The BRT vehicles on the three BRT lines (4L, 37L, and 71L) could have left-side doors, but the regular fixed-route buses that would also use the guideway would not. For these buses to be able to use the center-platform stations, all buses would need to operate in a contra-flow configuration in downtown Vancouver. The contra-flow operation would occur along Washington Street beginning at Sixth Street and ending at the Mill Plain District Transit Center. Because the intersection of Washington and Sixth Street would be signalized and would operate at slower urban speeds, it would be an appropriate place to conduct the crossover from contra-flow traffic circulation to normal flow.

○ Within downtown Vancouver, the BRT alternative would include three new stations with amenities such as shelters, benches, ticket vending machines, brick or architectural concrete paving and level boarding. One station would be located on Washington Street between Sixth and Seventh Streets, a layout of this station is shown in Figure 4-27. Another station would be located along Washington Street between 11th and 12th Street (shown in Figure 4-28) and a third within the Mill Plain District between 15th and 16th Street, Figure 4-29. The facility constructed in the Mill Plain District would also serve as a Transit Center, with nine bus bays that would provide for connections to BRT from the local bus network. These facilities would comply with the Americans with Disabilities Act (ADA).

Figure 4-26. BRT Washington Street Two-Way Median Running Design Option





Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing.

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Figure 4-27. Washington and Seventh Street Station Layout

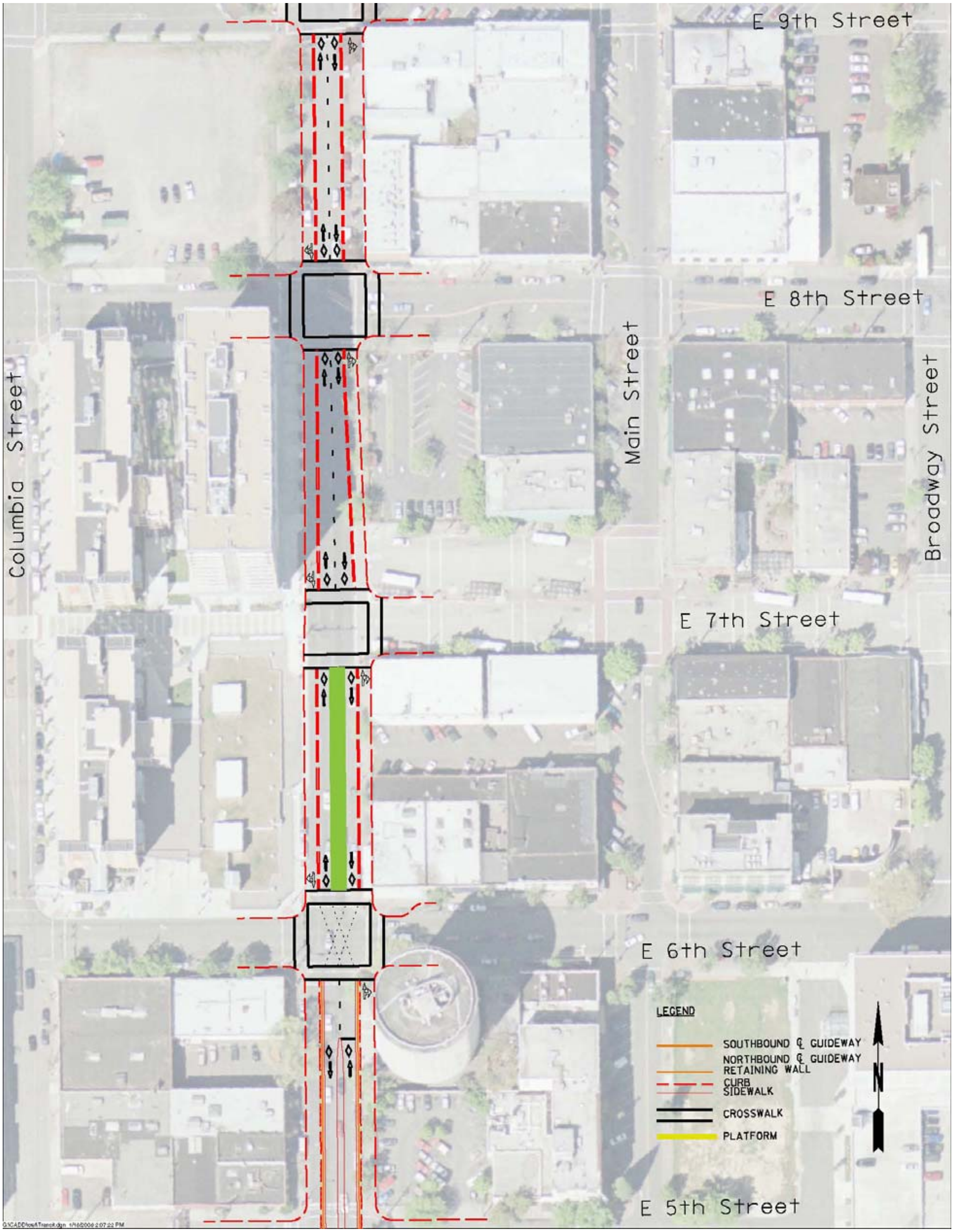

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Figure 4-28. Washington and 12th Street Station Layout

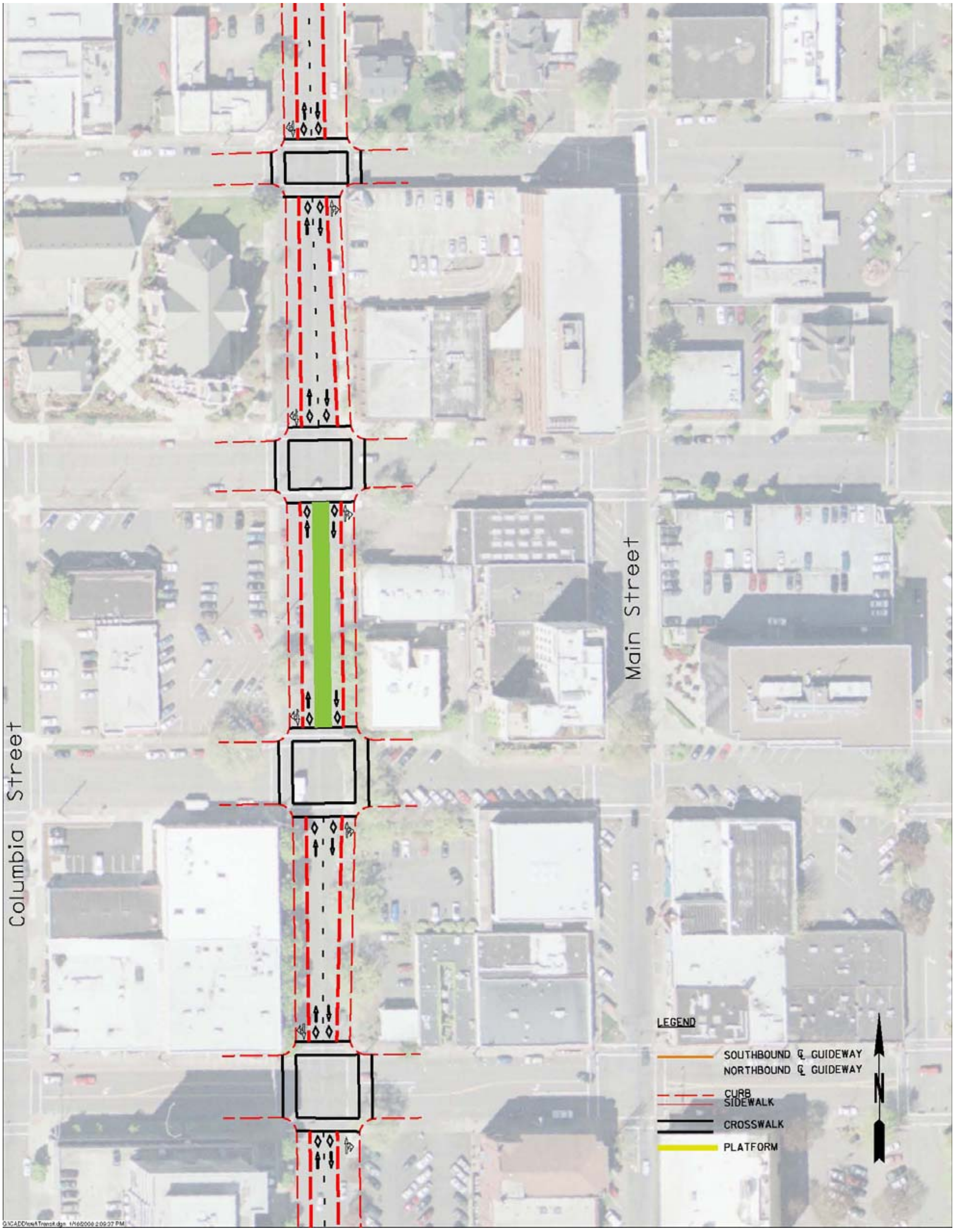

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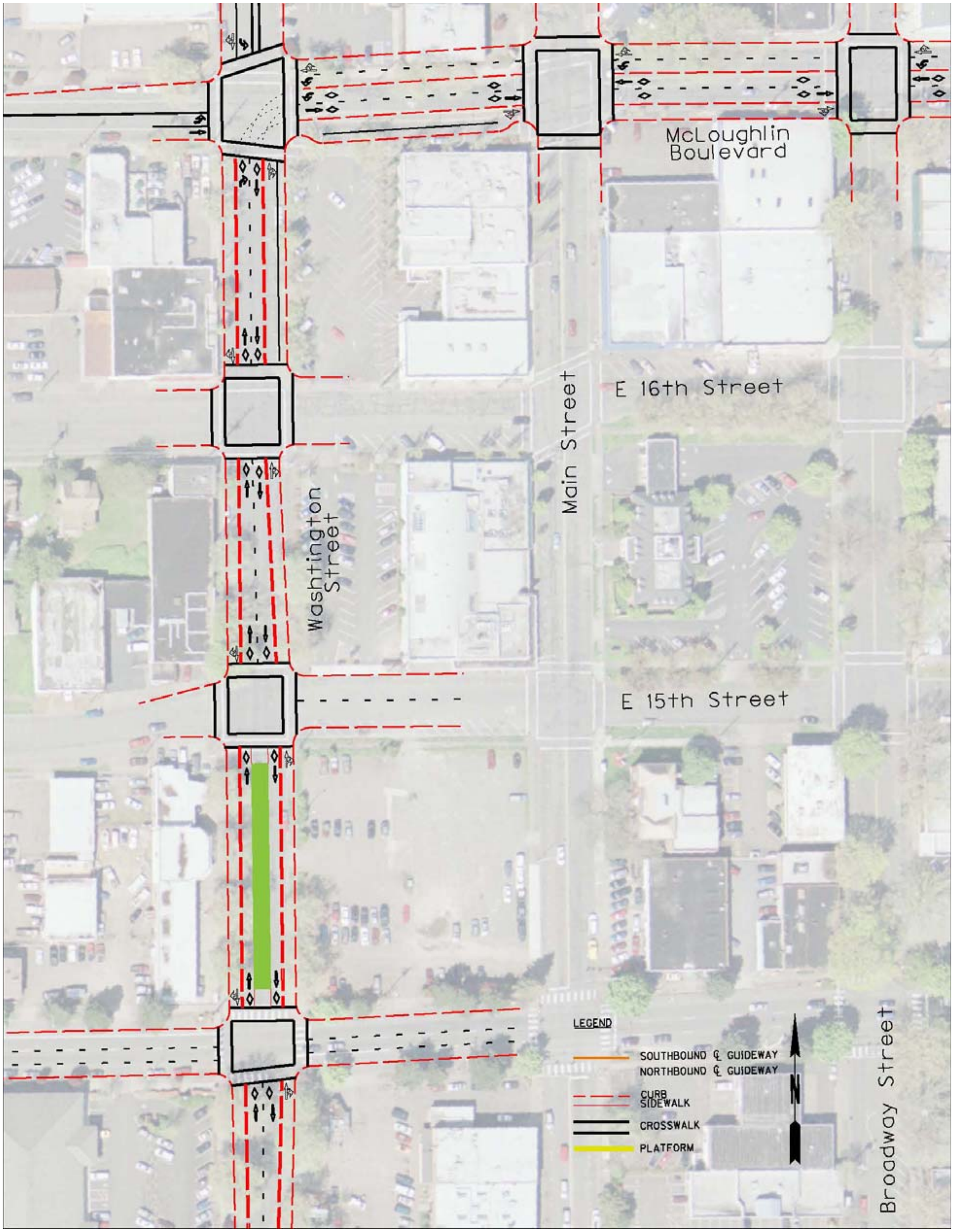
Figure 4-29. Mill Plain District Transit Center Layout



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- **Washington/Broadway Street Couplet Design Option:** Buses need to load on the right side so the station platforms need to be on the right side of the street. In this design option, the northbound travel direction of the BRT guideway would then need to be along the east side of Broadway Street and the southbound direction of travel would be a one-way guideway along the west side of Washington Street (two blocks west of Broadway Street). With this design option, buses and traffic would travel in opposite directions on one-way streets so that traffic would not be required to make right turns across the guideway.
    - The proposed cross section along both Washington and Broadway Streets would be similar to what is shown in Figure 4-30. The cross section for a non-station and a station block would be similar.
    - BRT stations would be constructed in downtown Vancouver at three locations for southbound travel on Washington Street and three locations for northbound travel on Broadway Street. These stations, which would be ADA compliant, would include passenger amenities such as shelters, benches, ticket vending machines, brick or architectural concrete paving, and level boarding. One stop would be located between Sixth and Seventh Street, another between 11th and 12th Street, and the third within the Mill Plain District between 15th and 16th Street. The Mill Plain District facility would also serve as a Transit Center, with nine bus bays, which would provide connections with the local bus network.
- **Mill Plain District MOS Terminus**: In this design option, the alignment could operate as detailed in of the design options discussed above but terminate at the Mill Plain District Transit Center. As detailed in Figure 4-31, the guideway for this option would terminate at McLoughlin Street but buses would continue their routes in mixed traffic. This option would require the construction of and a terminus Park and Ride. The park and ride would include 560 spaces.

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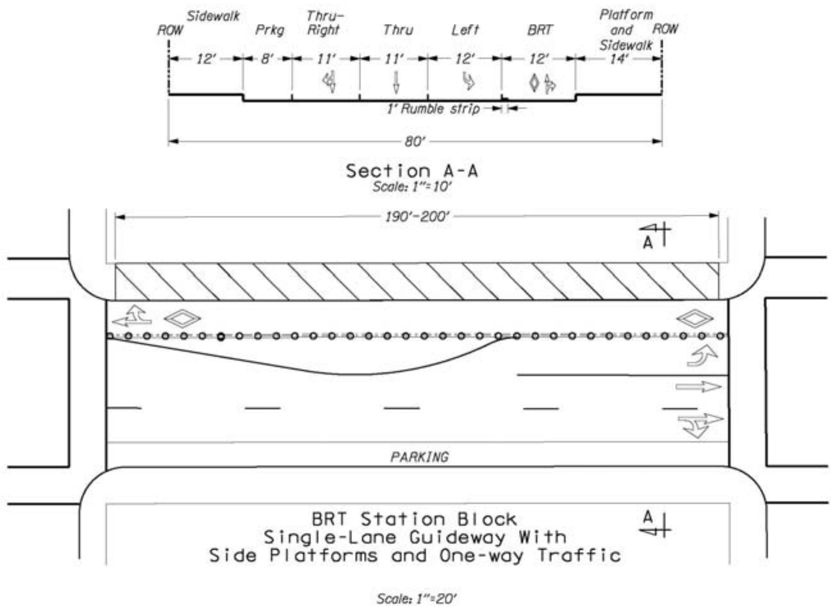
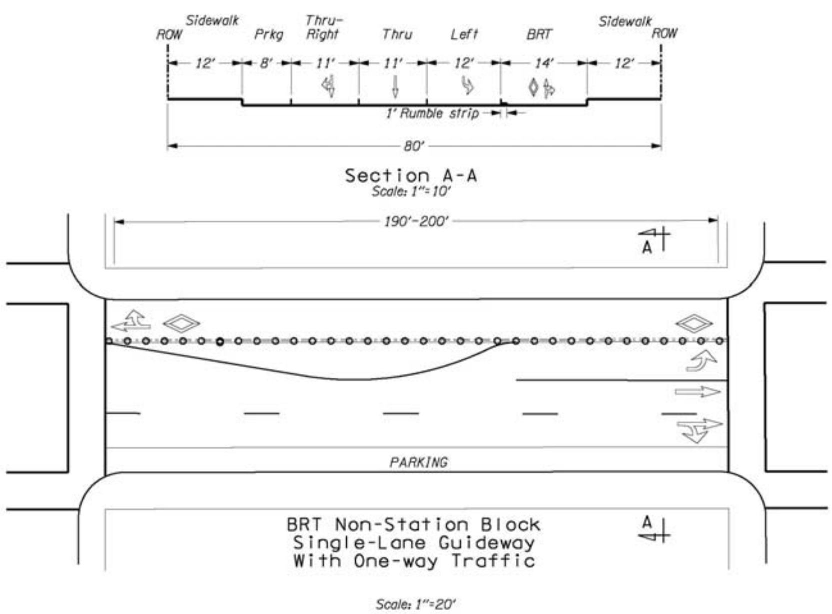
Figure 4-30. One Way on Washington and Broadway Streets at Station Blocks (top) and Non-Station Blocks (bottom)





Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing.

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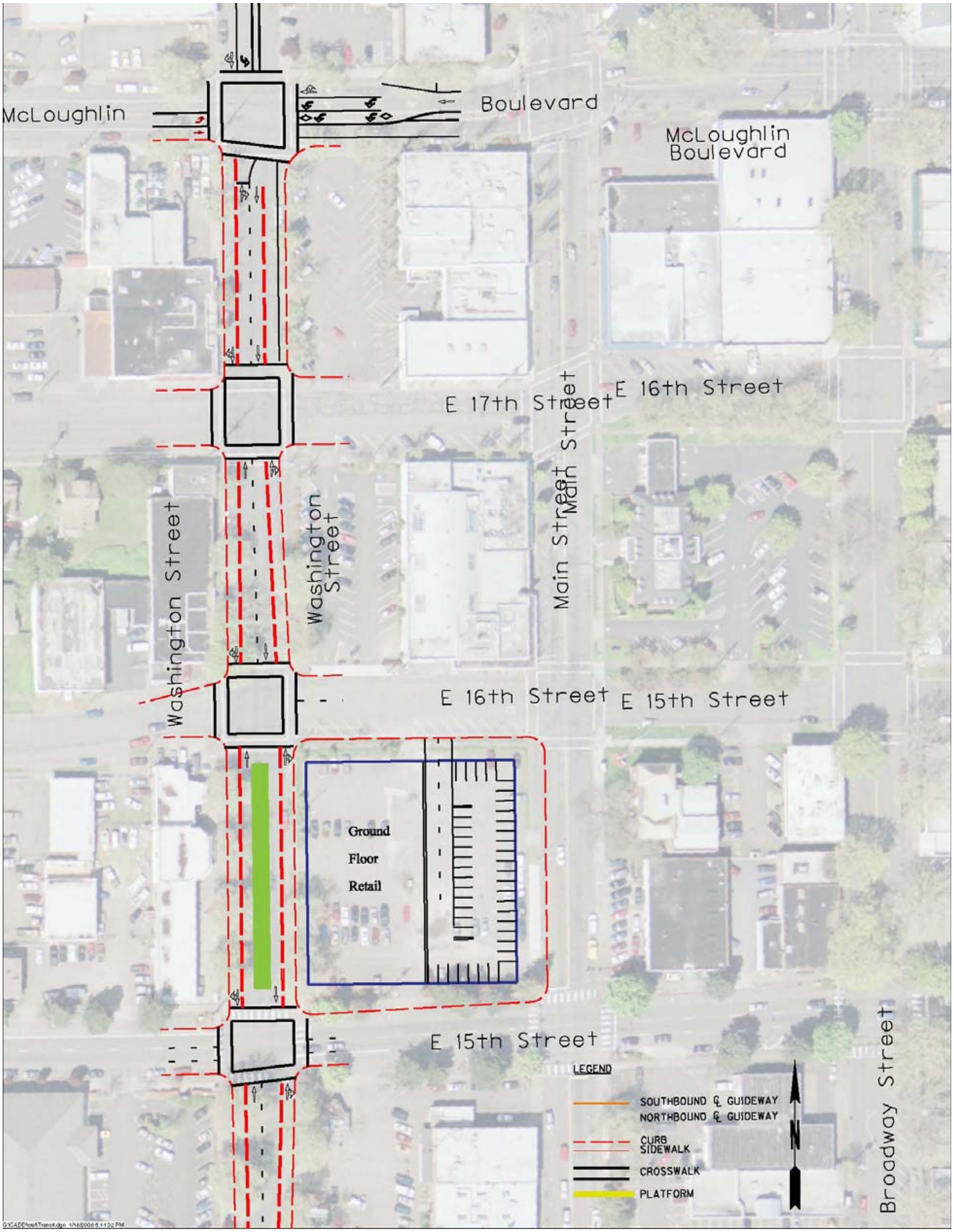
Figure 4-31. Mill District Transit Center



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4.7.1.3 BRT Vancouver Full-Length Alignment Segment B: Mill Plain District to Lincoln Park and Ride (Full-Length Northern Terminus)

With the Vancouver alignment, the BRT guideway would continue north from the Mill Plain District Transit Center along arterial city streets to the northern terminus.

From the Mill Plain District Transit Center, the 37L would continue east outside of the guideway along E Mill Plain Boulevard with limited stops ½ to 1 mile apart. BRT Route 4L would continue east outside of the guideway along McLoughlin Boulevard to the Clark College Park and Ride lot, where a lot with 460 parking spaces would be constructed (see Figure 4-40). From the Clark College Park and Ride lot the new BRT Route 4L would continue east, outside of the exclusive guideway, operating in mixed traffic along Fourth Plain Avenue. The 4L would have limited stops ½ to 1 mile apart that would not require special construction.

BRT Route 71L would continue north within an exclusive transit guideway from the Mill Plain District Transit Center. There are two design options for the Uptown section of the guideway between the Mill Plain District Transit Center and 29th Street.

Uptown Design Options

- **Uptown Main/Broadway Couplet Design Option:** This is the representative design option for the Vancouver alignment. The guideway would enter a couplet with the northbound direction of travel traversing one additional block east and then turning north up Broadway Street while the southbound direction would be along Main Street (see Figure 4-32). Along this section of Main Street, the right-of-way in the south is 74 feet detailed in Figure 4-33. North of Fourth Plain Blvd., the right-of-way is 60 feet and the cross section loses one through lane until it meets up with the guideway from Broadway at 29th Street at which time it changes to the section shown in Figure 4-34.
    - With this design option a BRT station, in compliance with ADA standards, would be located at 24th Street on Main Street for southbound travel and one would be located on Broadway Street for northbound travel. The BRT station would include passenger amenities such as a shelter, benches, ticket vending machines, brick or architectural concrete paving, and level boarding.
- **Uptown Broadway Street Design Option:** In this design option, the Mill Plain District Transit Center would be constructed the same as in Figure 4-31 in the middle of Washington Street. The guideway would then travel two additional blocks east on McLoughlin Blvd. to Broadway Street. From 16th Street to 29th Street the BRT exclusive guideway would be constructed as a two-way side running configuration along the west side of Broadway Street. See Figure 4-34 for a typical section of the BRT guideway along this segment of Broadway Street. Alongside the guideway, there would be one through northbound lane for general purpose traffic. From Fourth Plain Boulevard to 28th Street there would be two lanes for two-way general purpose traffic (one lane in each direction).
    - With this design option a BRT station, in compliance with ADA standards, would be located at 24th Street (see bottom Figure 4-34). The BRT station would include

passenger amenities such as a shelter, benches, ticket vending machines, brick or architectural concrete paving, and level boarding.

○ North of 29th Street, where Main and Broadway converge the right-of-way width is 60 feet. However, a cross section with a width of 100 feet is proposed. The guideway would be two-way median running, with two-way automobile traffic, turn lanes and, where feasible, on-street parking (see Figure 4-35**)**. BRT stations would be located at 33rd Street (see Figure 4-35) and at the Lincoln Park and Ride lot at 40th Street, which would be the northern terminus of the BRT guideway. The Lincoln Park and Ride lot would consist of 1,800 parking spaces (see Figure 4-36). From the Lincoln Park and Ride lot, the BRT Route 71L would continue north along Highway 99 in mixed traffic to the proposed Kiggins Bowl Park and Ride lot, which would include 150 parking spaces in a surface lot (see Figure 4-44), From the Kiggins Bowl Park and Ride lot, the 71L would continue north along Highway 99 to the existing Salmon Creek Park and Ride lot with stops (that would not require special construction) every ½ to 1 mile apart.

Figure 4-32. BRT Uptown Couplet at McLoughlin

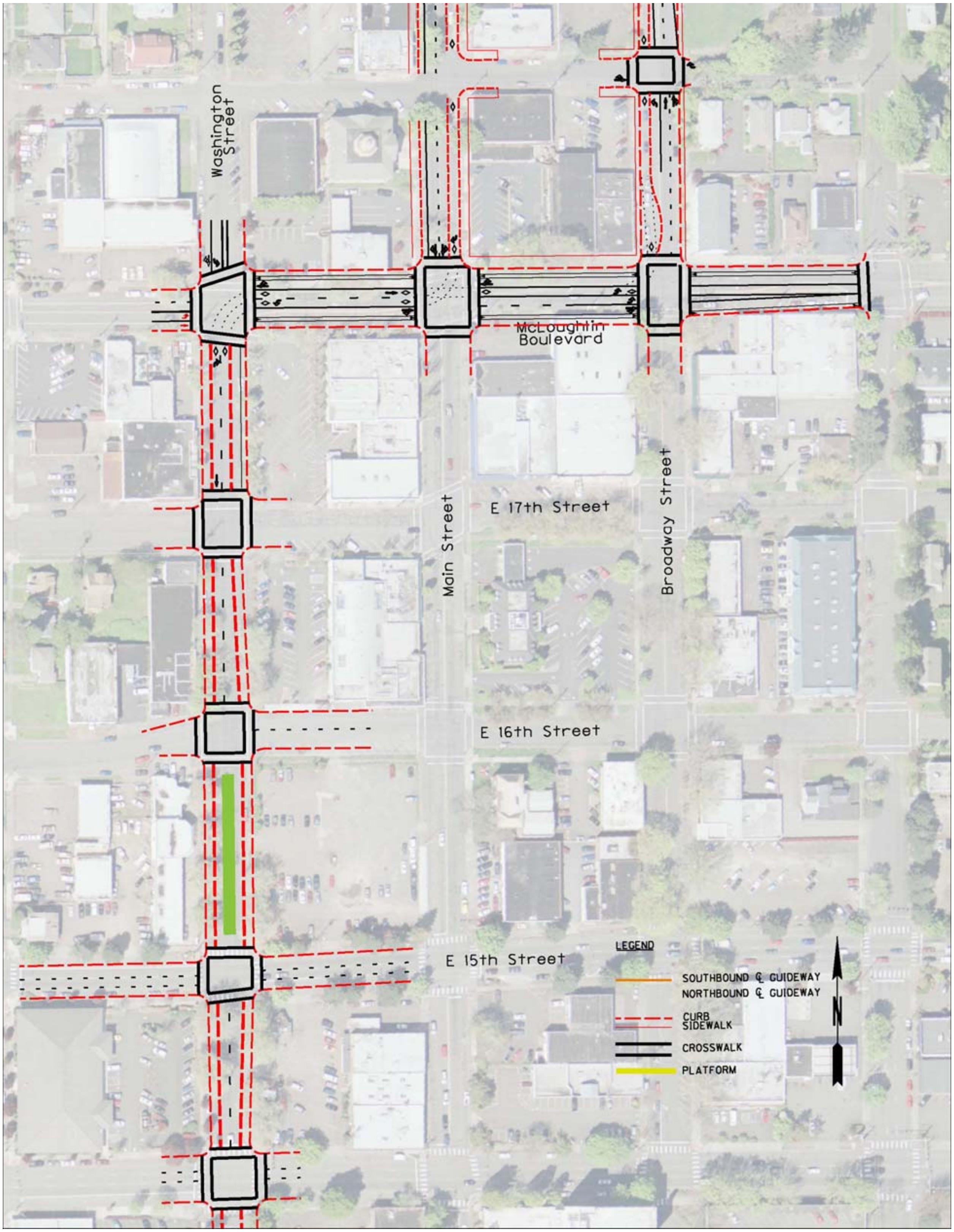

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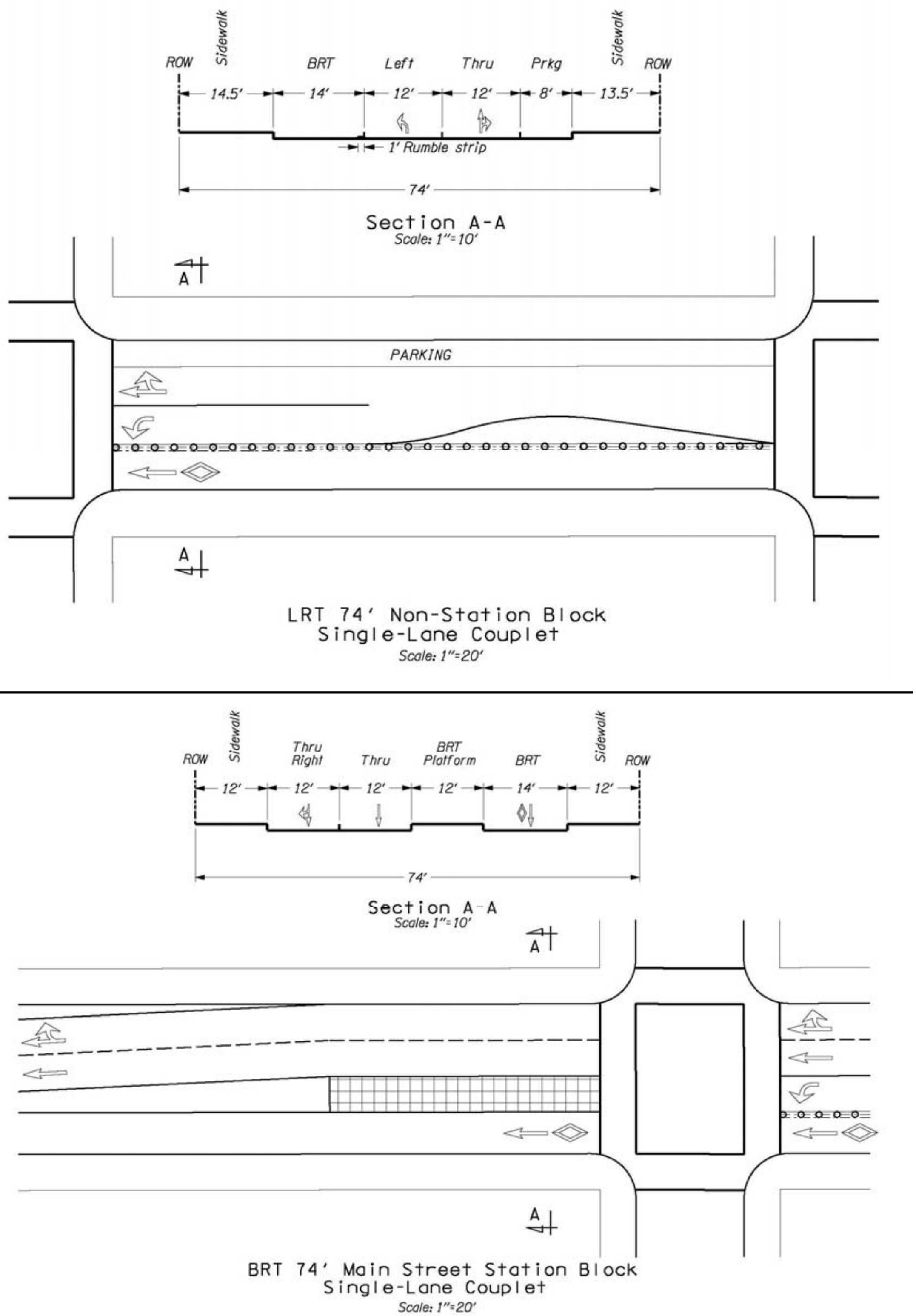
Figure 4-33. BRT Uptown Main/Broadway Couplet Design Option: Side Running on Uptown Main (top) with the Station on Uptown Main (bottom)



Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing.

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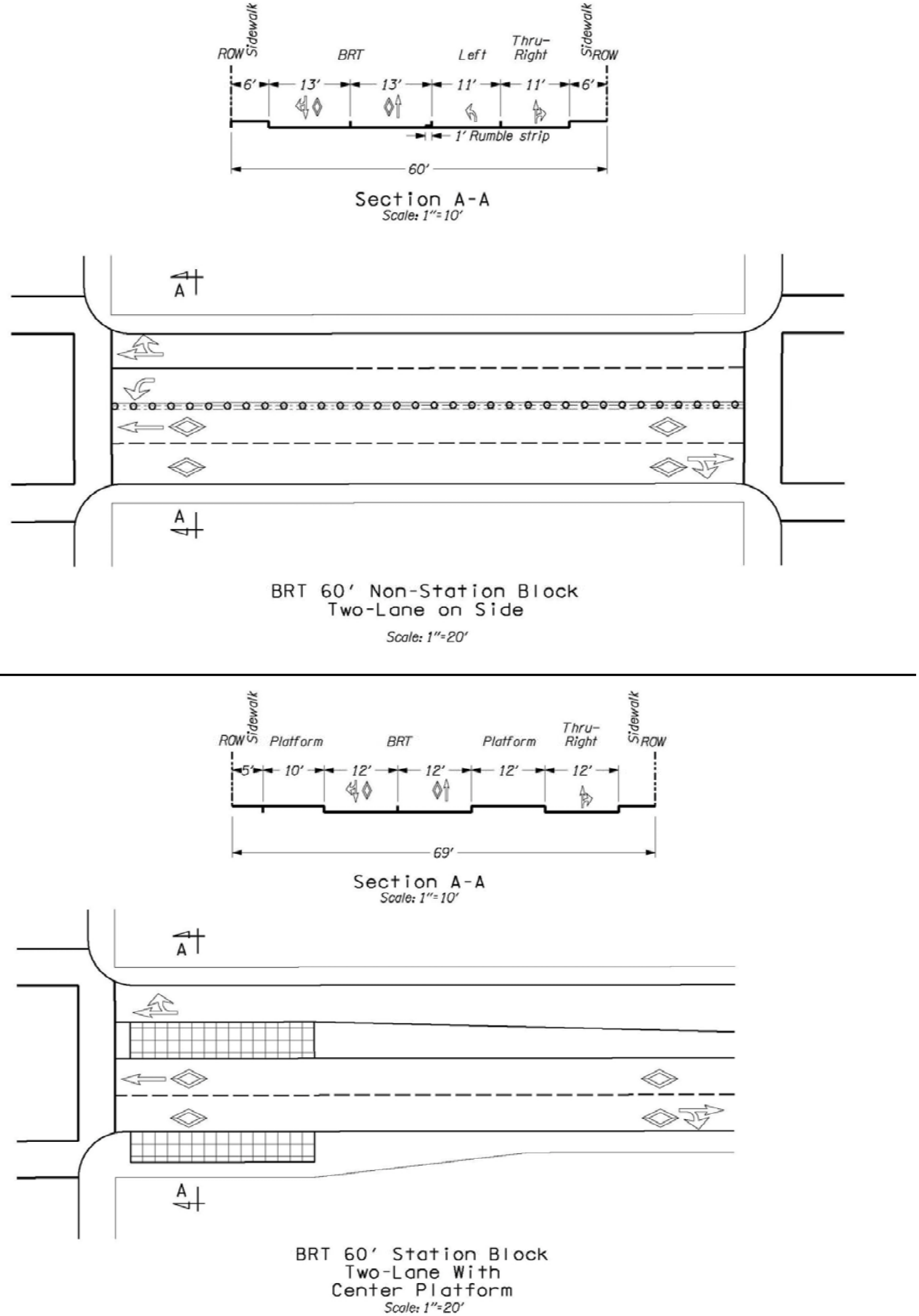
Figure 4-34. BRT Broadway Street Design Option: Two Way Side Running on Uptown Broadway



Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing.

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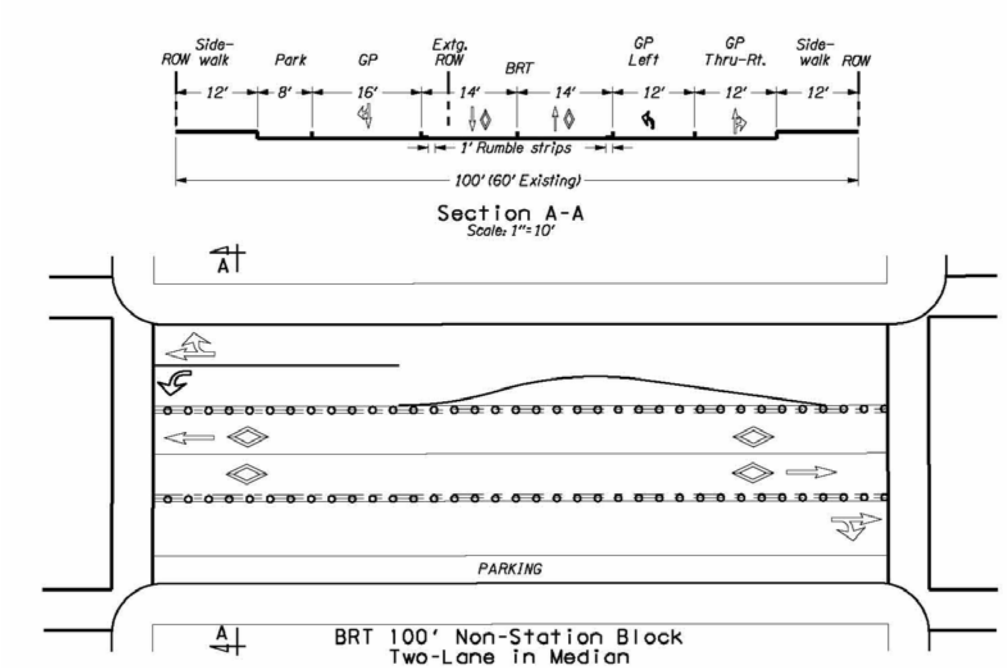
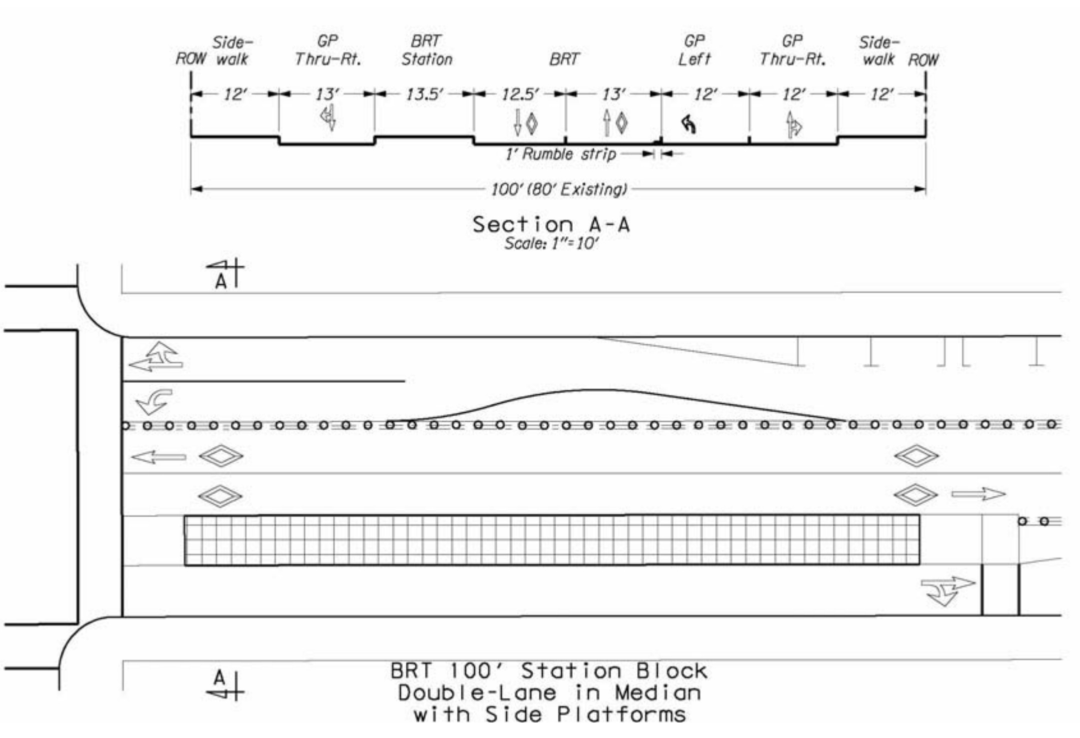
Figure 4-35. BRT Vancouver from 29th Street to 40th Street





Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing.
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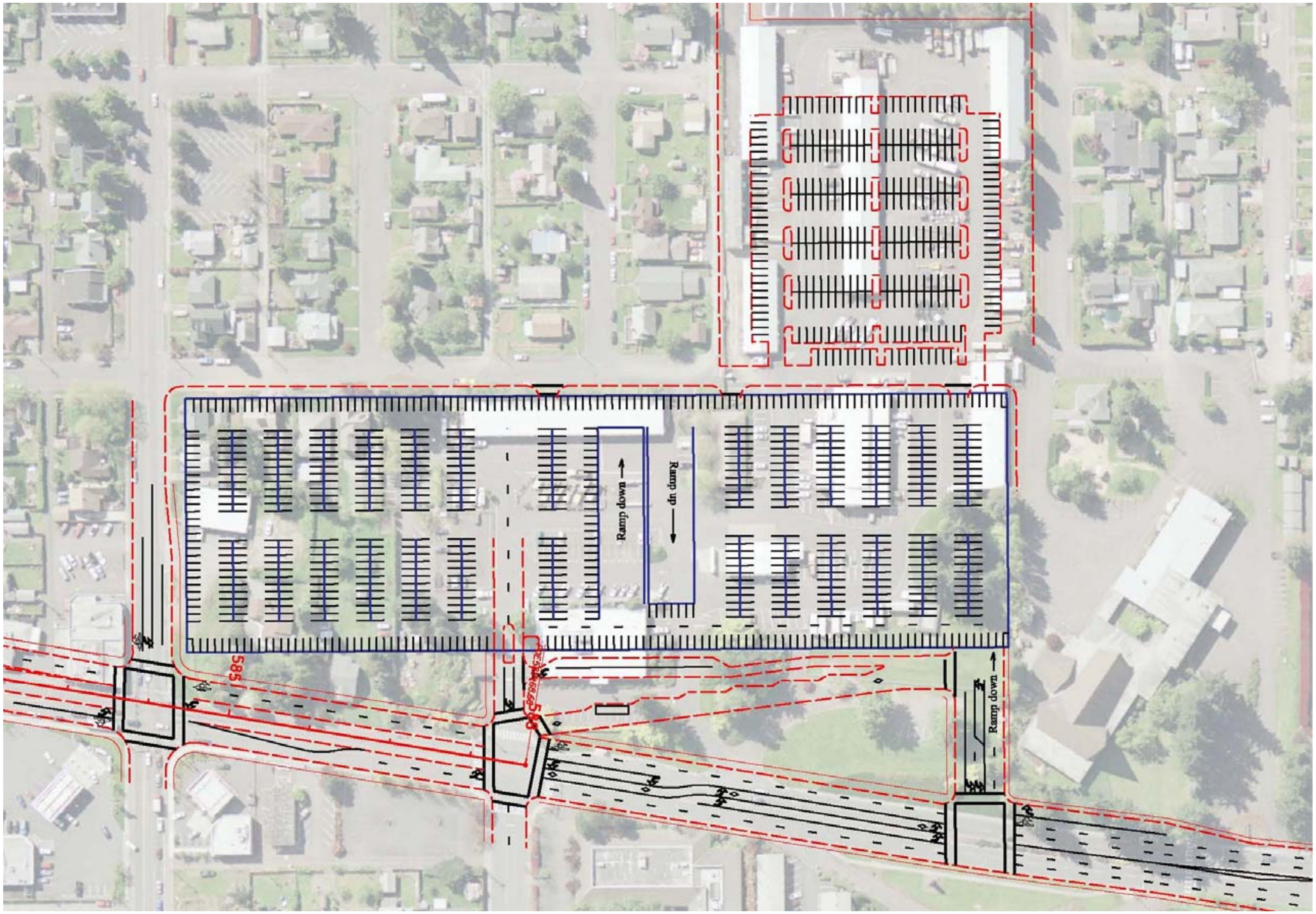
Figure 4-36. Lincoln Park and Ride Lot Layout



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4.7.1.4 BRT I-5 Alignment Segment B: Mill Plain District to Kiggins Bowl Northern Terminus

From the Mill Plain District Transit Center, the BRT Line 37L would continue east along E Mill Plain Boulevard and travel along the Mill Plain corridor outside of the guideway in mixed traffic. Outside of the CRC Bridge Influence Area, the 37L would make limited stops located approximately ½ to 1 mile apart. These stops would not require special construction.

With the I-5 alignment, from the Mill Plain District Transit Center the BRT guideway would turn east to the Clark College Park and Ride lot. For this segment of the alignment there are two east-west design options for the BRT alignment and guideway cross section.

East-West Design Options

- **McLoughlin Boulevard Design Option:** This design option is part of the representative alignment. In this design option, shown as the top alignment in Figure 4-37, the BRT guideway would head east from the Mill Plain District Transit Center onto McLoughlin Boulevard. The guideway would travel along McLoughlin Boulevard through the existing cut under I-5 to the Clark College Park and Ride lot that would be located on the east side of I-5 near Clark College and the Veteran's Administration (VA) Hospital. Along McLoughlin Boulevard the guideway would be two-way median running with one general purpose lane on either side of the guideway for two-way traffic. The existing right-of-way width for McLoughlin Boulevard is 80 feet; however, the proposed cross section along McLoughlin would have a width of 92 feet. See Figure 4-38.
- **W 16th Street Design Option:** In this design option, shown as the bottom alignment in Figure 4-37. From the Transit Center, the BRT guideway would head east along 16th Street and through a new tunnel under I-5 to the Clark College Park and Ride lot. Along 16th Street the BRT guideway would be constructed as a two-way side running configuration along the south side of the street, similar to the cross section shown in Figure 4-39. Along 16th Street, between Washington and E Street there would be one lane for general purpose traffic heading west. Between E Street and G Street 16th Street would have two lanes for two-way general purpose traffic. There would be one access in this section along the south side of 16th Street at G Street.

With both the I-5 full-length alignments and Clark College MOS, the new Clark College Park and Ride lot would include 1,100 spaces in four levels of parking. With the I-5 full-length alignment the guideway would continue north up I-5 as shown in Figure 4-41. With the MOS terminus, the Clark College Park and Ride lot would be the end of the BRT guideway as detailed in Figure 4-41.

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Figure 4-37. East-West Design Options

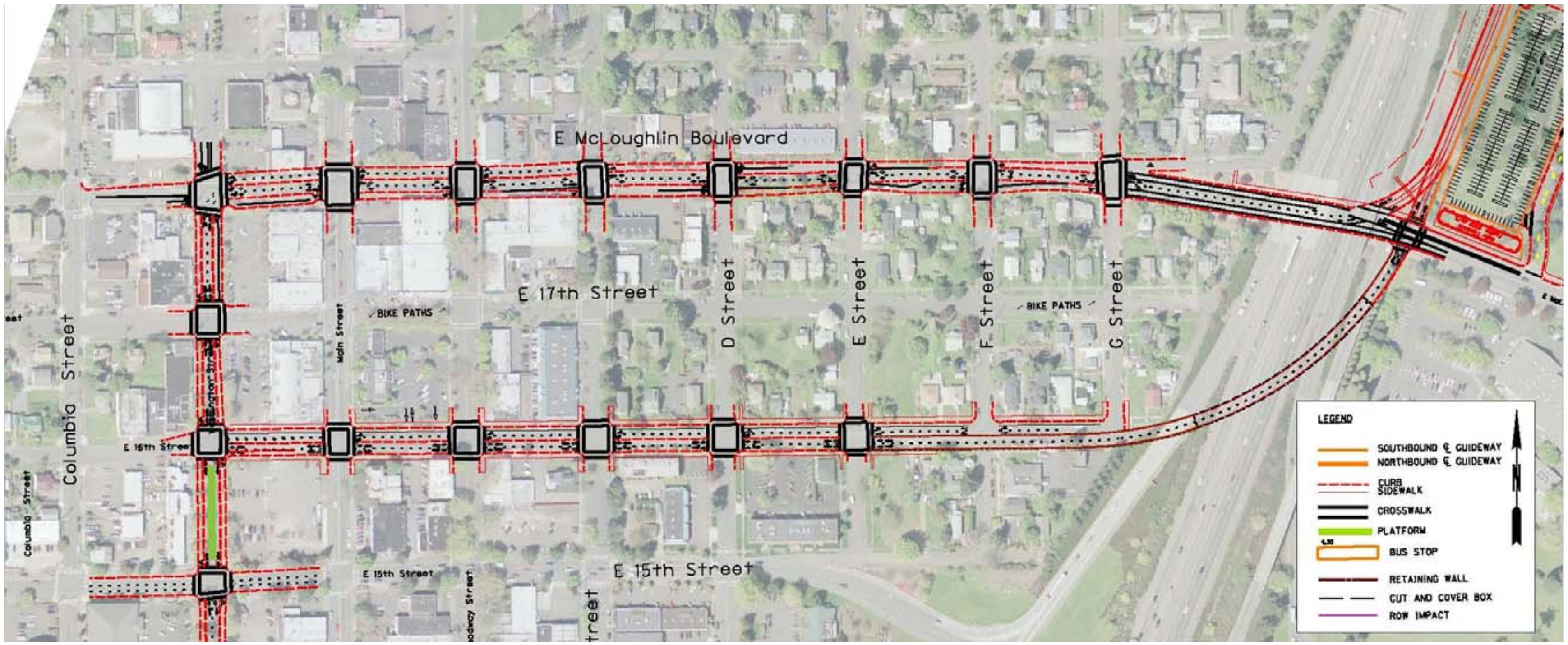

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Figure 4-38. BRT McLoughlin Boulevard Design Option

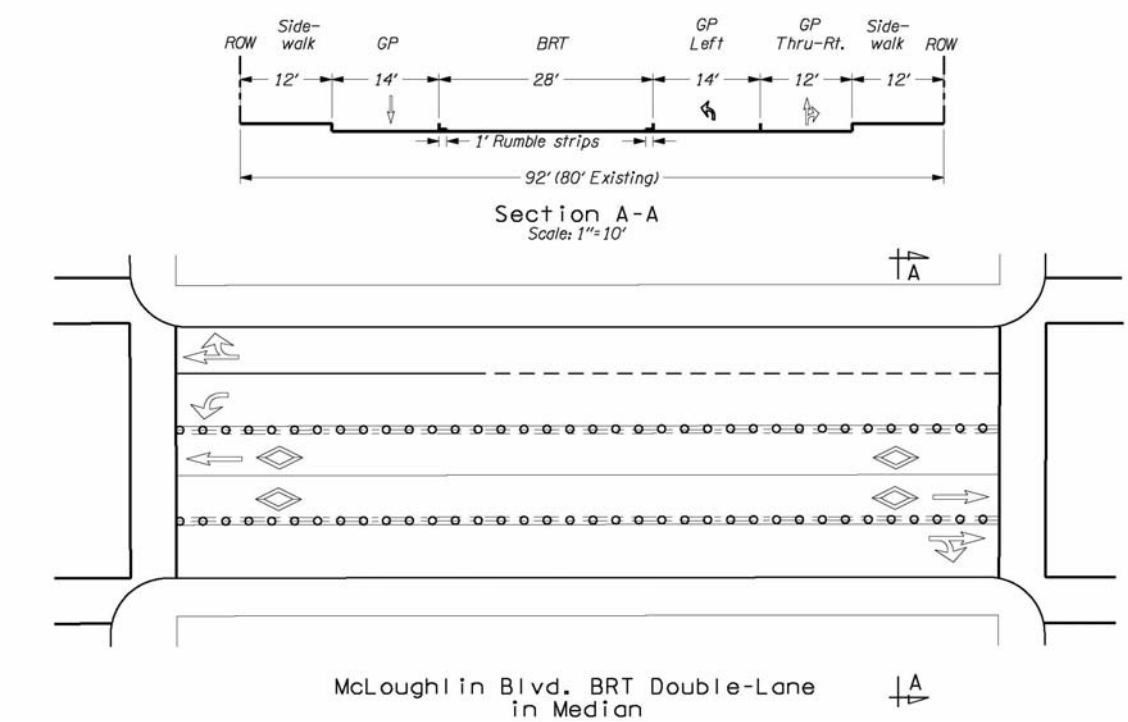

Figure 4-39. BRT 16th Street Design Option

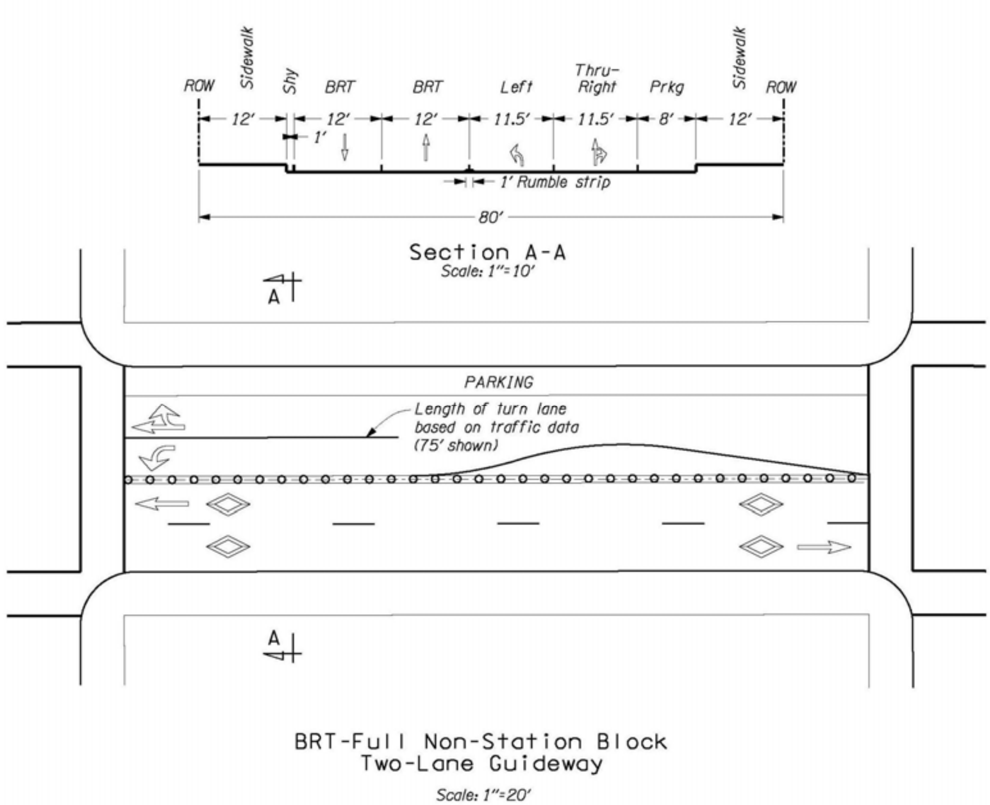

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Figure 4-40. Clark College Park and Ride Lot Layout Paired with the I-5 Full-Length Alignment

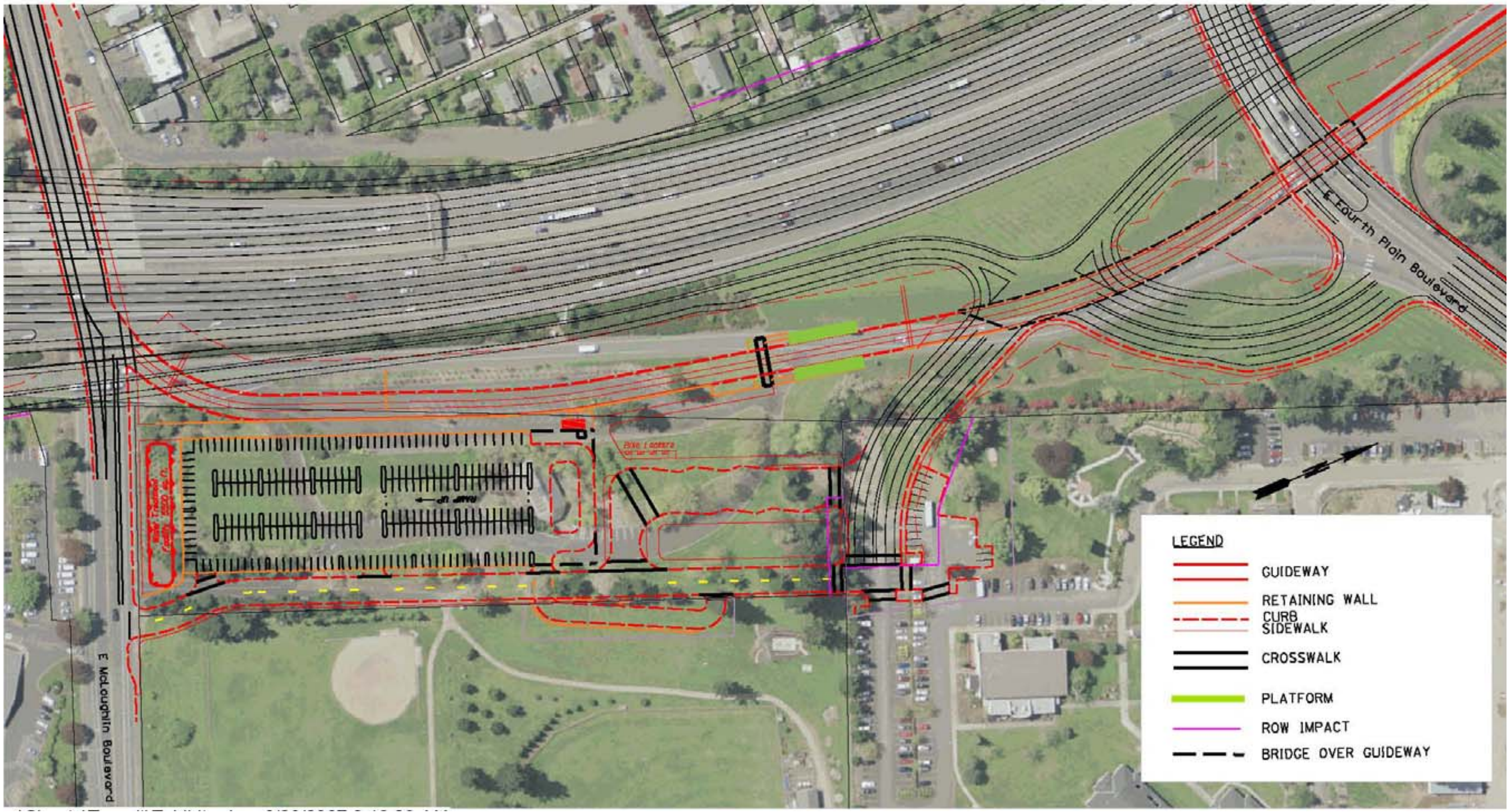

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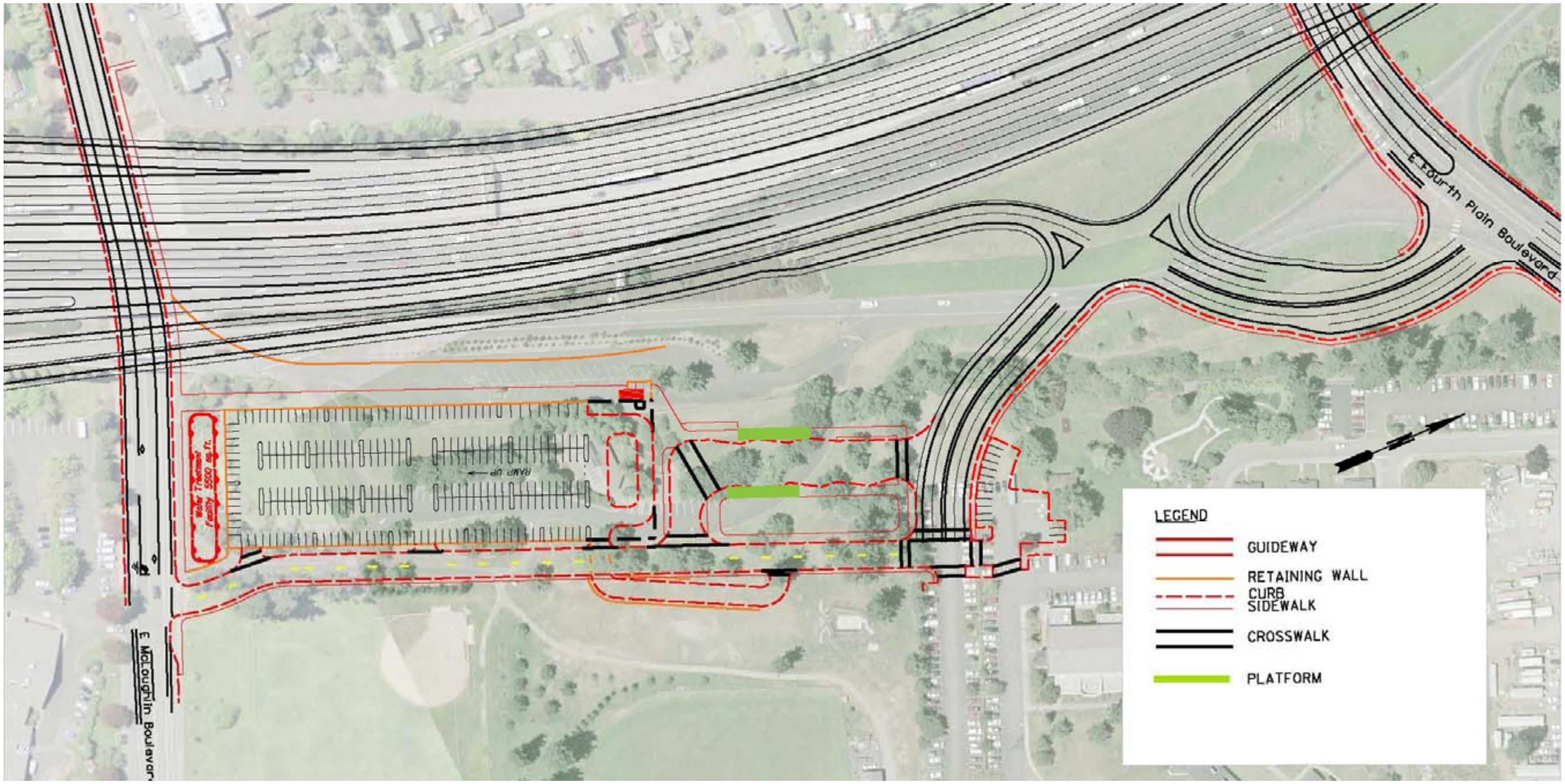
Figure 4-41. Clark College Park and Ride Lot Layout Paired with the Clark College MOS Alignment



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With either the I-5 full-length alignment or Clark College MOS, from the Clark College Park and Ride lot the BRT Route 4L would continue east outside of the guideway, operating in mixed traffic along Fourth Plain Boulevard. The 4L would make limited stops ½ to 1 mile apart that would not require special construction. With I-5 full-length, from the Mill Plain District Transit Center the BRT Route 71L would travel within the guideway to the Clark College station and continue north within the guideway. With the Clark College MOS, from the Mill Plain District Transit Center the BRT Route 71L would travel north along Main Street and Highway 99 in mixed traffic to the Salmon Creek Park and Ride lot.

For the I-5 full-length alignment, a guideway would be constructed along the east side of I-5 from the Clark College Park and Ride lot to the Kiggins Bowl Park and Ride lot, which is located along the west side of I-5 just south of the intersection of Main Street with Highway 99. The guideway would be built within I-5 right-of-way but would not take capacity away from the mainline. Figure 4-42 shows the cross section that was selected, which would place the guideway along the east side of I-5 at grade with the freeway (side running east). The 29th Street and 33rd Street bridges would be rebuilt above by the highway construction. Along this segment of the alignment a station would be located at approximately I-5 and 33rd Street to serve the Rosemere neighborhood.

The Kiggins Bowl Park and Ride lot, which is the I-5 full-length alignment terminus of the exclusive guideway, would be constructed to include a 6-story structure with 1,400 parking spaces (see Figure 4-43). With the Clark College MOS, a surface park and ride lot would be constructed at Kiggins Bowl with 150 parking spaces (see Figure 4-44). From Kiggins Bowl, BRT Route 71L would continue north along Highway 99 in mixed traffic to the existing Salmon Creek Park and Ride lot with stops (that would not require special construction) every ½ to 1 mile apart.

Figure 4-42. BRT and I-5 Cross Section

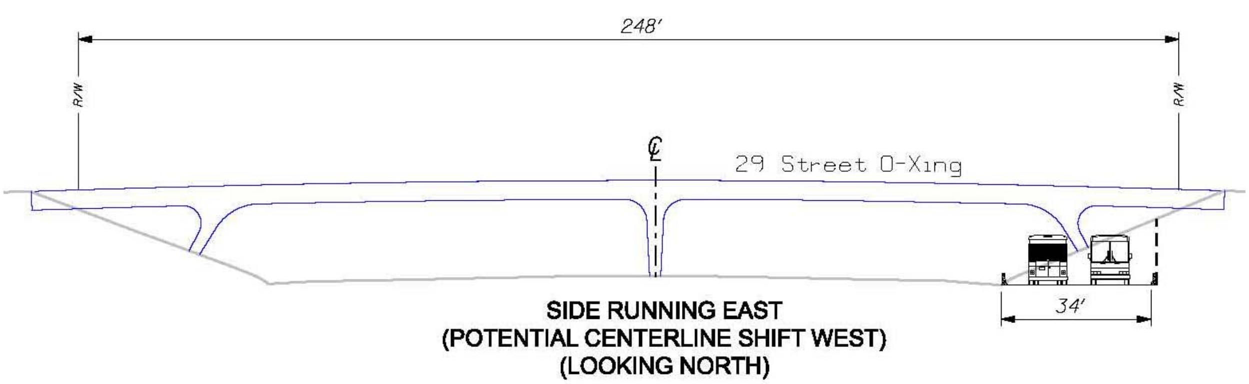

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Figure 4-43. Kiggins Bowl Park and Ride Lot Layout with the I-5 Full-Length Alignment

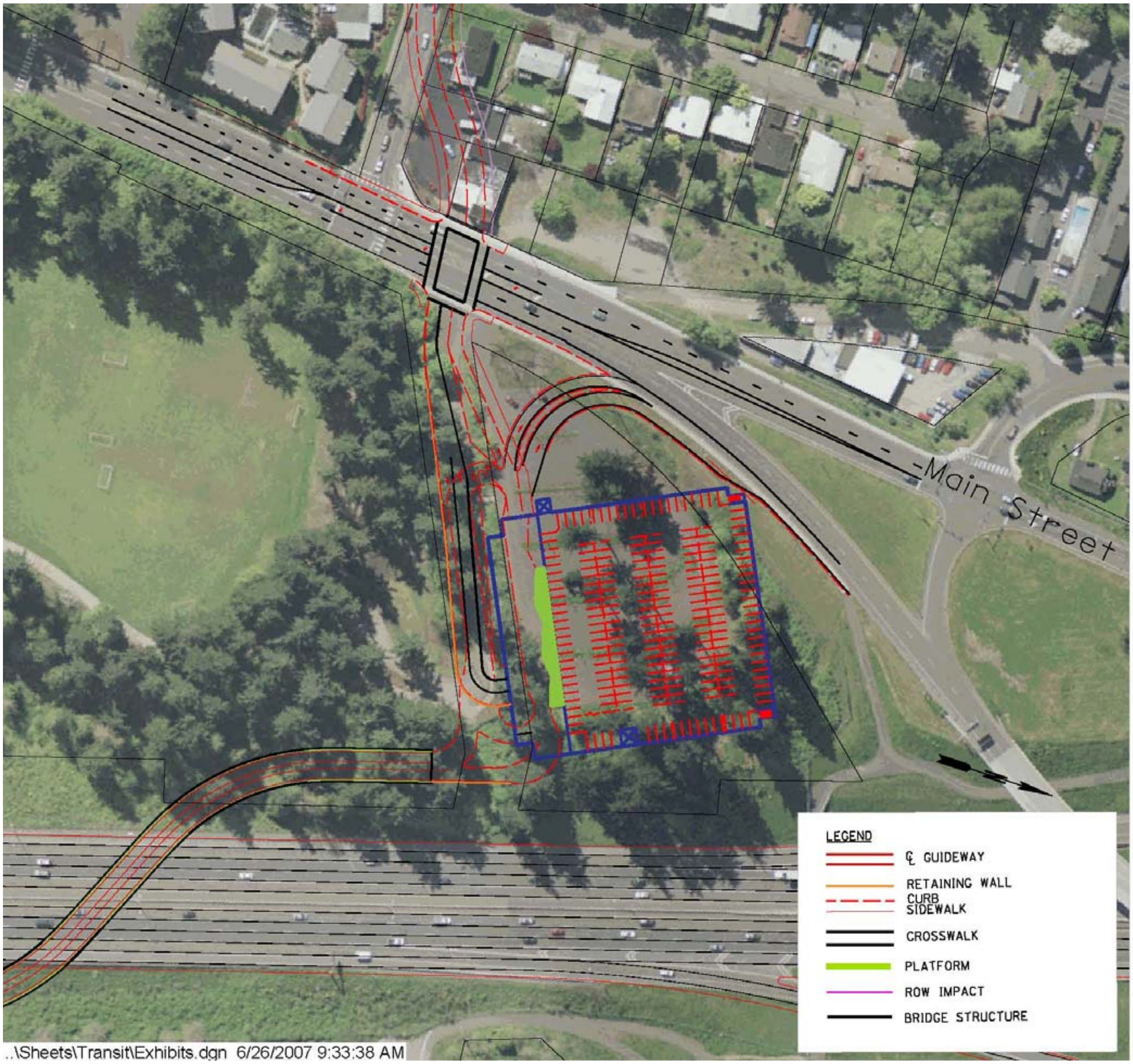

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Figure 4-44. Kiggins Bowl Satellite Park and Ride Lot Layout

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4.7.2 Alternatives 3 and 5: LRT Design Options by Segment

This section describes the capital improvements by segment that would occur within the CRC Corridor with the LRT alternatives. From the Expo Center station to the Mill Plain District Transit Center the I-5 and the Vancouver alignments are the same and are described together. North of the Mill Plain District Transit Center the alignments diverge and are described separately. The description of the transit capital facilities also includes the design options for LRT, which are the same as for BRT, shown in Figure 4-2.

4.7.2.1 LRT Vancouver and I-5 Alignment Segment A1: Expo Center to Sixth Street

Within this segment, an LRT exclusive guideway would be constructed as a continuation of the MAX LRT Yellow Line that currently terminates at Expo Center. The capital improvements would include the construction of an exclusive guideway for LRT from Expo Center to Hayden Island. An LRT station would be constructed on Hayden Island on the west side of I-5. There are two design options for the location of the LRT guideway across Hayden Island and for the LRT station. In addition, the new I-5 crossing of the Columbia River, if paired with a replacement bridge option, would have a design option variation that would place HCT inside the structure supporting the highway lanes for the southbound replacement bridge called a Stacked Transit/Highway Bridge. This design option could be paired with either BRT or LRT HCT mode. The specifics of this design option are discussed above in BRT Section 4.7.1.1.

Hayden Island and Bridge Design Options

The LRT Alternative would include the same design options for the guideway and station on Hayden Island as described in the BRT Alternative design options section (Section 4.7.1):

- Adjacent to I-5 with Downstream I-5 Bridge (See Figure 4-22); and
- Offset from I-5. (See Figure 4-23).

Both of these design options would also have the option of the station being located in the center of the island or on the south side of the island closer to N Jantzen Avenue. The station would also have a range in the elevation it could be constructed at, which would be between 25 and 38 feet above grade. The station for the adjacent option can be built lower, 16 to 20 feet above grade, since there will be no traffic under the guideway. This lower station can only be placed between Jantzen Drive and the Tomahawk Drive extension due to clearance issues. The final station design would depend on the upcoming Hayden Island Master Plan to be conducted by the City of Portland.

From Hayden Island the transit capital improvements would include the construction of an exclusive guideway over the Columbia River along the west side of the highway for a length of approximately 1.4 miles (similar to what is shown in Figure 3-2).

4.7.2.2 LRT Vancouver and I-5 Alignment Segment A2: Sixth Street to Mill Plain District Transit Center

Once over the Columbia River, the LRT exclusive guideway would separate from the I-5 bridge and descend into downtown Vancouver at a touchdown point at Sixth Street. Within downtown

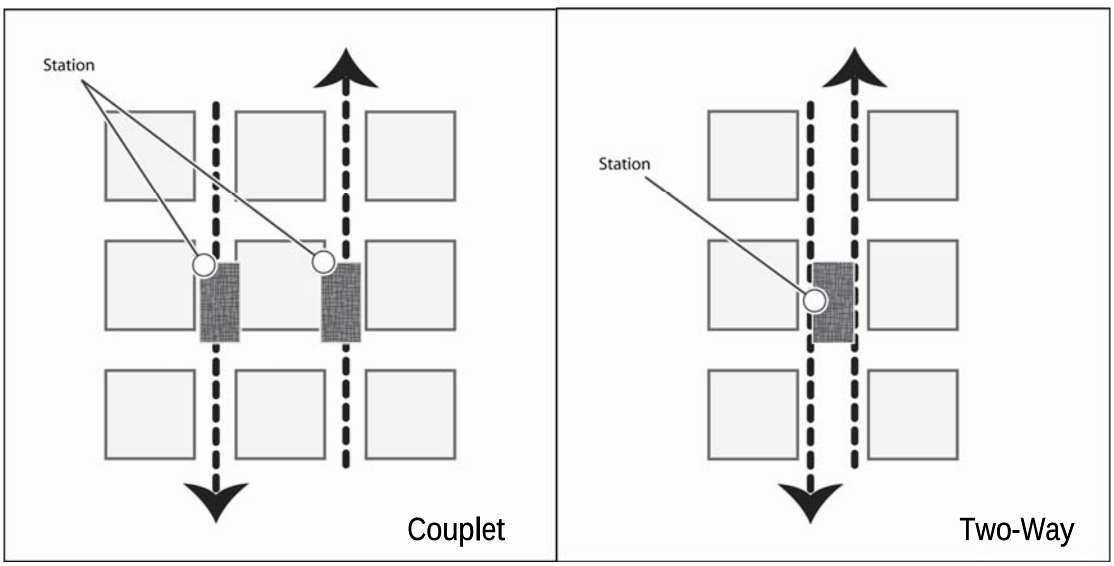
Vancouver, from Seventh Street to the Mill Plain District Transit Center, there are three design options for the LRT alignment.

Downtown Vancouver Design Options

The three design options for downtown Vancouver are representative. For each design option, the location of the guideway and the platforms within the right-of-way may change as further analysis is conducted. The right-of-way width in downtown Vancouver presents a design challenge and the traffic circulation impacts of the design options still needs to be evaluated. The potential design options range from more auto-oriented to more transit and pedestrian oriented.

The three design options proposed for downtown Vancouver include options where the guideway would operate as a couplet, with one direction of travel on each of two streets, and options where the guideway would have a two-way operation with both directions of travel on one street. See Figure 4-45 for a representative illustration of a couplet and a two-way operation for LRT.

Figure 4-45. LRT Representative Couplet and Two-Way Operation



- **Washington/Broadway Street Couplet Design Option:** In this design option, the northbound travel direction of the LRT guideway would be along the west side of Broadway Street and the southbound direction of travel would be a one-way guideway along the east side of Washington Street (two blocks west of Broadway Street). With this design option, light rail and auto traffic would travel in the same direction on one-way streets. The proposed cross section along both Washington and Broadway Street would be similar to what is shown in Figure 4-30. The cross section for a non-station and a station block would be similar; on a station block, the sidewalk widens two and a half feet towards the track to accommodate the platform.

  ○ LRT stations would be constructed in downtown Vancouver at three locations for southbound travel on Washington Street and three locations for northbound travel on Broadway Street. These stations, which would be ADA compliant, would include passenger amenities such as shelters, benches, ticket vending machines, brick or architectural concrete paving, and level boarding. One stop would be located between Sixth and Seventh Street, another between 11th and 12th Street, and the third within the Mill Plain District between 15th and 16th Street. The Mill Plain District facility would also serve as a Transit Center, with nine bus bays, which would provide connections with the local bus network.

- **Washington Street Two-Way Median Design Option:** This design option is included in the representative alignment. In this design option, the LRT guideway would be a two-way median guideway along Washington Street. The LRT guideway would be separated from general purpose lanes by a physical barrier, such as a rumble strip. An example of this configuration on a non-station block and a station block is shown in Figure 4-46. On a non-station block the LRT guideway would have a total width of 26 feet, with one lane of general purpose traffic on either side. On a station block, shared platforms would be constructed in the middle of the street with a width of 15 feet; the total guideway width would be 38 feet.

  ○ Within downtown Vancouver the LRT Alternatives would include three new stations, constructed to ADA standards, with amenities such as shelters, benches, ticket vending machines, brick or architectural concrete paving, and level boarding. One station would be constructed between Sixth Street and Seventh Street (see Figure 4-47); another between 11th and 12th Street (see Figure 4-48); and a third within the Mill Plain District Transit Center between 15th Street and 16th Street (see Figure 4-49). The facility constructed at the Mill Plain District would also serve as a Transit Center, with nine bus bays to provide connections to LRT from the local bus network.

From the Mill Plain District Transit Center there are two potential full-length LRT alignments; the Vancouver and the I-5 alignment. The Vancouver full-length alignment would terminate at the Lincoln Park and Ride and the I-5 full-length alignment would terminate at the Kiggins Bowl Park and Ride. There are also two MOS termini; the Mill Plain District MOS would terminate at the Mill Plain District Transit Center, discussed herein Segment A2. The Clark College MOS is discussed within Segment B because it terminates at the Clark College Park and Ride.

- **Mill Plain District MOS Terminus**: In this design option, the alignment could operate as detailed in any of the design options discussed above but terminate at the Mill Plain District Transit Center. As detailed in Figure 4-49 the Mill Plain District Transit Center would require the construction of a turn-around facility and a terminus park and ride. The park and ride would include 560 spaces.

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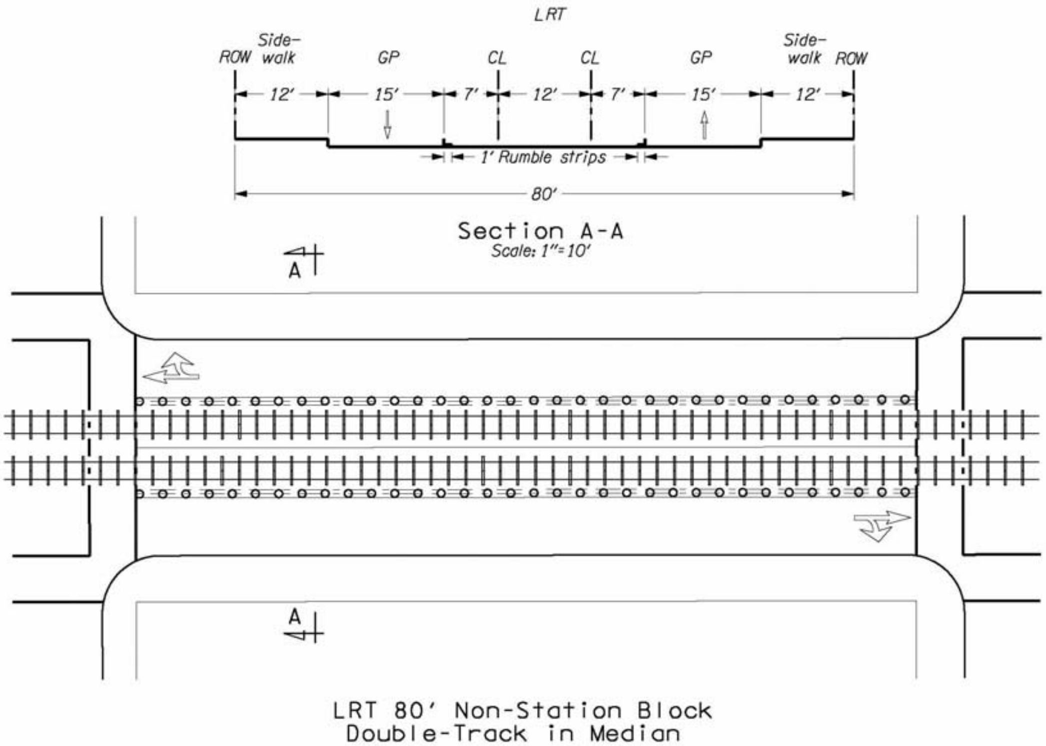
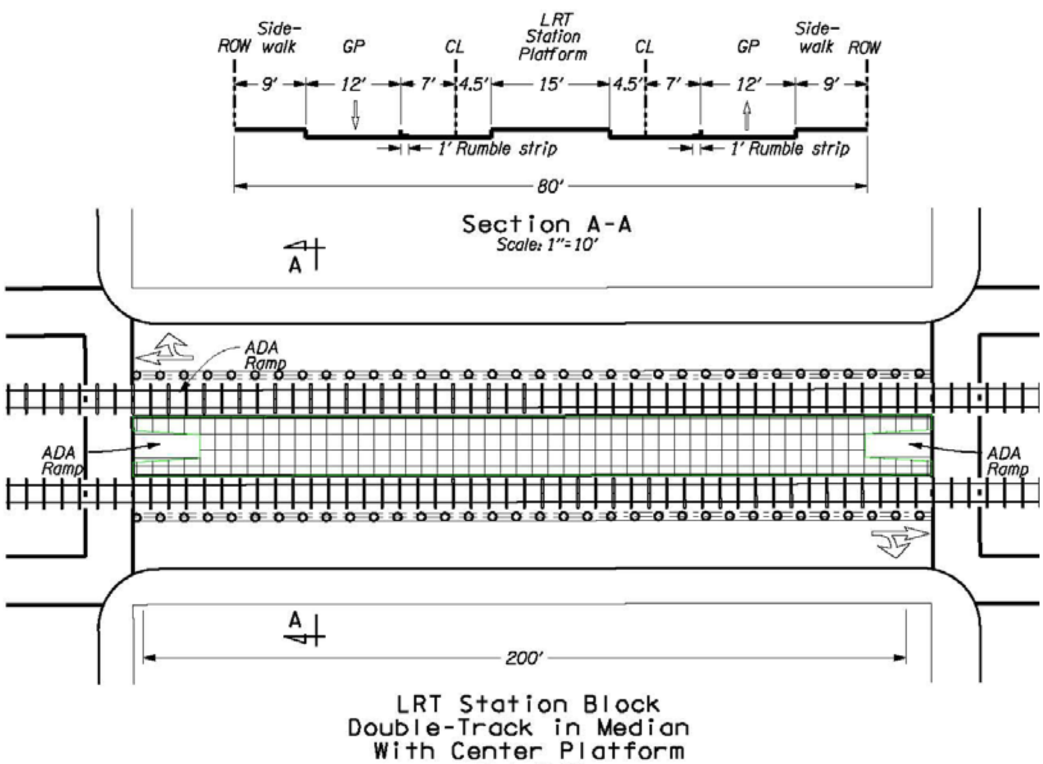
Figure 4-46. LRT Washington Street Two-Way Median Design Option





Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing.

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Figure 4-47. Washington and Seventh Street Station Layout

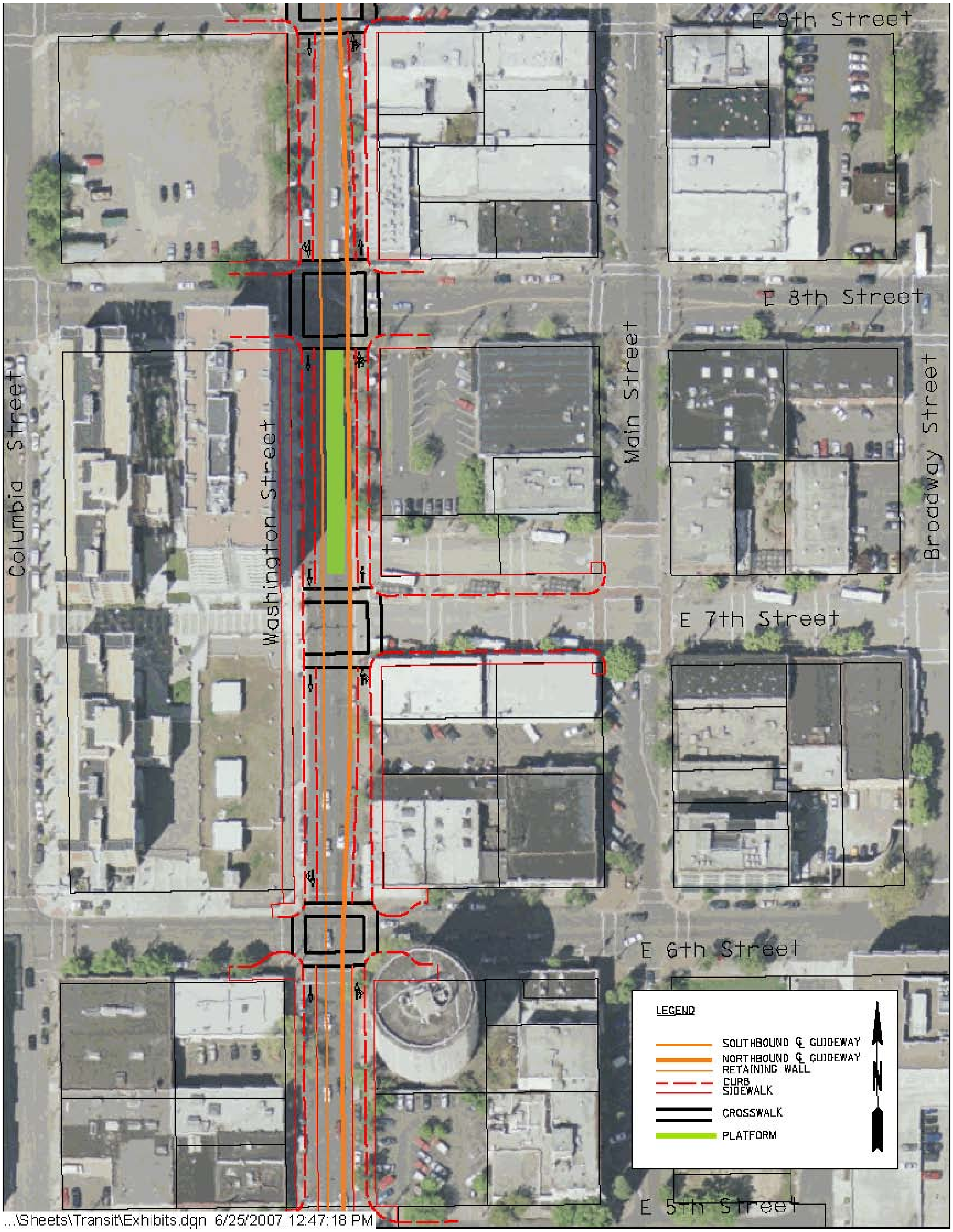

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Figure 4-48. Washington and 12th Street Station Layout

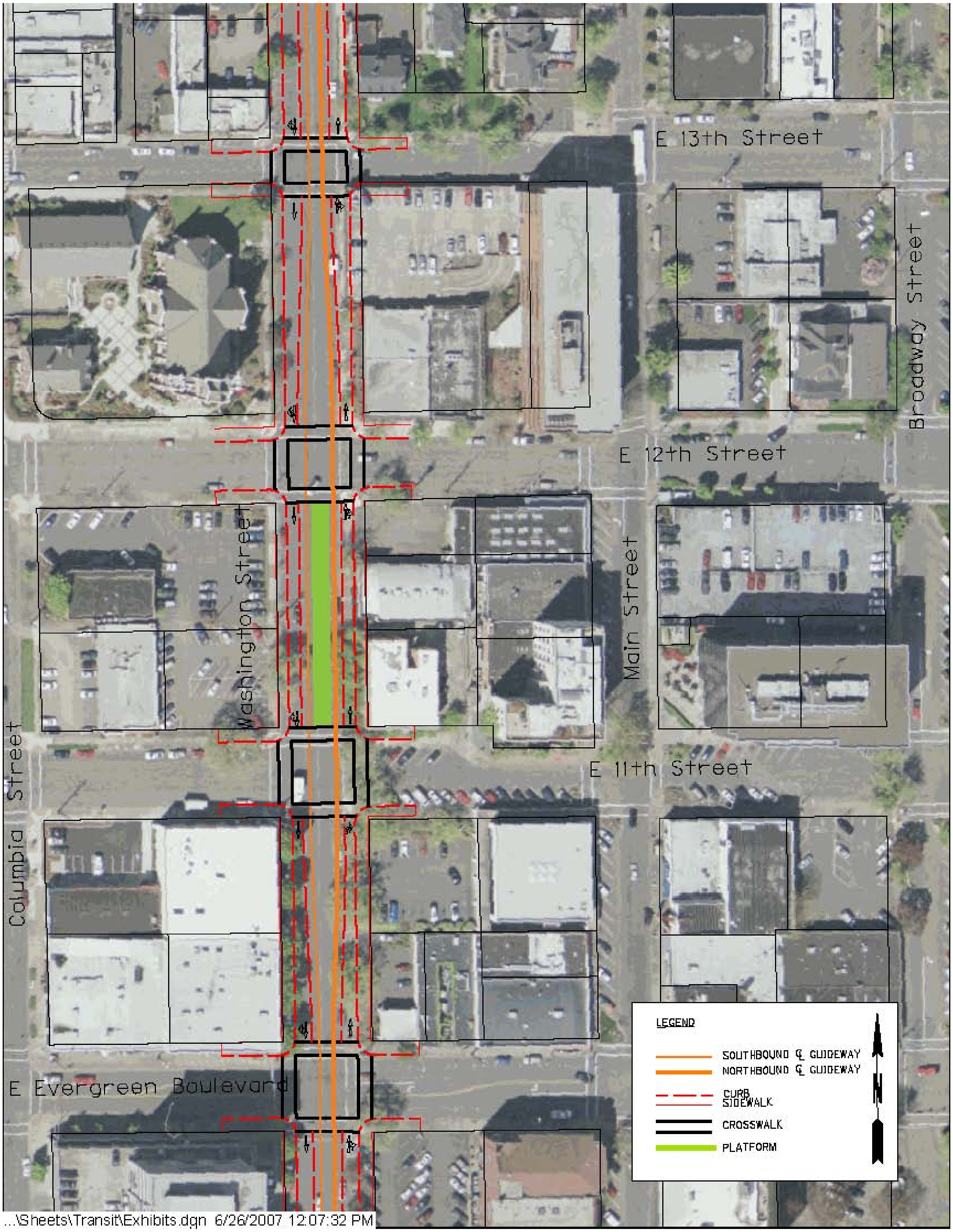

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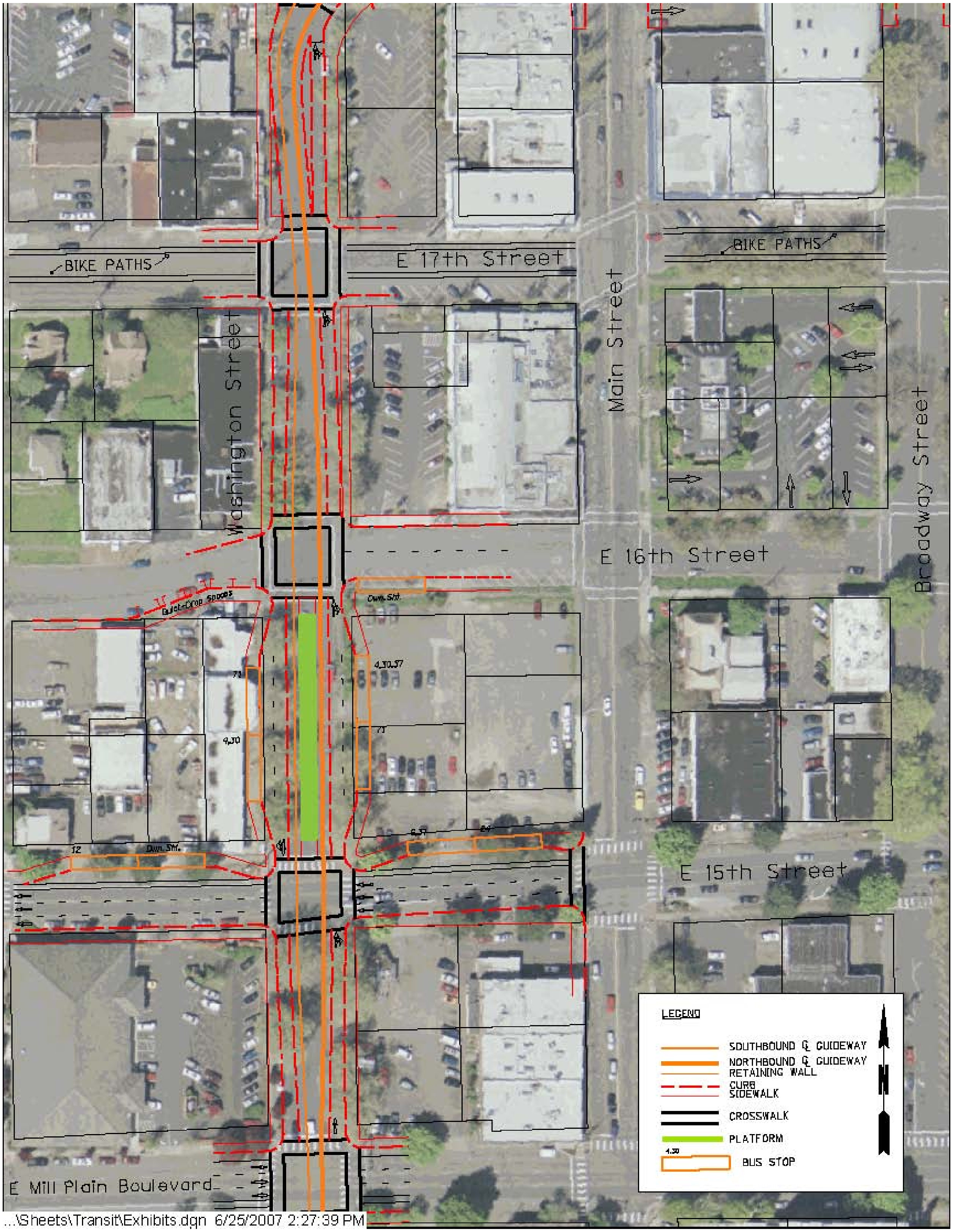
Figure 4-49. Mill Plain District Transit Center Layout



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4.7.2.3 LRT Vancouver Alignment Segment B: Mill Plain District to Lincoln Park and Ride (Full-Length Northern Terminus)

In the Vancouver alignment, the LRT guideway would continue north from the Mill Plain District Transit Center along arterial city streets to the northern terminus. With the Vancouver alignment, a satellite park and ride lot would be constructed at the Clark College site with 460 parking spaces (see Figure 4-50). The new limited line 4L would stop at the Clark College Park and Ride lot and provide a transfer to the LRT line at the Mill Plain District Transit Center.

In the Vancouver alignment, there are two design options for the Uptown section of the guideway between the Mill Plain District Transit Center and 29th Street.

- **Uptown Main/Broadway Couplet Design Option:** This is the representative design option for the Vancouver alignment. In this design option from the Mill Plain District Transit Center, which would be constructed diagonally between 15th Street and 16th Street through a block that is currently used for surface parking (see Figure 4-51), the guideway would enter a couplet with the northbound track traversing one additional block east and then turning north up Broadway Street while the southbound track would be along Main Street. The cross section along Broadway would be similar to what is shown in Figure 4-53. Along this section of Main Street the right-of-way in the south is 74 feet, and the cross section would be as shown in Figure 4-52. To the north, towards 29th Street, the right-of-way is 60 feet and the cross section would be similar to what is shown in Figure 4-53.

  ○ With this design option, an LRT station, constructed to ADA standards, would be located at 24th Street on Main Street for southbound travel and one would be located on Broadway Street for northbound travel. The LRT station would include passenger amenities such as a shelter, benches, ticket vending machines, brick or architectural concrete paving, and level boarding.

- **Broadway Street Design Option:** In this design option, the Mill Plain District Transit Center would be constructed diagonally between 15th Street and 16th Street through a block that is currently used for surface parking. The guideway would then travel one additional block east to Broadway Street. From 16th Street to 29th Street the LRT exclusive guideway would be constructed as a two-way side running configuration along the west side of Broadway Street. See Figure 4-54 for a typical section of the LRT guideway along uptown Broadway Street. Alongside the guideway, there would be one through northbound lane for general purpose traffic. From Fourth Plain Boulevard to 28th Street there would be two lanes for two-way general purpose traffic (one lane in each direction).

  ○ With this design option an LRT station, constructed to ADA standards, would be located at 24th Street (see Figure 4-54). The LRT station would include passenger amenities such as a shelter, benches, ticket vending machines, brick or architectural concrete paving and level boarding.

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Figure 4-50. Clark College Park and Ride as Paired with the Full-Length Vancouver and Mill Plain District MOS Alignments

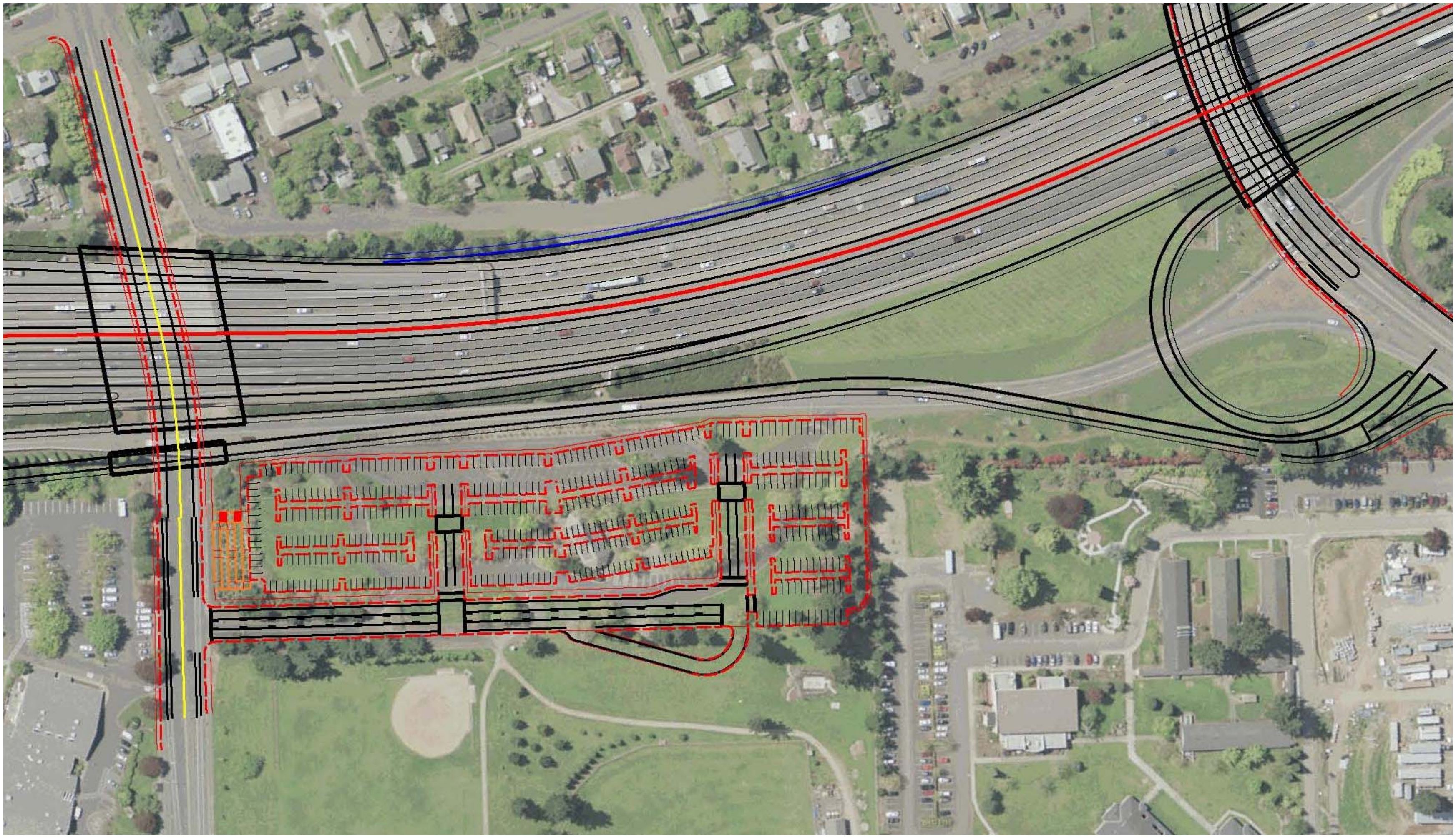

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Figure 4-51. Mill District Transit Center as Paired with the Vancouver Alignment

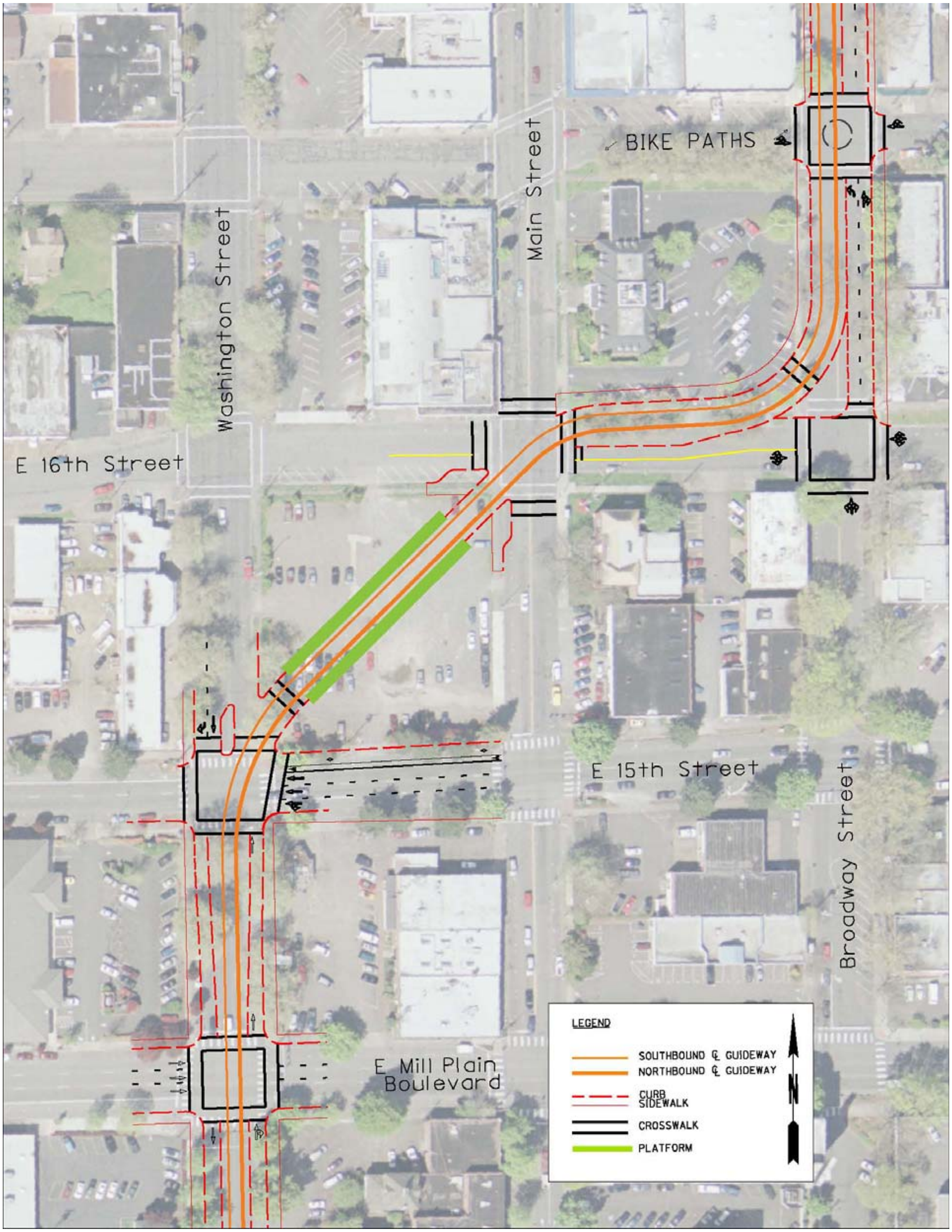

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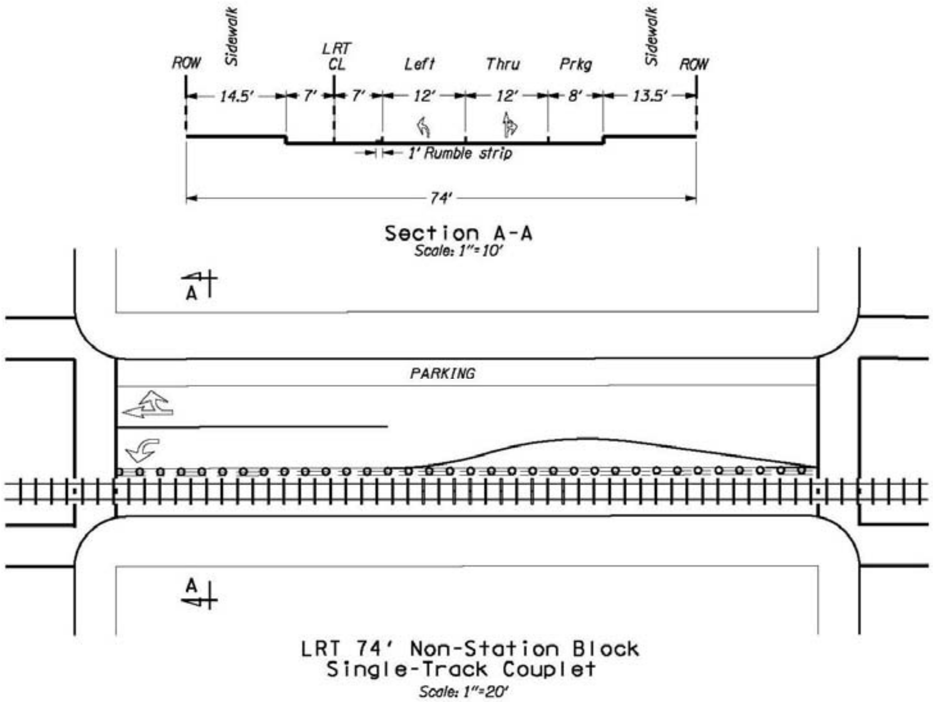
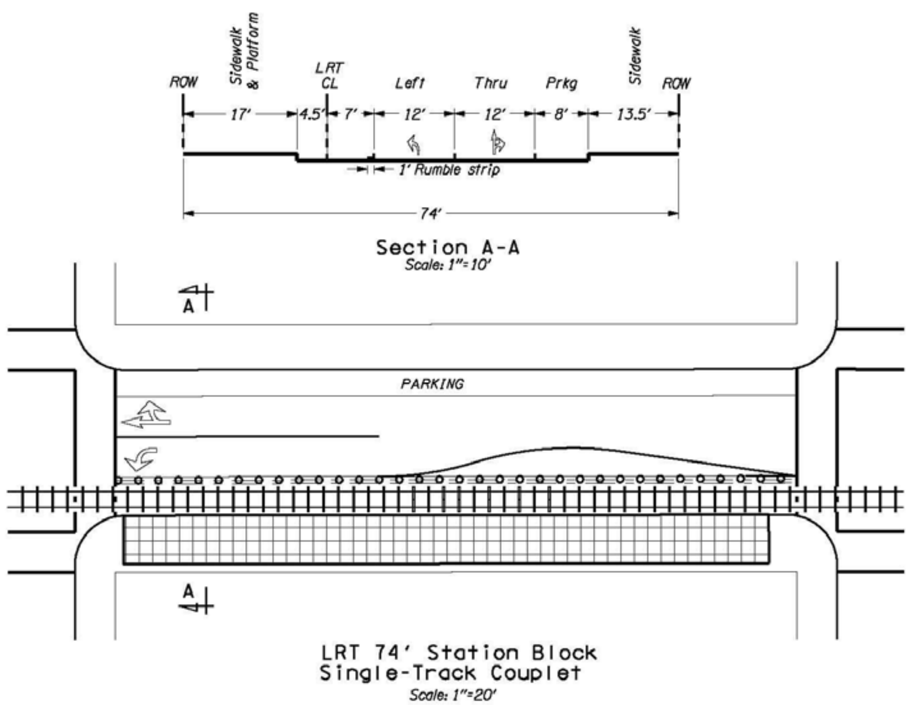
Figure 4-52. LRT Uptown Main/Broadway Couplet Design Option: Side Running on Uptown Main (top) with the Station on Uptown Main (bottom)





Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing. Figures not to scale.

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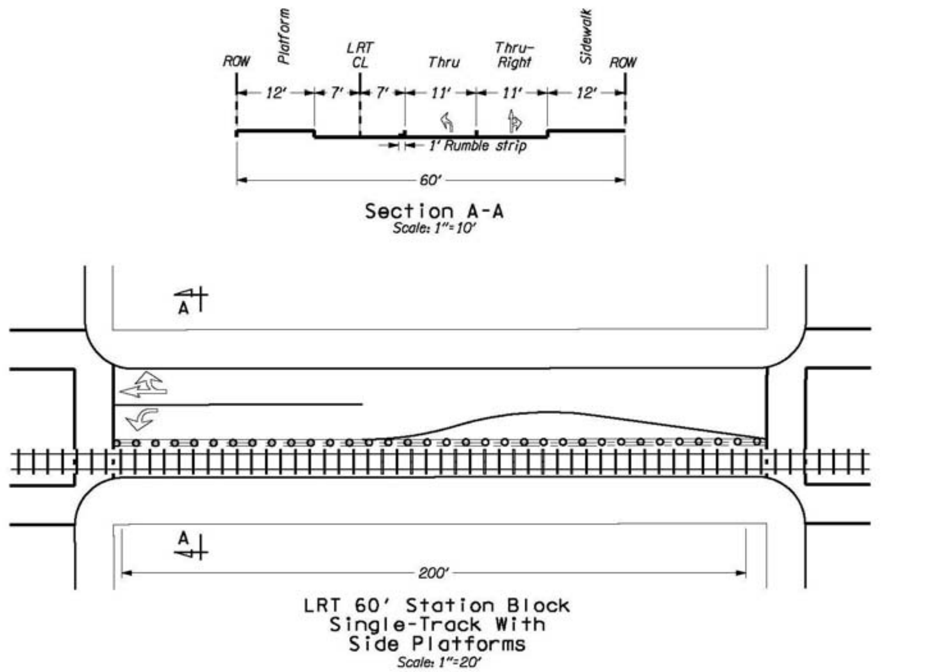
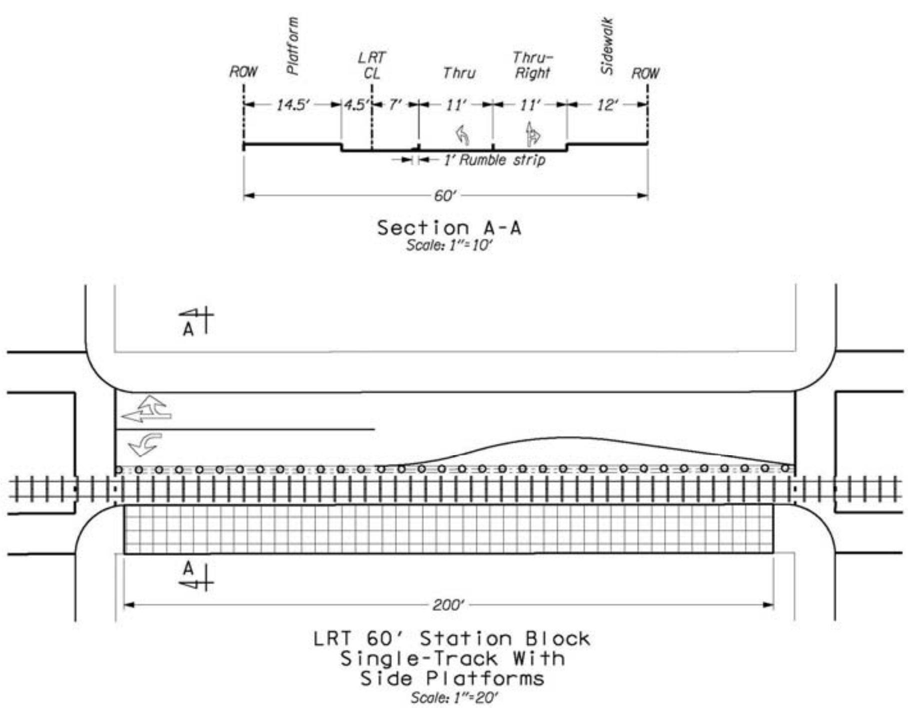
Figure 4-53. LRT Uptown Main/Broadway Couplet Design Option: Side Running on Uptown Broadway (top) with the Station on Uptown Broadway (bottom)





Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing. Figures not to scale.

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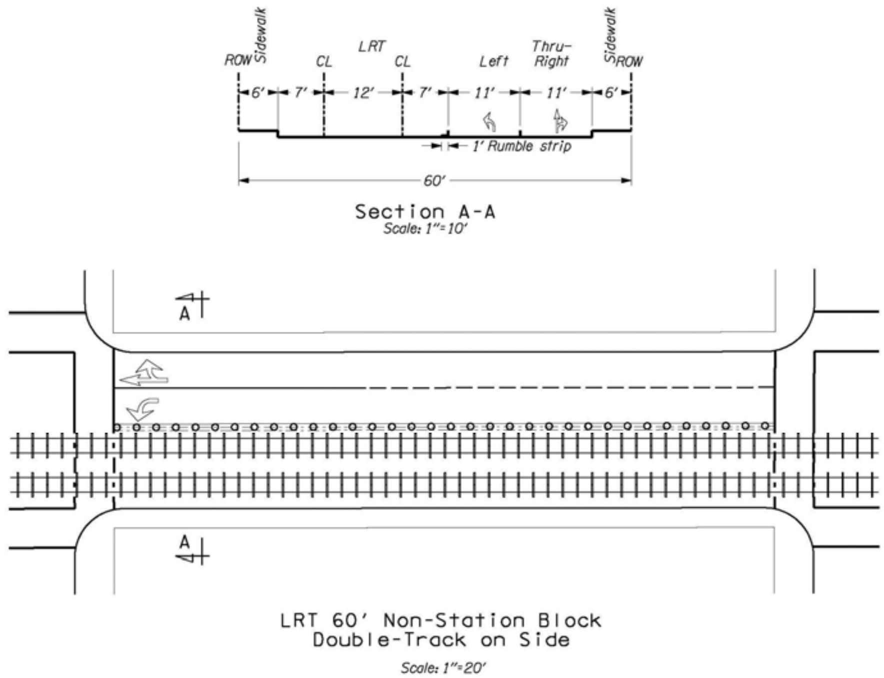
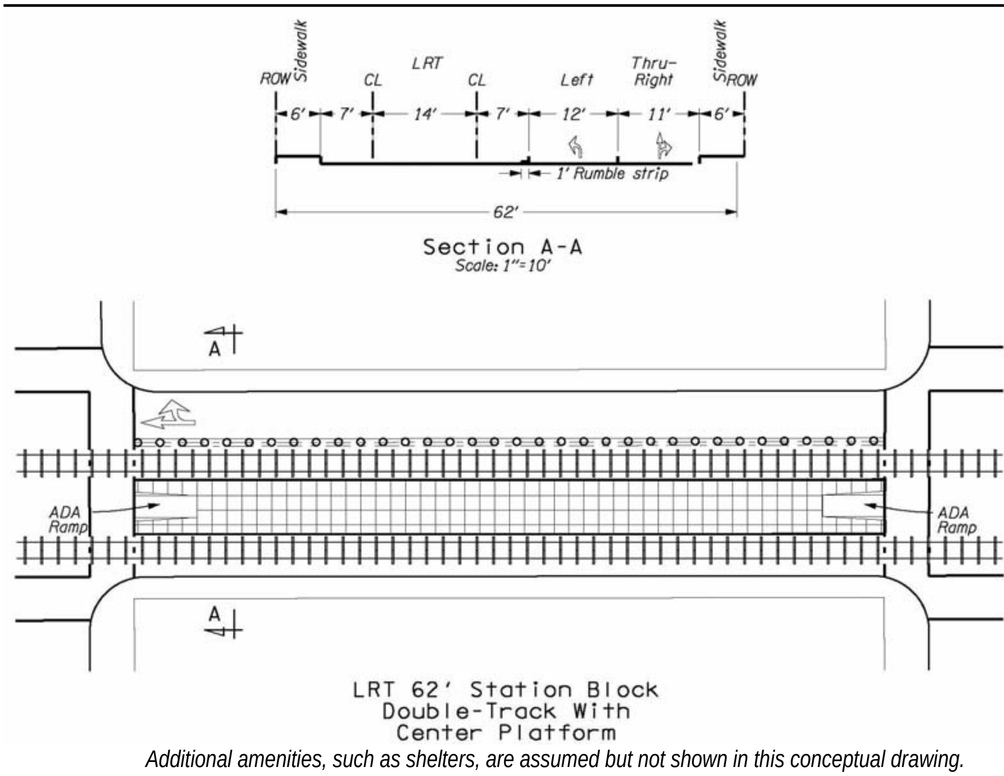
Figure 4-54. LRT Broadway Street Design Option: Two Way Side Running LRT on Uptown Broadway





Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing. Figures not to scale.

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North of 29th Street, where Main and Broadway converge, the right-of-way width is 60 feet, however, the proposed cross section would require 100 feet of right-of-way. The guideway would be two-way median running, with two-way automobile traffic, turn lanes and, where feasible, on-street parking (see Figure 4-56). LRT stations would be located at 33rd Street and at the Lincoln Park and Ride lot, which would be the northern terminus of the LRT exclusive guideway. The Lincoln Park and Ride lot would consist of 1,800 parking spaces (see Figure 4-55). The proposed Kiggins Bowl Park and Ride lot would include 150 parking spaces in a surface lot (see Figure 4-44). The new limited line, line 71L, would provide a transfer opportunity between the Kiggins Bowl Park and Ride lot and the LRT terminus at the Lincoln Park and Ride lot.

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Figure 4-55. Lincoln Park and Ride

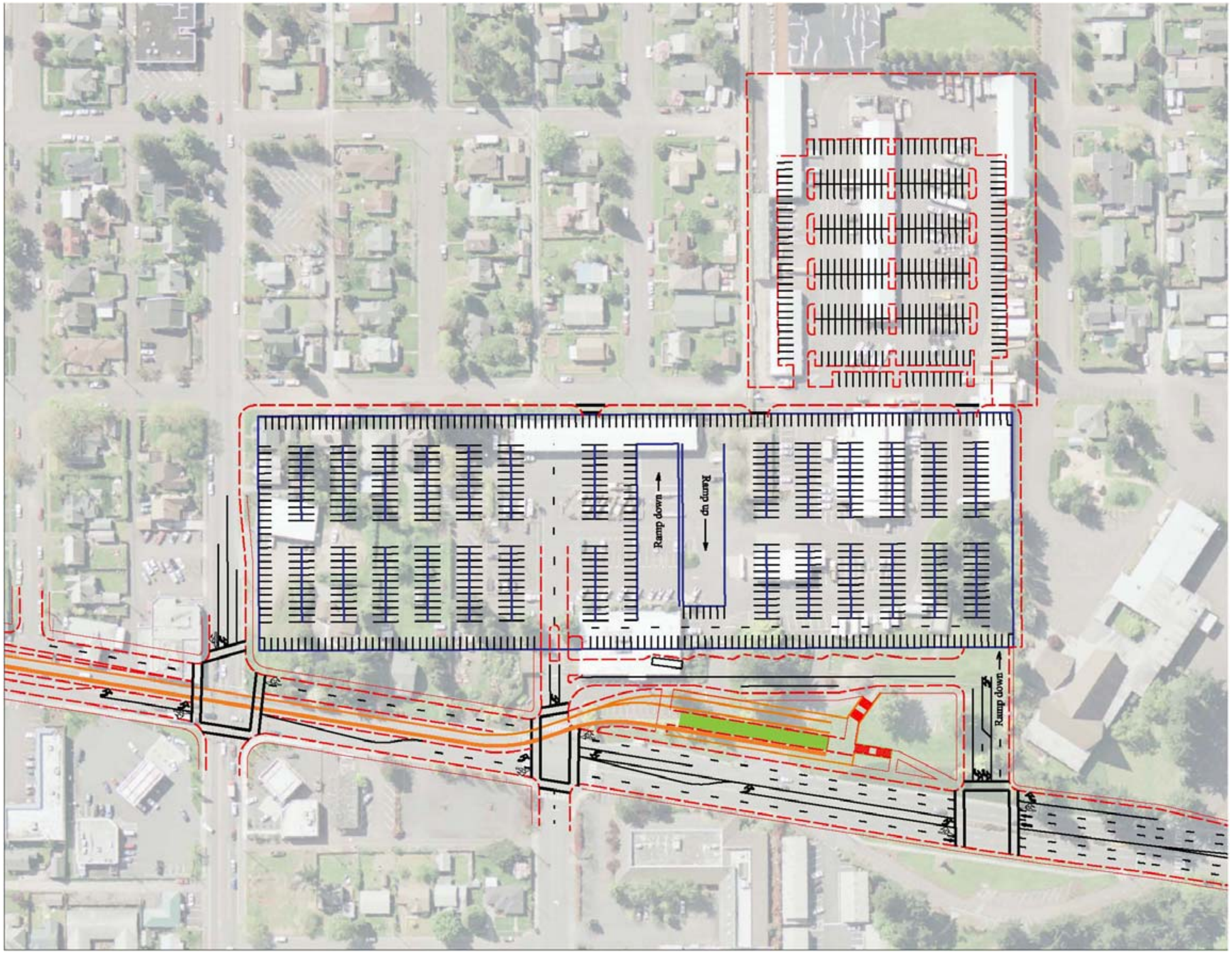

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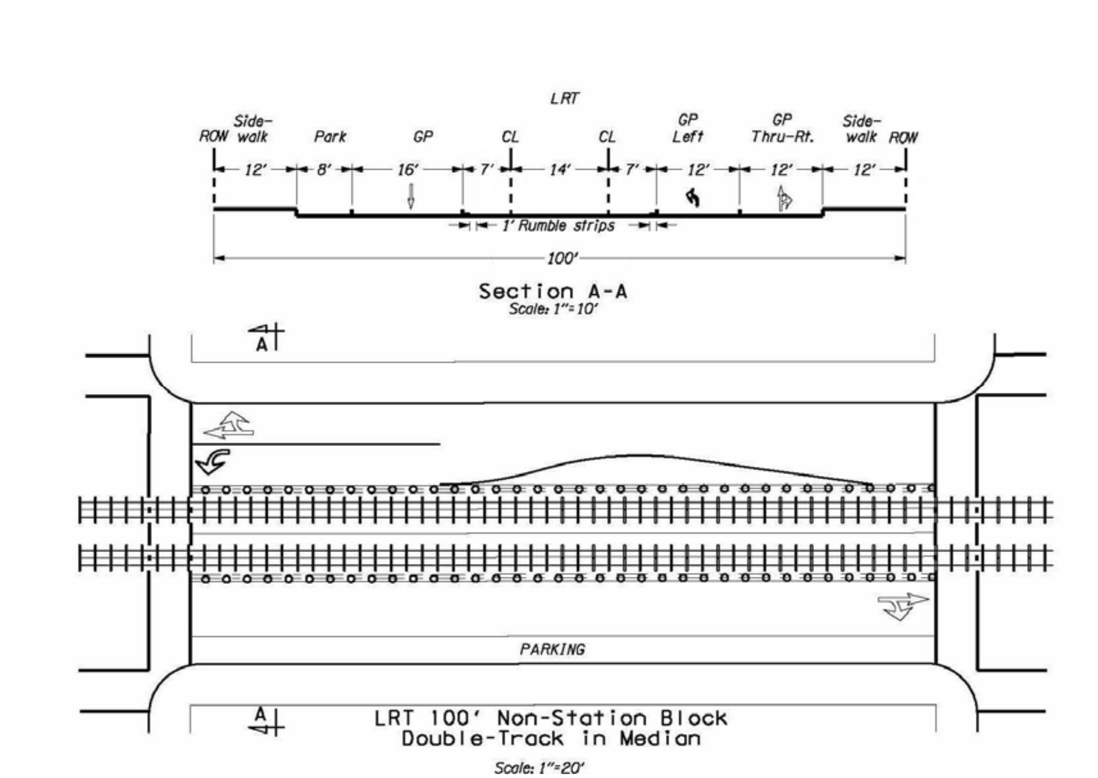
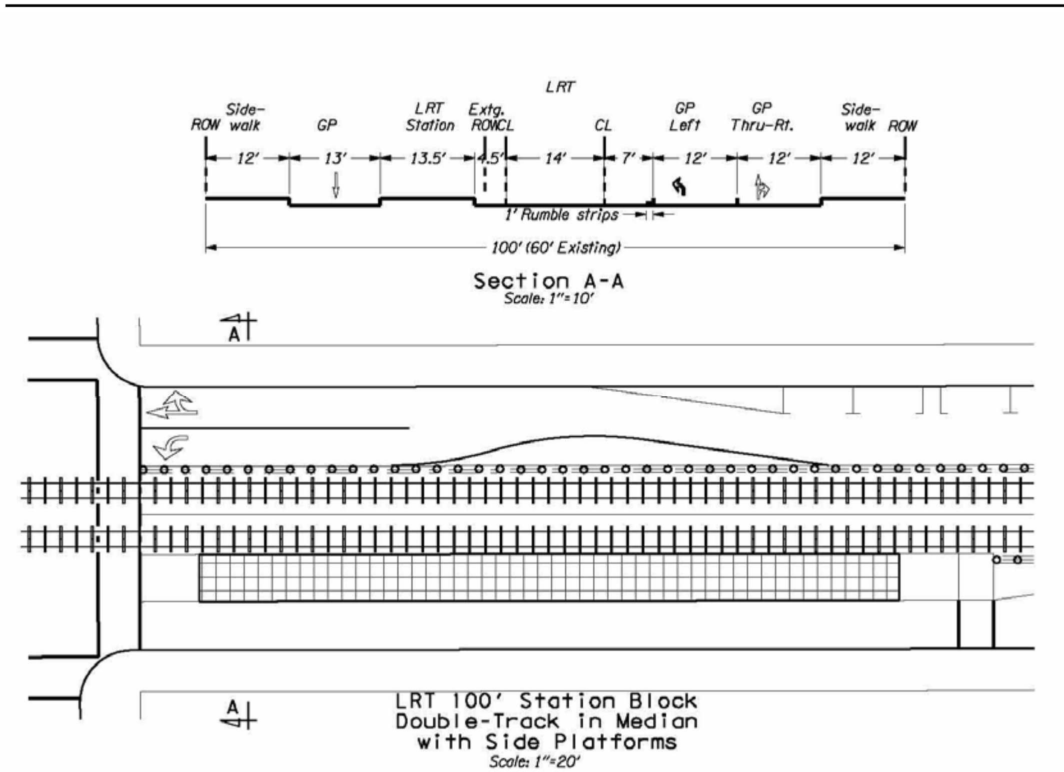
Figure 4-56. LRT on Uptown Main Street from 29th Street to 40th Street





Additional amenities, such as shelters, are assumed but not shown in this conceptual drawing.

Figures not to scale.

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4.7.2.4 LRT I-5 Alignment Segment B: Mill Plain District to Kiggins Bowl Park and Ride (Full-Length Northern Terminus)

With the I-5 alignment from the Mill Plain District Transit Center the LRT guideway would turn east and continue to the Clark College Park and Ride lot. There are two east-west design options for the location of the guideway from the Mill Plain District Transit Center to the Clark College Park and Ride lot, See Figure 4-57.

East-West Design Options

- **McLoughlin Boulevard Design Option:** In this design option the guideway would travel along McLoughlin Boulevard and through the existing cut under I-5 to the Clark College Park and Ride lot. The guideway would be two-way median running along McLoughlin Boulevard with one general purpose lane on either side of the guideway for two-way traffic and on-street parking where feasible (see Figure 4-57). McLoughlin has an existing 80 foot right-or-way but this design option would require 94 feet as detailed in Figure 4-59. The guideway width on a non-station block would be 28 feet with a center running track. There would be no stations along McLoughlin Boulevard.
- **W 16th Street Design Option:** In this design option, from the Mill Plain District Transit Center the LRT guideway would head east along 16th Street and through a new tunnel under I-5 to the Clark College Park and Ride lot. Along 16th Street the LRT exclusive guideway would be constructed as a two-way side running configuration, similar to the cross section shown in Figure 4-39**.** Along 16th Street, between Washington and E Street there would be one lane for general purpose traffic heading west. Between E Street and G Street there would be two lanes for two-way general purpose traffic along 16th Street. There would be one access in this section along the south side of 16th Street at G Street.

With both the I-5 full-length alignment and the Clark College MOS, the new Clark College Park and Ride lot would include 1,100 spaces in two levels of parking (see Figure 4-58). With the Clark College MOS, the Clark College Park and Ride lot would be the end of the LRT exclusive guideway; the end of the LRT line.

With the full-length alignment an exclusive guideway would be constructed alongside I-5 from the Clark College Park and Ride lot to the Kiggins Bowl Park and Ride lot, which would be located along the west side of I-5 just south of the intersection of Main Street with Highway 99. The guideway would be built within I-5 right-of-way but would not take capacity away from the mainline.

Figure 4-60 shows the cross section that could be selected which would place the guideway along the east side of I-5 at grade with the freeway (side running east) allowing the 29th Street bridge (and other overcrossings) to be rebuilt above. Along this section of the guideway a station would be constructed at 33rd Street to serve the Rosemere neighborhood.

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Figure 4-57. LRT on McLoughlin Boulevard Design Option

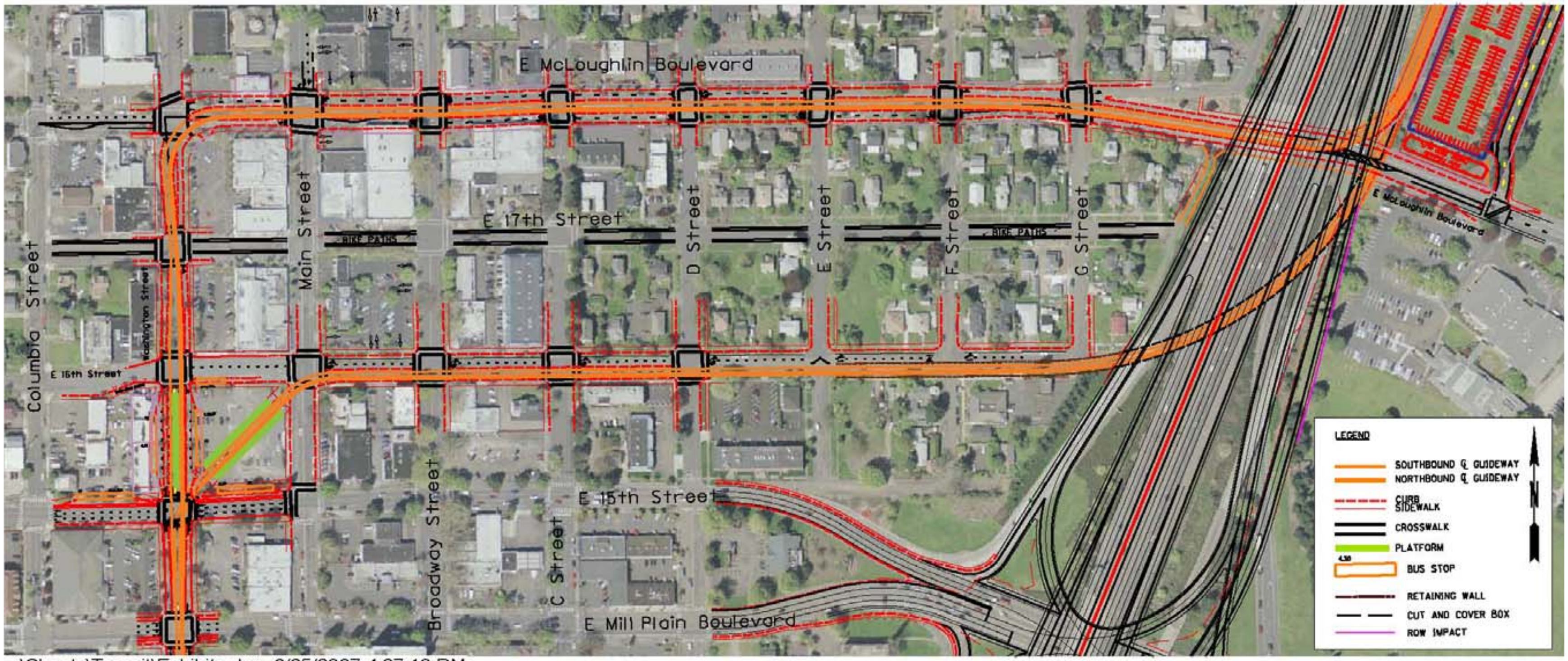

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Figure 4-58. LRT Clark College Park and Ride

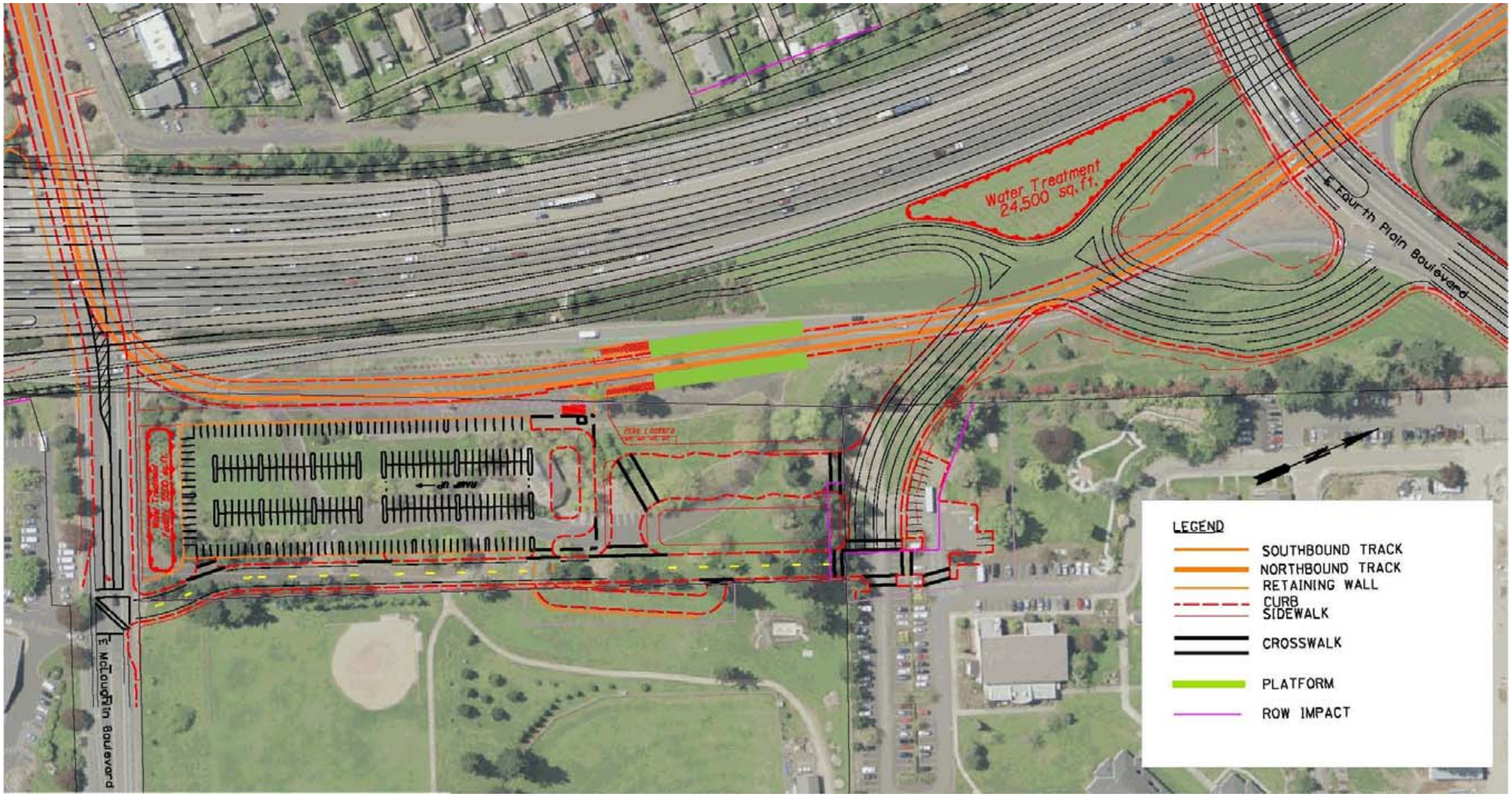

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Figure 4-59. LRT on McLoughlin Boulevard Design Option

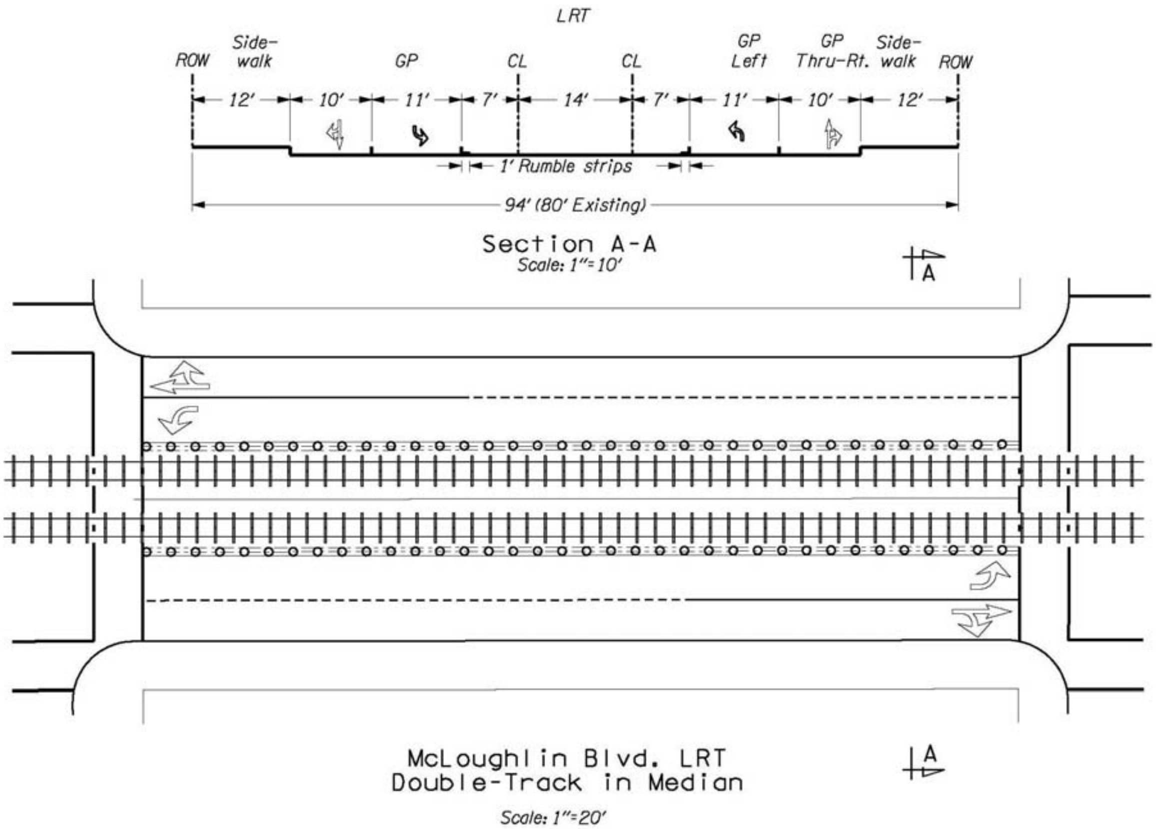
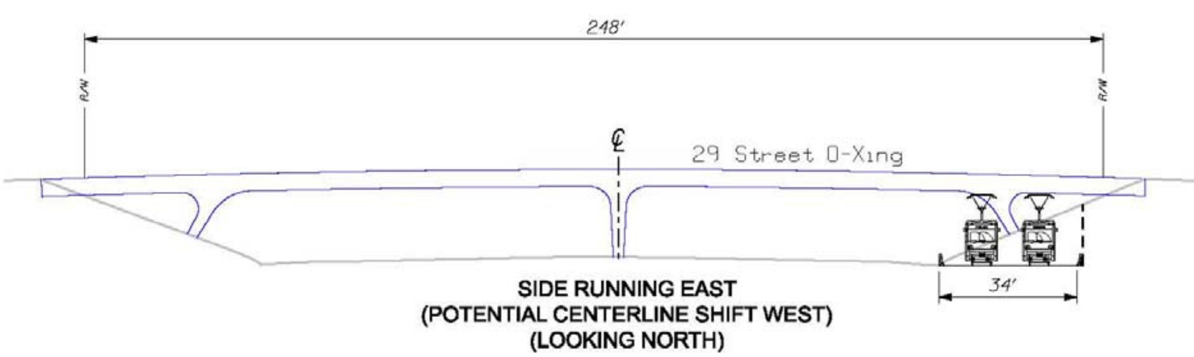


Figure not to scale.

Figure 60. LRT and I-5 Cross Section



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The Kiggins Bowl Park and Ride lot, which is the end of the LRT alignment and exclusive guideway in the I-5 full-length alignment, would be constructed to include 1,400 parking spaces, (see Figure 4-61). In the LRT Clark College MOS, a surface park and ride lot would be constructed at Kiggins Bowl with 1,100 spaces similar to what is shown in the BRT alternative (see Figure 4-44).

With the I-5 full-length alignment, the new limited line, line 71L, would provide a transfer at the LRT line at the Kiggins Bowl Park and Ride lot. In the LRT Clark College MOS, the 71L would provide a transfer to LRT at the Mill Plain District Transit Center.

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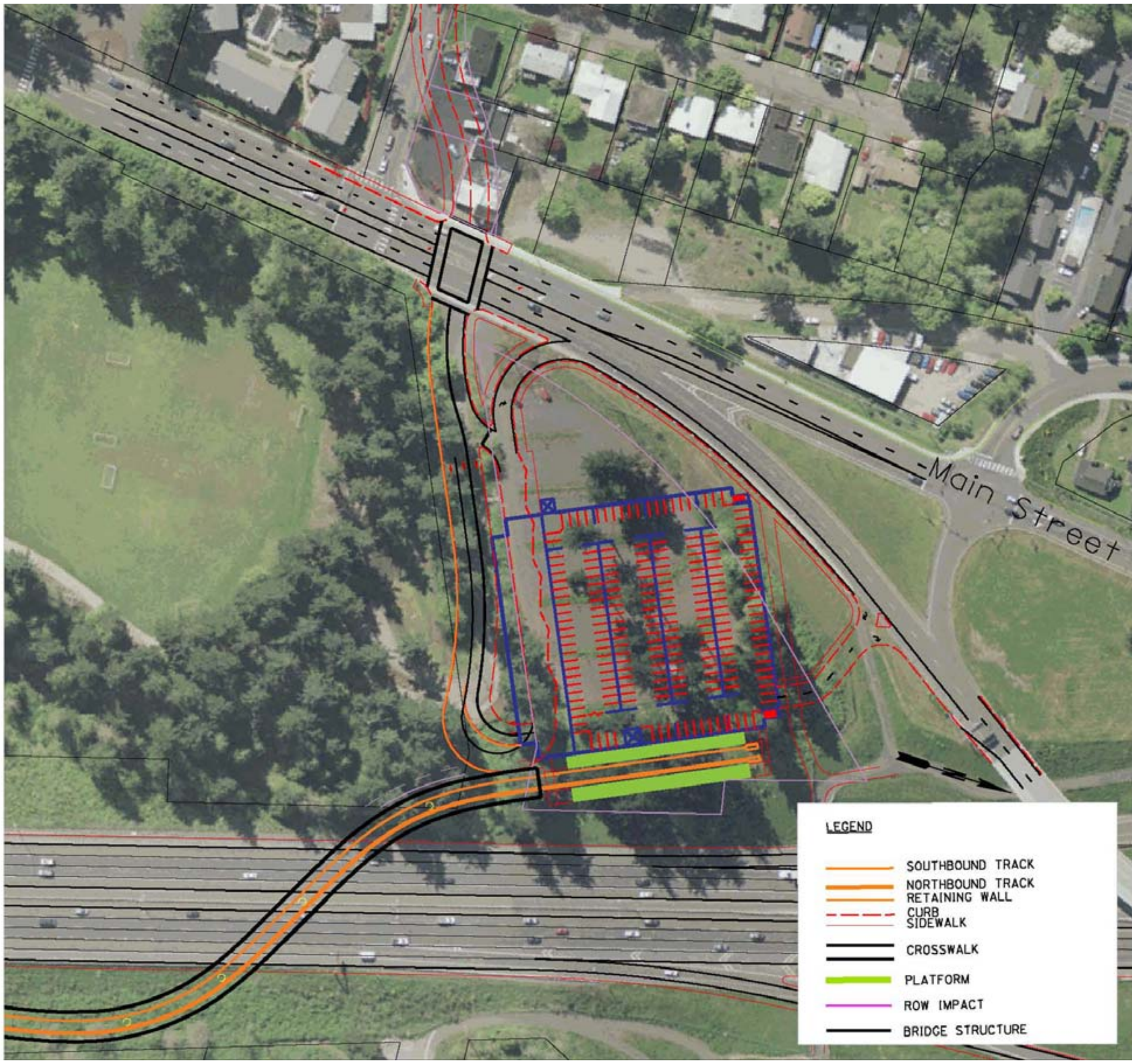
Figure 4-61. Kiggins Bowl Park and Ride Lot Layout with the LRT I-5 Full-Length Alignment



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A. Appendix A: Transit Fare Methodology

Date: March 1, 2007

To: CRC Transit Working Group

From: Jennifer John

Subject: Phase 2 Transit Fare Application

Agreement was reached at the Modeling Technical Team meeting on Tuesday February 27th with regard to how transit fares would be applied in the modeling work for Phase 2. The purpose of this memo is to document these final assumptions.

In application, two transit fare matrices will be used. There will be one for park and ride access and one for walk access.

- Park and Ride Access will reflect a premium fare ($3.00 one way) for customers using express service from park and ride lots in Clark County that offer a one-seat ride into and through the Portland CBD (this would include service to Lloyd Center and OHSU).
- Walk Access will reflect a full zone fare from Clark County to Oregon ($2.25 one way cash fare rate) rather than a Premium Fare. The exception to this will be for zones that have direct walk access at park and ride lots with premium service as described above (except for the 99th Street park and ride lot, discussed below). The meeting participants agreed that the walk access zones for Clark County park and ride lots served by express bus service to downtown Portland (and Lloyd Center and OHSU) will see the premium fare for their trip if they are traveling to or through the Portland CBD.
- The 99th Street park and ride lot fare was discussed at length because of the nature of the service that is being provided there. The concern was that based on this service, customers at this location would use local service to get to Oregon just as often as they would be using premium service. The meeting participants agreed that Metro would average the two fares (i.e., $2.25 and $3.00) at this park and ride lot for the walk access trips only.

Transit fare matrices will vary by alternative based on the type of service that is offered at the park and ride lot locations. Only park and ride lots with premium express bus service will be seeing the premium fares. As a result, part of the input process will be to identify how the transit fare matrices are defined for the alternative. A subgroup of the Technical Team will work together to do this.

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B. Appendix B: CRC Transit Line List

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Columns River Crossing Study

Transit Line Listing		2007 C-TRAN Serv. Redesign — Updated to match Nov. 18, 2007 Service Change and No-Build Highway		2030 No Action NA-3 — Old 2007 C-TRAN Service Redesign		BRT Full Length - I-5 2030 CRC T-8 — 2030 CRC BRT Local Bus Network (Some Changes to C-TRAN Redesign)		LRT - MOS to Clark 2030 CRC T-11 — 2030 CRC LRT to Clark w/ Local Bus Network		LRT - MOS to Mill 2030 CRC T-21.2 — 2030 CRC LRT to Clark w/ Local Bus Network		LRT Full Length - I-5 2030 CRC T-9 — 2030 CRC LRT Local Bus Network (Some Changes to C-TRAN Redesign)		Opt. LRT - Main St 2030 CRC T-17.3 — 2030 CRC LRT Local Bus Network (Initial Summit Run)		BRT - Main Street 2030 CRC T-18.1 — 2030 CRC BRT (initial Summit Run)		ETS - LRT Main St 2030 CRC T-19.1 — 2030 CRC LRT/ETS		ETS - BRT Main St 2030 CRC T-20.1 — 2030 CRC BRT/ETS	
LIGHT RAIL		peak headway	off-peak headway	peak headway	off-peak headway	peak headway	off-peak headway	peak headway	off-peak headway	peak headway	off-peak headway	peak headway	off-peak headway	peak headway	off-peak headway	peak headway	off-peak headway	peak headway	off-peak headway	peak headway	off-peak headway
01HGAP - Blue Line	LRT - (Hillsboro-Gresham) via cross-mall	6	15	6	15	6	15	6	15	6	15	6	15	6	15	6	15	6	15	6	10
01PDXB - Red Line	LRT - (PIA-BTC) via cross-mall	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
01I205 - Green Line	LRT - (PCBD / PSU-CTC) via mall	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15
01EXMI - Yellow Line	LRT - (EXPO-MILW) via mall	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
01MIVA-Yellow Max	LRT- (MILW-VANC) via mall replaces Orange Line	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
01MIVM-Yellow Max	LRT- (MILW-VANC on Main Street) via mall Main St in Vanc. replaces Orange Line	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
01EXPO-Yellow MAX	**LRT- (PCBD / PSU-Expo Center Station) via mall - no Milwaukie extension included**	**10**	**15**	**10**	**15**	**7.5**	**15**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**10**	**15**	**N/A**	**N/A**	**6**	**15**
01VANC-Yellow MAX	**LRT- (PCBD / PSU-VANC Kiggins Bowl P&R via I-5) via mall - no Milwaukie extension included**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**7.5**	**15**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
01MAIN-Yellow MAX	**LRT- (PCBD / PSU-VANC Lincoln P&R via Main Street) via mall - no Milwaukie extension included**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**7.5**	**15**	**N/A**	**N/A**	**6**	**10**	**N/A**	**N/A**
01CLRK-Yellow MAX	**LRT- (PCBD / PSU-VANC Clark College P&R via Washington Street and McLoughlin Blvd) via mall - no Milwaukie extension included**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**7.5**	**15**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
01Mill-Yellow MAX	**LRT- (PCBD / PSU-VANC Mill Dist P&R via Washington Street and McLoughlin Blvd) via mall - no Milwaukie extension included**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**7.5**	**15**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
COMMUTER RAIL																					
01COMR	Commuter Rail (BTC-Wilsonville)	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A
STREETCAR																					
01SCNW	Streetcar (NW 23rd-Gibbs / N. Macadam)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
01SCLP Caruthers Bridge	Streetcar - Loop (01SCAR & 01ESC Combined) Caruthers Bridge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
01SCOM	Streetcar - Eastside with OMSI terminus	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
TRAM																					
01TRAM	Tram (North Macadam-OHSU)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
TRI-MET BUSES																					
02G-PUP	Greeley - (PCBD - UofP)	7.5	30	7.5	30	7.5	30	7.5	30	7.5	30	7.5	30	7.5	30	7.5	30	5	15	5	15
02V-PV	Vermont - (PCBD - Vermont / Shattuck)	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
03I-205	I205 - (Gateway to CTC via I205)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
04D-P148D	Division - (PCBD - 148th / Division)	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
04D-PGL	Division Limited - (PCBD - Gresham TC)	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0
04D-PGTC	Division - (PCBD - Gresham TC) FB	15	20	15	20	15	20	15	20	15	20	15	20	15	20	15	20	15	20	15	20
04F-PSTJ	Fessenden - (PCBD - St. Johns) FB	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12	8	12
06MLSV - Vancouver via Steel Bridge/MLK	Collins Cir / Mall / Steel Br. / RQ / MLK / Lombard / Denver / Hayd Isld / Vanc (PCBD-Vancouver) FB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O6MLVM- Vac via Steel Bridge/MLK Managed Lanes	Collins Cir / Mall / Steel Br. / RQ / MLK / Lombard / Denver / Hayd Isld / Vanc Uses I-5 ML on I-5 (PCBD-Vancouver) FB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O6MLH- Hayd Is via Steel Bridge/MLK Managed Lanes	Collins Cir / Mall / Steel Br. / RQ / MLK / Lombard / Denver / Hayd Isld Uses I-5 ML on I-5 in Portland (PCBD-Hayden Island) Managed Lns	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
O6H- Hayd Is via Steel Bridge/MLK	**Collins Cir / Mall / Steel Br. / RQ / MLK / Lombard / Denver / Hayd Isld on I-5 in Portland (PCBD-Hayden Island)**	**7.5**	**12**	**7.5**	**12**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
O6HQ- Hayd Is via Steel Bridge/MLK	**(Collins Cir / Mall / Steel Br. / RQ / MLK / Lombard /Denver / Hayd Isld) QJ Hayden SB to I-5 in Portland (PCBD-Hayden Island)**	**N/A**	**N/A**	**N/A**	**N/A**	**7.5**	**12**	**7.5**	**12**	**7.5**	**12**	**7.5**	**12**	**7.5**	**12**	**7.5**	**12**	**5**	**10**	**5**	**10**
06HL-Hayd Is (longer routing) via Steel Br/MLK	**(Collins Cir / Mall / Steel Br. / RQ / MLK / Lombard /Denver / Hayd Isld) QJ Hayden SB to I-5 in Portland (PCBD-Hayden Island)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
06MLT - Van CBD via I-5 in partial Managed	Collins Cir / Mall / Steel Br. / RQ / MLK / Lombard / Denver / Hayd Isld / Vanc Uses I-5 partial ML on I-5 (PCBD-Vancouver)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arterial Bridge I-5 SB to PCBD in Managed Lanes	Collins Cir / Mall / SteelBr. / RQ / MLK / Lombard /Denver / Hayd Isld / Vanc Uses I-5 Uses ML SB on I-5 (PCBD-VanCBD) and Arterial Bridge to Vanc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
06PIR - PCBD	**Collins Cir / Mall / Steel Br. / RQ / MLK / Lombard / PIR / Hayd Isld Uses QJ from H.I. SB to I-5**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
07THES-OGCTC	Thiessen - (O.Grove / Concord-CTC)	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
08NE15-MID	NE 15th / MLK / Middlefield (PCBD - Middlefield) FB	10	12	10	12	N/A	N/A	10	12	10	12	N/A	N/A	10	12	10	12	5	10	5	10
08NE15-PIR	**NE 15th / MLK / Middlefield / Delta Park / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**8**	**12**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
08NE15-Expo	**NE 15th / MLK / Middlefield / DeltaPark / PIR / Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**10**	**12**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Columbia River Crossing Study

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Transit Line Listing		2007 C-TRAN Serv. Redesign: Updated to match Nov. 18, 2007 Service Change and No-Build Highway		2030 No Action NA-3: Old 2007 C-TRAN Service Redesign		BRT Full Length - I-5 2030 CRC T-8: 2030 CRC BRT Local Bus Network (Some Changes to C-TRAN Redesign)		LRT - MOS to Clark 2030 CRC T-11: 2030 CRC LRT to Clark w/ Local Bus Network		LRT - MOS to Mill 2030 CRC T-21.2: 2030 CRC LRT to Clark w/ Local Bus Network		LRT Full Length - I-5 2030 CRC T-9: 2030 CRC LRT Local Bus Network (Some Changes to C-TRAN Redesign)		Opt. LRT - Main St 2030 CRC T-17.3: 2030 CRC LRT Local Bus Network (Initial Summit Run)		BRT - Main Street 2030 CRC T-18.1: 2030 CRC BRT (initial Summit Run)		ETS - LRT Main St 2030 CRC T-19.1: 2030 CRC LRT/ETS		ETS - BRT Main St 2030 CRC T-20.1: 2030 CRC BRT/ETS	
08JPVA-PVA	Jackson Park / VA Hospital - (PCBD - VA Hospital) - Only with Tram, otherwise, go to 6/15 FB	10	12	10	12	10	12	10	12	10	12	10	12	10	12	10	12	10	12	10	12
09B-P27TH	Broadway - (PCBD - 27th / Saratoga) - via Rose Quarter TC	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15
09P98T-P98PWL	Powell/98th - (PCBD - 98th / Powell)	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
09PGL-PGR - New Limited, no local service	Powell/Gresham Limited all the way to Gresham- (PCBD-GreshamTC)	30	0	30	0	30	0	30	0	30	0	30	0	30	0	30	0	30	0	30	0
09PGTC	Powell/Gresham TC - (PCBD - Gresham TC) FB	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
09PGX-PGR	Powell/Gresham Express - (PCBD - Gresham TC)	60	0	60	0	60	0	60	0	60	0	60	0	60	0	60	0	60	0	60	0
10H-P122FSTR	Harold - (PCBD - 122nd / Foster)	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15
10T-P33	NE 33rd - (PCBD - 33rd / Sutherland)	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15
12BARB-PSWDX - Current Line 94(PSWDX (PCBD-Sherwood)	Barbur/Sherwood Express - (PCBD - Sherwood)	5	N/A	5	N/A	5	N/A	5	N/A	5	N/A	5	N/A	5	N/A	5	N/A	5	N/A	5	N/A
12BARB-PSWD	Barbur/Sherwood - (PCBD - Sherwood)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12BARB-PTI	Barbur/Tigard - (PCBD - Tigard TC) FB	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12
12SG-Gresham	Sandy - (PCBD - Gresham) FB	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12	7.5	12
12SP-Parkrose	Sandy - (PCBD - Parkrose)	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0
14HS-P94F (use route from P/F study)	Hawthorne Short - (PCBD - 94th / Foster) Not on 172nd FB	7.5	10	7.5	10	7.5	10	7.5	10	7.5	10	7.5	10	7.5	10	7.5	10	7.5	10	7.5	10
14HL - 14HX to Dam. (use route from P/F study)	Hawthorne Long - (PCBD - Damascus) Not on 172nd	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
154WILL-OC	Willamette - (Willamette / W. Linn - Oregon City)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
155S-OTCTC/DAM	Sunnyside/Damascus - (147th / Oregon Trail - CTC)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
156MR-OTCTC	Mather Rd. - (147th / OregonTrail - CTC)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
157HV-OTCTC	Happy Valley - (147th / Oregon Trail - CTC)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
15MTAB-PRKRS	Belmont / Mt.Tabor / Parkrose via Adventist (PCBD - Parkrose TC) FB	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10	4	10
15TMPK-P27MPK	NW 23rd / Montgomery Park - (PCBD - 27th / Mont. Park) FB	8	10	8	10	8	10	8	10	8	10	8	10	8	10	8	10	8	10	8	10
164MT-OHSUTI	Tigard / Marquam Hill - (OHSU - Tigard)	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A
166MH-OHSUHLYWD	Hollywood / Marquam Hill - (OHSU - Hollywood TC)	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A
16FMID Off-Mall JJ/RP	Front Ave / St. Johns / Marine Dr-(PCBD-Middlefield) via Fess / Col Off-Mall JJ/RP	30	N/A	30	N/A	30	N/A	30	0	30	0	30	0	30	0	30	0	15	0	15	0
16FHI Off-Mall JJ/RP	Front Ave / St. Johns / Hayden Island / Marine Dr - (PCBD-Middlefield) via Fess / Col / Hayden Is Off-Mall JJ/RP	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17H136-P136PWL	Holgate - (PCBD - 136th Powell)	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15
1721SI-PSI (SLIN)	NW 21st / Sauvie Island - (PCBD - Sauvie Is.)	20	60	20	60	20	60	20	60	20	60	20	60	20	60	20	60	20	60	20	60
1721MP-PMPK (SMPK)	NW 21st / Montgomery Park - (PCBD - Montgomery Park)	20	60	20	60	20	60	20	60	20	60	20	60	20	60	20	60	20	60	20	60
18HILL-PMCLY Off-Mall	Hillside - (PCBD - Maclay / Burnside) Off-Mall	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A
19GLIS-PGT	Glisan - (PCBD - GatewayTC)	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15
19WRHV (use route from P/F study)	Woodstock/Rex - (PCBD - Rex / Extended to Happy Valley)	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15
20BBTC-Gresham	Burnside / Beaverton TC - (BTC - Gresham)	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15
22ROSE-PRGT	Parkrose - (Parkrose - GatewayTC)	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
23SR223-GTGR	San Rafael / 223rd - (Gateway TC - Gresham TC)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
25GLIS-GTRWD	Glisan / Rockwood - (Gateway TC - Rockwood TC)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
27MKTM-GTRWD	Market / Main - (Gateway TC - Rockwood TC)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
2829LW	28 Linwood **interline** w/ 29Lake / Webster - (CTC - CTC)	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
30JC-MCTC	Johnson Creek - (MTC via 32nd - CTC)	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30
30CTCO	Holcomb Rd - (CTC - OC) via Holcomb / Bradley / Gronlund / 212 / 224 / I-205	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
31DAM-MTC	Damascus - (DAM / CTC - MTC) via 212 / 224 / 82nd / King Rd.	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
31EST-MTC	Estacada - (EST / CTC / MTC) via 212 / 224 / 82nd / King Rd.	20	60	20	60	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0
32OC-PCBD	Oatfield - (OC - PCBD)	12	0	12	0	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
32OC-MTC	Oatfield - (MTC - OC - Oatfield)	0	30	0	30	0	60	0	60	0	60	0	60	0	60	0	60	0	60	0	60
33PM	McLoughlin - (PCBD - MTC)	15	0	15	0	0	60	0	60	0	60	0	60	0	60	0	60	0	60	0	60
33PMOC	McLoughlin - (PCBD - OC)	0	30	0	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
33PMCC	McLoughlin - (PCBD - CCC)	15	30	15	30	0	60	0	60	0	60	0	60	0	60	0	60	0	60	0	60

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Columbia River Crossing Study		2007 C-TRAN Serv. Redesign		2030 No Action NA-3		BRT Full Length - I-5 2030 CRC T-8		LRT - MOS to Clark 2030 CRC T-11		LRT - MOS to Mill 2030 CRC T-21.2		LRT Full Length - I-5 2030 CRC T-9		Opt. LRT - Main St 2030 CRC T-17.3		BRT - Main Street 2030 CRC T-18.1		ETS - LRT Main St 2030 CRC T-19.1		ETS - BRT Main St 2030 CRC T-20.1	
Transit Line Listing		Updated to match Nov. 18, 2007 Service Change and No-Build Highway		Old 2007 C-TRAN Service Redesign		2030 CRC BRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT Local Bus Network (Initial Summit Run)		2030 CRC BRT (initial Summit Run)		2030 CRC LRT/ETS		2030 CRC BRT/ETS	
33F-PGTC	Fremont - (PCBD - GTC)	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	7.5	15	7.5	10
34R152	34 River Rd. **interline** w/ 152 Milwaukie Shuttle - (OC - CTC)	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
35MAC-POC	Macadam - (PCBD - OC) FB (no service to Canby)	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15	7.5	15
36SS-LOTU	South Shore - (LakeO - Tual - PCBD) to PCBD per JC Equil.	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
37NS-LBF - New Routing	North Shore - (LakeO - Tual PNR) via Cclub/LowerBoones	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
38BOON-PTU (See Line 50TIGTUAL) Term. @ Tigard NOT Tual.	Boones Ferry - (PCBD - Tigard TC) via Kruse / 72nd / Hunziker / Hall	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
39LNC-LCBU	Lewis and Clark - (L&C College - BurlingameTC)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
40MOCK-PSTJ	Mocks Crest - (PCBD - St.Johns)	**12**	15	**12**	15	**10**	15	**12**	15	**12**	15	12	15	12	15	**12**	15	7.5	10	**7.5**	10
40TAC-PM Off-Mall stay on Macadam/ Moody	Tacoma - (PCBD - MTC) Off-Mall stay on Macadam/Moody	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
42CMS	Cedar Mill Shuttle - (SunsetTC - CM) - Saltzman / Thompson / 143rd / 107th	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A
43TFN -PWSQN	Taylors Ferry Nimbus - (PCBD - Wash Sq. / Nimbus)	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A
43TF-PWSQ	Taylors Ferry - (PCBD - Wash Sq.)	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30
44CHWY-PPCCC (formally known as 41CHWY)	Capital Hwy. - (PCBD - PCC Sylvania)	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15
45G-PTI	Garden Home - (PCBD - Tigard)	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
46NH-FHI	North Hillsboro - (WashCo Fairgrounds - Hillsboro)	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
47BLEV-WC185	Baseline/Evergreen - (Willow Crk / 185th - Hillsboro)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
48CORN-WC185	Cornell Rd. - (Willow Crk. / 185th - Hillsboro)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
50TIGTUAL (see map)	Tigard - Tualatin (Tig TC - Tual Mhwk) via Com Rail / Lboones / 72nd / Hwy 99W	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
51V-PCCPL	Vista - (PCBD - Council Crest - Patrick Place)	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A
51V-PCCDSH	Vista - (PCBD - Council Crest - Dosch)	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60
52FARM-F185	Farmington - 185th (BTC - PCC Rock Crk.)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
52ORENCO	Orenco	**20**	15	**20**	15	**20**	15	**20**	15	**20**	15	**20**	15	**20**	15	**20**	15	**20**	15	**20**	15
53ALLN-BA	Artic / Allen - (BTC - Allen / Mercer Ind.)	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A
54BH-PB	Beaverton - Hillsdale Hwy (PCBD - BTC) FB	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
55HAML-PRH	Hamilton - (PCBD - Scholls / Hamilton)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
55HAML-PRH Off-Mall JJ/RP	Hamilton - (PCBD - Scholls / Hamilton) Off-Mall JJ/RP	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A
56SF-PWSQ	Scholls Ferry - (PCBD - WashSq.) FB	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
57FFGV-BFG	Forest Grove - (BTC - Forest Gr.) FB	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15
58CANY-PB	Canyon Rd. - (PCBD - BTC)	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
59WPCH-WCSUN	Walker / Parkway / Cedar Hills - (Willow Crk. / 185th - SunsetTC)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
60L	Leahy - (Cornell - SusetTC)	45	N/A	45	N/A	45	N/A	45	N/A	45	N/A	45	N/A	45	N/A	45	N/A	45	N/A	45	N/A
61XMAR-MHB	BTC - Beav. - Hillsdale Hwy - (Marquam Hill/OHSU-BTC)	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A
62MRBV	Murray Blvd - (WashSq. - Sunset TC)	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
63ZOO	Washington Park (PCBD - Zoo)	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
67J158-BPCC	Jenkins / 158th - (BTC - PCC Rock Crk.)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
68CMH-POHSU Off-Mall	Collins Circle - (PCBD - OHSU / VA Hospital) Off-Mall	10	N/A	10	N/A	10	N/A	10	N/A	10	N/A	10	N/A	10	N/A	10	N/A	10	N/A	10	N/A
70T13	12th Ave. - (Rose Qtr. - MTC) via 13th	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
70T17	12th Ave. - (Rose Qtr. - MTC) via 17th	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
71P122	60th / 122nd - (Woodstock / 94th - CTC) via Parkrose LRT	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
72K82	82nd / Killingsworth - (Swan Is. - CTC) FB	10	12	10	12	**8**	**12**	**10**	**12**	**10**	**12**	**10**	**12**	10	**12**	**10**	**12**	6	**12**	**6**	**12**

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Columbia River Crossing Study		2007 C-TRAN Serv. Redesign		2030 No Action NA-3		BRT Full Length - I-5 2030 CRC T-8		LRT - MOS to Clark 2030 CRC T-11		LRT - MOS to Mill 2030 CRC T-21.2		LRT Full Length - I-5 2030 CRC T-9		Opt. LRT - Main St 2030 CRC T-17.3		BRT - Main Street 2030 CRC T-18.1		ETS - LRT Main St 2030 CRC T-19.1		ETS - BRT Main St 2030 CRC T-20.1	
Transit Line Listing		Updated to match Nov. 18, 2007 Service Change and No-Build Highway		Old 2007 C-TRAN Service Redesign		2030 CRC BRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT Local Bus Network (Initial Summit Run)		2030 CRC BRT (initial Summit Run)		2030 CRC LRT/ETS		2030 CRC BRT/ETS	
74X	SE Portland / Lloyd - (Lloyd Cntr / RoseQtr - Woodstock / 52nd)	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A	30	N/A
75TMTC	39th / Lombard - (St. Johns - MTC) FB	15	15	15	15	**10**	15	**15**	15	**15**	15	**15**	15	15	15	**15**	15	10	15	**10**	**15**
76BVTU	Beaverton / Tualatin - (BTC - Tualatin TC) FB	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15
77NTRDL	Broadway / Lovejoy - (Troutdale - Montgomery Park)	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15	12	15
78LOTIG (same as today's 78 but terminates at Tigard TC)	Tigard / LakeO - (Tigard TC - Lake Oswego)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
79OC (should be same route as today)	CTC / OC - (CTC - Or. City) via Gladstone - South End Loop FB	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
80TTRT	Kane Rd. - (Gresham TC - Troutdale) via Springwater	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30	**30**	30
84BOR	Boring	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A
84KEL	Kelso	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A
87R181 - New Routing (see map and P/F	181st Ave. - (Alderwood / Damascus) via Airport / 181st / 182nd - no Rockwood	**20**	N/A	**20**	N/A	**20**	N/A	**20**	N/A	**20**	N/A	**20**	N/A	**20**	N/A	**20**	N/A	**20**	N/A	**20**	N/A
87R182 (see map and P/F study)	181st / 182nd - (Sandy - Damascus)	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15	N/A	15
88H198	198th / Hart - (Willow Crk. / 185th TC - BTC)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
89RKN	Tanasbourne / North - (Tanasbourne - Sunset TC)	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60
89RKS	Tanasbourne / South - (Tanasbourne - Sunset TC)	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60
92X	South Beaverton Express - (Murray Hill - PCBD)	20	N/A	20	N/A	20	N/A	20	N/A	20	N/A	20	N/A	20	N/A	20	N/A	20	N/A	20	N/A
96TUAL	Tualatin / I-5 - (PCBD - Tualatin)	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
96WILS	N. Wilsonville / I-5 - (PCBD - N. Wilsonville)	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
99MX	McLoughlin Express - (PCBD - OC / CCC)	12	0	12	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0
201WILS	SMART / BARBUR	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30
202WIL	SMART / Oregon City	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30
203WIL	SMART / Wilsnvle. Rd.	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30
204WIL	SMART / Wilsnvle. Rd.	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30
205CAN	SMART / Canby	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
300SES	Sandy - Estacada	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
300SGR	Sandy - Gresham	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60
300SME	Sandy - Rhododendron	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
302MCC	Molalla / CCC	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
302MCN	Molalla / Canby	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
400CAN	Canby (Canby - OCTC)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
C-TRAN Routes																					
C0BRTF	Bus Rapid Transit (KigPR / CCPR / VCBD / PIR / PCBD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C0BRTL	Bus Rapid Transit LITE (219PR / SCPR / 99PR / KigPR / VCBD / PCBD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C001	Fruit Valley (7th St TC / Fruit Valley Rd / 99PR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C001M	Fruit Valley (Mill Dist LRT Sta / Fruit Valley Rd / 99PR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C001LMI	**Fruit Valley (Mill Dist / Fruit Vly Rd / Lakeside Mobile Estates) Interline w/ #25NN for NA-3 Only**	**30**	**30**	**30**	**30**	**30**	**60**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
C001SR	**Service Redesign: Fruit Valley (Interline from #25SR at Evergreen&C / Broadway / 15th / Mill Plain / 4th Plain / Fruit Vly Rd / 61st) (SB uses Franklin / 13th before Interlining w/ #25SR @ 13th&Washington)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C002	Lincoln	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C002M	Lincoln (SCPR to Mill Dist - Coded to 12th St.) See Note 2.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C002A	Lincoln/Felida Circulator	N/A	N/A	N/A	N/A	60	60	60	60	60	60	60	60	60	60	60	60	**30**	60	**30**	60
C002B	Lincoln/Felida Circulator	N/A	N/A	N/A	N/A	60	60	60	60	60	60	60	60	60	60	60	60	**30**	60	**30**	60
C002NN	**Lincoln (Columbia / 39th / Lincoln / Bernie / 78th / 9th / 99PR)**	**60**	**60**	**60**	**60**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C002SVN	**Lincoln (7th/Columbia/Mill Dist/ 39th / Lincoln / Bernie / 78th / 9th / 99PR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C002MD	**Lincoln (Mill Dist / Columbia / 39th / Lincoln / Bernie / 78th / 9th / 99PR)**	**N/A**	**N/A**	**N/A**	**N/A**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**
C002SR	**Service Redesign: Lincoln (Interline w/ #3ACW @ 13th&Washington / 6th / Broadway / 15th / Columbia / 39th / Lincoln / Bernie / 78th / 9th / 99th / 99TC)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C003A	Kauffman-Columbia (33rd & Main)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C003B	Columbia- Kauffman (33rd & Main)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Columbia River Crossing Study		2007 C-TRAN Serv. Redesign		2030 No Action NA-3		BRT Full Length - I-5 2030 CRC T-8		LRT - MOS to Clark 2030 CRC T-11		LRT - MOS to Mill 2030 CRC T-21.2		LRT Full Length - I-5 2030 CRC T-9		Opt. LRT - Main St 2030 CRC T-17.3		BRT - Main Street 2030 CRC T-18.1		ETS - LRT Main St 2030 CRC T-19.1		ETS - BRT Main St 2030 CRC T-20.1	
Transit Line Listing		Updated to match Nov. 18, 2007 Service Change and No-Build Highway		Old 2007 C-TRAN Service Redesign		2030 CRC BRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT Local Bus Network (Initial Summit Run)		2030 CRC BRT (initial Summit Run)		2030 CRC LRT/ETS		2030 CRC BRT/ETS	
C003CW	Kauffman-Columbia (Clockwise Columbia Wy / Grand / 33rd / Kauffman) Serves Waterfront	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C003CCW	Columbia- Kauffman (Counterclockwise of C003CW Route)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C003C	**Kauffman-Columbia (Clockwise Grand / 33rd / Kauffman) No service to Marine Park**	30	30	30	30	30	30	30	30	**30**	**30**	30	30	**30**	**30**	30	30	30	30	N/A	N/A
C003CC	**Columbia- Kauffman (Counterclockwise of C003C Route)**	30	30	30	30	30	30	30	30	**30**	**30**	30	30	**30**	**30**	30	30	**30**	30	N/A	N/A
C003CEX	**Kauffman-Columbia (Clockwise 7St/ Kauffman/ 33St/ Grand/ Columbia Wy to Wintler Park/ New Boise Cascade Development)**	**N/A**	**N/A**	**N/A**	**N/A**	N/A	N/A	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**30**
C003CWX	**Columbia-Kauffman (Counterclockwise of C003CEX without service to Wintler Park)**	**N/A**	**N/A**	**N/A**	**N/A**	N/A	N/A	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**15**	**30**
C003ACW	**Service Redesign: Clockwise Downtown Circulator (8th / Broadway / Evergreen / Washington / 8th / Franklin / 11th / Kauffman / 33rd / Grand / Columbia Wy to Wintler Park / New Boise Cascade Development / interlines w/ #2SR at 6th & Columbia)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C003BCCW	**Service Redesign: Counterclockwise Circulator (#2SR becomes #3BCCW at 13th & Washington / Washington / 4th / Columbia Wy / Grand (no service to Wintler Park) / 33rd / Kauffman / 11th / Franklin / 8th / Broadway / interlines with #3ACW)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004	Fourth Plain (VCBD / Van Mall)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C004A	Fourth Plain (VCBD / FLTC)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C004L	Fourth Plain (VCBD / Van Mall w/ Limited Stops)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C004O	**Fourth Plain (Ward Rd / Van Mall / 4th Plain / Main / Mill Dist / 7th St)**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**60**	**30**	**15**	**20**	**15**	**30**	**15**	**30**	**15**	**N/A**	**N/A**	**15**	**10**	**N/A**	**N/A**
C004MG	**Local 4th Pl Van Mall to Expo in Guideway (Van Mall / 4th Plain / Main / Mill Dist / 7th St / Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**60**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**15**	**N/A**	**N/A**	**N/A**	**15**
C004OG	**Local Fourth Plain to Expo in Guideway (Ward Rd/Van Mall / 4th Plain / Main / Mill Dist / 7th St / Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**60**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**N/A**	**N/A**	**N/A**	**7.5**	**N/A**
C004LSP	**Fourth Plain Ltd w/Signal Priority at Ft Vanc. Wy & 4th Plain and Ft Vanc. Wy & McLoughlin (Van Mall / 4th Plain / Ft Vanc Wy / Clk Col PR / Mill Dist / 7th St)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**10**	**0**	**10**	**0**	**15**	**0**	**15**	**0**	**N/A**	**N/A**	**10**	**0**	**N/A**	**N/A**
C004OSP	**Fourth Plain w/Signal Priority (Ward Rd / Van Mall / 4th Plain / Main / Mill Dist / 7th St)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004Van	**Fourth Plain (Van Mall / 4th Plain / Main / McLoughlin / Broadway / Mill District / Evergreen / 8th St / Broadway)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004LW	**Fourth Plain Ltd w/Sig Priority (Ward Rd / Van Mall / 4th Plain / Ft Vanc Wy / McLoughlin / Mill Dist / Broadway / Evergreen / 8th / Broadway)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004PIR	**Fourth Plain Service Redesign (Van Mall / 4th Plain / Main/Broadway / Mill D/7th St / I-5 / Hayden Is. / PIR)**	**15**	**15**	**15**	**15**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004PIRX	**Fourth Plain Ltd Service Redesign (Ward Rd / Van Mall / 4th Plain / Ft Vanc Wy / McLoughlin / WA / I-5 / PIR)**	**30**	**0**	**30**	**0**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004PQJ	**Fourth Plain Service Redesign w/QJ (Van Mall / 4th Plain/ Mill District/ Main/Broadway /7th/ I-5 / Hayden Is / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004PKG	**Fourth Plain Lmtd Guideway Peak Trip(Clark College PR /McLoughlin/ WA-Guideway /7th/ Hayden Is. / Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**0**	**0**	**N/A**	**N/A**	**N/A**	**N/A**
C004PK	**Fourth Plain Ltd Peak Trip Guideway (Clark College PR / McLoughlin / WA /7th/ I-5 / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**NA**	**N/A**	**N/A**	**N/A**	**NA**	**N/A**
C004PQJX	**Fourth Plain Ltd Service Redesign w/QJ (Ward Rd / Van Mall / 4th Plain / Ft Vanc Wy /McLoughlin / WA /7th/ I-5 / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004DPX	**Fourth Plain Ltd - Mall to PIR w/ QJs & Sig Priority (Van Mall / 4th Plain / Ft Vanc Wy /McLoughlin/Mill/ Washington /7th/ I-5 / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004G	**Fourth Plain Guideway Ltd (Van Mall / 4th Plain / Ft Van Wy/Clark PR/McLoughlin-BRT Guideway /Mill/ WA-Guideway /7th/ Hayden Is. / Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**10**	**15**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**15**	**0**	**N/A**	**N/A**	**7.5**	**0**
C004HIP	**Fourth Plain Service Redesign with build highway longer route on Hayden Is. (Van Mall / 4th Plain / Main / Mill D / Washington / 7th St / SR-14 LoopPR / I-5 / Hayden Is. / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004SR	**Service Redesign: Fourth Plain (Van Mall / 4th Plain / Main St / McLoughlin / Broadway / 8th / Washington / I-5 / Hayden Is. (longer Build Hwy routing) / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C004LSR	**Service Redesign: Fourth Plain Limited Stop (Ward Rd / Fourth Plain / Van Mall / 4th Plain / Ft Vanc Wy / Evergreen / Washington / I-5 / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C006	**Hazel Dell (99TC / Hazel Dell / KigPR / LincPR / Mill DistPR / 7th Street)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**N/A**	**N/A**	**30**	**30**	**N/A**	**N/A**
C006M	Hazel Dell to Mill Dist (Hazel Dell / KigPR / LincPR / Mill Dist)	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C006K	Hazel Dell to Kiggins Bowl (Hazel Dell / KigPR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C006NN	**Service Redesign: Hazel Dell to Evergreen (99TC / 94th / Hazel Dell / Main / Mill Dist / Broadway / Evergreen / Interline w/ #32 at Evergreen&C St)**	**30**	**30**	**30**	**30**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C006PIRQ	**Hazel Dell to PIR w/ Signal Priority (99PR / KigPR&orLincPR / Mill Dist / 7th St / QJ / PIR)**	**NA**	**N/A**	**NA**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

DRAFT

Columbia River Crossing Study

DRAFT

Transit Line Listing		2007 C-TRAN Serv. Redesign – Updated to match Nov. 18, 2007 Service Change and No-Build Highway		2030 No Action NA-3 – Old 2007 C-TRAN Service Redesign		BRT Full Length - I-5 2030 CRC T-8 – 2030 CRC BRT Local Bus Network (Some Changes to C-TRAN Redesign)		LRT - MOS to Clark 2030 CRC T-11 – 2030 CRC LRT to Clark w/ Local Bus Network		LRT - MOS to Mill 2030 CRC T-21.2 – 2030 CRC LRT to Clark w/ Local Bus Network		LRT Full Length - I-5 2030 CRC T-9 – 2030 CRC LRT Local Bus Network (Some Changes to C-TRAN Redesign)		Opt. LRT - Main St 2030 CRC T-17.3 – 2030 CRC LRT Local Bus Network (Initial Summit Run)		BRT - Main Street 2030 CRC T-18.1 – 2030 CRC BRT (initial Summit Run)		ETS - LRT Main St 2030 CRC T-19.1 – 2030 CRC LRT/ETS		ETS - BRT Main St 2030 CRC T-20.1 – 2030 CRC BRT/ETS	
C006VG	**Hazel Dell to VCBD enters guideway at McLoughlin (99PR / KigPR / Mill Dist / 7th St)**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**30**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**30**	**N/A**	**N/A**	**10**	**30**
C006G	**Hazel Dell to Expo enters guideway at McLoughlin (99PR / KigPR / Mill Dist / 7th St / Guideway to Hayden Island and Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**30**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C007	Battleground (Van Mall / Central Co PR / BG)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C007C	Battleground Circulator	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C007LIB	**Battleground (Van Mall / Central Co / SR503 / BGPR / BG Library)**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**30**	**30**	**15**	**30**
C019A	**Salmon Creek Shuttle CCW Loop (WSU / SCPR / Felida Loop /99PR)**	**30**	**60**	**30**	**60**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C019B	**Salmon Creek Shuttle CW Loop (99PR / Felida Loop / SCPR / WSU)**	**30**	**60**	**30**	**60**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C025	St. Johns	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C025G	**St Johns (Expo/HI/7th St/CCPR/St Johns/99PR/WSU) in Guideway**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C025PIR	**St Johns (PIR/HI/7th St/CCPR/St Johns/99PR/WSU)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C025WSU	St. Johns (7th St / CCPR / St Johns / 99PR / WSU)	N/A	N/A	N/A	N/A	30	30	30	30	30	30	30	30	**30**	**30**	**30**	**30**	**15**	**15**	**15**	**15**
C025NN	**St. Johns (Evergreen&Broadway / CCPR / St. Johns / 99PR) Interline w/ #1LMI in NA-3 Only**	**30**	**30**	**30**	**30**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C025SVN	**St. Johns (7th/Evergreen&Broadway / CCPR / St. Johns / 99PR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C025SR	**Service Redesign: St. Johns (13th&Washington / Evergreen / Ft Vanc Wy / St. Johns Blvd / 50th / 99th / 25th / 88th / 15th / 99th / 99TC)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C030	Burton (FLTC to Van CBD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C030Mc	Burton via McGillvray (FLTC / Evgn PR / CCPR / 7th Street)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C030C	**Burton with Signal Priority (FLTC / 164th / Columbia Tech Ctr / 162nd / 39th / 28th/Burton / Andresen / 18th / McLoughlin / Clk Col PR / Mill Dist / 7th)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**N/A**	**N/A**	**15**	**15**	**N/A**	**N/A**
C030CTC	**Burton with Signal Priority (FLTC / 164th / Columbia Tech Ctr / 162nd / 39th / 28th/Burton / Andresen / 18th / McLoughlin / Clk Col PR / Mill Dist)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C030M	**Burton (FLTC / 164th / Columbia Tech Ctr / 162nd / 39th / 28th / Burton / Andresen / 18th / McLoughlin / Clk Col PR / Mill Dist / Evergreen / Ft Vanc Wy)**	**30**	**30**	**30**	**30**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C030PIRQ	**Burton w/Signal Priority (FLTC / 164th / Columbia Tech Ctr / 162nd / 39th / 28th/Burton / Andresen / 18th / McLoughlin / Clk Col PR / Mill Dist / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C030T	**Burton Tripper to 7th Ave (86th/Burton / 39th / 28th/Burton / Andresen / 18th /Clark P&R/McLoughlin-Guideway / 7th Street)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**240**	**0**	**120**	**0**	**240**	**0**	**240**	**0**	**120**	**0**	**60**	**0**	**60**	**0**
C030G	**Burton in Guideway to Expo (FLTC / 164th / Columbia Tech Ctr / 162nd / 39th / 28th/Burton / Andresen / 18th /Clark P&R/ McLoughlin-Guideway / 7th Street / Hayden Is / Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**30**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**30**	**N/A**	**N/A**	15	15
C030SR	**Service Redesign: Burton (FLTC / 164th / Columbia Tech Ctr / 162nd / 39th / 138th / 28th / Burton / Andresen / 18th / Grand / McLoughlin / Broadway / Evergreen / Washington / 8th / Broadway)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C030TSR	**Burton Tripper to 8th Ave (86th / Burton / 25th / Andresen / 18th / Grand / McLoughlin / Broadway / Evergreen / Washington / 8th / Broadway)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C032	Evergreen/Andresen (Van Mall / Van CBD) Interline with #6	30	30	30	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C032VCBD	**Evergreen/Andresen (Van Mall / 7th Street)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**60**	**30**	**60**	**30**	**60**	**30**	**60**	**N/A**	**N/A**	**15**	**30**	**N/A**	**N/A**
C032VG	**Evergreen/Andresen (Van Mall /Evergreen/WA-Guideway/ 7th Street)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**60**	**N/A**	**N/A**	**30**	**15**
C032PIRQ	**Evergreen/Andresen w/Signal Priority and QJ (Van Mall / 7th Street / QJ / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C032G	**Evergreen/Andresen (Van Mall / Evergreen / WA-Guideway / Hayden Island / Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**60**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C037	Mill Plain	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C037CTC	**Mill Plain (Mill District / Mill Plain / CCPR / 164th / Mill Plain / 192nd / 164th / FLTC)**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**30**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C037TC	**Mill Plain w/signal priority on Wa (7th / Mill Dist / Mill Plain Blvd / CCPR / Hudson Bay HS / 164th / 192nd / 164th / FLTC)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**60**	**15**	**60**	**15**	**60**	**15**	**60**	**15**	**N/A**	**N/A**	**30**	**10**	**N/A**	**N/A**
C037TCG	**Mill Plain Local to Expo in Guideway (Expo / 7th / Mill Dist / Mill Plain Blvd / CCPR / Hudson Bay HS / 164th / 192nd / 164th / FLTC)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	N/A	N/A	**N/A**	**N/A**	**60**	**15**	**N/A**	**N/A**	**30**	**10**
C037L	Mill Plain Limited Stop (FLTC / 7th Street)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C037SVN	**Mill Plain Limited Stop (FLTC / Mill Dist / 7th Street)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**15**	**0**	**15**	**0**	**15**	**0**	**15**	**0**	**N/A**	**N/A**	**10**	**0**	**N/A**	**N/A**
C037MDL	**Mill Plain Limited Stop (FLTC / Mill Dist)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C037CC	**Mill Plain (7th Street / Broadway / Mill Plain / CCPR / Hudson Bay HS / 164th / FLTC) Interline w/ #71NN**	**15**	**15**	**15**	**15**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C037PIRX	**Mill Plain-PIR Limited Stop w/QJ & Signal Priority (FLTC/ Mill Dist / 7th Street / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C037G	**Mill Plain-Expo Lmtd in Guideway (FLTC / Mill Plain / WA-Guideway / Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**10**	**15**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**15**	**0**	**N/A**	**N/A**	**7.5**	**0**

DRAFT

Columbia River Crossing Study		2007		2030		BRT Full Length - I-5		LRT - MOS to Clark		LRT - MOS to Mill		LRT Full Length - I-5		Opt. LRT - Main St		BRT - Main Street		ETS - LRT Main St		ETS - BRT Main St	
		C-TRAN Serv. Redesign		No Action NA-3		2030 CRC T-8		2030 CRC T-11		2030 CRC T-21.2		2030 CRC T-9		2030 CRC T-17.3		2030 CRC T-18.1		2030 CRC T-19.1		2030 CRC T-20.1	
Transit Line Listing		Updated to match Nov. 18, 2007 Service Change and No-Build Highway		Old 2007 C-TRAN Service Redesign		2030 CRC BRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT Local Bus Network (Initial Summit Run)		2030 CRC BRT (initial Summit Run)		2030 CRC LRT/ETS		2030 CRC BRT/ETS	
C037SR	Service Redesign: Mill Plain (FLTC / 164th / Mill Plain / Broadway / Evergreen / Washington / 8th / Interline w/ #71SR at Mill Plain&Broadway)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C037LSR	Limited Stop version of Service Redesign Route: Mill Plain Limited (FLTC / 164th / Mill Plain / Broadway / Evergreen / Washington / 8th / Broadway)							N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C039	Clark Coll/Med Cen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C039Mall	Clark Coll/Med Center/VanMall	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C050LC	La Center (99th Street P&R via NE 10th Ave)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	30	30	30
C051R	Ridgefield (SCPR via Pioneer/ Hillhurst/ Royle Lp and 31Av/ 199St/ NW11Av/ 149St/ NE10Av/ SCPR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	60	30	60
C052VL	Vancouver Lake (99TC/ 4th Pl/ Lwr Rvr Rd/ Amtrak/ 7th Street)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	60	15	60
C053E	East Vanc (VNML/ 4th Pl/ 162Av/ SE1St/ SE34St/ FLTC)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	60	30	60
C054CCF	Clark Co. Fairgrounds (99TC/ Hwy99/ 20Av/ 15Av/ 179St/ Delfel/ 10Av/ SCPR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	60	30	60
C071	Highway 99 (99PR / 7th Street)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071SC	Highway 99 (SCPR / 99PR / KigPR / Mill Dist / 7th Street)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071K	Highway 99 (SCPR to Kiggins Bowl PR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071LFIV	Highway 99 Lmtd to 7th via I-5 (SCPR, 99th, Hwy99, I-5, Mill Plain,Mill District,7th)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	0	N/A	N/A	15	0	N/A	N/A
C071FIV	Highway 99 Local to 7th via I-5 (SCPR, 99th,Hwy99, I-5, Mill Plain,Mill District,7th)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	15	N/A	N/A	15	10	N/A	N/A
C071LNCL	Highway 99 Limited to Lincoln (SCPR, 99th, Lincoln P&R)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071V	Highway 99 to 7th Street (SCPR / 99PR / KigPR / Mill Dist / 7th Street)	N/A	N/A	N/A	N/A	N/A	N/A	30	15	30	15	30	15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071XPO	Highway 99 to Expo Local in Guideway (SCPR / 99PR / KigPR / Mill Dist / 7th St / Expo)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	15	N/A	N/A	15	10
C071LV	Highway 99 Limited to 7th Street (SCPR / 129th / 117th / 104th / 99PR / 88th / 78th / KigPR / 33rd / Fourth Plain/24th / Mill Dist / 12th / 7th Street)	N/A	N/A	N/A	N/A	N/A	N/A	30	0	30	0	30	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071ML	Highway 99 Limited to Mill District (SCPR / 129th / 117th / 104th / 99PR / 88th / 78th / KigPR / LincPR / 33rd / 24th / Mill Dist)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071M	Highway 99- Mill District local (SCPR / 99PR / KigPR / LincPR / MillDist)	N/A	N/A	N/A	N/A	30	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071MSP	Highway 99- Mill District w/Signal Priority (SCPR / 99PR / KigPR / LincPR / Mill Dist)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071LK	Highway 99 Lmtd to Kig (SCPR / 117th / 99PR / 88th / 78th / Minnehaha / KigPR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071NN	Highway 99 (7th Street / Broadway / Main / Hwy 99 / KigPR / 99PR / SCPR) Interline w/ #37CC	15	15	15	15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071LN	Highway 99 Lmtd Shorter Peak Only (99PR / KigPR / Mill Dist / 7th Street)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071PKL	Highway 99 Lmtd Short Peak-Only (Lincoln/Mill/WA/7th St/Hayden Island/PIR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071PK	Highway 99 Lmtd Short Peak-Only (Kiggins/Lincoln/Mill/WA/7th St/Hayden Island/PIR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071PKG	Highway 99 Guideway Lmtd Short (Lincoln-Guideway/Mill/WA/7th St/Hayden Island/Expo)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15	15	N/A	N/A	15	10
C071PIRX	Hwy 99 Lmtd w/Signal Priority (SCPR / 99PR / KigPR / Mill Dist / 7th Street / PIR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071L	Highway 99 Limited (SCPR / 99PR / KigPR / Mill Dist / 7th Street)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071G	BRT Hwy 99 to Expo (SCPR / 99PR / KigPR - I-5 Guideway / Mill Dist / WA-guideway / 7th Street / Expo)	N/A	N/A	N/A	N/A	15	15	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071GL	BRT Hwy 99 to Expo (SCPR / 99PR / LincPR - Main Street Guideway / Mill Dist / WA / 7th Street / Hayden Is / Expo)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	0	N/A	N/A	15	0
C071T	Lmtd Tripper Lincoln P&R to Mill Dist (LincPR / Main Street / Mill Dist)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071LPIR	Highway 99 Limited (99PR / KigginsPR / LincolnPR / 7th Street / SR-14 LoopPR / I-5 / PIR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071LI5	BRT Hwy 99 to Expo (SCPR / 99PR / KGPR / Guideway to CCPR / McLoughlin Guideway / Mill Dist / WA / 7th Street / Hayden Is / Expo)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071SI5	Highway 99 Guideway Lmtd Short (KGPR / Guideway to CCPR / McLoughlin / MDTC / WA / 7th St / Hayden Island / Expo)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071I5	Highway 99 to Expo Local outside of Guideway on Main Street (SCPR / 99PR / KigPR / Main Street / Mill Dist / 7th St / Hayden Island / Expo)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C071HIS	Lincoln P&R to PIR Shortline (LincolnPR / 33rd / 24th / Mill DistPR / 12th / 7th / Hayden Island / PIR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Columbia River Crossing Study		2007 C-TRAN Serv. Redesign		2030 No Action NA-3		BRT Full Length - I-5 2030 CRC T-8		LRT - MOS to Clark 2030 CRC T-11		LRT - MOS to Mill 2030 CRC T-21.2		LRT Full Length - I-5 2030 CRC T-9		Opt. LRT - Main St 2030 CRC T-17.3		BRT - Main Street 2030 CRC T-18.1		ETS - LRT Main St 2030 CRC T-19.1		ETS - BRT Main St 2030 CRC T-20.1	
Transit Line Listing		Updated to match Nov. 18, 2007 Service Change and No-Build Highway		Old 2007 C-TRAN Service Redesign		2030 CRC BRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT Local Bus Network (Initial Summit Run)		2030 CRC BRT (initial Summit Run)		2030 CRC LRT/ETS		2030 CRC BRT/ETS	
C071SR	**Service Redesign: Highway 99 (SCPR / Hwy 99 / 99TC / Hwy 99 / Main St / McLoughlin / Broadway / Interline w/37SR at 15th & Broadway)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C071LSR	**Highway 99 Limited to 8th Street based on Service Redesign routing (SCPR / Hwy 99 / 99TC / Hwy 99 / Main St / McLoughlin / Broadway / Evergreen / Washington / 8th / Broadway)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C071TSR	**Lmtd Tripper Lincoln P&R to Mill District (Lincoln P&R / Main / McLoughlin / Broadway / Mill District)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C072	Orchards	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C072E	**Orchards (Van Mall / 4th Plain / Ward / Orchards Loop)**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**
C078	78th Street (99PR to Evrg PR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C078Evgn	78th St (99PR / Van Mall / Evgn PR) Interline w/ 32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C078NN	**78th St (99PR / Hwy 99 / 78th / Andresen / Van Mall) Interline w/ #80E in NA-3 Only**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**30**	**60**	**30**	**60**
C080	Van Mall / Fishers	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C080WMS	Van Mall / 112th (WyEast Middle School)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C080E	**Van Mall to Fishers (VanMall / 4th Plain / 112th / 28th / Evgrn PR / Mt. View HS / FLTC) Interline w/ #78NN in NA-3 Only**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**60**	**30**	**30**	**30**	**30**
C092	**Camas/Washougal (FLTC / Camas / Washougal)**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**15**	**30**	**15**	**30**
C093	SE 34th/LaCamas (Fishers/LaCamas Lake/Camasl)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C093C	**Camas Loop (FLTC/ 164Av/ 1St/ 192Av/ 13St/ Goodwin/ SR500/ dwtn Camas/ Lake/ Parker/ 38Av/ 20St/ Bybee/ 15St/ FLTC)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**60**	**60**	**60**	**60**
C100SC	**P&R Shuttle (KigPR / 99PR / SCPR)**	**N/A**	**N/A**	**N/A**	**N/A**	**30**	**60**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C100LNC	**P&R Shuttle (Linc PR / 99PR / SCPR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C100CLK	P&R Shuttle (Clk ColPR / Ross RdPR / KigPR / 99PR / SCPR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C105P	I-5 Express to PCBD (PRM) (NOTE 1.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C105ML	I-5 Express to PRM in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C105QJ	I-5 Express to PCBD uses Queue Jump from V CBD to I-5 SB (NOTE 1.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C105NN	**I-5 Express (99th St / I-5 / 15th-MillPlain / Washington-Columbia in VanCBD / I-5 / PCBD)**	**30**	**60**	**30**	**60**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C105NQ	**I-5 Express w/99th St QJ (99PR / I-5 / 15th-MillPlain / Washington-Columbia in VanCBD / I-5 / PCBD)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C105SR	**Service Redesign: I-5 Express w/99th St QJ SB: (99TC / I-5 / Mill Plain / Washington / I-5) NB: (I-405 / I-5 / Broadway / Mill Plain / I-5 / 99TC)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C105VN	**I-5 Express w/99th St QJ (99TC / I-5 / KigginsPR / LincPR / Main St / Mill DistPR / Washington St / SR-14 LoopPR / SR-14 Loop onramp / I-5 / PCBD)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C114X	Camas/Washougal LTD to PCBD (via VCBD)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C114MLQ	Camas/Washougal LTD to PCBD (via VCBD) in Managed Lane (Note 1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C114V	**Camas/Washougal LTD to FLTC and Van CBD (7th St)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**240**	**0**	**240**	**0**	**240**	**0**	**240**	**0**	**N/A**	**N/A**	**60**	**0**	**N/A**	**N/A**
C114Q	Camas/Washougal LTD to PCBD (via VCBD) with Queue Jump (Note 1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C114PIR	**Camas/Washougal LTD to PIR (SR14 / FLTC / 7th Street / PIR) QJ**	**120**	**0**	**120**	**0**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C114PIRQ	**Camas/Washougal LTD to PIR (SR14 / FLTC / 7th Street /Hayden Island/ PIR) QJ (Note 4)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C114G	**Camas/Washougal LTD to Expo (SR14 / FLTC / 8th St-Guideway / 7th Street / Hayden Is / Expo)**	**N/A**	**N/A**	**N/A**	**N/A**	**60**	**60**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**240**	**N/A**	**N/A**	**N/A**	**60**	**N/A**
C114SR	**Service Redesign: Camas/Washougal LTD to PIR w/ ramp queue jumps (SR14 / FLTC / Broadway / Evergreen / Washington / I-5 / PIR)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C134P	Salmon CreekExp PRM to PCBD	12	0	12	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C134Q	**Salmon Creek Exp PRM to PCBD w/Queue Jump**	**N/A**	**N/A**	**N/A**	**N/A**	**12**	**0**	**12**	**0**	**12**	**0**	**12**	**0**	**12**	**0**	**12**	**0**	**10**	**0**	**10**	**0**
C134ML	Salmon Creek Exp PRM to PCBD in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C134 MLT	Salmon Creek Exp PRM to PCBD in partial Managed Lane & Queue Jump	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C157P	BPA to Lloyd Center PRM (Van Mall / BPA / Lloyd Ctr)	60	0	60	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C157PML	BPA to Lloyd Center PRM in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C157SR	**Service Redesign: 99TC to Lloyd District w/ Queue jumps (99TC / 99th / I-5 / Lloyd District)**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C164P	Fishers PR Exp PRM to PCBD (return via I-5)	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	10	0	10	0
C165X	Fishers Exp to Gateway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173L	Battle Ground Express to Salmon Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173Van	**Battle Ground Express to VCBD via Main St**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**240**	**0**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
C173VML	Battle Ground Express to VCBD via Main in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Columbia River Crossing Study		2007 C-TRAN Serv. Redesign		2030 No Action NA-3		BRT Full Length - I-5 2030 CRC T-8		LRT - MOS to Clark 2030 CRC T-11		LRT - MOS to Mill 2030 CRC T-21.2		LRT Full Length - I-5 2030 CRC T-9		Opt. LRT - Main St 2030 CRC T-17.3		BRT - Main Street 2030 CRC T-18.1		ETS - LRT Main St 2030 CRC T-19.1		ETS - BRT Main St 2030 CRC T-20.1	
Transit Line Listing		Updated to match Nov. 18, 2007 Service Change and No-Build Highway		Old 2007 C-TRAN Service Redesign		2030 CRC BRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT to Clark w/ Local Bus Network		2030 CRC LRT Local Bus Network (Some Changes to C-TRAN Redesign)		2030 CRC LRT Local Bus Network (Initial Summit Run)		2030 CRC BRT (initial Summit Run)		2030 CRC LRT/ETS		2030 CRC BRT/ETS	
C173VG	Battle Ground Express to VCBD Guideway (BG /I-5/ Main St/ Mill Dist/7th)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173K	Battle Ground Express to Kiggins in Managed Lanes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173KQ	Battle Ground Express to Kiggins with QJ's (Yacolt / BG / 219PR / KigPR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173FIV	Battle Ground Express to 7th via I-5 (Yacolt / BG / 219PR / I-5 / Mill Plain / Mill District / 7th St)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	240	0	240	0	N/A	N/A	60	0	N/A	N/A
C173LNQ	Battle Ground Express to Lincoln P&R with QJ's (Yacolt / BG / 219PR / LincolnPR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173MLT	Battle Ground Express to Kiggins in partial Managed Lanes on Main St.(Note 3)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173PIR	Battle Ground Express to PIR via VCBD (Yacolt / BG / 219PR / KigPR / Mill Dist / 7th Street / PIR)	120	0	120	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173PIRL	Battle Ground Express to PIR via VCBD (Yacolt / BG / 219PR / Lincoln PR / Mill Dist / 7th Street /Hayden Island/ PIR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173PQJ	Battle Ground Exp to PIR via VCBD w/ Queue Jumps (Yacolt / BG / 219PR / Mill Dist / 7th Street /Hayden/ PIR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173G	Battle Ground Exp to Expo via VCBD in Guideway (Yacolt / BG / 219PR /KigPR / Main /Mill D/ WA-Guideway /7th/ Hayden Is / Expo)	N/A	N/A	N/A	N/A	120	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173GL	Battle Ground Exp to Expo via VCBD in Guideway (Yacolt / BG / 219PR / LincolnPR enters Main St Guideway / Main / Mill / 7th Street / Hayden Is / Expo)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	240	0	N/A	N/A	60	0
C173CLK	Battle Ground Express to Clark College P&R (Yacolt / BG / 219PR / Clk Col PR)	N/A	N/A	N/A	N/A	N/A	N/A	240	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C173SR	Service Redesign: Battle Ground Exp to PIR via VCBD w/ Queue Jumps (Yacolt / BG / 219PR / I-5 / Mill Plain / Broadway / 8th / Washington / I-5 / PIR)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C177P	Evergreen PR to PCBD (return via I-5, SR 14)	60	0	60	0	60	0	60	0	60	0	60	0	60	0	60	0	30	0	30	0
C183	Central County P&R to PCBD via I-205	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0
C190P	Marquam Hill Express PRM (Kmart / BPA / Marq Hill)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C190PML	Marquam Hill Express PRM, BPA in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C190K	Kmart/Kiggins/Marquam Hill Express PRM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C190KML	Central Co / I-205 / SR500 / KigPR / M Hill Express PRM in Managed Lanes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C190Cen	Central Co / I-205 / SR500 / KigPR / M Hill Express PRM (Note	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C190MH	Central Co / I-205 / SR500 / KigPR / M Hill Express PRM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C190KPR	Central Co / I-205 / SR500/39th/Main/Kiggins PR / Main/39th/ I-5/M Hill Express PRM	N/A	N/A	N/A	N/A	60	0	60	0	60	0	60	0	60	0	60	0	30	0	30	0
C190CCo	Central Co / I-205 / SR500 / BPA / M Hill	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C190CCV	Central Co / I-205 / Van Mall / SR500 / BPA / M Hill	60	0	60	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C190VM	Van Mall / SR500 / BPA / M Hill	60	0	60	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C199P	99th Express to PCBD	15	0	15	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C199Q	99th Express to PCBD with Queue Jump at 99th/I-5	N/A	N/A	N/A	N/A	15	0	10	0	10	0	10	0	10	0	10	0	7.5	0	4	0
C199ML	99th Express to PCBD in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C199MLT	99th Express to PCBD in partial Managed Lanes (Note 3)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C219X	219th Express to PCBD	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0	15	0
C219XML	219th Express to PCBD in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C219MLT	219th Express to PCBD in partial Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C265X	Fishers-Pk Rose Exp.	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	7.5	15	7.5	30
C299X	99th Express to Delta Park	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C299XML	99th Express to Delta Park in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C300S	Battle Ground SHTL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C300SML	Battle Ground SHTL in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C301S	Ridgefield SHTL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C301SML	Ridgefield SHTL ML	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C301RDG	Ridgefield - 99th Street P&R SHRL (99PR / Ridgfld)	60	N/A	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C301RQJ	Ridgefield - 99th Street P&R SHRL w/QJ (99PR / Ridgfld)	N/A	N/A	N/A	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	60	N/A	N/A	N/A	N/A	N/A
C302S	La Center SHTL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C302SML	La Center SHTL in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C302LC	La Center - 99th Street P&R SHTL (99PR / LaCenter)	90	N/A	90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C302LCQ	La Center-99th PR SHTL w/ QJs (99PR / LaCenter)	N/A	N/A	N/A	N/A	90	N/A	90	N/A	90	N/A	90	N/A	90	N/A	90	N/A	N/A	N/A	N/A	N/A
C303S	Yacolt Shuttle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C303SML	Yacolt Shuttle in Managed Lane	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C304RLC	Ridgefield - 99th Street P&R SHRL (99PR / Ridgfld)	N/A	120	N/A	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C304RLQ	Ridgefield-99th P&R SHRL w/ QJ (99PR / Ridgfld)	N/A	N/A	N/A	N/A	N/A	120	N/A	120	N/A	120	N/A	120	N/A	120	N/A	120	N/A	N/A	N/A	N/A

Source: Metro, TriMet, C-TRAN

C. Appendix C: No-Build Project List

Metro's 2004 Regional Transportation Plan (RTP) - Financially constrained system in City of Portland only

RTP #	2040 Link	Jurisdiction	Project Name (Facility)	Project Location	Project Description	2020 RTP Priority System	2030 RTP Illustrative System	2030 RTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	RTP Program Years	Primary Modal Type	Primary Mode	2040 Category
1024	Central City	ODOT	I-5/McLoughlin Ramps	McLoughlin to I-5 north at Division	Construct new I-5SB off-ramp and I-5 NB on-ramp at McLoughlin Boulevard	X	X	X	$ 23,100,000	2016-25	13	mv	1
1025	Central City	ODOT	I-5/North Macadam Access Improvements	NB I-5 to NB Macadam Avenue	Construct new off-ramp	X	X	X	$ 20,000,000	2016-25	13	mv	1
1027	Central City	Portland/ODOT	South Portland Improvements	South Portland sub-area	Redesign Naito Pkwy as a neighborhood collector and reconnect east-west local streets. Rebuild Ross Island Bridge Ramps to separate regional traffic from neighborhood streets and improve access to I-405 and I-5	X	X	X	$ 28,293,000	2010-15	13	mv	1
1028	Central City	Portland/ODOT	Kerby Street Improvements	Kerby Street at I-5	Improve I-405/Kerby Street interchange to calm traffic and improve local access	X	X	X	$ 515,000	2004-09	1	mv	1
1029	Central City	Portland	SE Water Avenue Extension	SE Water Avenue	Extend SE Water Avenue from Carruthers to Division Place	X	X	X	$ 288,750	2004-09	1	mv	2
1030	Central City	ODOT	Ross Island Bridge Interchange	East approach to Ross Island Bridge	Interchange improvement	X	X	X	$ 5,082,000	2016-25	13	mv	2
1032	Central City	Portland	Southern Triangle Circulation Improvements	Between the Ross Island Bridge - Hawthorne Bridge/ Willamette River - SE Grand-MLK	Improve local street network and regional access routes in the area. Improve highway access route from CEID to I-5 SB via the Ross Island Bridge	X	X	X	$ 2,887,500	2016-25	1	mv	2
1035	Central City	Portland	SW Columbia Street Reconstruction	18th Avenue to Naito Parkway	Rebuild street	X	X	X	$ 924,000	2004-09	1	mv	1
1036	Central City	Portland	Broadway/Flint Arena Access	Broadway/Flint at Rose Quarter	Intersection realignment	X	X	X	$ 358,050	2004-09	1	mv	1
1037	Central City	Portland	Bybee Boulevard Overcrossing	Bybee Boulevard/McLoughlin Boulevard	Replace substandard 2-lane bridge with 2-lane bridge with standard clearance	X	X	X	$ 4,042,500	2010-15	1	mv	1
1039	Central City	Portland	SE Belmont Ramp	Belmont ramp of Morrison Bridge, eastside	Reconstruction of the ramp to provide better access to the Central Eastside	X	X	X	$ 1,732,500	2010-15	1	mv	1
1047	Central City	Portland	SE Seventh-Eighth Avenue Connection	Central Eastside Industrial District	Construct new street connection from SE Seventh to Eighth Avenue at Division Street	X	X	X	$577,500	2010-15	1	mv	2
1051	Central City	Portland	W. Burnside Street Improvements	W 15th to NW 23rd	Boulevard design improvements including pavement reconstruction, wider sidewalks, curb extensions, safer crossings, traffic signals at W 20th Pl and W 22nd, and traffic management to limit motorist delays	X	X	X	$10,000,000	2004-09	4	blvd	1
1052	Central City	Portland	North Macadam Street Improvements	South Waterfront District of the central city	Implement street improvements identified in the South Waterfront Framework Plan, including Bancroft, Bond, Curry, River Parkway, Harrison connector, key access intersections and other street improvements	X	X	X	$20,501,250	2004-09	1	mv	1

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RTP #	2040 Link	Jurisdiction	Project Name (Facility)	Project Location	Project Description	2020 RTP Priority System	2030 RTP Illustrative System	2030 RTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	RTP Program Years	Primary Modal Type	Primary Mode	2040 Category
1053	Central City	Portland	Naito Parkway Improvements	NW Davis to SW Market	Complete boulevard design improvements, including bike lanes, pedestrian crossings and pavement reconstruction	X	X	X	$ 7,400,000	2004-09	4	blvd	1
1054	Central City	Portland	Broadway/Weidler Improvements, Phase II and III	At Arena and 15th Avenue to 24th Avenue	Complete boulevard design improvements and ITS	X	X	X	$ 6,456,450	2004-09	4	blvd	1
1055	Central City	Portland/ODOT	MLK/Grand Improvements	Central Eastside and Lloyd districts	Complete boulevard design improvements	X	X	X	$ 3,465,000	2016-25	4	blvd	1
1082	Central City	Portland	SE Grand Avenue Bridgehead Improvements	Central Eastside Industrial District	Reconstruct west edge of SE Grand at bridgehead to provide sidewalks and urban standard turn lanes for vehicles and truck safety and access	X	X	X	$ 1,600,000	2004-09	6	ped	1
1084	Central City	Portland	Clay/Second Pedestrian/Vehicle Signal	SW Clay Street and SW Second Avenue	New signal installation	X	X	X	$ 115,500	2004-09	6	ped	1
1089	Central City	Portland	East Burnside/NE Couch Couplet and Street Improvements	East 12th Avenue to Burnside Bridge	Implement a one-couplet design including new traffic signals, widened sidewalks, curb extension, bike lanes, on-street parking and street trees	X	X	X	$ 7,500,000	2010-15	4	blvd	1
1090	Central City	Portland	W Burnside/NW Couch Couplet and Street Improvements	Burnside Bridge to West 15th Avenue	Implement a one-couplet design including new traffic signals, widened sidewalks, curb extension, bike lanes, on-street parking and street trees	X	X	X	$ 7,500,000	2010-15	4	blvd	1
1096	Central City	Portland	Barbur/I-5 Corridor Study	I-405 to Highway 217	Assess corridor improvement options	X	X	X	$ 1,732,500	2004-09	2	mmstudy	3
2109	Fairview/WV Transit Center (TC)	Multnomah Co.	Glisan Street Improvements	202nd Avenue to 207th Avenue	Complete reconstruction of Glisan Street to five lanes	X	X	X	$ 1,800,000	2004-09	1	mv	3
2110	Fairview/WV TC	Multnomah Co.	MKC Collector	Halsey Street to Arata Road	Construct new collector of regional significance	X	X	X	$ 1,100,000	2016-25	1	mv	3
1266	Gateway RC	Portland	NE/SE 99th Avenue Phases II and III	NE Glisan Street to SE Washington Street and SE Washington Street to SE Market Street	Reconstruct primary local main street in Gateway regional center	X	X	X	$ 4,042,500	2010-15	1	mv	1
2008	Gateway RC	Portland	102nd Avenue Boulevard and ITS/Safety Improvements, Phase 1	NE Weidler to NE Glisan Street	Implement Gateway regional center plan with boulevard design retrofit, new traffic signals, improved pedestrian facilities and crossings, street lighting, bicycle lanes and multimodal safety improvements	X	X	X	$ 3,234,000	2004-09	4	blvd	1
2010	Gateway RC	Portland	Halsey/Weidler Boulevard and ITS	within regional center between I-205 and NE 114th Avenue	Implement Gateway regional center plan with boulevard design retrofit, new traffic signals, improved pedestrian facilities and crossings, street lighting and new bicycle facilities	X	X	X	$ 12,127,500	2016-25	4	blvd	1
2011	Gateway RC	Portland	Glisan Street Boulevard and ITS	within regional center between I-205 and NE 106th Avenue	Implement Gateway regional center plan with boulevard design retrofit, new traffic signals, improved pedestrian facilities and crossings, street lighting and new bicycle facilities	X	X	X	$ 2,310,000	2010-15	4	blvd	1
2012	Gateway RC	Portland	SE Stark/Washington Boulevard and ITS/Safety Improvements	92nd Avenue to 111th Avenue	Implement Gateway regional center plan with boulevard design retrofit, new traffic signals, improved pedestrian facilities and crossings, street lighting, bicycle lanes and multimodal safety improvements	X	X	X	$ 4,389,000	2010-15	4	blvd	1

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RTP #	2040 Link	Jurisdiction	Project Name (Facility)	Project Location	Project Description	2020 RTP Priority System	2030 RTP Illustrative System	2030 RTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	RTP Program Years	Primary Modal Type	Primary Mode	2040 Category
2015	Gateway RC	Portland	102nd Avenue Boulevard and ITS/Safety Improvements, Phase II	NE Glisan Street to SE Market Street	Implement Gateway regional center plan with boulevard design retrofit, new traffic signals, improved pedestrian facilities and crossings, street lighting, bicycle lanes and multimodal safety improvements	X	X	X	$ 7,091,700	2010-15	4	blvd	1
2029	Gresham RC	Multnomah Co.	242nd Avenue Reconstruction	Powell Boulevard to Burnside Road	Reconstruct 242nd Avenue to five lanes	X	X	X	$2,400,000	2016-25	1	mv	1
2032	Gresham RC	Multnomah Co.	Burnside/Hogan Intersection Improvement	Intersection of 242nd/Burnside Street	Improve intersection by adding a southbound through lane	X	X	X	$ 546,000	2016-25	1	mv	1
2041	Gresham RC	Multnomah Co.	257th Avenue Corridor Improvements	Division Street to Powell Valley Road	Reconstruct street to arterials standards, including bike lanes, sidewalks, drainage, lighting and traffic signals	X	X	X	$ 4,800,000	2004-09	1	mv	2
2044	Gresham RC	Multnomah Co.	Orient Drive Improvements	282nd Avenue to 257th Avenue	Improve Orient Drive	X	X	X	$4,158,000	2016-25	1	mv	2
2045	Gresham RC	Multnomah Co.	190th Avenue Improvements	Butler Road to Highland Drive and Powell Boulevard to 190th Avenue	Reconstruct and widen street to five lanes with sidewalks and bike lanes. Widen and determine the appropriate cross section for Highland Drive and Pleasant View Drive from Powell Boulevard to 190th Avenue based on the recommendations from Phase 2 of the Powell Boulevard/Foster Road Corridor Study	X	X	X	$ 12,500,000	2010-15	1	mv	3
2048	Gresham RC	Multnomah Co.	Burnside Street Improvements	NE Wallula Street to Hogan Road	Complete boulevard design improvements	X	X	X	$7,484,400	2004-09	4	blvd	1
1119	Hollywood TC	Portland	Sandy Boulevard/Burnside/12th Avenue Intersection	Sandy Boulevard/Burnside/12th Avenue Intersection	Redesign intersection	X	X	X	$ 4,620,000	2004-09	1	mv	3
1120	Hollywood TC	Portland	Sandy Boulevard Multimodal Improvements, Phase I	12th Avenue to 47th Avenue	Retrofit existing street with multimodal boulevard improvements including redesign of selected intersections to add turn lanes and improve pedestrian crossings, bike lanes, on-street parking, and safety improvements	X	X	X	$ 17,325,000	2004-09	4	blvd	3
1122	Hollywood TC	Portland	Sandy Boulevard Multimodal Improvements, Phase II	47th Avenue to 99th Avenue	Retrofit existing street with multimodal boulevard improvements including redesign of selected intersections to add turn lanes and improve pedestrian crossings, bike lanes, on-street parking, and safety improvements	X	X	X	$ 4,620,000	2010-15	4	blvd	3
1226	Interstate SC	Portland	Killingsworth Bridge Improvements	Killingsworth at I-5	Improvements to bridge to create a safe and pleasant crossing for pedestrians and bicyclists over I-5	X	X	X	$2,700,000	2016-25	15	bike/ped	3
1160	Lents TC	Portland	Foster-Woodstock, Phase I	87th-94th Avenues and 92nd Avenue within the Foster-Woodstock couplet	Implement Lent Town Center Business District Plan with new traffic signals, pedestrian amenities, wider sidewalks, pedestrian crossings, street lighting, increased on-street parking	X	X	X	$6,930,000	2004-09	6	ped	3
1161	Lents TC	Portland	Foster-Woodstock, Phase II	87th-94th Avenues and 92nd Avenue within the Foster-Woodstock couplet	Implement Lent Town Center Business District Plan with new traffic signals, pedestrian amenities, wider sidewalks, pedestrian crossings, street lighting	X	X	X	$5,775,000	2010-15	6	ped	3

Metro's 2004 Regional Transportation Plan (RTP) - Financially constrained system in City of Portland only

RTP #	2040 Link	Jurisdiction	Project Name (Facility)	Project Location	Project Description	2020 RTP Priority System	2030 RTP Illustrative System	2030 RTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	RTP Program Years	Primary Modal Type	Primary Mode	2040 Category
1162	Lents TC	Portland	Foster Road Improvements	79th to 87th Avenues	Implement Lent Town Center Business District Plan with new traffic signals, pedestrian amenities, wider sidewalks, pedestrian crossings, street lighting, increased on-street parking, as appropriate	X	X	X	$ 2,310,000	2016-25	6	ped	3
2069	PDX IA	ODOT	I-205 Interchange Improvement	I-205 NB/Airport Way Interchange	New I-205 NB on-ramp at I-205/Airport Way interchange (Phase 1 in FC: modify signing, striping channelization and signal timing for NB on-ramp)	X	X	X	$23,100,000	2004-09	13	mv	2
2070	PDX IA	ODOT	I-205 Interchange Improvement	I-205 SB/Airport Way Interchange	Widen I-205 SB on-ramp at Airport Way; modify signing, striping channelization and/or signal timing for the I-205 NB on-ramp at Airport Way	X	X	X	$650,000	2004-09	13	mv	2
4017	PDX IA	Port	SW Quad Access	33rd Avenue	Provide street access from 33rd Avenue into SW Quad	X	X	X	$ 1,732,500	2004-09	1	mv	2
4021	PDX IA	Port	Airport Way Improvements, West	82nd Avenue to PDX terminal	Widen to three lanes in both directions	X	X	X	$11,550,000	2010-15	1	mv	2
4022	PDX IA	Portland/Port	East Columbia/Lombard Street Connector	Columbia/US 30 Bypass: NE 82nd Avenue to I-205	Provide free-flow connection from Columbia Boulevard/82nd Avenue to US 30 Bypass/I-205 interchange	X	X	X	$28,865,250	2004-09	1	mv	2
4026	PDX IA	Port/Portland	Cascades Parkway Connection	Cascades Parkway to Alderwood Road	Construct two-lane extension	X	X	X	$1,732,500	2004-09	1	mv	2
4028	PDX IA	Port	Airport Way/82nd grade separation	82nd Avenue/Airport Way	Construct grade separated overcrossing	X	X	X	$ 12,705,000	2010-15	1	mv	2
4031	PDX IA	Port	Airport Way return and Exit Roadways	Airport Way	Relocate Airport Way exit roadway and construct new return roadway	X	X	X	$16,170,000	2010-15	1	mv	2
4032	PDX IA	Port	Airport Way terminal entrance roadway relocation	PDX terminal	Relocate and widen Airport Way northerly at terminal entrance to maintain access and circulation	X	X	X	$4,620,000	2004-09	1	mv	2
4033	PDX IA	Port	Airport Way east terminal access roadway	PDX east terminal	Construct Airport Way east terminal access roadway	X	X	X	$9,240,000	2010-15	1	mv	2
4038	PDX IA	Port	82nd Avenue/Alderwood Road Improvement	82nd Avenue/Alderwood Road intersection	Construct new turn lanes, restripe and modify traffic signal	X	X	X	$ 790,000	2004-09	1	mv	2
4039	PDX IA	Port	NE 92nd Avenue	NE 92nd/Columbia Boulevard/Alderwood	Improvement to be defined	X	X	X	$ 1,732,500	2016-25	1	mv	2
4040	PDX IA	Portland	47th Avenue Intersection and Roadway Improvements	at Columbia Boulevard	Widen and channelize NE Columbia Boulevard to facilitate truck turning movements; add sidewalks and bike facilities	X	X	X	$ 2,800,000	2004-09	1	mv	2
4041	PDX IA	Portland	Columbia Boulevard/Alderwood Improvements	at Alderwood Road intersection	Widen and signalize intersection	X	X	X	$ 1,460,000	2004-09	1	mv	2
4042	PDX IA	Port	Cornfoot Road Intersection Improvement	Alderwood/Cornfoot intersection	Add signal, improve turn lanes at intersection	X	X	X	$ 730,000	2004-09	1	mv	2
4043	PDX IA	Portland	33rd/Marine Drive Intersection Improvement	NE 33rd and Marine Drive	Signalize 33rd/Marine Drive intersection for freight movement	X	X	X	$ 288,750	2010-15	1	mv	2
4044	PDX IA	Port/Portland	Columbia/82nd Avenue Improvements	Columbia Boulevard at 82nd Avenue southbound ramps	Add through lanes on Columbia Boulevard, a SB right turn lane and signalize	X	X	X	$ 1,130,000	2004-09	1	mv	2
4045	PDX IA	Port/Portland	Airport Way/122nd Avenue Improvements	Airport Way at 122nd Avenue	Add NB left-turn lane, modify traffic signal and reconstruct island	X	X	X	$ 490,000	2004-09	1	mv	2

Metro's 2004 Regional Transportation Plan (RTP) - Financially constrained system in City of Portland only

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7006	Pleasant Valley TC	Portland	SE Foster Improvements	SE 122nd Avenue to Jenne Road	Widen Foster Road to four lanes from SE 122nd to SE Barbara Welch Road. Widen and determine the appropriate cross section of Foster Road from SE Barbara Welch Road to Jenne Road by completing Phase 2 of the Powell Boulevard/Foster Road Corridor Study in order to meet roadway, transit, pedestrian and bike needs	X	X	X	$14,000,000	2010-15	1	mv	3
7007	Pleasant Valley TC	Portland/Gresham	SE 174th North/South Improvements	SE Foster to Powell Boulevard	Based on the recommendations from the Powell Boulevard/Foster Road Corridor Study (#1228), construct a new north-south capacity improvement project in the vicinity of SE 174th Avenue/Jenne Road between SE Powell Boulevard and Giese Road in Pleasant Valley. This replaces former project 7007 which widened Jenne Road to three lanes from Powell Boulevard to Foster Road	X	X	X	$ 13,000,000	2010-15	1	mv	3
1271	Portland Corridor	ODOT	Linnton Community Bike and Pedestrian Improvements	Harbor Avenue to 112th Avenue	Replace 2 traffic signals @ 105th & 107th Ave., curb bulb-outs, sidewalks, and possibly adding pedestrian crossings	X	X	X	$550,000	2016-25	15	ped/bike	4
1209	Portland Mainstreet	Portland	NW 23rd Avenue Reconstruction	Burnside Street to Lovejoy Street	Rebuild street	X	X	X	$ 1,810,000	2004-09	1	mv	3
1012	Region	Multnomah Co.	Sellwood Bridge Replacement	Multnomah County	Implement recommendations from South Willamette Study	X	X	X	$ 90,000,000	2004-09	10	mv	3
1163	Region	ODOT	I-205/Powell Boulevard/Division interchanges	I-205 and Powell Boulevard and Division Street	Construct improvements to allow full turning movements	X	X	X	$12,000,000	2016-25	1	mv	4
1164	Region	ODOT	I-205 Ramp Study - PE/EA	I-205/Powell to Division	Perform a design study to evaluate modifications to the existing overpass at I-205 and Powell Boulevard, including full access ramps to and from I-205. The study should also address impacts to the interchange influence area along Powell Boulevard, Division Street, and SE 92nd Avenue.	X	X	X	$1,000,000	2004-09	2	mv	4
1165	Region	ODOT	I-205 Ramp Right-of-way Acquisition	I-205/Powell to Division	Acquire ROW	X	X	X	$2,000,000	2004-09	2	mv	4
2000	Region	Multnomah Co.	Hogan Corridor Improvements	Stark Street to Palmquist (Stark to Powell in FC)	Interim capacity improvements and access controls	X	X	X	$ 13,860,000	2004-09	13	mv	1
3006	Region	ODOT	US 26 Improvements	US 26 between Sylvan and Highway 217	Complete interchange improvements by adding third through-lane and collector distributor system from Camelot Court to Sylvan Road (Phase 3)	X	X	X	$ 25,410,000	2004-09	13	mv	2
4004	Region	ODOT	Greeley Street Ramp Improvements	Greeley Street/I-5 ramps	Modernize Greeley Street ramps	X	X	X		2004-09	13	mv	1
4005	Region	ODOT	I-5 North Improvements	Lombard Street to Expo Center/Delta Park	Widen to six lanes	X	X	X	$ 41,000,000	2004-09	13	mv	1
4006	Region	ODOT	I-5/Columbia Boulevard Improvement	I-5/Columbia Boulevard interchange	Construct full direction access interchange based on recommendations from I-5 North Trade Corridor Study	X	X	X	$56,000,000	2010-15	13	mv	2
4009	Region	ODOT	I-5 Trade Corridor Study and Tier 1 DEIS	I-405 (OR) to I-205 (WA)	Plan improvements to I-5 to benefit freight traffic	X	X	X	$ 15,000,000	2004-09	2	mm study	2

Metro's 2004 Regional Transportation Plan (RTP) - Financially constrained system in City of Portland only

RTP #	2040 Link	Jurisdiction	Project Name (Facility)	Project Location	Project Description	2020 RTP Priority System	2030 RTP Illustrative System	2030 RTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	RTP Program Years	Primary Modal Type	Primary Mode	2040 Category
5016	Region	ODOT	Highway 213 Grade Separation	Washington Street at Highway 213	Grade separate southbound Highway 213 at Washington Street and add a northbound lane to Highway 213 from just south of Washington Street to the I-205 on-ramp.	X	X	X	$ 10,395,000	2010-15	13	mv	1
5017	Region	ODOT	Highway 213 Intersection Improvements	Abernethy at Highway 213	Intersection improvements	X	X	X	$ 3,465,000	2010-15	13	mv	1
5021	Region	ODOT	Highway 224 Extension	I-205 to Highway 212/122nd Avenue	Construct new four-lane highway and reconstruct Highway 212/122nd Avenue interchange	X	X	X	$84,315,000	2010-15	13	mv	2
5023	Region	ODOT	I-205/Highway 213 Interchange Improvement	I-205 at Highway 213	Reconstruct I-205 southbound off-ramp to Highway 213 to provide more storage and enhance highway operations and safety	X	X	X	$1,155,000	2010-15	13	mv	1
5199	Region	ODOT	I-205 Auxiliary Lanes	I-5 to Stafford Road	Add auxiliary lanes as part of pavement preservation project	X	X	X	$ 8,000,000	2004-09	13	mv	1
4063	Rivergate IA	ODOT/Portland	N. Lombard Improvements	Lombard Street from Rivergate Boulevard (Purdy) to south of Columbia Slough bridge	Widen street to three lanes	X	X	X	$ 3,610,000	2004-09	1	mv	2
4065	Rivergate IA	Port/Portland	North Lombard Overcrossing	South Rivergate	Construct overpass from Columbia/Lombard intersection into South Rivergate entrance to separate rail and vehicular traffic. Project includes motor vehicle lanes, bike lanes, and sidewalks.	X	X	X	$24,453,660	2004-09	1	mv	2
4087	Rivergate IA	Port	Leadbetter Street Extension and Grade Separation	to Marine Drive	Extend street and construct grade separation	X	X	X	$ 8,000,000	2004-09	1	mv	2
4088	Rivergate IA	Port/Portland	Terminal 4 Driveway Consolidation	Lombard Street at Terminal 4	Consolidate two signalized driveways at Terminal 4	X	X	X	$ 1,000,000	2004-09	1	mv	2
2074	South Shore IA	Multnomah Co.	Sandy Boulevard Widening	122nd Avenue to 238th Avenue	Widens street to five lanes with sidewalks and bike lanes	X	X	X	$ 11,800,000	2016-25	1	mv	2
2051	Springwater IA	ODOT	US 26/Springwater Interchange Improvement	US 26 at Springwater	New interchange on US 26 to serve industrial area		X	X	$ 25,000,000	2004-09	13	mv	2

RTC's 2030 Metropolitan Transportation Plan (MTP) - Financially constrained system south of Ridgefield, west of City of Vancouver/Camas border, and east of Fruit Valley Road

RTC Metropolitan Transporta-tion Plan		Jurisdiction (Not provided in MTP)	Project Name (Facility)	Project Location	Project Description			2030 MTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	MTP Program Years	Primar y Modal Type	Primar y Mode	2040 Categor y
MTP		WSDOT	I-5	99th Street to I-205	3 lanes ea. direction			X	N/A	2007		mv	N/A
MTP		WSDOT	I-5	SR-502 Interchange	New Interchange			X	N/A	2008		mv	N/A
MTP		WSDOT	I-5	Pioneer Street (Ridgefield)/ SR-501 Interchange	Improve Interchange			X	N/A	2009		mv	N/A
MTP		WSDOT	I-5	The Salmon Creek Interchange Project (SCIP) at 134th/139th Street	Construct NE 139th St. from NE 20th Ave. to NE 10th Ave. Reconstruct interchange with ramps added at 139th St. Improve access to I-205 with flyover from 134th St to I-205 southbound NE 10th Ave. Improve NE 10th Ave. from 134th to 149th St. to include turn lanes.			X	N/A	2010-2013		mv	N/A
MTP		WSDOT	I-5	I-205 to 179th Street	Auxiliary lane in each direction			X	N/A	2012-2013		mv	N/A
MTP		WSDOT	I-5	179th Street Interchange	Reconstruct Interchange			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	I-5	179th Street to SR-502	Auxiliary lane in each direction					2016-2025			
MTP		WSDOT	I-205	Mill Plain Exit (112th Avenue connector)	Build direct ramp to NE 112th Avenue			X	N/A	2007		mv	N/A
MTP		WSDOT	I-205	Mill Plain to 28th Street	Ramps/Frontage Road between Mill Plain and 28th Streets			X	N/A	2013		mv	N/A
MTP		WSDOT	I-205	SR-14 to Mill Plain	Ramp Separation			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	I-205	28th Street	North ramps			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	I-205	SR-500	WB SR-500 to SB I-205 Flyover			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	I-205	SR-500 to Padden Parkway	3 lanes each direction 83rd ramps			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	I-205	Padden Parkway to 134th Street	3 lanes each direction			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	SR-14	NW 6th Av. to SR-500/Union	2 lanes ea. direction w. interchange			X	N/A	2011		mv	N/A
MTP		WSDOT	SR-14	I-205 to 164th Avenue	3 lanes ea. direction			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	SR-14	SR-500/Union to 32nd Street	Improve capacity			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	SR-14	32nd Street Vicinity	Interchange			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	SR-500	I-205	Extend westbound auxiliary lane			X	N/A	2009		mv	N/A
MTP		WSDOT	SR-500	St. Johns Interchange	New Interchange			X	N/A	2011		mv	N/A
MTP		WSDOT	SR-500	42nd Avenue	Grade Separation			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	SR-500	54th Avenue	Interchange with collector-distributor connecting to Andresen			X	N/A	2016-2025		mv	N/A
MTP		WSDOT	SR-502	NE 10th Avenue to Battle Ground	2 lanes each direction			X	N/A	2013		mv	N/A
MTP		WSDOT	SR-503	East Fork Lewis River	Northbound and southbound climbing lane			X	N/A	2011		mv	N/A
MTP		Clark County/ WSDOT	SR-503	Padden Parkway	Add Interchange			X	N/A	2016-2025		mv	N/A
MTP		Clark County	117/119th Street	NW Seventh Avenue to Hazel Dell Avenue	1 lane ea. direction, w/turn lane			X	N/A	2006		mv	N/A
MTP		Clark County	Ward/172nd Av.	S. 99th Street to 119th St.	Realignment			X	N/A	2007		mv	N/A
MTP		Clark County	72nd Avenue	N. of 88th Street to St. Johns	2 lane ea. direction, w/turn lane			X	N/A	2008		mv	N/A

RTC's 2030 Metropolitan Transportation Plan (MTP) - Financially constrained system south of Ridgefield, west of City of Vancouver/Camas border, and east of Fruit Valley Road

RTC Metropolitan Transporta-tion Plan		Jurisdiction (Not provided in MTP)	Project Name (Facility)	Project Location	Project Description			2030 MTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	MTP Program Years	Primar y Modal Type	Primar y Mode	2040 Categor y
MTP		Clark County	St. John's Blvd.	NE 50th Avenue to 72nd Avenue	2 lanes ea. direction, w/turn lane			X	N/A	2007		mv	N/A
MTP		Clark County	Ward Road	NE 137th Avenue to Fourth Plain	1 lane ea. direction, w/turn lane			X	N/A	2009		mv	N/A
MTP		Clark County	119th Street	72nd Avenue to SR-503	2 lanes ea. direction, w/turn lane			X	N/A	2011-2015		mv	N/A
MTP		Clark County	179th Street	NE 10th Avenue to NE 29th Avenue	2 lane ea. direction, w/turn lane			X	N/A	2011-2015		mv	N/A
MTP		Clark County	179th Street	Cramer Road to SR-503	2 lanes ea. direction, w/turn lane			X	N/A	2016-2025		mv	N/A
MTP		Clark County	Padden Parkway	Andresen	Add Interchange			X	N/A	2016-2025		mv	N/A
MTP		Clark County	179th Street	I-5 to NW 5th Avenue	2 lanes ea. direction, w/turn lane			X	N/A	Partial Completion 2003 Completion will be by frontage improvements		mv	N/A
MTP		Clark County	NE 15th Avenue	179th Street to Union Road	1 lane ea. direction, w/turn lane			X	N/A	2006		mv	N/A
MTP		Clark County	63rd Street	Andresen Road to 72nd Avenue	2 lanes ea. direction, w/turn lane			X	N/A	2009		mv	N/A
MTP		Clark County	NE 88th Street	Hazel Dell Avenue to Highway 99	1 lane ea. direction, w/turn lane			X	N/A	2011-2015		mv	N/A
MTP		Clark County	NE 15th Avenue	NE 179th Street to SR-502	1 lane ea. direction, w/turn lane			X	N/A	2016-2025		mv	N/A
MTP		Clark County	NE 99th Street	St. Johns Rd. to SR-503	1 lane ea. direction, w/turn lane			X	N/A	2016-2025		mv	N/A
MTP		Vancouver	138th Avenue	18th Street to 28th Street	2 lanes ea. direction, w/turn lane			X	N/A	2006		mv	N/A
MTP		Vancouver	Main Street	Sixth Street to 15th Street (Mill Plain)	Convert to two-way street			X	N/A	2006		mv	N/A
MTP		Vancouver	137th Avenue	49th Street to Vancouver City Limits	2 lanes ea. direction, w/turn lane			X	N/A	2008		mv	N/A
MTP		Vancouver	138th Avenue	28th Street to 49th Street	2 lanes ea. direction, w access management			X	N/A	2008		mv	N/A
MTP		Vancouver	18th Street	112th Avenue to 138th Avenue	2 lanes ea. direction, w/turn lane			X	N/A	2008		mv	N/A
MTP		Vancouver/Clark Co (annexation area)	NE 137th Avenue	City Limits to Fourth Plain	2 lanes ea. direction, w/turn lane			X	N/A	2008		mv	N/A
MTP		Vancouver	18th Street	86th Avenue to 112th Avenue	Extend existing street 1 lane ea. direction, w/turn lane			X	N/A	2010		mv	N/A
MTP		Vancouver	18th Street	138th Avenue to 162nd Avenue	2 lanes ea. direction, w/turn lane			X	N/A	2010		mv	N/A
MTP		Vancouver	192nd Avenue	SE First Street to NE 18th Street	2 lanes ea. direction, w/turn pockets			X	N/A	2010		mv	N/A
MTP		Vancouver	SE First Street	164th Avenue to 192nd Avenue	2 lanes ea. direction, w/turn lane			X	N/A	2010		mv	N/A
MTP		Vancouver	18th Street	162nd Avenue to 192nd Avenue	2 lanes ea. direction, w/turn lane			X	N/A	2012		mv	N/A
MTP		Vancouver	49th Street	112th Avenue to 122nd Avenue	2 lanes ea. direction, w/turn lane			X	N/A	2006		mv	N/A
MTP		Vancouver	26th Avenue	Fourth Plain to Whitney Road	1 lane ea. direction, w/turn lane new minor industrial arterial			X	N/A	2012		mv	N/A
MTP		Vancouver	Columbia Shores	S. of SR-14	Rail Trestle, Widen Portal			X	N/A	2012		mv	N/A
MTP		Vancouver	NE 87th Avenue	Lieser Road to E. Fifth Street	1 lane ea. direction, w/turn lane			X	N/A	2013		mv	N/A
MTP		Vancouver	SE Tenth Street	Ellsworth to I-205	2 lanes ea. direction, w/turn lane			X	N/A	2016-2025		mv	N/A

RTC's 2030 Metropolitan Transportation Plan (MTP) - Financially constrained system south of Ridgefield, west of City of Vancouver/Camas border, and east of Fruit Valley Road

RTC Metropolitan Transporta-tion Plan		Jurisdiction (Not provided in MTP)	Project Name (Facility)	Project Location	Project Description			2030 MTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	MTP Program Years	Primar y Modal Type	Primar y Mode	2040 Categor y
MTP		Vancouver	Vancouver Mall Dr.	Andresen Road to 66th Avenue	1 lane ea. direction, w/turn lane			X	N/A	2016-2025		mv	N/A
MTP		Vancouver	Esther Street	At RR Tracks	Railroad Undercrossing			X	N/A	2009		mv	N/A
MTP		Clark County	Highway 99	117th to 129th Street	2 lanes each direction w/ turn lane					2023			
MTP		Clark County	NE 137th Avenue	99th to 119th Street	1 lane each direction w/ turn lane					2023			
MTP		Clark County	NE 72nd Avenue	119th to 133rd Street	2 lanes each direction w/ turn lane					2023			
MTP		Clark County	Highway 99	NE 63rd to NE 99th Street	Pedestrian route completion								
MTP		Clark County	NE Heisson Road	at 244th Street	Improve intersection					2007			
MTP		Clark County	NE Delfel Road	179th to 199th Street	1 lane each direction w/ turn lane					2023			
MTP		Clark County	NE 15th/20th Avenues	NE 154th to NE 15th Avenue	Street upgrade								
MTP		Ridgefield	Pioneer Street/SR-501	I-5 NB Ramps to S Tenth Street	2 lanes each direction w/ turn lane					2008			
MTP		Ridgefield	Pioneer Street/SR-501	0.5 mile west of S 45th to I-5 NB ramps	2 lanes each direction w/ turn lane					2010			
MTP		Ridgefield	Pioneer Street/SR-501	0.5 miles west of S 45th to W of Reiman Road	Widen, 1-2 lanes each direction					2015			
MTP		Vancouver	164th Avenue	SE First to SR-14	Reconstruct 5 intersections to improve traffic flow			X	N/A	2006		mv	N/A
MTP		Vancouver	Broadway	Sixth Street to 15th Street	Reconstruct and convert to two-way street			X	N/A	2007		mv	N/A
MTP		Vancouver	I-205 South Corridor		Conduct environmental analysis for approved access plan for I-205 south corridor			X	N/A	2007		mv	N/A
MTP		Vancouver	Fourth Plain Boulevard/ Andresen	Intersection Influence Area	Reconstruct Fourth Plain in vicinity of 65th/66th Avenue to Andresen			X	N/A	2009		mv	N/A
MTP		Vancouver	Lieser Road/ NE 87th Avenue	at Mill Plain	Intersection improvement			X	N/A	2009		mv	N/A
MTP		Vancouver	SE 20th Street	192nd Ave. to Camas City Limits	New urban minor arterial roadway			X	N/A	2009		mv	N/A
MTP		Vancouver	Fourth Plain	I-5 to Railroad Bridge	2 lanes each direction			X	N/A	2012		mv	N/A
MTP		Vancouver	Highway 99 South	63rd to Ross St.	Build to 5 Lane principal arterial standard, rebuild rail bridge			X	N/A	2013		mv	N/A
MTP		Vancouver	E Fourth St.	136th Avenue to Hearthwood	Complete First/Fourth St. corridor connection, take Mill Plain local traffic					2007			
MTP		Vancouver	Olympia Drive north extension	Mill Plain to First St.	New N/S roadway through Evergreen Airport property					2007			
MTP		Vancouver	NE 147th Avenue	Ward Road/Fourth Plain to NE 59th Street	Construct new minor arterial 1 lane each direction with turn lane					2008			
MTP		Vancouver	NE 59th Street	137th to 162nd Avenue	Construct new minor arterial 1 lane each direction with turn lane					2008			
MTP		Vancouver	49th Street	15th Avenue to St James	Reconstruct, widen and upgrade to urban standards					2009			
MTP		Vancouver	Ninth Avenue	Van Mall Drive to NE 54th Street	Urban upgrade					2009			
MTP		Vancouver	NE 54th St. Corridor	18th Avenue to St. James Blvd.	Upgrade to collector arterial standard					2009			
MTP		Vancouver	Ninth Street/11th Street	I-205 to 162nd Avenue	Close gaps and complete corridor					2010			
MTP		Vancouver	Lincoln Street	Fourth Plain Boulevard to Railroad Avenue	Realign, reconstruct and grade separate					2010			

RTC's 2030 Metropolitan Transportation Plan (MTP) - Financially constrained system south of Ridgefield, west of City of Vancouver/Camas border, and east of Fruit Valley Road														
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MTP		Vancouver	Lincoln Street	Fourth Plain to 39th Street	Construct new section of road 1 lane each direction					2013			
MTP		Vancouver	Jefferson/ Kauffman St.	Mill Plain to Sixth St.	Realign offset @ 13th, grade separate from rail @ 8th St.					2012			
MTP		Vancouver	Railroad Avenue	Columbia to new Lincoln Avenue grade separated facility	New waterfront east/west arterial					2010			
MTP		Vancouver	NE 104th Avenue	NE 14th Street to NE 18th Street	Extend existing street1 lane each direction					2012			
MTP		Vancouver	54th Street	18th Avenue to St James	Reconstruct, widen and upgrade to urban standards					2013			
MTP		Vancouver	Brady Road West Extension	192nd Ave. interchange to 171st Ave.	New arterial roadway from 192nd interchange, west to existing neighborhoods					2015+			

Transit Projects

RTP #	2040 Link	Jurisdiction	Project Name (Facility)	Project Location	Project Description	2020 RTP Priority System	2025 RTP Illustrative System	2025 RTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	RTP Program Years	Primary Modal Type	Primary Mode	2040 Category
1001	Region	TriMet	I-205 LRT Extension	Gateway RC to Clackamas TC	Construct LRT and improvements to downtown transit mall	X	X	X	$475,000,000	2004-09	3	transit	1
1046	Central City	Portland	Transit Mall Restoration	Central City	Reduce maintenance and repair costs	X	X	X	$2,852,850	2004-09	3	transit	1
1049	Central City	Portland	South Waterfront Transit Improvements	South Waterfront District of the central city	Implement transit improvements identified in the North Macadam Framework Plan, including central city transit hub and local bus service improvements	X	X	X	$ 2,000,000	2010-15	3	transit	1
1086	Central City	TriMet/Portland	Portland Street Car - Phase 3b (Gibbs)	Riverplace to Gibbs Street	Construct street car		X	X	$ 20,000,000	2004-09	3	transit	1
1087	Central City	TriMet/Portland	Portland Street Car - Phase 3c (Bancroft)	Gibbs Street to Bancroft Street	Construct street car		X	X	$12,000,000	2004-09	3	transit	1
1098	Central City	Portland	Aerial Tram	Marquam Hill - South Waterfront District	Develop and implement an aerial tram between Marquam Hill and South Waterfront District. Project implementers include Oregon Health & Science University, Portland Aerial Tram Inc, and others.	X	X	X	$ 15,000,000	2004-09	3	transit	1
1106	Central City	Portland	Portland Streetcar - Eastside, Phase 1 (Lloyd District)	Pearl District to Lloyd District	Construct street car from NW Lovejoy/10th Avenue to NE 7th Avenue/Oregon Street	X	X	X	$ 36,900,000	2004-09	3	transit	1
1107	Central City	Portland	Portland Streetcar - Eastside, Phase 2 (Central Eastside Industrial District)	Lloyd District to Central Eastside Industrial District	Construct street car from NE Oregon Street to Water Avenue	X	X	X	$ 44,000,000	2004-09	3	transit	1
1118	Hollywood TC	TriMet	Sandy Boulevard Frequent Bus	Sandy Boulevard	Construct improvements that enhance Frequent Bus service	X	X	X	$ 1,760,000	2010-15	3	transit	3
1135	St. Johns TC	TriMet	MLK/Lombard Frequent Bus	PCBD to St. Johns Town Center	Construct improvements that enhance Frequent Bus service	X	X	X	$ 2,100,000	2010-15	3	transit	3
1138	St. Johns TC	TriMet	Lombard/39th Frequent Bus	Milwaukie Town Center to St. Johns Town Center	Construct improvements that enhance Frequent Bus service	X	X	X	$ 2,700,000	2004-09	3	transit	3
1232	Portland Mainstreet	TriMet	NW 23rd/Belmont Frequent Bus	NW 23rd to Mt. Tabor via Belmont Avenue	Construct improvements that enhance Frequent Bus service	X	X	X	$ 2,490,000	2004-09	3	transit	3
1233	Portland Mainstreet	TriMet	Hawthorne Boulevard Frequent Bus	Hawthorne Boulevard	Construct improvements that enhance Frequent Bus service	X	X	X	$ 2,460,000	2004-09	3	transit	3
1236	Portland Mainstreet	TriMet	NE 15/Jackson Park Frequent Bus Improvements		Construct improvements that enhance Frequent Bus service	X	X	X	$ 930,000	2004-09	3	transit	3
1237	Portland Mainstreet	TriMet	Fessenden Frequent Bus Improvements		Construct improvements that enhance Frequent Bus service	X	X	X	$ 1,485,000	2004-09	3	transit	3
2025	Gresham RC	TriMet	Division Street Frequent Bus Capital Improvements	Gresham to PCBD	Construct improvements that enhance Frequent Bus service	X	X	X	$ 3,525,000	2004-09	3	transit	1
2027	Gresham RC	TriMet/Gresham	Civic Neighborhood LRT station/plaza	MAX line west of Gresham City Hall	LRT station and retail plaza	X	X	X	$3,500,000	2004-09	3	transit	1
2076	South Shore IA	TriMet	181st Avenue Frequent bus	Gresham to Columbia South Shore	Construct improvements that enhance Frequent Bus service	X	X	X	$ 1,350,000	2010-15	3	transit	1
3017	Region	TriMet	Beaverton Hillsdale Highway- Frequent Bus	Beaverton-Hillsdale Highway	Improvements to enhance Frequent bus service	X	X	X	$ 3,300,000	2004-09	3	transit	3

Transit Projects

RTP #	2040 Link	Jurisdiction	Project Name (Facility)	Project Location	Project Description	2020 RTP Priority System	2025 RTP Illustrative System	2025 RTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	RTP Program Years	Primary Modal Type	Primary Mode	2040 Category
3164	Forest Grove TC	TriMet	TV Highway Frequent Bus	Forest Grove to Hillsdale via TV Highway and B-H Highway	Provide improvements that enhance frequent bus service	X	X	X	$ 1,575,000	2004-25	3	transit	3
4001	Region	TriMet	Killingsworth Frequent Bus	Swan Island to Clackamas TC	Construct improvements that enhance Frequent Bus service	X	X	X	$ 4,540,000	2010-15	3	transit	3
4060	PDX IA	Port/Portland	Light Rail station/track realignment	PDX terminal	Realign light rail track into terminal building (includes double tracking)	X	X	X	$ 14,000,000	2010-15	3	transit	2
5001	Region	TriMet	Transit center and park and ride upgrades	Various locations in subarea	Construct, expand and/or upgrade transit stations and park and rides throughout subarea	X	X	X	See Tri-Met Total	2004-25	3	transit	3
5035	Milwaukie TC	TriMet	McLoughlin Boulevard Rapid Bus	Milwaukie TC to Oregon City TC	Construct improvements that enhance Rapid Bus service	X	X	X	see Tri-Met total	2010-15	3	transit	1
5098	Clackamas RC	TriMet	King Road Frequent Bus	Clackamas Regional Center	Construct improvements that enhance Frequent Bus service	X	X	X	$ 1,236,000	2010-15	3	transit	1
5099	Clackamas RC	TriMet	Webster Road Frequent Bus	Clackamas Regional Center	Construct improvements that enhance Frequent Bus service	X	X	X	$ 1,510,000	2010-15	3	transit	1
5142	Oregon City RC	TriMet	Molalla Avenue Frequent Bus	Oregon City to Clackamas Community College	Construct improvements that enhance Frequent Bus service	X	X	X	$1,085,000	2010-15	3	transit	1
5161	Lake Oswego TC	TriMet	Macadam Frequent Bus	Lake Oswego to PCBD	Construct improvements that enhance Frequent Bus service	X	X	X	$ 2,015,000	2010-15	3	transit	1
5169	Lake Oswego TC	Lake Oswego	Trolley Trestle Repairs	Lake Oswego to Portland	Repair trestles along rail line	X	X	X	$ 1,155,000	2004-09	3	transit	1
5171	Lake Oswego TC	Lake Oswego	Transit Station Relocation	From Fourth Avenue to location TBD	Relocate transit station	X	X	X	$ 4,190,000	2016-25	3	transit	3
6000	Region	WashCo/TriMet	Beaverton-Wilsonville Commuter Rail	Wilsonville to Beaverton	Peak-hour service only with 30-minute frequency in existing rail corridor	X	X	X	$ 82,582,500	2004-09	3	transit	1
6029	Tigard TC	TriMet	Hall/Kruse Frequent Bus	Tigard-Lake Oswego-Kruse Way	Construct improvements that enhance Frequent Bus service	X	X	X	$ 275,000	2010-15	3	transit	3
6064	Tualatin TC	TriMet	Hall Boulevard Frequent Bus	Tualatin-Hall-TV Highway	Construct improvements that enhance Frequent Bus service	X	X	X	$ 7,700,000	2010-15	3	transit	3
7022	Damascus TC	TriMet	Sunnyside Road Frequent bus	Clackamas TC to Damascus TC	Construct improvements that enhance Frequent bus service	X	X	X	$ 913,000	2010-15	3	transit	3
8025	Region	TriMet/SMART	Transit Center Upgrades	Region-wide	New or improved transit centers at various locations in the region			X	$ 20,002,273	2004-25	3	transit	1
8028	Region	TriMet	Vehicle Purchases	1.5% per year expansion	Vehicle purchases to provide for expanded service			X	$ 169,785,000	2004-25	3	transit	1
8032	Region	TriMet/SMART	Bus Operating Facilities	Region-wide	Bus operating facilities			X	$ 75,000,000	2004-25	3	transit	1
8035	Region	TriMet/SMART	Frequent/Rapid Bus Improvements	Baseline Network	Transit stations, improved passenger amenities, bus priority and reliability improvements			X	$ 26,297,000	2016-25	3	transit	1
8038	Region	TriMet	Tri-Met park and ride lots	Baseline Network	Park and ride facilities to serve bus and light rail stops and stations			X	$ 5,782,970	2004-25	3	transit	1
8042	Region	SMART	SMART park and ride lots	SMART district	Park and ride facilities to serve bus and commuter rail station	X	X	X	$ 3,927,000	2004-25	3	transit	1
8043	Region	TriMet/SMART	Bus Stop Improvements	Region-wide	Bus stop improvements region-wide			X	$ 7,939,181	2004-25	3	transit	1
8046	Region	TriMet/SMART	Bus Priority Treatments	Region-wide	Bus Priority Treatments			X	$ 19,891,988	2016-25	3	transit	1
8057	Region	TriMet	LIFT Vehicle Purchases	Region-wide	4% per year expansion	X	X	X	$ 16,890,000	2004-09	3	transit	1
8058	Region	TriMet	Ride Connection Vehicle Purchases	Region-wide	Purchase five vehicles per year	X	X	X	$ 4,767,600	2004-09	3	transit	1

Transit Projects

RTP #	2040 Link	Jurisdiction	Project Name (Facility)	Project Location	Project Description	2020 RTP Priority System	2025 RTP Illustrative System	2025 RTP Financially Constrained System	Est. Project Cost in 2003 dollars ("*" indicates phasing in financially constrained system)	RTP Program Years	Primary Modal Type	Primary Mode	2040 Category
MTP	Region	C-Tran	99th Street park and ride lots	off I-5	Park & Ride			X	$ 8,399,000	2006-2007		mv	N/A
MTP	Region	C-Tran	Vancouver Transit Center	Mall area	Relocate Van Mall Transit Center to C-TRAN AOM			X	$5,700,000	2006-2007		mv	N/A
MTP	Region	C-Tran	Salmon Creek Park & Ride	at I-5/NE 134th Street	Realign Salmon Creek Park & Ride at current site in conjunction with I-5/134th/139th Interchange			X	$ 4,000,000	2011		mv	N/A
MTP	Region	C-Tran	C-TRAN Fleet	N/A	Vehicle Replacement for fixed route and demand response (through 2010)			X	$5,722,000	2010		mv	N/A
MTP	Region	C-Tran	C-TRAN Transit Enhancements	N/A	Improvements/amenities at bus stops (through 2010)			X	$ 314,000	2010		mv	N/A
MTP	Region	C-Tran	C-TRAN System	System Wide	Transit Service Change			X	N/A	Continuing		mv	N/A
MTP	Region	C-Tran	C-TRAN System	System Wide	Deploy ITS (Phase 2 and 3)			X	$8,521,000	Continuing		mv	N/A
MTP	Region	C-Tran	C-TRAN System	Super Stops	Enhanced stop locations at key connections			X	$430,000	2006-2008		mv	N/A

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D. Appendix D: Proposed TSM/TDM Measures

Table 1- Transportation Demand Management (TDM) Strategies and Features						
Updated 6-7-07		**Replacement Bridge Alts.**		**Supplemental Bridge Alts.**		**Responsible**
	No Build	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**	**Agencies**
Strategy 1- Improved public awareness of transportation choices that promote TDM						
Broad Public Outreach Advertising campaign through TV, radio, billboard, bus billboard, newspaper, special events, incentives, Southbound solutions, plus marketing of new modal opportunities (e.g., BRT or LRT)	Continued funding of Southbound Solutions program and other current outreach efforts	Focused outreach to Clark County Commuters consisting of: - 12-wk cable outreach to 52% of Clark Co residents. - 12-wk radio outreach to 154,000 Clark Co. adults age 25-54 - 3-mo billboard outreach to 25% of Clark Co. residents - 6-mo C-TRAN outreach to 25% of Clark Co. thru bus ads - 12-wk Columbian outreach to 50,000 subscribers		Focused outreach to Clark County Commuters consisting of: - 24-wk cable outreach to 52% of Clark Co residents. - 24-wk radio outreach to 154,000 Clark Co. adults age 25-54 - 6-mo billboard outreach to 25% of Clark Co. residents - 12-mo C-TRAN outreach to 25% of Clark Co. thru bus ads - 24-wk Columbian outreach to 50,000 subscribers		ODOT, Metro, C-TRAN, City of Vancouver Clark County
Cost (2007 dollars):	Approx $50,000/yr	Approx $500,000/yr for package described		Approx $850,000/yr for package described		
Individualized Marketing Individualized reach to interested regional residents regarding transportation choices, incentives, travel information, travel surveys	Continued funding of SmartTrips program and other current outreach efforts	Reach 50% of identified CRC travel shed (1.5 mil. people) through mail at cost of $10/person at an outreach frequency every 5 years		Reach 90% of identified CRC travel shed (2.7 mil. people) through mail at cost of $10/person at an outreach frequency every 3 years		City of Vancouver City of Portland
Cost (2007 dollars):	Approx $50,000/yr	$xxx/yr annualized		$xxx/yr annualized		
Strategy 2- Improved alternatives to the single occupant vehicle (SOV)						
High Capacity Transit (BRT or LRT) **Express feeder transit routes to HCT**		Yes	Yes	Yes	Yes	
Cost (2007 dollars):	See Transit Section					
Park and ride lots	3,384 existing spaces serving I-5 Travel markets	Relative to No-Build, create 3,905 additional spaces serving I-5 travel markets for total of 7,289 spaces		Same number of spaces as Alternatives 2 and 3.		TriMet C-TRAN
Cost (2007 dollars):	N/A	Surface parking: $5,400/space x 2,830 spaces = $15.3 mill Structure parking: $25,200/space x 1,100 spaces = $27.7 mill		Same as Alternatives 2 and 3		
Vanpool program	50% incentive -driver and user pay same	• 50% incentive for passengers • Cost free for drivers • Dedicated P&R spaces		• 75% incentive for passengers • Cost free for drivers • Dedicated P&R spaces		Metro C-TRAN Vancouver
Cost (2007 dollars):	Cost: $6,600/van/yr	Cost: $8,700/van/yr		Cost: $12,300/van/yr		
Bike/Ped Facilities -Connection points with roadways -Parking at P&Rs & transit stations -Bike/ped system expansion (to be programmed/implemented by local agencies)		Separated and dedicated bike/ped pathway to be integrated with transit bridge	Separated and dedicated bike/ped pathway to be integrated with transit bridge	Separated and dedicated bike/ped pathway to be cantilevered from the existing northbound bridge Double the connection points relative to Alternatives 2 and 3 to accommodate two bridges		ODOT/WSDOT for Interstate related facilities and connections only
Cost (2007 dollars):	Cost: See Bike/Ped section					
Strategy 3- Improved incentives/disincentives to favor non-SOV alternative modes						
Pricing	None	Differential time of day tolling		Approx 1 ½ to 2 times the toll level used for replacement bridge alternatives (Alt 2 &3)		CRC project
Strategy 4- Improved institutional/organizational approaches to TDM						
Employer sponsored employee outreach -Parking cash out - shuttle to HCT -Flex work week - subsidized transit pass -Utilize tax benefits -incentives to walk/bike -Carpool and vanpool match	TriMet employer outreach program supporting 5.25 FTE and material costs	Continue TriMet employer outreach program, plus outreach to individual employers with 50 or more employees with a focus on employers located within the CRC travel markets utilizing 2 FTE and $60,000 in material costs		Continue TriMet employer outreach program, plus outreach to employment sites with 50 or more employees with a focus on employers located within the CRC travel markets utilizing 4 FTE and $120,000 in material costs		TriMet C-TRAN Metro Clark county TMAs
Cost (2007 dollars):	Approx $375,000/yr	Approx $575,000/yr		Approx $775,000/yr		
Transportation Management Associations within I-5 Travel Markets	$50,000/yr each for Swan Is. TMA and Lloyd District TMA	- Increase support to $100,000/yr for existing TMAs - Create new TMAs within South Waterfront and Rivergate for $600,000 over 3 years to create and $250,000 per year after year 3 to maintain- requires 50% match by TMA participants to operate		- Increase support to $100,000/yr for existing TMAs - Create new TMAs within South Waterfront, Rivergate, Delta Park, Hayden Park, and downtown Vancouver for $1 million over 3 years to create and $350,000 per year after year 3 to maintain- requires 50% match by TMA participants to operate		Metro City of Portland City of Vancouver
Cost (2007 dollars):	Approx $100,000	$xxx/yr annualized		$xxx/yr annualized		
Transit-oriented design (TOD)	Promote TOD along HCT corridor to include mixed use development, higher densities, station area focus, etc.					

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E. Appendix E: FTA Comment Log with Responses

Project Title:	FTA Comments on Draft Detailed Definition of Transit Alternative Report				
Job Charge: N/A	Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
1		Pg 1-3 states that an objective of designing the build alts is to serve most markets with a single transfer. The text states BRT requires a downstream transfer at Expo, while the LRT service plan is designed for the transfer to occur from local bus to Vancouver-area stations. The BRT service plan suggests that many BRT passengers are utilizing similar local bus connections as LRT, but because BRT forces a transfer at Expo, this results in two transfers. This is acknowledged in the following paragraph, somewhat nullifying the single transfer statement. According to preliminary travel forecasts, what is the percentage of 0, 1, 2, and 3 transfers for each of the alternatives?	In 2006, the CRC Transit Team surveyed 1,395 bi-state transit passengers from the Clark County suburban commuter, Clark County urban, and Oregon urban transit markets. All local and express bus routes that crossed the state line were included in the survey. The survey found that 53% of passengers transfer twice or more to make their bi-state trip. One of the design objectives for the BRT and LRT alternatives was to minimize the number of transfers needed to make a bi-state trip. All build alternatives achieve some reduction in the bi-state transfer rate, although some alternatives reduce the transfer rate more than others. The forecasts completed as part of the CRC Draft Environmental Impact Statement indicate lower overall transfer rates compared to existing conditions and an increase in the number of transit trips that would be made with zero or one transfer. As an example, the Clark County to downtown Portland transit market was evaluated for both LRT and BRT in their design year of 2030. The BRT alternative would attract approximately 6,400 trips in this market, with 38% of passengers having 2 or more transfers. The LRT alternative would attract 8,600 trips in this market with 14% of passengers having 2 or more transfers. The transit networks for both the LRT and BRT alternatives include background local bus service and complementary express bus service, which would serve the Clark County suburban commuter transit market and provide a zero transfer trip from suburban Clark County to downtown Portland. The table below shows the percentage of bi-state passengers that would have 0 to 3 or more transfers between Clark County and Oregon.	

Alternative	Transfers (Clark County-Oregon)			
	0	1	2	3
2006 Clark County and Oregon Urban Markets	21%	25%	28%	25%
2030 Alt. 2 BRT (All Markets)	13%	37%	50%	0%
2030 Alt. 3 LRT (All Markets)	27%	45%	27%	0%

Project Title:		FTA Comments on Draft Detailed Definition of Transit Alternative Report				
Job Charge: N/A		Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
2		p. 2-23 – The discussion of the development of alternatives notes that the CRXing staff recommended alternatives that would "…improve service to the inner urban market and serve the suburban commuter market, while…; preserving the direct service currently provided to and from Clark County to central Portland during morning and evening peak commuting hours." The alternatives now under consideration seen to have omitted the services that would preserve the direct service. Is there something we are missing?	All build alternatives preserve direct point to point express bus service from the Clark County suburban commuter market to downtown Portland. Page 2-23 summarizes a key CRC staff finding during the step four evaluation, which is that high capacity transit (HCT) modes would be paired with complementary express bus service. The HCT modes would primarily serve the Clark County and Oregon urban transit markets, which based on 2006 passenger surveys, would have a diversity of trip origins, destinations and trip purposes throughout the operating day. The HCT modes would also serve the Clark County suburban commuter market by constructing up to 2,500 new park and ride spaces located adjacent to HCT stations. With either HCT mode, the existing and programmed express bus routes would continue to serve the Clark County suburban commuter transit market consistent with the No Build Alternative. This service would provide point-to-point peak period service for primarily home-based work trips between suburban Clark County park and ride lots and downtown Portland. For the Clark County urban market, the build alternatives remove one express bus route that connects downtown Vancouver to downtown Portland. This route was removed since it is redundant to the HCT service in the urban market. Figures 1-6 to 1-8 and 1-11 to 1-13 of the DDTAR depict the four suburban commuter point-to-point express bus routes in the I-5 corridor (labeled on the far left of the figure in grey) that would continue to connect remote park and ride lots in suburban Clark County to downtown Portland. These express bus routes travel on I-5 in general purpose lanes through the bridge influence area. We are preparing revised service map files which contain the latest versions of the BRT and LRT service plans, and will include those in the Draft Final Definition of the Transit Alternatives report.	

Project Title:	FTA Comments on Draft Detailed Definition of Transit Alternative Report				
Job Charge: N/A	Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
3		What is the purpose of the 100 shuttle? Is there any experience in the Portland-Vancouver region for transit passengers who access transit by auto are willing to take such a short transit trip (into downtown Vancouver) or endure additional transfers to complete their journey (as any destination to downtown Portland would require)? Why not run the 100 as express service, with a stop at the LRT termini (and perhaps the BRT termini) but continue it south as non- or limited-stop service to downtown Portland? Or simply increase service on the 71L?	The 100 shuttle was tested but was subsequently removed (after the draft report was sent to you) from the BRT and LRT service plans due to poor ridership and the relatively high number of platform hours it took to deliver the service. Originally the 100 shuttle was designed to accommodate Washington park and ride patrons returning from Oregon during the middle of the operating day. Subsequent analysis indicated that route 71L could accommodate these passengers.	
4		Pg 4-35 – "All express bus routes would operate in general purpose lanes southbound." Why don't the express bus lanes utilize the BRT guideway? Please explain and provide justification for the infeasibility of such operations.	Routing the complimentary express bus service off of I-5 to travel through downtown Vancouver to access the guideway and then routing them back on the highway south of the Expo Center LRT station would add more time to the express bus travel times than it would save. In order to use the BRT guideway express buses would need to travel out of direction, would experience delays in downtown Vancouver, and would travel along a circuitous route on local streets to re-enter I-5 after the Expo Station LRT stop. Due to right of way limitations in downtown Vancouver the contra-flow BRT guideway is not designed for express operation, and express buses would be unduly delayed by local and BRT buses serving stations along the guideway. As a result, express buses would pick up passengers in suburban Clark County and then continue to central Portland via I-5 general purpose lanes southbound. In the PM peak period these express bus routes would use the existing northbound managed lane on I-5 from Going Street to Marine Drive.	

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Job Charge: N/A	Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
5		The Highway1 alternative includes tolling of all I-5 lanes. Would these tolls reduce congestion enough that buses could operate reliably in mixed traffic? Would tolling the bridge lanes reduce traffic on I-5 between the Columbia River and downtown Portland sufficiently that reliable through bus service to and from downtown Portland could be maintained and be part of a TSM alternative.	All build highway alternatives evaluated in the CRC DEIS include tolling of all I-5 lanes. The implementation of tolling does slightly decrease the auto volumes across the I-5 Columbia River Crossing and results in an overall improvement in traffic flow (merging and diverging) within the bridge influence area. However, while the build alternatives would generally reduce congestion and improve traffic flow within the bridge influence area, the improvement would not remove congestion, and bus travel time reliability would still be negatively affected by the remaining congestion problems south of the project area. According to the 2006 CRC survey of 1,395 transit passengers, travel time and schedule reliability was the number one public transit attribute for existing passengers in all current markets. The build alternatives address this fact by constructing an exclusive transit guideway to transport the majority of bi-state transit passengers in a protected right of way. All the build alternatives continue express buses operations in I-5 general purposes lanes southbound and the existing I-5 managed lane between Going Street and Marine Drive northbound. A future TSM alternative may also include these express buses. In the No Build alternative 24 express buses per hour would use the I-5 general purpose lanes southbound and the existing I-5 managed lane northbound. In the build alternatives this number ranges from 17 to 40 depending on the build alternative service plan. However, the remaining congestion south of the project area would affect the travel time and schedule reliability of these services in all alternatives, including the TSM.	

Project Title: FTA Comments on Draft Detailed Definition of Transit Alternative Report					
Job Charge: N/A	Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
6		p.1-7 Vehicle Capacity – The average passenger capacity is computed as a percentage of the maximum capacity as reported by the manufactures (seats plus standees). These are not necessarily comparable in terms of square feet per passenger and may need to be refined for further analysis. Also, the percentages used differ by mode: 85% for express bus 77% for BRT 80% for LRT The reasons for these differences must be explained or a common percentage must be used for all modes.	Based on this comment the CRC Transit Team has revised its vehicle capacity numbers. In October 2006 the CRC Transit Team undertook a physical survey of existing transit vehicles and evaluated the seating and standee arrangements for the proposed BRT vehicle. The BRT vehicle evaluation included the floor plans for Lane Transit District's EmX and the vehicle currently being tested for the Orange Line in Los Angeles. To determine the revised vehicle capacities the number of seats and standee floor areas were measured. The table below reports the results, which will be included in the Final Definition of the Transit Alternatives report. For express buses operating on I-5 in mixed traffic, a policy decision could be made not to allow standees, but C-TRAN does not have a adopted policy that states this. When calculating total standees per square meter, we followed existing and adopted transit district policy, or defaulted to the national average at 3 persons per square meter, whichever was lower.	

Bus and Service Type	Seats	Standee floor area (meters)	Standees at 3 per square meter	Total seats plus standees	Total seats plus standees at 2.7 persons per square meter[1]	Final Passenger Capacity per Vehicle
CTRAN Express bus	43	6.14	18	61	N/A	61
CTRAN Local bus	43	6.14	18	61	N/A	61
TriMet Light Rail car (1-car train)	64	25.5	77	141	133	133
TriMet Light Rail car (2-car train)	128	51	153	281	266	266
TriMet Local Bus	39	6.7	20	59	N/A	59
BRT vehicle	47	14.7	44	91	N/A	91

[1] TriMet standard for achievable capacity.

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Job Charge: N/A	Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
7		A paragraph of related comments has been broken down into constituent parts, which is listed as #7 to #10 below. A) p. 1-8 - In the No-build alternative C-TRAN operates bi-state service in the bridge influence area with service continuing to downtown Portland. In the BRT alternatives all C-TRAN routes terminate at the Expo Center Light Rail station. This introduces a transfer that some riders would not need to make in the No-Build, effectively reducing the quality of service.	All build alternatives preserve direct point to point express bus service from the Clark County suburban commuter market to downtown Portland. As a result, these riders would not experience a transfer and their trip would remain consistent between the No Build and build alternatives. The CRC project is examining a proposed extension of HCT across the Columbia River and into Clark County, and the existence of LRT in the I-5/North Portland corridor affects how the transit alternatives for the DEIS were developed. Prior to the DEIS, the step four evaluation of transit modes indicated that having a BRT-LRT transfer at the Expo Center station was more cost effective than running duplicative BRT service between the Expo LRT station and downtown Portland. The evaluation also revealed that congestion on I-5 south of the project area would still exist, would increase over time, and would introduce travel time and schedule unreliability into the BRT service, conflicting with the 2006 stated preferences of existing passengers. Please see comment #1 and #2 above. The service plans in the build alternatives would decrease the number of transfers required to make a bi-state trip, and would preserve the opportunity of the Clark County suburban commuter market to maintain a zero transfer trip if so desired. In the No Build alternative, the bulk of the bi-state service would be 4 CTRAN-operated local and limited stop bus routes that would travel in I-5 general purpose lanes and transfer passengers to the Yellow Line LRT at the Delta Park station. Express bus routes would operate in I-5 general purpose lanes connecting remote park and rides in suburban Clark County to downtown Portland. In the BRT alternatives all C-TRAN local bus routes and the new branded BRT routes would utilize a new exclusive guideway to transfer passengers to the Yellow Line LRT at the Expo Center light rail station. The construction of the exclusive guideway would result in substantially improved travel times and schedule reliability. Express bus routes would operate in I-5 general purpose lanes connecting remote park and rides in suburban Clark County to downtown Portland. In the LRT alternatives all C-TRAN local and limited stop bus routes would not cross the river; instead, passengers would transfer to the Yellow Line LRT in downtown Vancouver. Express bus routes would operate in I-5 general purpose lanes connecting remote park and rides in suburban Clark County to downtown Portland.	

Project Title:	FTA Comments on Draft Detailed Definition of Transit Alternative Report				
Job Charge: N/A	Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
8		B) To accommodate these transfers the peak service frequency on Tri-Met's Yellow Line will be reduced from 10 minutes to 7.5 minutes. If C-TRAN's operating costs are significantly different from Tri-Met's costs, shifting riders from C-TRAN services to Tri-Met services could complicate the O&M cost analysis.	Originally, the service plans started out by matching headways of connecting services. However, subsequent service planning efforts equilibrated each build alternative. This affected the frequency of TriMet's Yellow Line which was changed in late September after the DDTAR was submitted to you. In the BRT alternative, TriMet's Yellow Line frequency would be maintained at the 2030 No Build level. This action was taken in part because the span of service of 3 branded BRT routes was reduced to peak period service only during the final BRT optimization and equilibration process. This reduction in branded BRT service was made to optimize performance and operating costs at the request of our local sponsor agencies. C-TRAN and TriMet operating and maintenance costs for local bus operations is very similar and should not unduly complicate the O&M cost analysis. The two systems have a long history of institutional experience sharing riders, costs, and revenues.	

Project Title:	FTA Comments on Draft Detailed Definition of Transit Alternative Report				
Job Charge: N/A	Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
9		D) In addition, the increased Yellow Line frequency will result in better service on the Yellow Line leading to increased ridership and user benefits for markets along the Interstate Avenue corridor in Portland. These benefits would not be a direct result of the proposed project.	We understand that increasing frequencies on the Yellow Line LRT would lead to increased ridership and some additional user benefits along the Interstate Avenue corridor. However, after equitably equilibrating all build alternatives and all services in the corridor, our understanding is that the increased ridership and user benefits along the Interstate Avenue corridor would be a direct result of the proposed project. In the 2030 No Build alternative, the analysis indicates that increasing frequencies is not warranted based on vehicle capacities and the location of the LRT peak load point. Analysis indicates that the Yellow Line LRT would be at 43% of capacity in the 2 hour PM peak period, and its current frequency is set by TriMet adopted policy not vehicle capacity and peak load point. In the BRT alternative, the Yellow Line LRT can accommodate the additional BRT-LRT transfers and as a result increasing frequencies is also not warranted. Analysis indicates that the Yellow Line LRT would be at 64% of capacity in the 2 hour PM peak period. However, with the introduction of LRT service in downtown Vancouver, the combined LRT vehicle capacity at 10 minute frequencies is exceeded in the 2 hour PM peak period. Analysis indicates that the Yellow Line LRT would be at 121% of capacity at the peak load point in the 2 hour PM peak period. During the equilibration step the Yellow Line LRT frequencies were improved to 7.5 minutes, resulting in a 91% of capacity number at the peak load point. As a result, the LRT frequencies on Interstate Avenue would be need to be increased as a direct result of the CRC project. Increased ridership and user benefits will occur along the Interstate Avenue corridor as a direct result of the service improvement made necessary by the extension.	
10		E) The Baseline alternative for the BRT alternatives, whatever that may be, should also included reduced peak headways on the Yellow Line in order to isolate the project benefits.	Increasing LRT frequencies in the BRT alternative is not warranted based on the peak load point, vehicle capacity data currently available and the set of TriMet service policies currently in place. That being said, it may be useful in subsequent analysis of the TSM alternative to isolate these project benefits for comparative purposes.	

Project Title:	FTA Comments on Draft Detailed Definition of Transit Alternative Report				
Job Charge: N/A	Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
11		p. 2-14 - The discussion of travel markets makes several references to markets being "time-sensitive." "Most of the inner urban trips are time-sensitive." "For the suburban commuter market the vast majority of trips are for work (which is a time-sensitive trip)…." What trip markets are not time-sensitive?	We understand that most if not all trips are time-sensitive. We will reword the text to attempt to underscore that some trips are more time sensitive to the reliability of arrival times. For example, it is generally more important to reliably arrive on time to your job than it is to reliably arrive on time for a shopping trip. The discussion of time sensitive trips between the travel markets was intended to emphasize the finding from the CRC 2006 passenger survey that travel time reliability was the single most important public transit attribute for existing bi-state transit patrons (instead of an attribute such as fastest travel time).	
12		p. 2-24 – Bus Rapid Transit with Express Bus Service – The report states the "Prior to the step four screening, the BRT Alternative was to travel to the Expo Center…and then continue south to downtown Portland….Due to travel delays south of Delta Park the BRT Alternative that was recommended to be carried forward would connect directly to the Interstate MAX line at Expo Center and avoid traveling further on I-5 south." The scheduled MAX time from Expo Center to Pioneer Square is 29 minutes. What would the bus times via I-5, or even express on Interstate Avenue, be?	See the response to comment #1 and #7 above. Because of operating costs, schedule reliability, travel time variability, the number of vehicles required, and downstream congestion on I-5 south of the project area, the BRT guideway was recommended to end at the Expo Center LRT station. The CRC Transit Team is currently evaluating multiple travel time pairs as part of the DEIS. In general, the ongoing Microsimulation tool VISSIM suggests that I-5 travel times will increase in the future, and the effect of downstream congestion problems south of the project area will worsen over time. The CRC Transit Team is also currently evaluating the travel time and schedule reliability of buses using I-5 general purpose lanes southbound, and expect to have preliminary data soon that compares the VISSIM I-5 travel speeds to that of the fixed guideway. As stated in comment #2, despite the variability of highway speed and travel time, express bus service would to continue on I-5 as in the No Build Alternative; therefore express bus service on Interstate Avenue was not analyzed. BRT service on Interstate Avenue was not analyzed because that segment of HCT service would be redundant to the existing Yellow Line LRT service currently provided on Interstate Avenue south of the Expo Center.	
13		p 2-26 – Lessons Learned – "The existing Interstate MAX Yellow line has capacity to serve additional transit riders south of Expo Center." If this is so, why is it proposed to increase the service frequency from 10 to 7.5 minutes?	See response to comment #9 above regarding LRT frequencies. Since the Draft DDTAR was submitted in August of 2007, the service frequency of the Yellow Line was equilibrated to maintain 10 minute headways in 2 hour PM peak period at the peak load point for the BRT alternatives.	

Project Title:	FTA Comments on Draft Detailed Definition of Transit Alternative Report				
Job Charge: N/A	Reviewed By G Snyder	Office & Mail Stop: CRC	Phone:	Date: 9-27-07	Sheet 1 of

#	Sht/Pg	Reviewer's Comment	Designer's Response	Init.
14		p. 3-1 – "Appendix A …include the fare estimation methodology used in the project's travel demand model." Will this structure apply to the No-build and TSM alternatives?	Yes, a consistent fare policy applies to all DEIS alternatives, as well as any future New Starts Baseline alternative. This memo was included in the appendix of the DDTAR and will be included in the Final Definition of the Transit Alternatives report.	

F. Appendix F: Fourth CRC DEIS Alternative Recommendation

Columbia River CROSSING

Memorandum

March 26, 2007

TO:	Hal Dengerink and Henry Hewitt, Co-Chairs
FROM:	Fourth Alternative Subcommittee (Prepared by CRC Staff)
SUBJECT:	Fourth CRC DEIS Alternative Recommendation
COPY:	Doug Ficco, WSDOT and John Osborn, ODOT – Co-Directors
ATTACHMENTS:	Fourth Alternative Progression Diagram Fourth Alternative Subcommittee Recommendation

BACKGROUND

At the February 27, 2007 Task Force meeting, a subcommittee was formed to develop a potential fourth alternative for analysis in the CRC project's DEIS. The subcommittee included the following members:

Metro Councilor Rex Burkholder, Co-Chair
Clark County Commissioner Steve Stuart, Co-Chair
Hal Dengerink, CRC Task Force Co-Chair, ex-officio subcommittee member
Henry Hewitt, CRC Task Force Co-Chair, ex-officio subcommittee member
Dean Lookingbill, SW Washington Regional Transportation Council
Fred Hansen, TriMet
Jeff Hamm, C-TRAN
Walter Valenta, Bridgeton Neighborhood
Scot Walstra, Greater Vancouver Chamber of Commerce
Tom Zelenka, Schnitzer Group

Meetings were held weekly at the former Hayden Island Yacht Club, 12050 N. Jantzen Drive, Portland, Oregon. Meeting dates and times were:

March 12, 2007, 2:30 p.m. to 4:30 p.m.
March 19, 2007, 8:00 a.m. to 9:00 a.m.
March 26, 2007, 8:00 a.m. to 10:00 a.m.

The following ground rules were adopted at the initial March 12th meeting:

Ground Rules for Developing the Fourth Alternative:

1. We will produce an alternative in three weeks.
2. The alternative will aspire to meet the CRC project's Purpose and Need Statement.
3. Our job is to assemble the best possible solutions that do the following:
   a. Maximize the utility of the existing bridges
   b. Provides High Capacity Transit (HCT) between Clark and Multnomah counties
   c. Provides high quality bicycle and pedestrian access
   d. Minimizes impacts on downtown Vancouver and Hayden Island
   e. Ensure better freight mobility
   f. Address issues of barge and ship traffic on the Columbia River
4. The Task Force members named by the chairs will be the members of the subcommittee unless the co-chairs (Commissioner Stuart and Councilor Burkholder) and the CRC Task Force co-chairs decide more expertise is needed.

360/737-2726 503/256-2726 WWW.COLUMBIARIVERCROSSING.ORG 700 WASHINGTON STREET, SUITE 300, VANCOUVER, WA 98660

5. While subcommittee meetings will be noticed and will be open to the public, only officially designated members will participate. Given that the recommendation on including any proposed alternative will be made by the CRC Task Force, the subcommittee will not take any public testimony.
6. Our goal is to make decisions by consensus.

Evaluation Criteria for the Fourth Alternative

The subcommittee recommended the performance of the fourth alternative should aspire to achieve the following criteria in accordance with the CRC project's Purpose and Need:

- encouraging mode shift
- moving people and freight
- optimizing interchanges
- using existing bridges most effectively
- minimizing impacts to land use, minimizing footprints
- providing a lower cost alternative

PROCESS

For the initial meeting, CRC presented two "book-end" options for review by the committee. Option A was essentially a "No-Build" for I-5 with TDM/TSM and transit service. Option B added six lanes of new capacity for I-5, three in each direction, and used the existing bridges for auxiliary lanes in addition to transit service. Both alternatives addressed appropriate interchange modifications, safety improvements, TDM/TSM, freight enhancements, bicycle/pedestrian upgrades, seismic retrofits, and relocation of the railroad moveable span.

For the March 19, 2007 meeting, CRC staff was asked to provide conceptual layouts for three modifications to Options A and B along with an evaluation of their performance sufficient to begin shaping the proposed fourth alternative. The following three recommendations were optimized and evaluated by CRC staff:

- Option A+: Essentially a No-Build option for I-5 with aggressive TDM and Transit components to meet the demand to move people across the river, including a new HCT bridge across the river. I-5 improvements were targeted at improving safety and system flow.

- Option A++: The same as Option A+ with the addition of two I-5 auxiliary lanes, one in each direction, on a new bridge combined with HCT.

- Option B-: Uses the existing I-5 Bridges as auxiliary lanes and provides for two new I-5 lanes in each direction on a new bridge to carry through traffic and HCT. Appropriately sized TDM strategies and increased transit service is added to balance the demand.

Upon presentation of the performance results of the three options, CRC staff was asked to evaluate an additional option that fell somewhere between Option A++ and Option B-. CRC staff added another option for review at the March 26th meeting. These two options are described below:

- Option A++ Modified: This option uses the existing Interstate Bridges for I-5 traffic and adds two lanes, one in each direction, on a new bridge with HCT. Pricing or tolling may be used on the new or existing lanes to reduce vehicle demand. Transit service is increased sufficiently to encourage options to driving alone. A new moveable span is provided on the railroad crossing that best serves navigation needs.

- Option B- Modified: CRC staff recommended an option that uses the existing bridges for NB traffic and a new bridge for SB traffic. The total number of lanes can be limited to eight, two lanes each on the existing bridges and four lanes on the new bridge. This option has the same number of I-5 lanes as Option A++ Modified described above, but more effectively and efficiently uses existing infrastructure and alignments. SB lanes can transition directly to the new alignment without the need for additional shoulders and the fly-over. TDM and Transit is similar to Option A++ Modified. HCT can share the SB highway bridge. This option also improves opportunities to toll all vehicles crossing the Columbia River.

At the March 26, 2007 subcommittee meeting, Option B- Modified was recommended as the fourth alternative for presentation to the Task Force at their March 27, 2007 meeting.

Following is a detailed description of the Fourth Alternative subcommittee recommendation:

FOURTH ALTERNATIVE SUBCOMMITTEE RECOMMENDATION

A total of eight I-5 lanes will be provided, four in each direction. The existing Interstate Bridges will carry northbound traffic and will be modified to carry two lanes on each bridge. The existing southbound bridge will be converted to northbound for two general purpose through lanes. The existing northbound bridge will carry two lanes, one for general purpose and the other as an auxiliary lane. Four I-5 southbound lanes will be provided on a new bridge with HCT, three general purpose lanes and one auxiliary lane. HCT lanes can either be for light rail or express bus. Transit service will be sized to meet increase demand for riders. Tolling will be used for project funding and will also reduce travel demand. Other TDM as well as TSM and freight enhancements will be included. Bicycles and pedestrians will be on a wider, retrofitted path on the existing bridges. Interchange modifications will be included in relationship to the mainline I-5 improvements to assure the best operational characteristics. A seismic upgrade of the existing bridges may be required. A new railroad moveable span may be required to benefit navigation.

Component improvements recommended include:

Highway

- The existing I-5 bridges are re-striped to provide two lanes on each bridge and allows for an outside safety shoulder for disabled vehicles. The two lanes on the NB bridge will connect with the interchanges as well as allow for through traffic. The two lanes on the SB bridge will become through NB lanes.
- Four new SB I-5 lanes are provided on a new bridge along with HCT. The new lanes will allow for three through lanes and one auxiliary lane connecting SR 14 with Hayden Island.
- Interchanges are modified to improve intersection performance in accordance with operational analysis that balances the mainline improvements. Spot safety improvements are included.
- Traffic system management tools are incorporated to improve I-5 operations.

Transit

- A new river crossing bridge for HCT is included with the new highway bridge.
- HCT capacity is increased to serve approximately 25,000 persons per day.
- Express bus service and local and feeder bus service are increased to serve the added transit capacity. Increase in transit service is based on data generated from model runs and confirmed by the transit providers.
- Park-and-ride lot capacity is increased from the existing 1,872 spaces in the I-5 corridor to approximately 7,500. Recommendations for reduction in park-and-ride spaces can be achieved based on modeling results and transit service recommendations.

TDM/TSM

- Tolling is included for both the new I-5 bridge and existing bridges with variable pricing to reflect peak hour demand. Pricing is focused on generating revenue to help fund the new improvements as well as reducing demand.
- Transit operating subsidies are provided to encourage increased transit service and use.

Freight Mobility

- Trucks have the opportunity to use the new I-5 capacity.

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G. Appendix G: Transit Design Options and Park and Ride Lot Recommended to be Removed from Further Consideration

July 30, 2007

TO: CRC Project Team

FROM: CRC Transit Team

SUBJECT: Transit Design Options and Park and Ride Lot Recommended to be Removed from Further Consideration

COPY: Rex Wong, P.E.

This memorandum documents the rationale for removing three transit design options and a park and ride lot from further consideration, including the two-way on Broadway, the Washington/Main couplet, the Washington/Columbia couplet, and the Ross Road park and ride lot. An extensive review of the transportation and environmental performance of the design options and potential park and ride locations revealed that these three options and the park and ride lot have undesirable characteristics that warrant their removal from further consideration. The rationale for this action is detailed below.

The remaining options that will be evaluated in the DEIS would perform better and have lower adverse impacts than these options that would be dropped from further consideration.

5.1.1.1 Two-Way on Broadway Design Option

The two-way on Broadway option is designed with both directions of the HCT alignment on Broadway Street.

This option is recommended to be removed from further consideration for the following reasons:

- It would be inconsistent with current and planned development.
- HCT would cross the Columbia River from Hayden Island and touch down in Vancouver at Washington and 6th Street. Transitioning both directions of the HCT guideway from this touch down location to Broadway Street would require an east-west couplet, on both 6th and 7th Streets, that would:
  - Have the highest number of acquisitions in lower downtown Vancouver;

– Conflict with traffic circulation;

– Remove important, on-street retail parking from Main Street near the intersections of 6th and Main and 7th and Main; and

– Have the greatest number of sharp turns in the alignment that would generate noise and vibration impacts.

The Vancouver Central City Vision Plan (VCCV), the City's plan for the future development of downtown Vancouver, shows an HCT alignment on Washington Street. According to City of Vancouver staff recent development along Washington Street, such as the Vancouver Center, has occurred with the understanding that it would be served by HCT in the future. Since the two-way on Broadway option is designed with both tracks/lanes of the HCT guideway transitioning off of Washington Street and operating along Broadway Street, this option would not serve recent and planned development, done in compliance with the VCCV, and would be inconsistent with the City's vision for transit in their downtown.

Relocating both directions of the guideway two blocks east to Broadway Street would require a cross-over couplet with one direction of travel along 6th Street and the other along 7th Street. The turning radius required to maneuver the guideway on to and off of 6th and 7th Street would result in the need to acquire a portion of the properties located on the corners of 6th and 7th Street, and Broadway Street. Constructing the cross-over couplet would require more property acquisitions in lower downtown Vancouver than any other option.

The cross-over couplet would also have the greatest impact on the east-west circulation in downtown Vancouver. Both 6th and 7th Street would be required to be one way streets, in the same direction as HCT, and each would lose one automobile travel lane; a total reduction of two east-west travel lanes (more than other options). These two east-west streets currently provide important access to nearby businesses, including the convention center at the corner of Columbia Boulevard and 6th Street and the proposed retail core at the intersection of Main Street and 7th Street. The impact of the cross-over couplet would create unavoidable auto-transit conflicts to local circulation.

To provide adequate station spacing and equivalent service with other design options, a station would be located on both 6th and 7th Streets between Washington and Main Street. Due to the short, 200-foot block length between Washington and Main, the platform for the HCT stations would extend into the right-of-way for Main Street at both 6th and 7th Streets requiring a non-standard realignment of the travel lanes to the east side of Main Street in this area. On Main Street, an important retail street in downtown Vancouver (see the discussion of impacts to Main Street in the Washington/Main couplet below), this would eliminate more than 20 on-street parking spaces.

The cross-over couplet would also require four minimum radius turns in the guideway to be made in close proximity to each other; one from Washington Street to 6th Street, a second from 6th Street to Broadway Street, a third from Washington Street to 7th Street and then the fourth from 7th Street to Broadway Street. Transit vehicles create unique noise and vibration impacts along sharp turns in the guideway; particularly "wheel squeal" which would occur regularly with the light rail transit mode. The cross-over couplet would create a permanent and negative noise and vibration effect.

Because of the inconsistency with current and planned development, greater property acquisitions, impacts to traffic circulation, and noise, it is recommended that this design option be removed from further consideration.

5.1.1.2 Washington/Main Couplet Design Option

The Washington/Main couplet is designed with the northbound direction of HCT travel on Main Street and the southbound direction on Washington.

This design option is recommended to be removed from further consideration because it would:

- Reduce parking and traffic access on Main Street, a primary commercial corridor, in downtown Vancouver where the uses are dependent on on-street parking and on-street parking has been identified as important to revitalization efforts. One side of Main Street would lose all parking spaces and direct automobile access;

- Prohibit the planned traffic circulation on Main Street, a key downtown arterial; and
- Preclude the planned connection of Main Street from the downtown to the waterfront.

The VCCV designates Main Street as an important retail and commercial street in downtown Vancouver. The City of Vancouver has identified on-street parking as an important element of the revitalization efforts because it is critical to the success of retail and commercial uses along Main Street. Of the existing angled on-street parking on Main Street, an HCT alignment on Main Street would eliminate 80 parking spaces from 5th Street to McLoughlin Boulevard. The City's Main Street redevelopment plan proposes to change the on-street parking along Main Street from angled parking to parallel parking. With parallel on-street parking an HCT alignment on Main Street would eliminate 65 on-street parking spaces from 5th Street to McLoughlin Boulevard - about one third of the total spaces planned by the City.

The City of Vancouver's Main Street redevelopment plan states that Main Street will become one of two primary north-south arterials in downtown Vancouver (the other being Columbia Street) with a planned future extension connecting to the downtown waterfront area. Routing one direction of HCT along Main Street would prohibit this street to function as a north-south arterial because it would permanently change it to a one-way street with traffic in the northbound direction only. Construction of this design option would also permanently preclude the planned future extension of Main Street to the waterfront. The southbound direction of a future extension of Main Street to the waterfront would consequently only be accessible from 6th Street which substantially limits its usefulness.

Because of the parking, circulation, and land use impacts to an important commercial corridor and downtown arterial it is recommended that this design option be removed from further consideration.

5.1.1.3 Washington/Columbia Couplet Design Option

The Washington/Columbia couplet is designed with the northbound direction of HCT travel on Washington Street and the southbound direction on Columbia Street.

This design option is recommended to be removed from further consideration because it would:

- Impact traffic circulation on Columbia Street, a key downtown arterial. One side of Columbia Street would lose all parking spaces and direct automobile access;
- Result in out-of-direction travel; and
- Impact a historic resource that could be avoided by design options that do not use Columbia Street that perform as well, or better, than this option.

Locating one direction of HCT along Columbia Street has an impact similar to Main Street in regards to traffic circulation in downtown Vancouver. Columbia Street is currently the only north-south arterial in downtown Vancouver and the City of Vancouver has recently adopted local plans and policies that stress its importance to remain a two-way street. Columbia Street is the only street in downtown Vancouver that already extends south to the waterfront and can serve future redevelopment of the waterfront. Constructing the southbound direction of an HCT couplet along Columbia Street would permanently preclude continuous two-way automobile traffic on Columbia Street and would restrict automobile traffic to one-way in the southbound direction. Therefore, a couplet including Columbia Street would substantially impact the existing and planned traffic circulation in downtown Vancouver.

Locating HCT along Columbia Street would also affect access to the St. James Catholic Church property, an important historic resource and one of the oldest buildings in downtown Vancouver. Since there are other reasonable and better performing design options in downtown Vancouver, this historic resource effect can be readily avoided without reducing transit performance or resulting in other significant impacts.

Finally, locating one direction of the HCT alignment along Columbia Street would have the greatest out of direction travel (resulting in an additional guideway length of approximately 500 feet). This is because from the touch down point on Washington Street the guideway would head west to Columbia Street and then head back east, near McLoughlin Boulevard, to the proposed Mill District Transit Center.

Because of the impacts to traffic circulation on an important downtown arterial, the out-of-direction travel, and the historic resource impact that could be avoided with other, better performing options, it is recommended that this design option be removed from further consideration.

5.1.1.4 Ross Road Park and Ride

The site for the proposed Ross Road park and ride lot is currently undeveloped WSDOT right-of-way adjacent to I-5, located along Highway 99 at the intersection with E Ross Road. Initial modeling assumed a 500 space park and ride lot that would cover the whole site. However, environmental constraints on the northern portion of this property and zoning restrictions do not make this site suitable for development as a park and ride lot.

The Cold Creek canyon runs through the northern edge of this property. This creek is protected by the City of Vancouver's Critical Areas Ordinance (VMC 20.740) because it is part of the Burnt Bridge Fish and Wildlife Habitat Conservation Area (VMC 20.740.110). As a tributary of Burnt Bridge Creek, the Cold Creek canyon has a required 100-foot Riparian Management Area and an additional 50-foot Riparian Buffer that is protected from development. This protection does not prohibit development, but requires development to attempt to avoid, then minimize, and mitigate any impacts. Furthermore, since development is allowed on the southern part of this property, WSDOT may be prohibited from developing the northern part under the "Reasonable Use Exceptions" that would otherwise allow some development within the protected portions of this property.

As a tributary of a salmonid bearing stream (Burnt Bridge Creek), water quality and water quantity of Cold Creek are protected under the Endangered Species Act (ESA). Thus, any activity that would affect the quality or quantity of water in Cold Creek would need to be approved through consultation with NOAA Fisheries (the regulatory agency that enforces the ESA).

Avoiding the critical lands reduces the developable area by over half and would only allow for the development of a park and ride lot with approximately 200 parking spaces. The capital costs to construct a facility on this site, and the operational costs to connect it to the HCT service, would not be cost effective for a 200 space park and ride lot. In addition, the current zoning of this site (Office Commercial Industrial (OCI)) specifically prohibits the transportation use of park and ride lots. Locating a 200 space park and ride lot within this zone would require the City of Vancouver to approve an amendment to their zoning code.

Because of the environmental impacts to critical areas, cost effectiveness and the zoning restrictions it is recommended that a park and ride lot on this site be removed from further consideration.

H. Appendix H: Draft Components Considered But Not Advanced

Prepared for CRC Project Team

March 2006

WBS #CR-7.0-Rep-PDT-06-03-00

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Contents

Executive Summary

This memorandum identifies and considers transportation components that were put forward by the public, local governments, and other stakeholders during the Columbia River Crossing (CRC) project scoping period. The transportation components that have been suggested during scoping but for technical reasons are not being advanced into component screening include:

- High Speed Rail
- Magnetic Levitation Railways
- Heavy Rail
- Automated Guideway Transit (AGT or People Movers)
- Ferries
- Monorail
- Personal Rapid Transit

Exhibit 1 on the following page lists the above technologies in terms of the CRC project, and provides explanations of each, whether they were advanced and why.

EXHIBIT 1: Technology and Strategy Characteristics Matrix

HIGH CAPACITY TRANASPORTATION TECHNOLOGIES AND STRATEGIES:	HIGH SPEED RAIL	MAGLEV	HEAVY RAIL	AUTOMATED GUIDEWAY TRANSIT	FERRY	MONORAIL	PERSONAL RAPID TRANSIT
Is the Component Free of Known or Obvious Fatal Flaws?	NO - Serves primarily long-distance trips of 100-300 miles	NO - The ideal trip distance for Maglev technology is between 50-500 miles	NO - Large person carrying capacity of heavy rail not warranted in BIA	NO - Would require an entirely elevated system from N. Portland to Clark County	NO - Travel-time would not be competitive; cumbersome operation over the river	NO - Primarily for specialty niche applications such as amusement parks, tourist destinations	NO - This is a concept that exists in theory only
Does the component meet the CRC Purpose and Need?							
1) Improve transit operations, connectivity or reliability in the BIA?	NO - cannot be constructed in the BIA's built environment	NO - cannot be constructed in the BIA's built environment	NO - cannot be constructed in the BIA's built environment	NO - cannot be constructed in the BIA's built environment	NO - would not serve BIA, rather only the shorelines	NO - cannot be constructed in the BIA's built environment	NO - cannot be constructed in the BIA's built environment
2) Improve transit service to transportation markets?	NO - cannot provide service to identified markets	NO - cannot provide service to identified markets	NO - cannot provide service to identified markets	NO - cannot provide service to identified markets	NO - service would only be between shorelines	NO - cannot provide service to identified markets	NO - cannot provide service to identified markets
3) Improve transit service reliability and travel speed?	YES-but cost prohibitive	NO	YES-but cost prohibitive	NO	NO	NO	NO
Has the component been proven and currently in revenue service in North America?	YES (Acela)	NO	YES	YES	YES	YES	NO
Does the component have little or no undesirable characteristics?	NO - Requires complete grade-separation; not compatible with existing systems	NO - Requires complete grade-separation; not compatible with existing systems	NO - Requires complete grade-separation and/or subway	NO - Requires complete grade-separation and either aerial or underground stations	NO - Requires new terminals on either side of the river to be constructed, possibly hampering new bridge footprint	NO - Requires complete grade-separation; not compatible with existing systems	NO - Has never been constructed for revenue service anywhere in the world

SECTION 1

Transportation Components Considered but Not Advanced

This memorandum identifies and considers transportation components that were put forward by the public, local governments, and other stakeholders during the Columbia River Crossing (CRC) project scoping period. For the purposes of this report, a transportation component is defined as a specific idea to address one or more of the identified needs in the I-5 Bridge Influence Area (BIA). These selected components, mainly public transportation technologies, have been considered by the CRC project team but for technical reasons are not being advanced into component screening. These components include:

- High Speed Rail
- Magnetic Levitation Railways
- Heavy Rail
- Automated Guideway Transit (AGT or People Movers)
- Ferries
- Monorail
- Personal Rapid Transit

This report discusses the general characteristics of the above public transportation components and summarizes the rationale as to why these components have been eliminated from further consideration. The rationale for not advancing these components includes the knowledge that a component has a known fatal flaw, a component that clearly does not meet the project's purpose and need, components that are untested or unproven in North America, or components with other associated undesirable characteristics.

All public transportation components that are advanced into component screening must improve the limited public transportation operations, connectivity and reliability in the Bridge Influence Area. Due to limited public transportation options that currently exist, public transportation components must improve the overall level of service to a number of transportation markets that are not well served today. The key transit markets include trips between the Portland Central City and the City of Vancouver and Clark County, trips between North/Northeast Portland and the City of Vancouver and Clark County, and trips connecting the City of Vancouver and Clark County with the regional transit system in Oregon. Lastly, congestion in the corridor adversely impacts the current public transportation service reliability and travel speed. For public transportation components to be advanced into component screening, they must improve the overall level of public transportation service reliability and travel speed within the Bridge Influence Area.

In summary, for a public transportation component to advance to component screening, it must pass each of the following questions in the affirmative:

- Is the component free of known or obvious fatal flaws?
- Does the component meet the CRC purpose and need?
    - Improve operations, connectivity, or reliability in the BIA?
    - Improve service to identified transportation markets?

  - Improve service reliability and speed?
- Has the component been proven and currently in revenue service in North America?
- Does the component have little or no undesirable characteristics?

The remainder of this report considers the transportation components that have been suggested during scoping but for technical reasons are not being advanced into component screening.

HIGH SPEED RAIL

Description:


FIGURE 1
TGV Vehicle

High speed rail is an inter-city service that operates primarily on a dedicated guideway or track not used by freight trains with typical train speeds over 150 miles per hour. Examples of high speed rail systems are found in Europe and Asia where trains routinely travel in excess of 170+ mph. High speed rail systems are used in metropolitan areas ranging from 3 to over 15 million people. AMTRAK operates a form of inter-city high speed rail in the Northeast Corridor (Washington D.C. to New York & Boston) but its Acela service in the corridor has travel speeds typically below 125 miles per hour. A more local example, although not officially fast enough to qualify as high speed rail, is the Amtrak Cascades route here in the Pacific Northwest (Vancouver, BC to Eugene, Oregon). High speed rail requires special grade crossing restrictions. The capital costs of constructing a new high speed rail system can range from $50 million to more than $200 million per mile, depending on location and specific engineering required by the site.

Rationale for Not Advancing:

High speed rail is a proven technology but is designed primarily for long, inter-city or inter-state trips. Given that the average bi-state trip within the region is just over 16 miles, high speed rail cannot adequately serve the identified regional travel markets between the City of Vancouver and North Portland because it could not achieve high travel speeds between stations that may be placed 1-2 miles apart. There are no local plans which include future high speed rail lines, and the technology would require a completely grade separated right-of-way within the Bridge Influence Area. High speed rail lines often compete with airlines for passengers traveling less than 300 miles and where travel times between airplanes and high speed rail are roughly proportionate. For these reasons, high speed rail is not an appropriate public transportation component for the Bridge Influence Area.

MAGNETIC LEVITATION RAILWAY (MAGLEV)

Description:

A magnetic levitation railway is an experimental high-technology rail system that would operate on a specially-designed exclusive right-of-way and exceed speeds of 200+ miles per hour. Magnetic levitation vehicles are propelled along a fixed guideway at high speeds by the attraction and repulsion of magnets on the rails and under the rail cars. The ideal trip distance for Maglev technology is a distance of between 50-500 miles. Magnetic levitation cannot share existing infrastructure and must be designed as a completely separate system. The capital costs of constructing a new magnetically levitated railway are based on estimates of $100 million to more than $200 million per mile, depending on location and specific engineering required by the site. Plus, there is nothing unique about Maglev that can expedite a passenger's access to the originating station or ultimate final destination; overall, the shorter the trip, the less that Maglev can influence the passenger's total travel time.

FIGURE 2
Maglev Vehicle

Rationale for Not Advancing:

Magnetic levitation railways are an experimental technology designed primarily for long distance trips. There are no operating magnetic levitation railways anywhere in North America, and it is highly unlikely that the technology would ever be implemented without a prior federal, state, and local commitment. Given its travel speeds and acceleration characteristics, magnetic levitation railways cannot adequately serve the identified regional travel markets between the City of Vancouver and North Portland. There are no local plans to build a magnetic levitation railway, and the technology would require a completely grade separated right-of-way within the Bridge Influence Area. A magnetic levitation railway would be incompatible with the existing regional transit system. For these reasons, magnetic levitation railways are not an appropriate public transportation component for the Bridge Influence Area.

HEAVY RAIL

Description:

Heavy rail is a moderate-speed, passenger rail service operating on fixed rails in exclusive rights-of-way from which all other vehicular/pedestrian traffic is excluded (also known as rapid rail; subway; or metro). Heavy rail generally uses longer train sets and has longer station spacing than light rail. Most heavy rail systems have at least part of their trackway underground. Heavy rail systems are used in large metropolitan areas ranging from 3 to over 15 million people. Examples include San Francisco's BART system and the

FIGURE 3
BART Heavy Rail vehicle

subway systems of New York and Washington, D.C. The capital costs of constructing a new rapid rail system can range from $100 million to more than $200 million per mile, depending on location and specific engineering required by the site.

Rationale for Not Advancing:

Similar to light rail, heavy rail is a proven technology that serves regional trips. One of the main differences between heavy rail and light rail is that heavy rail typically requires a completely grade separated right of way while light rail can operate in mixed right of way environments. Another key difference is that light rail trains can serve between 5,000 to 12,000 people per hour in the peak direction, while heavy rail trains can accommodate between 15,000 to 60,000 people per hour in the peak direction. Heavy rail is typically considered as a logical option when passenger demand far exceeds the person carrying capacity of either buses or light rail. The requirement of grade-separated right-of-way and the benefit of extra passenger carrying capacity are the main differences between heavy rail and light rail.

There are no heavy rail lines in the Portland-Vancouver metropolitan area, and it is highly unlikely that a heavy rail or subway system would ever be implemented in the region. Heavy rail becomes cost effective only when there are large peak hour passenger demands, such as those seen in the world's largest and congested cities: New York, Washington D.C., London, Tokyo, etc. There are no local plans to build a heavy rail or subway system, and the technology would require a completely grade separated right-of-way within the Bridge Influence Area. Heavy rail would be incompatible with the existing regional rail system since it is unlikely it could share existing light rail transit right of way. For these reasons, heavy rail is not an appropriate public transportation component for the Bridge Influence Area.

AUTOMATED GUIDEWAY TRANSIT (AGT)

Description:

FIGURE 4
People Mover/Automated Guideway Transit

Also commonly known as 'People-Movers' – AGT is an automatically controlled (driverless) train operating over an exclusive guideway. Applications include short loop or shuttle operations (less than 5-miles in length) in airports, central business districts, or other high-activity centers. Urban automated guideway systems (AGTs) are used in moderately sized urban areas of North America, such as Vancouver B.C., Detroit, and Miami. Because of AGT's need for grade-separation, its capital costs are significant, beginning at $50 million per mile for the elevated guideway alone, and climbing to over $100 million per mile in urban areas. The true cost of AGTs typically depends on the station geometrics and whether existing right-of-way is already owned by the constructing agency.

Rationale for Not Advancing:

Automated guideway transit is proven technology suitable for regional trips, but its application in North America has been limited. Light rail transit and automated guideway transit share some of the same capacity and operating characteristics, but unlike light rail transit, AGT requires a completely grade separated right-of-way and either underground or aerial stations. Given these two requirements, automated guideway transit lines cannot adequately serve the identified regional travel markets between the City of Vancouver and North Portland because to do so would require the construction of a completely separated alignment north, through, and south of the bridge influence area. There are no local plans to build an automated guideway transit line. For these reasons, automated guideway transit lines are not an appropriate public transportation component for the Bridge Influence Area.

FERRIES

Description:

FIGURE 5
Ferry Vessel

A ferry is a passenger carrying vessel providing passage over a river, lake, or other body of water for passengers, vehicles, or freight. Ferries were especially important in the days before permanent bridges and tunnels were constructed across bodies of water. At first most ferries were small boats or rafts, propelled by oars or poles and sometimes assisted by sails. In places without bridges, ferries today still make short passages by winching themselves back and forth along a chain fastened to the shore on both sides. A modern ferry system currently serves various points in the Puget Sound area in Washington, but provides service to only those points where a bridge or tunnel system does not exist. The average travel distance of a ferry route varies from between 30-500 miles. One limitation to a ferry system on the Columbia River would be that the proposed ferries will only serve limited routes and have little connectivity to existing transit services. Placing the land-based facilities would also be challenging, as would accessing the terminals with fixed-route transit. Travel times would also be significantly longer than the slowest land-based bus, since a ferry connecting downtown Vancouver with downtown Portland would have to travel many miles out of direction to access the Willamette River.

Rationale for Not Advancing:

Ferries are more ideal for longer distances over water; the route over the Columbia River would be less than a mile, and would not be competitive, in terms of travel-time, even with the existing congested bridges in place. The last ferry over the Columbia River closed on the exact day the first bridge over the Columbia River was opened. The travel time for a ferry service connecting downtown Vancouver to downtown Portland would also be slower than the slowest land-based transit bus. The disadvantage to a ferry system also relates to the need for up-front public sector investment to build the terminals. There are no local plans to build or locate a ferry system, and the technology would require new infrastructure for which there are no plans. For these reasons, ferries are not an appropriate public transportation component for the Bridge Influence Area.

MONORAIL

Description:

FIGURE 6
Monorail Vehicle

Monorails are guided transit vehicles operating on or suspended from a single rail, beam, or tube. The most common type of monorail system known to most Americans is the one in Seattle, Washington and the one in Disneyworld in Orlando, Florida. Monorail cars themselves are rubber-tired and straddle a single, narrow, elevated beam that is approximately 25 feet above the ground. The cars are self-propelled by electric motors and are usually coupled together in trains of 2-6 cars. Historically, most monorail systems were built and operated as one-way loops. Modern monorail systems now incorporate new track switching technology that lets them operate like most modern rail systems. Several cities in the United States have considered monorails, namely Seattle, Washington; Las Vegas, Nevada; Jacksonville, Florida; and others. However, due to cost overruns, the Seattle monorail project was recently terminated.

Rationale for Not Advancing:

The capital cost for constructing monorail systems is between $50 and $200 million per mile. It has been estimated that the majority of capital costs stems from the guideway construction. Monorail systems are more commonly used in specialty niche applications, and have never been used as a regional transit system in North America. Because it straddles a single beam, monorail needs a much more complicated support than rail systems. Thus, a monorail vehicle has 24 rubber tires as compared to a rail vehicle's eight steel wheels. Much higher resistance of rubber tires than steel wheels results in greater energy consumption and heat production. Moreover, monorails have less riding comfort and their interiors are less spacious than rail vehicles.

Generally, it is accepted industry wide that light-rail and heavy-rail are more efficient and appropriate for high-quality urban mass transportation than monorails. Monorails typically have been built only for special purposes, such as amusement parks and airport shuttles. Very few cities, mostly in Japan, have built monorail as an actual transit line. In fact, there is no city with more than one monorail line anywhere in the world. There are no local plans to build or locate a monorail system, and the technology would require new infrastructure for which there are no plans. For these reasons, monorail is not an appropriate public transportation component for the Bridge Influence Area.

PERSONAL RAPID TRANSIT (PRT)

Description:

FIGURE 7
PRT Vehicle and Guideway

Personal rapid transit is a theoretical concept which would have small rail cars (two to five passengers) under computer control running over an elaborate system of elevated guideways. In short, passengers would board the rail car and program their destination into the computer. The computer controller would then route the rail car to its destination. Because personal rapid transit is still a theoretical concept, no personal rapid transit systems are operating in the U.S. The preliminary capital cost estimates of constructing a new PRT system range from $1 million to more than $200 million per mile, depending on the location and specific engineering required by the site. It is believed that the elevated guideways are small, light, and relatively easy to build, and the majority of the capital cost goes into developing the system controls and providing connectivity. However, there is no documented evidence that this is indeed the case.

Rationale for Not Advancing:

Personal rapid transit is a theoretical concept and not one appropriate for the Columbia River Crossing project. Capacity is one of the primary limitations of PRT, and incompatibility with the existing regional systems; the economics of PRT will likely not pencil out unless the system serves every place that patrons might want to go. To this end, PRT will not attract demand because it simply would not go to many regional destinations, and how a PRT system would grow from a niche to a local, or even a metropolitan network, is unclear. There are no local plans to build or locate a PRT system, and the technology would require new infrastructure for which there are no plans. For these reasons, PRT is not an appropriate public transportation component for the Bridge Influence Area.

CONCLUSIONS

These aforementioned transportation components each have their niche and have been implemented in some instances. However, with regard to the CRC project, these components are not planned for in regional transportation documents; they are not compatible with the current infrastructure, which brings their cost-effectiveness into question; and in some cases, as with Maglev and PRT, these are largely unproven technologies in North America, and therefore are not recognized as feasible options for revenue service. Even if these components could be readily implemented, the regional transit properties, TriMet and C-TRAN, would likely not support their consideration, nor would they have interest in operating these technologies, as they are inconsistent with their current systems. As a result, these transportation components have not been advanced to component screening.

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