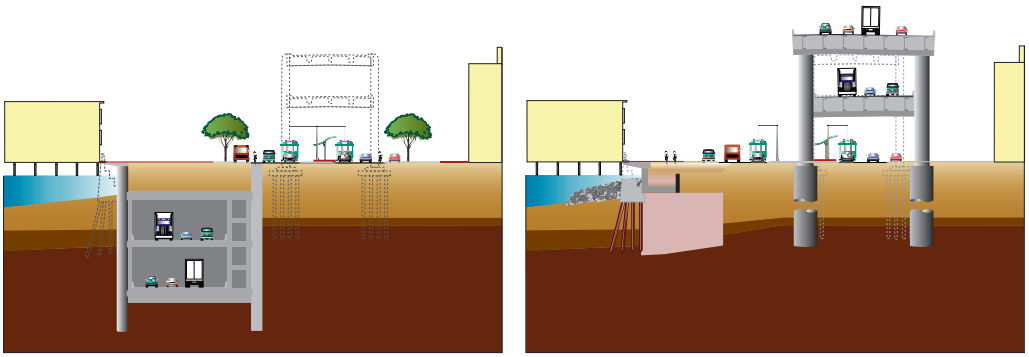
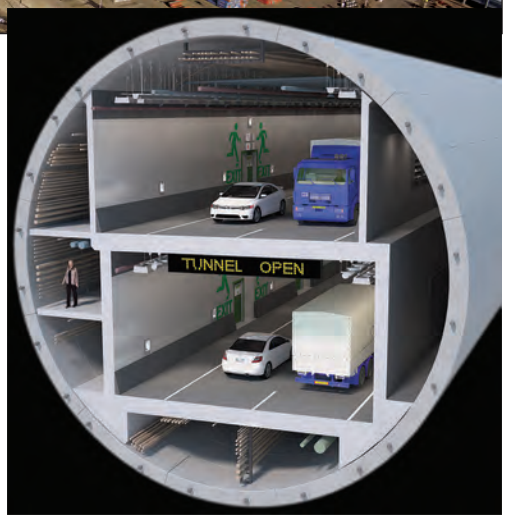
ALASKAN WAY VIADUCT REPLACEMENT PROJECT
Final Environmental Impact Statement

APPENDIX L Economics Discipline Report





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U.S. Department of Transportation
Federal Highway Administration

Washington State
Department of Transportation

City of Seattle

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Alaskan Way Viaduct Replacement Project
Final EIS
Economics Discipline Report

The Alaskan Way Viaduct Replacement Project is a joint effort between the Federal Highway Administration (FHWA), the Washington State Department of Transportation (WSDOT), and the City of Seattle. To conduct this project, WSDOT contracted with:

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In association with:
Coughlin Porter Lundeen, Inc.
EnviroIssues, Inc.
GHD, Inc.
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ACRONYMS AND ABBREVIATIONS

AM	morning
B&O	business and occupation
BINMIC	Ballard Interbay Northend Manufacturing and Industrial Center
CBD	Central Business District
CEVP®	Cost Estimate Validation Process
City	City of Seattle
EIS	Environmental Impact Statement
FAZ	forecast analysis zone
FHWA	Federal Highway Administration
HOV	high-occupancy vehicle
I-5	Interstate 5
I-90	Interstate 90
MIC	Manufacturing and Industrial Center
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
O&M	operations and maintenance
PM	afternoon
Program	Alaskan Way Viaduct and Seawall Replacement Program
project	Alaskan Way Viaduct Replacement Project
PSRC	Puget Sound Regional Council
RIMS II	Regional Input-Output Modeling System
Sea-Tac	Seattle-Tacoma International (Airport)
SDOT	Seattle Department of Transportation
SMC	Seattle Municipal Code
SODO	South of Downtown
SR	State Route
TBM	tunnel boring machine
VMT	vehicle miles of travel
WOSCA	Washington-Oregon Shippers Cooperative Association
WSDOT	Washington State Department of Transportation

Chapter 1 INTRODUCTION AND SUMMARY

1.1 Introduction

This discipline report was prepared in support of the Final Environmental Impact Statement (EIS) for the Alaskan Way Viaduct Replacement Project (project). The Final EIS and all of the supporting discipline reports evaluate the Viaduct Closed (No Build Alternative) in addition to the three build alternatives: the Bored Tunnel Alternative (preferred), the Cut-and-Cover Tunnel Alternative, and the Elevated Structure Alternative. The designs for both the Cut-and-Cover Tunnel Alternative and the Elevated Structure Alternative have been updated since the 2006 Supplemental Draft EIS (WSDOT et al. 2006) to reflect that the section of the viaduct between S. Holgate Street and S. King Street is being replaced by a separate project, and the alignment at S. Washington Street no longer intrudes into Elliott Bay. All three build alternatives are evaluated with tolls and without tolls.

The Federal Highway Administration (FHWA) is the lead federal agency for this project, primarily responsible for compliance with the National Environmental Policy Act (NEPA) and other federal regulations, as well as distributing federal funding. Per the NEPA process, FHWA was responsible for selecting the preferred alternative. FHWA has based its decision on the information evaluated during the environmental review process, including information contained in the 2010 Supplemental Draft EIS (WSDOT et al. 2010a) and previous evaluations in 2004 and 2006. After issuance of the Final EIS, FHWA will issue its NEPA decision, called the Record of Decision (ROD).

The 2004 Draft EIS (WSDOT et al. 2004) evaluated five Build Alternatives and a No Build Alternative. In December 2004, the project proponents identified the Cut-and-Cover Tunnel Alternative as the preferred alternative and carried the Rebuild Alternative forward for analysis as well. The 2006 Supplemental Draft EIS (WSDOT et al. 2006) analyzed two alternatives—a refined Cut-and-Cover Tunnel Alternative and a modified rebuild alternative called the Elevated Structure Alternative. After continued public and agency debate, Governor Gregoire called for an advisory vote to be held in Seattle. The March 2007 ballot included an elevated structure alternative (differing in design from the current Elevated Structure Alternative) and a surface-tunnel hybrid alternative. The citizens voted down both alternatives.

After the 2007 election, the lead agencies committed to a collaborative process (referred to as the Partnership Process) to find a solution to replace the viaduct along Seattle's central waterfront. In January 2009, Governor Gregoire, King County Executive Sims, and Seattle Mayor Nickels announced that the agencies had reached a consensus and recommended replacing the aging viaduct with a bored tunnel, which is being evaluated in this Final EIS as the preferred alternative.

1.2 Build Alternatives Overview

The Alaskan Way Viaduct Replacement Project is one of several independent projects developed to improve safety and mobility along State Route (SR) 99 and the Seattle waterfront from the South of Downtown (SODO) area to Seattle Center. Collectively, these individual projects are often referred to as the Alaskan Way Viaduct and Seawall Replacement Program (the Program). See Exhibit 1-1. Because these individual projects are included with the Cut-and-Cover Tunnel Alternative and Elevated Structure Alternative, the costs for these alternatives, presented in Chapter 6, are substantially higher than those of the Bored Tunnel Alternative.

Exhibit 1-1. Other Projects Included in the Alaskan Way Viaduct and Seawall Replacement Program

Project	Bored Tunnel Alternative	Cut-and-Cover Tunnel Alternative	Elevated Structure Alternative
Independent Projects That Complement the Bored Tunnel Alternative			
Elliott Bay Seawall Project	X	Included in alternative	Included in alternative
Alaskan Way Surface Street Improvements	X	Included in alternative	Included in alternative
Alaskan Way Promenade/Public Space	X	Included in alternative	Included in alternative
First Avenue Streetcar Evaluation	X	Included in alternative	Included in alternative
Elliott/Western Connector	X	Function provided[1]	Function provided[1]
Transit enhancements	X	Not proposed[2]	Not proposed[2]
Projects That Complement All Build Alternatives			
S. Holgate Street to S. King Street Viaduct Replacement Project	X	X	X
Mercer West Project	X	X	X
Transportation Improvements to Minimize Traffic Effects During Construction	X	X	X
SR 99 Yesler Way Vicinity Foundation Stabilization	X	X	X
S. Massachusetts Street to Railroad Way S. Electrical Line Relocation Project	X	X	X

1. These specific improvements are not proposed with the Cut-and-Cover Tunnel and Elevated Structure Alternatives; however, these alternatives provide a functionally similar connection with ramps to and from SR 99 at Elliott and Western Avenues.
2. Similar improvements included with the Bored Tunnel Alternative could be proposed with this alternative.

The Final EIS evaluates the cumulative effects (Chapter 7) of each of the build alternatives; however, the direct and indirect environmental effects of these independent projects within the Program will be (or have been) considered separately in independent environmental documents.

The S. Holgate Street to S. King Street Viaduct Replacement Project, currently under construction as a separate project, was designed to be compatible with any of the three build alternatives analyzed in the Final EIS.

1.2.1 Overview of Bored Tunnel Alternative (Preferred)

The Bored Tunnel Alternative (preferred alternative) would replace SR 99 with a bored tunnel and associated improvements, such as relocating utilities located on or under the existing viaduct, removing the viaduct, decommissioning the Battery Street Tunnel, and making improvements to the surface streets in the south and north portal areas of the bored tunnel.

The Bored Tunnel Alternative would replace SR 99 between S. Royal Brougham Way and Roy Street, with two lanes in each direction.

Beginning at S. Royal Brougham Way, SR 99 would be a side-by-side surface roadway that would descend to a cut-and-cover tunnel segment. Just south S. King Street, SR 99 would be conveyed in a stacked bored tunnel, with two southbound travel lanes on the top and two northbound travel lanes on the bottom. The bored tunnel design accommodates an 8-foot shoulder on one side and a 2-foot shoulder on the other side.

The bored tunnel would continue under Alaskan Way S. to approximately S. Washington Street, where it would curve slightly away from the waterfront and then travel under First Avenue beginning at approximately University Street. At Stewart Street, it would extend north under Belltown. At Denny Way, the bored tunnel would travel under Sixth Avenue N., where it would transition to a side-by-side surface roadway at about Harrison Street.

Access and exit ramps in the south would include a southbound on-ramp to and northbound off-ramp from SR 99 that would be built in retained cuts and feed directly into a reconfigured Alaskan Way S., with three lanes in each direction. Alaskan Way S. would have one new intersection, with a new east-west cross street at S. Dearborn Street.

The Bored Tunnel Alternative also includes reconstructing a portion of the east-west S. King Street and widening the East Frontage Road from S. Atlantic Street to S. Royal Brougham Way to accommodate truck turning movements. Railroad Way S. would be replaced by a new one-lane roadway on which northbound traffic would travel between S. Dearborn Street and Alaskan Way S.

Access from northbound SR 99 and access to southbound SR 99 would be provided via new ramps at Republican Street. The northbound off-ramp to Republican Street would be provided on the east side of SR 99 and routed to an intersection at Dexter Avenue N. Drivers would access the southbound on-ramp via a new connection with Sixth Avenue N. on the west side of SR 99.

Surface streets in the north portal area would be reconfigured and improved. The street grid between Denny Way and Harrison Street would be connected by restoring a section of Aurora Avenue just north of the existing Battery Street Tunnel portal. John, Thomas, and Harrison Streets would be connected as cross streets.

1.2.2 Overview of Cut-and-Cover Tunnel Alternative

Under the Cut-and-Cover Tunnel Alternative, a six-lane stacked tunnel would replace the existing viaduct between S. Dearborn Street and Pine Street. At Pine Street, SR 99 would transition out of the tunnel near the Pike Street Hillclimb and cross over the BNSF Railway tracks on a side-by-side aerial roadway. Near Lenora Street, SR 99 would transition to a retained cut extending up to the south portal of the Battery Street Tunnel. SR 99 would travel under Elliott and Western Avenues. The southbound on-ramp from Elliott Avenue and the northbound on-ramp from Western Avenue would be rebuilt. The northbound on-ramp from Bell Street and the southbound off-ramp at Battery Street and Western Avenue would be closed and used for maintenance and emergency access only.

The Battery Street Tunnel would be retrofitted for improved seismic safety, and the existing tunnel safety systems would be updated. Improvements would include a new fire suppression system, updated ventilation, and new emergency egress structures near Second, Fourth, and Sixth Avenues.

From the north portal of the Battery Street Tunnel, SR 99 would be lowered in a retained cut to about Mercer Street, with improvements and widening north to Aloha Street. Broad Street would be closed between Fifth and Ninth Avenues N., allowing the street grid to be connected. The street grid would be connected over Aurora Avenue at Thomas and Harrison Streets. Mercer Street would continue to cross under SR 99 as it does today. However, it would be widened and converted from a one-way street to a two-way street, with three lanes in each direction and a center turn lane.

Access to and from SR 99 would be provided at Denny Way and Roy Street. In the northbound direction, drivers could exit at Republican Street.

The Cut-and-Cover Tunnel Alternative would replace the existing Elliott Bay Seawall with the west wall of the tunnel. Alaskan Way would be rebuilt with this alternative.

1.2.3 Overview of Elevated Structure Alternative

The Elevated Structure Alternative would replace the existing viaduct mostly within the existing right-of-way. It would replace the seawall between S. Jackson and Broad Streets.

In the central section of Seattle's downtown, the Elevated Structure Alternative would replace the existing viaduct with a stacked aerial structure along the central waterfront. The SR 99 roadway would have three lanes in each direction, with wider lanes and shoulders than those of the existing viaduct.

The existing ramps at Columbia and Seneca Streets would be rebuilt and connected to a fourth lane. This extra lane would improve safety for drivers accessing downtown Seattle on the midtown ramps.

The existing SR 99 roadway would be retrofitted, starting between Virginia and Lenora Streets up to the south portal of the Battery Street Tunnel. SR 99 would travel over Elliott and Western Avenues to connect to the Battery Street Tunnel. This aerial structure would transition to two lanes in each direction as it enters the Battery Street Tunnel by dropping a northbound lane and southbound lane. The Battery Street Tunnel would be upgraded with new safety improvements, which include a fire suppression system, seismic retrofitting, and access and egress structures. The vertical clearance would be increased to about 16.5 feet throughout the length of the tunnel. However, unlike the Battery Street Tunnel improvements provided by the Cut-and-Cover Tunnel Alternative, the roadway at the south portal would not be widened.

The Elliott/Western Avenue ramps would be rebuilt, and the existing southbound off-ramp at Battery Street and the northbound on-ramp from Western Avenue would be closed and used for maintenance and emergency access only.

The Alaskan Way surface street would be rebuilt, with the southbound lanes in a location similar to the existing roadway and the northbound lanes beneath the viaduct.

From the north portal of the Battery Street Tunnel, Aurora Avenue would be modified, from Denny Way to Aloha Street. Aurora Avenue would be lowered in a side-by-side retained cut roadway from the north portal of the Battery Street Tunnel to about Mercer Street and would be at-grade between Mercer and Aloha Streets. Ramps to and from Denny Way would provide access to and from SR 99 similar to the access today. The street grid would be connected over Aurora Avenue at Thomas and Harrison Streets. Mercer Street would be widened and converted to a two-way street with three lanes in each direction and a center turn lane. It would continue to cross under Aurora Avenue as it does today.

1.3 Summary

This discipline report describes the existing economic conditions and the potential effects and mitigation related to the construction and operation of the three build alternatives: the Bored Tunnel Alternative, the Cut-and-Cover Tunnel Alternative, and the Elevated Structure Alternative. It includes the following chapters.

Chapter 2 describes the methodology used for the economic analysis and preparation of this discipline report.

Chapter 3 describes the studies and coordination that contributed to the economic analysis and preparation of this report.

Chapter 4 describes the most current economic conditions in the study area. The information is often described at three levels: local economic conditions of neighborhoods, districts, and the city; regional economic conditions of King County and, in some instances, Pierce and Snohomish Counties; and statewide economic conditions.

Chapter 5 describes the potential operational effects, mitigation measures for the operational effects, and benefits of each of the build alternatives as compared to the current conditions detailed in Chapter 4.

Chapter 6 describes the potential construction effects of each of the build alternatives on Seattle's economy and presents possible mitigation strategies developed with input from the Washington State Department of Transportation (WSDOT).

Chapter 7 describes the effects of tolling the build alternatives.

Chapter 8 lists the references used in the economics analysis.

Attachment A describes the Regional Input-Output Modeling System (RIMS II) model used to analyze effects that would be attributed to project construction, as measured by increases in regional and state activity, employment, and associated job earnings.

The following subsections summarize the key findings of this report.

1.3.1 Affected Environment

The greater Seattle area and King County host a large and diverse economy. King County is the largest business center in both the state of Washington and the Pacific Northwest. The county is a leading global center for several industries: aerospace, biotechnology, clean technology, information technology, and international trade and logistics (CTED 2009). To support this economy, transportation infrastructure in this area includes two transcontinental railroads,

extensive nationwide trucking capacity, three interstate highways, dozens of state highways, the largest ferry system in the country, a world-class port, and an international airport.

Tourism is a major industry for the state and a critical component of Seattle's economy, particularly in the study area. According to the City of Seattle (City), "The Seattle-King County area attracts more than 9.4 million overnight visitors annually who spend $4.75 billion and contribute more than $419 million in state and local tax revenues. Direct visitor spending supports 62,000 jobs in the Seattle region." (City of Seattle 2008)

Study Area

The study area for the economic analysis was determined by looking at the potential direct economic effects related to the construction period, as well as some of the indirect effects that could be experienced in the broader geographic area. The area of direct effects extends one city block around all sides of the construction areas in the north and south and one block on either side of the existing viaduct alignment, including all access ramps and surface street modifications. Regional economic benefits for the economic multipliers associated with construction are considered to be at the Puget Sound regional level and at the state level. Regional economic effects associated with changes in traffic due to construction activity were evaluated at the neighborhood, district, or industrial area level. Operational economic benefits and effects were assessed as they relate to the economic health of Seattle and the Puget Sound region.

Established Business Districts

The study area is located within or near several business districts, retail/commercial centers, manufacturing/industrial centers, and urban centers. These districts and centers include the Ballard Interbay Northend Manufacturing and Industrial Center (BINMIC), Greater Duwamish Manufacturing and Industrial Center (MIC), International District, Financial District, Pioneer Square Historic District, Pike Place Market Historic District, Seattle Central Business District (CBD) and Westlake Center, Seattle Center, South Lake Union Urban Center, Uptown Urban Center, and central waterfront.

Employment

The number of jobs in the King-Kitsap-Pierce-Snohomish County region has nearly doubled over the last three decades, with an increasing percentage of jobs gained in the services industries. Employment was evaluated in detail in three geographic areas, which are described in Chapter 4: the Seattle CBD, Seattle Central, and Seattle South. Most of the employment in the Seattle CBD and the Seattle Central area (including Seattle Center) is in the service sector (55.6 to 60.0 percent), substantially higher than King County's percentage, the regional percentage, and

Seattle's overall average of 38.9 percent. See Exhibit 4-3 for a map of forecast analysis zones (FAZs).

Unemployment rates within the region have historically been lower than the statewide average. In 2010, approximately 8.4 percent of King County's civilian labor force was unemployed, compared with the average statewide unemployment rate of 8.6 percent (LMEA 2010b).

Parking Inventory

For this report, parking is categorized as on-street parking and off-street parking throughout the study area. The available inventory of on-street parking provided by the City is quantified by the number of paid parking spaces, which is most of the on-street parking. According to the Seattle Department of Transportation (SDOT) Parking Strategic Advisor, there are more than 13,500 paid on-street parking spaces throughout Seattle. About 55 percent (or about 7,400) of these spaces are in the Seattle CBD (bounded by Denny Way to the north, Interstate 5 [I-5] to the east, S. Royal Brougham Way to the south, and Elliott Bay) to the west. The total number of spaces in paid service at any time fluctuates somewhat depending on nearby construction, temporary no-parking zones, holidays, and other variables that remove curb-space from use.

State and Local Government Revenues

The state of Washington and the City rely on a variety of taxes to fund state and local government programs. These taxes include a combined state and local sales and use tax; business and occupation (B&O) tax; public utility tax; property tax; and several other excise, real estate, and estate taxes.

The combined state and local retail sales tax rate for the study area is 9.5 percent, which also includes a Regional Transit Authority tax. For the City's proposed 2011-2012 budget, retail sales tax revenues account for $151.1 million, which is 17 percent of the General Subfund Revenue (City of Seattle 2010). Most businesses operating in the state are subject to the B&O tax, which is typically assessed on gross income, proceeds of sales, or the value of doing business.

Real and personal property is subject to property tax. Within King County, property taxes account for 42 percent of the total taxes collected as General Fund revenue (King County Budget Office 2010). Property tax revenues in the City's proposed 2011-2012 budget account for $248.6 million, which is 28 percent of the General Subfund Revenue (City of Seattle 2010).

Urban Mobility and the Cost of Congestion

Data on traffic congestion and the cost of congestion as it relates to vehicle mobility in Seattle and other urban areas were compiled from the Texas Transportation

Institute's *2009 Urban Mobility Study* (TTI 2009b) for the following congestion measures:

- Annual delay – person hours
- Number of "rush hours" – time when system has congestion
- Amount of congested travel – percentage of peak vehicle miles of travel (VMT)
- Total annual congestion cost
- Annual congestion cost per peak hour road traveler
- Annual congestion cost per person

The costs for travelers associated with congestion in Seattle have increased year after year. However, Seattle has seen a slowing trend, especially in the last ten years, whereas both large and very large urban areas have seen steady increases, particularly for annual congestion cost per peak hour road traveler and annual congestion cost per person.

Ferry and Cruise Ship Facilities

Five areas of the central waterfront are used for ferry and cruise ship operations: the Terminal 91 Cruise Facility, Seattle Ferry Terminal at Colman Dock (Pier 50/52), Pier 66/Bell Street Cruise Terminal, Argosy Cruises/Piers 55 and 56, and Pier 69/*Victoria Clipper*. In 2009, the Port of Seattle hosted 875,000 cruise ship passengers and 218 cruise ship vessel calls (Port of Seattle 2010).

Inventory of Existing Businesses

Project team members inventoried businesses within the area of direct effects by means of pedestrian reconnaissance. The area of direct effects for this inventory includes businesses within one block of the proposed changes to the existing facilities or the proposed new facilities. For this discipline report, it was determined that approximately 1,400 businesses could be directly affected by the Bored Tunnel Alternative and the Cut-and-Cover Tunnel Alternative while the Elevated Structure Alternative could affect 1,540 businesses because of their location along the Broad Street detour.

Businesses operating in commercial office space accounted for more than half (53.0 percent) of the businesses, while commercial retail accounted for 15.7 percent of the businesses. Other service (primarily non-retail food service) accounted for 11.5 percent of businesses; over half (64 percent) of these other service businesses were involved in food service as opposed to retail grocery. Other represented 10.3 percent of the businesses (primarily public parking, religious institutions, public event space, and City-owned property), with the majority identified as

parking (42 percent). Residential multifamily[1] use represented 7.4 percent of the businesses. Government service[2] represented only 1.7 percent of the businesses.

Most (78.4 percent) of the businesses were estimated to be small (fewer than 20 employees). Medium-sized businesses (20 to 100 employees) accounted for 14.4 percent of the businesses. The remaining businesses were divided between large businesses (more than 100 employees) at 1.6 percent and vacant businesses (no discernable business activity) at 5.6 percent.

The majority of businesses (60.5 percent) in the area of direct effects had neither on-site nor readily identifiable off-street parking for customers and employees. More than a quarter of all businesses (34.6 percent) provided on-site parking for employees and customers. The remainder had directly identifiable off-street parking (4.9 percent).

1.3.2 Operational Effects, Mitigation, and Benefits

Viaduct Closed (No Build Alternative)

The Viaduct Closed (No Build Alternative) would close SR 99 between S. King Street and the south portal of the Battery Street Tunnel. All vehicles that would have used SR 99 would either navigate the Seattle surface streets to their final destination or take S. Royal Brougham Way to I-5 and continue north.

Two scenarios were evaluated as part of the Viaduct Closed (No Build Alternative). Scenario 1 would involve an unplanned closure of the viaduct for some structural deficiency, weakness, or damage due to a smaller earthquake event. The loss of the viaduct could result in a substantial increase in traffic volumes on the surface street network and on I-5, because these roadways would have to absorb the approximately 110,000 trips per day of north-south traffic that currently use the viaduct. The flow of goods and vehicles through this area would be disrupted. Under this scenario, SR 99, and possibly Alaskan Way as well, would be closed for an unknown period of time until a viaduct replacement could be built.

Scenario 2 would involve catastrophic failure and collapse of the viaduct. If this occurred, a number of the waterfront and Port of Seattle facilities may be rendered unusable due to the resulting collapse of piers and buildings. Collateral damage to buildings and railroad facilities within and adjacent to the viaduct may

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[1] Residential multifamily was included as a business to capture individuals employed for property management.

[2] Government service, while not a for-profit business, still operates in a businesslike manner and was included in this inventory. Government service includes municipal government offices and social service agencies.

occur due to the collapse of aerial structures. Failure of the viaduct structure could cause injuries or death to people traveling on or near the structure at the time of the seismic event. This type of event could cause other buildings to be damaged or collapse and would also likely cause extensive damage to various utility lines. Complete removal of the entire collapsed structure would be required before access to the waterfront and use of the roadway beneath the elevated structure could be restored. The loss of the viaduct could result in a substantial increase in traffic volumes on the surface street network as well as I-5, because these roadways would have to absorb the north-south traffic that currently uses the viaduct daily. The movement of goods and vehicles through this area would be severely curtailed even after the removal of the collapsed structure.

Bored Tunnel Alternative

South Portal

The Bored Tunnel Alternative would result in enhanced mobility to activity centers in both the south and north portal areas and beyond, particularly to the SODO commercial and business district and the stadium area.

Overall, the infrastructure improvements in the south portal area would improve truck freight mobility and vehicle and pedestrian connections. Local street connections in the south portal area would include one new intersection and cross street at S. Dearborn Street. These improvements would provide improved business efficiencies due to increased circulation near the project area.

Construction in the south portal area would remove approximately 110 of the existing 190 short- and long-term on-street parking spaces. If this estimate holds true, approximately $278,000 in parking revenue would be lost each year from Seattle's General Fund.

Project improvements in the south portal area would require two full and three partial property acquisitions. The economic effect of full property acquisition is typically the permanent conversion of the parcel from private to public ownership, which removes it from the taxable land base. The total amount of land to be fully acquired in the south portal area is approximately 173,000 square feet (about 4acres). The two properties to be acquired in full are owned by WSDOT; therefore, King County and the state of Washington would not lose any property taxes due to the acquisition of these two parcels. Construction staging would require the permanent removal of a building on the Port of Seattle's Terminal 46 property. Still, the loss of parcels with buildings would permanently displace approximately 33 workers.

After construction, WSDOT could sell the fully or partially acquired parcels that are not part of the permanent roadway right-of-way as surplus property and return them to private ownership. Parcels returned to private ownership would be subject to property taxes and could provide opportunities as replacement properties for displaced businesses, allowing owners to remain in the community. Some remnant parcels, however, may not be sold and redeveloped after construction because of potential access constraints resulting from the proposed roadway changes associated with the Bored Tunnel Alternative.

Central Segment

The bored tunnel would provide downtown access only at the south and north portals. The midtown ramps at Columbia and Seneca Streets that currently provide access to downtown would no longer be available. Some vehicles destined for the central portion of downtown would have to travel farther on arterial streets, but direct access to and from the south end of downtown including the Financial District, would be similar to today. Furthermore, the Bored Tunnel Alternative would contribute to local and regional mobility by providing drivers with an alternative to I-5 and Seattle's surface streets. A more in-depth discussion of mobility, including freight, is provided in Appendix C, Transportation Discipline Report.

Removal of the ramps at Columbia and Seneca Streets would improve pedestrian safety at the intersections with First Avenue. No properties would be acquired along this segment of the project area.

North Portal

Overall, the infrastructure improvements in the north portal area would improve truck freight mobility and vehicle and pedestrian connections. In turn, these benefits would improve business efficiencies due to the increased circulation near the project area.

Construction in the north portal area would remove about 280 of the existing 320 short- and long-term on-street parking spaces. If this estimate holds true, approximate $244,000 in parking revenue would be lost each year from Seattle's General Fund.

Improvements in the north portal area would require four full and three partial property acquisitions. The economic effect of full acquisition of four parcels would be their permanent conversion from private to public ownership, which would remove them from the taxable land base. The total amount of non-exempt (taxable) land to be fully acquired in the north portal area is approximately 131,500 square feet (about 3 acres). Consequently, King County and the state of Washington would lose taxes from properties that previously paid approximately $105,600 in annual property taxes. In addition to the economic effect associated

with the loss of property tax revenue, the loss of parcels with buildings would permanently displace an estimated 119 workers.

Viaduct Removal

Demolition of the Alaskan Way Viaduct from S. King Street to the Battery Street Tunnel would begin after the bored tunnel is open for use. Removal of the viaduct would permanently improve visual quality along Seattle's waterfront by eliminating the psychological, visual, and auditory barrier posed by the structure. Elimination of the viaduct would allow easier recognition of individual businesses by vehicle occupants traveling on the Alaskan Way surface street, although not from within the tunnel structure. Parking beneath the viaduct north of S. King Street would be removed before the viaduct demolition begins; some parking near the existing viaduct may be reinstated after completion of the waterfront promenade and the new Alaskan Way surface street, but the quantity and timing of the reinstatement of parking are unknown at this time.

Operations and Maintenance Costs

The Bored Tunnel Alternative would result in an increase in operations and maintenance (O&M) costs compared to existing conditions. The annual O&M expenditures would increase by $3.5 million over the O&M costs for maintaining the existing viaduct.

Operational Benefits

The benefits of the Bored Tunnel Alternative would include a transformed waterfront environment, which would result in three categories of economic value: enhanced value to waterfront users, new tourist spending locally and regionally, and increased downtown property values. The new facility would have a long life—at least 75 years. Over the lifetime of the facility, the Seattle region would benefit from avoiding the congestion and delay that would result from the Viaduct Closed (No Build Alternative).

Cut-and-Cover Tunnel Alternative

South Segment

The Cut-and-Cover Tunnel Alternative would result in enhanced mobility to activity centers in the south segment of the project area and beyond, particularly to the SODO commercial and business district and the stadium area. Overall, the infrastructure improvements in the south segment would improve truck freight mobility and vehicle and pedestrian connections. In turn, these benefits would improve business efficiencies due to the increased circulation near the project area.

Construction in the south segment would remove approximately 220 of the existing 370 short- and long-term on-street parking spaces. If this estimate holds

true, approximately $557,000 in parking revenue would be lost each year from Seattle's General Fund.

Project improvements in the south segment would require only three partial property acquisitions. Similar to the Bored Tunnel Alternative, after construction of the Cut-and-Cover Tunnel Alternative, WSDOT could sell the partially acquired parcels that are not part of the permanent right-of-way as surplus property, and return them to private ownership.

Central Segment

Similar to the Bored Tunnel Alternative, the cut-and-cover tunnel would provide downtown access only in the south and north segments; the on- and off-ramps at Columbia and Seneca Streets, respectively, that currently provide direct downtown access would no longer be available. Some vehicles destined for the central and northern portions of downtown would have to travel farther on arterial streets to access the ramps, but direct access to and from the south end of downtown, including the Financial District, would increase. Furthermore, the Cut-and-Cover Tunnel Alternative would contribute to local and regional mobility by providing drivers with an alternative to I-5 and Seattle surface streets. A more in-depth discussion of mobility, including freight, is provided in Appendix C, Transportation Discipline Report.

The removal of the ramps at Columbia and Seneca Streets would improve pedestrian safety at the intersections with First Avenue.

Construction in the central segment would remove approximately 240 of the existing 510 short-term on-street parking spaces. If this estimate holds true, approximately $660,000 in parking revenue would be lost each year from Seattle's General Fund.

Project improvements in the central segment would require 5 full and 12 partial property acquisitions. The economic effect of full acquisition of five parcels would be their permanent conversion from private to public ownership, which would remove them from the taxable land base. The total amount of non-exempt (taxable) land to be fully acquired in the central segment is approximately 30,200 square feet (about 0.73 acre). Consequently, King County and the state of Washington would lose taxes from properties that currently pay approximately $32,000 in annual property taxes. In addition to the economic effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace approximately 24 workers. Parking impacts are discussed in Chapter 5, Operational Effects, Mitigation, and Benefits.

North Segment

Overall, the infrastructure improvements in the north segment would improve truck freight mobility and vehicle and pedestrian connections. In turn, these benefits would improve business efficiencies due to the increased circulation near the project area.

Construction in the north segment would remove about 230 of the existing 330 short- and long-term on-street parking spaces. If this estimate holds true, approximately $200,000 in parking revenue would be lost each year from Seattle's General Fund.

Improvements in the north segment would require 11 full and 9 partial property acquisitions. The economic effect of full acquisition of 11 parcels would be their permanent conversion from private to public ownership, which would remove them from the taxable land base. The total amount of non-exempt (taxable) land to be fully acquired in the north segment is approximately 249,000 square feet (about 5.7 acres). Consequently, King County and the state of Washington would lose taxes from properties that paid approximately $478,900 in annual property taxes. In addition to the economic effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace an estimated 100 workers.

Viaduct Removal

Under the Cut-and-Cover Tunnel Alternative, the operational effects of the viaduct removal would be the same as those described for the Bored Tunnel Alternative in this section.

Operations and Maintenance Costs

The Cut-and-Cover Tunnel Alternative would result in an increase in O&M costs compared to existing conditions. The annual O&M expenditures would increase by $2.13 million over the O&M costs for maintaining the existing viaduct.

Operational Benefits

The benefits of the Cut-and-Cover Tunnel Alternative would be similar to those of the Bored Tunnel Alternative.

Elevated Structure Alternative

South Segment

The Elevated Structure Alternative would provide the same connections as those provided today, but with somewhat improved geometrics both for SR 99 and for the Battery Street Tunnel portals.

Construction in the south segment would remove approximately 240 of the existing 370 short- and long-term on-street parking spaces. If this estimate holds true, approximately $607,000 in parking revenue would be lost each year from Seattle's General Fund.

Similar to the Cut-and-Cover Tunnel Alternative, the Elevated Structure Alternative would require partial acquisition of three properties in the south segment (none would be fully acquired). The effects of these partial acquisitions would be the same as those of the Cut-and-Cover Tunnel Alternative.

Central Segment

Under the Elevated Structure Alternative, the midtown ramps at Columbia and Seneca Streets and the Western and Elliott Avenue ramps would provide access to the central portion of downtown Seattle. The Elevated Structure Alternative would contribute to local and regional mobility by providing drivers with an alternative to I-5 and Seattle's surface streets. A more in-depth discussion of mobility, including freight, is provided in Appendix C, Transportation Discipline Report.

Construction of the new elevated structure in the central segment would remove approximately 250 of the existing 510 short-term on-street parking spaces. If this estimate holds true, approximately $1.65 million in parking revenue would be lost each year from Seattle's General Fund.

Project improvements in the central segment would require five full and seven partial property acquisitions. The economic effect of full acquisition of five parcels would be their permanent conversion from private to public ownership, which would remove them from the taxable land base. The total amount of non-exempt (taxable) land to be fully acquired in the south segment is approximately 41,700 square feet (about 0.96 acre). Consequently, King County and the state of Washington would lose the ability to collect approximately $91,200 from properties that currently pay annual property taxes. In addition to the economic effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace approximately 70 workers.

North Segment

Overall, the infrastructure improvements in the north segment of the project area would improve truck freight mobility and vehicle and pedestrian connections. In turn, these benefits would improve business efficiencies due to the increased circulation near the project area.

The parking effects of the Elevated Structure Alternative in the north segment would be the same as those of the Cut-and-Cover Tunnel Alternative in the north area.

Similar to the Cut-and-Cover Tunnel Alternative, the Elevated Structure Alternative would require full acquisition of 11 properties and partial acquisition of 9 properties in the north segment. The effects of these partial acquisitions would be the same as those of the Cut-and-Cover Tunnel Alternative.

Operations and Maintenance Costs

The Elevated Structure Alternative would result in an increase in O&M costs compared to existing conditions. The annual O&M expenditures would increase by $3.33 million over the O&M costs for maintaining the existing viaduct.

Operational Benefits

The benefits of the Elevated Structure Alternative would not be as substantial as those of the Bored Tunnel Alternative. Pedestrian access would not change noticeably compared to existing conditions. The elevated structure would be larger than the existing viaduct, creating an even larger psychological barrier between the downtown core and the Seattle waterfront.

Under the Elevated Structure Alternative, on-ramps at Columbia Street and Elliott Avenue and off-ramps at Seneca Street and Western Avenue would be maintained, similar to existing conditions. This would allow trips that currently use these ramps to continue using the same routes, primarily benefiting BINMIC truck traffic.

Similar to the other build alternatives, the elevated structure would comply with current seismic standards and other design standards for withstanding an earthquake, flooding, or other disaster.

1.3.3 Construction Effects and Mitigation

Construction expenditures would occur over a number of years, directly resulting in new demand for construction materials and labor. These direct effects would lead to indirect effects as the production of output by firms in other industries increases to supply the demand for inputs to the construction industry. Both the direct and indirect effects of construction expenditures typically cause firms in all industries to employ more workers to meet the increased demand. The increase in employment leads to induced effects because the additional wages and salaries paid to workers result in greater consumer spending.

The mitigation measures for the build alternatives vary somewhat, especially when comparing the Bored Tunnel Alternative to the Cut-and-Cover Tunnel and Elevated Structure Alternatives. The mitigation measures for all the build alternatives, however, have common themes:

- Focusing on clearly defining and directing pedestrian and vehicle traffic in a systematic and streamlined manner

- Providing adequate parking for construction workers and encouraging short-term parking along the waterfront
- Distributing timely and informative project and construction updates
- Providing noise mitigation
- Preparing and assisting businesses within the project area to maintain an accessible and profitable business

1.3.4 Tolling

All three build alternatives would be subject to tolling if tolling is implemented. The funds generated by tolling are expected to pay back some of the state funds that would be used for construction. Under non-tolled conditions, the build alternatives would not allow the state to recoup any of the capital cost from the direct users of the new facility. Under non-tolled conditions, the build alternatives would place a higher burden on the state to use the gasoline tax and other state funds, which could be used for other projects in the state.

It is expected that most tolls would be paid by the residents of Seattle and King County who routinely use the existing viaduct. Because the Bored Tunnel Alternative has the earliest scheduled opening of any of the three build alternatives, it could begin collecting tolls sooner than the other two alternatives. This would allow the state to begin earlier repayment of the financing bonds for the Bored Tunnel Alternative compared to the other two alternatives.

The traffic diversion that might result from motorists seeking to avoid the tolled facilities would affect the traffic patterns and volumes on the local Seattle street network as presented in Appendix C, Transportation Discipline Report. The increase in congestion resulting from traffic diversion would increase the cost of congestion as compared to that of the build alternatives under non-tolled conditions.

Chapter 2 METHODOLOGY

This chapter outlines the process used to investigate, assess, and describe the potential economic effects that could occur with the Viaduct Closed (No Build Alternative) and the three build alternatives. The economic analysis (1) characterizes existing economic conditions within the study area, the specific districts of Seattle, the city as a whole, King County, and the state of Washington, as appropriate; (2) identifies possible beneficial and adverse effects of the three build alternatives and the Viaduct Closed (No Build Alternative); and (3) recommends mitigation measures, if any, that could be implemented to avoid or minimize the potential adverse effects.

2.1 Study Area

The study area for economic effects consists of an area of direct effects during construction, as well as a broader geographic area. The area of direct effects is one city block around all sides of the construction areas (including the north and south portal areas), related access ramps, and surface street modifications. The area of direct effects also extends one block to either side of the existing viaduct alignment.

Regional economic benefits for the economic multipliers associated with construction (described below) were evaluated at the Puget Sound regional level and at the state level. Regional economic effects associated with changes in traffic due to construction activity were evaluated at the neighborhood, district, or industrial area level.

Operational benefits and effects were assessed as they relate to the economic health of Seattle and the Puget Sound region.

2.2 Applicable Regulations and Guidelines

The following laws, statutes, local ordinances, and guidelines address potential economic effects:

- *Environmental Procedures Manual* (WSDOT 2010)
- *National Cooperative Highway Research Program (NCHRP) Report 122: Summary and Evaluation of Economic Consequences of Highway Improvements* (NCHRP 1971)
- *NCHRP Report 463: Economic Implications of Congestion* (NCHRP 2001)

2.3 Data Needs and Sources

The following data sources were used in the evaluation of economic effects:

- Local and state agencies were contacted to obtain information on existing economic conditions within the study area.

- Capital construction costs for all major project components, all right-of-way costs, annual worker employment estimates, and all funding sources for the project were obtained from the engineering design team. The capital construction costs were developed through the Cost Estimate Validation Process (CEVP®) analysis of project construction costs performed in Fall 2009 as additional capital construction costs were refined and value engineering decisions were incorporated into the project design.
- Surface street and off-street parking counts were obtained from the engineering design team for both existing conditions and built conditions.
- Changes in travel times between the Greater Duwamish MIC and the BINMIC were provided by the transportation team and are available in Appendix C, Transportation Discipline Report.
- Business inventories prepared for earlier phases of the Program were used. They were supplemented as necessary with additional inventories of businesses within one block of all construction activity in the central segment as well as limited areas in the south and north that were not updated in 2009.

2.4 Analysis of Existing Conditions

Existing conditions that could change as a result of implementation of the build alternatives were identified in the study area (see Chapter 4 for existing conditions). Information was collected to describe existing conditions for use in the discussion of potential effects, including the following topics:

- General role of the local economy, including the following aspects:
  - Average wages
  - Largest private and public employers
  - Size of tourism industry
  - Amount of cargo shipped by Port of Seattle facilities
  - Specifics about economic health of the Seattle CBD
- Established business districts and retail/commercial centers
  - Updated economic data for each of the 11 identified business districts in the study area
- Employment
  - Current data for the region, county, city, and three FAZ groups (Seattle CBD, Seattle Central, and Seattle South)

- Parking inventory
  - Current data for the number of parking spaces in the south, north, and central areas; utilization rates; and conversion of single-space parking meters to pay stations
- Local government revenues, including the following components:
  - Sales and use tax
  - B&O tax and public utility revenues
  - Property tax revenues
  - Other taxes and user fees
  - Revenue from parking meters and public garages
- Traffic congestion and cost of congestion
  - Updated cost of congestion figures from Urban Mobility Report 2009 (TTI 2009a)
- Ferry and Port of Seattle cargo/cruise facilities
  - Current ferry, cargo, and cruise ship utilization statistics
- Inventory of existing businesses

Inventories of existing businesses were used to the extent that they provided complete spatial coverage of the area of direct effects. When additional areas required inventories to fill in data gaps, a pedestrian reconnaissance inventory of businesses in the area of direct effects was performed. This activity did not include contacting any of the tenants or business owners. A work plan documenting the procedures for performing the inventory was prepared for lead agency review and approval before the inventory was conducted.

2.5 Analysis of Environmental Effects

This section describes the methods used to assess potential economic effects that could occur during construction and subsequent operation of the Bored Tunnel, Cut-and-Cover Tunnel, and Elevated Structure Alternatives.

Benefits and effects on traffic, access to businesses, and visibility of businesses were qualitatively assessed as they relate to the economic health of Seattle and the Puget Sound region. Changes in traffic circulation patterns were correlated with adaptations by commercial vehicles necessary to make connections to designated freight corridors and deliveries between industrial centers. The economic benefits of improved pedestrian access and circulation were evaluated qualitatively. The visual benefit of removing the existing viaduct was evaluated qualitatively. The Seattle fire code would prohibit the transport of hazardous cargo in the bored tunnel, the cut-and-cover tunnel, and the Battery Street Tunnel portion of the alignment for both the Cut-and-Cover Tunnel Alternative and the Elevated

Structure Alternative. The resulting congestion and increased costs for businesses affected by this restriction were evaluated qualitatively.

Changes in the number of on- and off-street parking spaces were assessed as they relate to changes in government revenues and to the health of established business districts. Economic effects of the potential loss of available parking were assessed relative to government revenue, effects on established business districts, and effects on individual businesses that depend on nearby on-street parking. Changes in parking could result in shifts in transportation mode, as well as changes in the economic viability of established business districts.

The number of properties to be acquired was identified to calculate the corresponding reduction in property tax revenue. Benefits and effects of property acquisitions are discussed as they relate to changes in government revenues. The number of affected employees (based on interviews with the businesses by project staff) was used to assess the effect of building acquisitions on worker displacement. When direct employment data were not provided to the project staff, the number of employees displaced by property acquisition was estimated by calculating building size (in square feet) and multiplying it by the mean number of workers per type of business floor space (U.S. Department of Energy 2008).

O&M costs were estimated for the three build alternatives, and the costs were compared to the annual cost of operating, maintaining, and preserving the existing Alaskan Way Viaduct.

Benefits and effects on regional economic activity were estimated using U.S. Department of Commerce, Bureau of Economic Analysis, RIMS II multipliers (BEA 1997). Temporary economic effects on businesses within or adjacent to the area of direct effects were evaluated. The construction footprint was evaluated in terms of its disruptive effects on businesses and neighborhoods, especially for businesses adjacent to the construction. The disruption factors that were evaluated include loss of short-term on-street parking, sidewalk access to businesses and their visibility, and parking for freight deliveries.

Temporary economic effects on Port of Seattle, ferry, and cruise ship facilities, as well as temporary changes in vehicle through-traffic on SR 99, were assessed.

Construction effects and the cost of congestion were evaluated. Construction expenditures and the effect on sales tax revenue were assessed. The number of temporary jobs created during construction was estimated using RIMS II multipliers (BEA 1997).

With the removal of the viaduct (a visual and psychological barrier between downtown and the waterfront), greater pedestrian activity is expected to follow. This would facilitate indirect revitalization and reinvestment in the study area.

As reflected in Appendix G, Land Use Discipline Report, land use changes, including the potential for large areas of redevelopment, were qualitatively evaluated for their ability to generate economic activity.

2.6 Determining Mitigation Measures

Mitigation measures were developed for construction and operational effects in accordance with FHWA's mitigation policy and the State Environmental Policy Act. The goal of the mitigation measures is to sustain business viability during and after construction for established business districts within and adjacent to the area of direct effects. Mitigation measures were developed in close coordination with the lead agencies.

The mitigation measures are general in nature. Specific mitigation measures would be determined based on their expected cost-effectiveness, the specific needs of individual businesses, and the resilience of individual businesses to the effects associated with any of the three build alternatives. Potential mitigation measures to reduce permanent adverse economic effects were developed in accordance with the following guiding principles:

- Through project design and right-of-way requirements, minimize the extent and number of businesses, jobs, and access that would be permanently affected.
- Compensate for right-of-way acquisition, displacement and relocation of businesses, and loss of property value according to the policies of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The requirements of these policies must be balanced against those of the applicable state and local policies, which will require close coordination with the lead agencies.

The parking needs of each of the businesses or groups of businesses within a district were evaluated to develop strategies to mitigate the loss of short-term on-street parking resulting from the removal of the existing viaduct structure.

Some commercial activity within the study area would be adversely affected by the duration of the construction activities, the physical extent of the project area, the complexity of construction, and the accumulation of direct construction effects such as traffic restrictions, traffic congestion, and vibration or noise. Although these effects would not be permanent, they would be comparatively long term. The expected construction duration for each of the build alternatives would be as follows: 5.4 years for the Bored Tunnel Alternative, 8.75 years for the Cut-and-Cover Tunnel Alternative, and, 10 years for the Elevated Structure Alternative.

Transportation management strategies were developed to minimize effects on businesses: ensuring pedestrian access; identifying replacement parking strategies;

and maintaining or improving freight mobility between the Port of Seattle and regional MICs. Similarly, public information strategies and business assistance measures were developed. A key measure is conducting public information campaigns to encourage patronage of businesses during construction.

The project team evaluated the access needs of each of the businesses or groups of businesses within a district that are within or adjacent to the area of direct effects and proposed appropriate mitigation measures. The primary goal of this evaluation was to maintain adequate access to all businesses so that they can continue to operate. The project team also identified safe routes for customer access and freight delivery service. Mitigation measures for operational and construction effects are described in more detail in Sections 5.3.6, 5.4.6, 5.5.5, and 6.5.

Chapter 3 STUDIES AND COORDINATION

3.1 Studies

The analysis of economic effects was performed according to the following procedures:

- FHWA NEPA guidelines
- FHWA Technical Advisory T6640.8A, *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (FHWA 1987)
- *NCHRP Report 122: Summary and Evaluation of Economic Consequences of Highway Improvements* (NCHRP 1971)
- *NCHRP Report 463: Economic Implications of Congestion* (NCHRP 2001)
- WSDOT *Environmental Procedures Manual* (WSDOT 2010)

3.2 Coordination

Ongoing coordination between FHWA, WSDOT, and the City occurred during the preparation of this discipline report and the response to comments on the 2004 Draft EIS (WSDOT et al. 2004), the 2006 Supplemental Draft EIS (WSDOT et al. 2006), and the 2010 Supplemental Draft EIS (WSDOT et al. 2010a).

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Chapter 4 AFFECTED ENVIRONMENT

This chapter characterizes the existing conditions in the study area. Some aspects of the affected environment are reported for the broader geographic area, which includes King County and the King-Kitsap-Pierce-Snohomish Counties region.

The national and global economic climate at the time of this report requires consideration. When this report was written, the full scale of the current economic recession had not yet been analyzed in most of the published documents that were used for reference. This report relied on the most recent data and reports, including current and forecasted employment statistics from state, regional, county, and local governments. However, many of the statistics in the reference documents were available only through 2007 or 2008.

The National Bureau of Economic Research, a private nonprofit organization that is the official arbiter of U.S. recessions, has now declared that the Great Recession that began in December 2007 ended in June 2009. The Washington State economy has been in a recovery since July 2009 but, like the national economy, the recovery has been tepid at best. Job gains in the private sector have been offset by job losses in the public sector, and housing continues to struggle (WSERFC 2010). Therefore, the information in this report is as current as its sources allow, but actual economic conditions may vary from those reported herein.

4.1 General Role of the Local Economy

The greater Seattle area and King County host a large and diverse economy. King County is the largest business center in both the state of Washington and the Pacific Northwest, and it is a leading global center for several emerging industries: aerospace, biotechnology, clean technology, information technology, and international trade and logistics (CTED 2009). Compared to other counties in the state, King County represents a disproportionate share of the state's population (29 percent) (Washington State Office of Financial Management 2008) and jobs (40 percent) (LMEA 2007).

4.1.1 Average Wages

King County supports an average annual wage of $58,112 (2008), compared to the state average of $46,559 (LMEA 2010a) and the national average of $43,460 (BLS 2009). The county also has a higher proportion of jobs in services, finance/ insurance/real estate, wholesale trade, and transportation/public utilities than the state (LMEA 2007).

To support this economy, transportation infrastructure in this area includes two transcontinental railroads, an extensive nationwide trucking capacity,

three interstate highways, dozens of state highways, a ferry system, a world-class port, and an international airport. Local transit and transportation systems allow the shipment of goods and services within the region, state, Pacific Northwest, and Canada.

4.1.2 Largest Private and Public Employers

The three public companies generating the highest revenue in the greater Seattle area are Costco Wholesale Corporation, Microsoft Corporation, and, before 2008, Washington Mutual, which contributed to combined annual revenues of more than $131 billion in 2006 (City of Seattle 2008). JPMorgan Chase acquired Washington Mutual in September 2008 (Washington Mutual 2009). The three top regional employers (public and private) are the Boeing Company, Costco Wholesale Corporation, and Group Health Cooperative, with a combined workforce of 70,348 employees (CTED 2009). Other major businesses in terms of revenue and employment include Weyerhaeuser, Paccar, Amazon.com, Nordstrom, Starbucks, Safeco, and Expediters International of Washington (City of Seattle 2008). The distribution of firm sizes in King County is indicated in Exhibit 4-1.

Exhibit 4-1. Size and Distribution of Firms in King County (First Quarter 2008)

Firm Size (No. of Employees)	No. of Firms	Percentage of Total No. of Firms	Employment	Percentage of Total Employment
0–4	48,642	63.3%	71,912	6.1%
5–9	11,237	14.6%	74,379	6.3%
10–19	7,578	9.9%	102,907	8.7%
20–49	5,581	7.3%	169,559	14.3%
50–99	2,078	2.7%	143,259	12.1%
100–249	1,211	1.6%	181,089	15.3%
250–499	316	0.4%	109,122	9.2%
500–999	115	0.1%	76,225	6.4%
1,000+	84	0.1%	256,920	21.7%
Total	**76,842**	**100.0%**	**1,185,372**	**100.0%**

Source: LMEA 2008a.

4.1.3 Size of Tourism Industry

Tourism is a major industry for the state of Washington and a critical component of Seattle's economy, particularly in the study area. According to the City, "The Seattle-King County area attracts more than 9.4 million overnight visitors annually who spend $4.75 billion and contribute more than $419 million in state and local tax

revenues. Direct visitor spending supports 62,000 jobs in the Seattle region" (City of Seattle 2008).

In 2008, the cruise ship industry created 2,380 jobs; it contributes $8 million to annual state and local taxes. Every time a homeport ship docked in Seattle in 2008, $1.7 million flowed into the local economy (Downtown Seattle Association 2010).

Key attractions and services tied to the Seattle CBD include the Washington State Convention and Trade Center, Seattle Center (location of the 1962 World's Fair) and the Space Needle, Pike Place Market, the Seattle Aquarium, Pioneer Square, the International District, and various waterfront activities, shopping venues, hotels, and restaurants. In addition, several professional sports teams (Seahawks football, Mariners baseball, Sounders soccer, and Storm basketball) call Seattle home (City of Seattle 2008).

4.1.4 Amount of Cargo Shipped by Port of Seattle Facilities

International commerce also plays a large role in the local economy. Containerized shipping at Port of Seattle facilities generated 7,000 direct jobs in 2007. Other forms of cargo are shipped from Port of Seattle terminals. The total number of jobs for all cargo types and for the associated indirect and induced jobs in 2007 was 33,291, translating to a payroll of $2.8 billion (Port of Seattle 2009a). Freight arrives at seaport cargo and vessel handling terminals (Terminals 5, 18, and 46), the Port of Seattle (Terminals 30, 91, and 115), Seattle-Tacoma International (Sea-Tac) Airport, and Fishermen's Terminal.

4.1.5 Transit Facilities Serving the Central Business District

Access to businesses, services, and government facilities located in the Seattle CBD is available via multiple modes of transportation and transit. On-street parking is limited; however, parking garages are available. The Seattle Center Monorail runs between Westlake Center and Seattle Center. King County Metro Transit operates a fleet of about 1,300 vehicles, including standard and articulated coaches, electric trolleys, hybrid diesel-electric buses, and streetcars (King County Metro Transit 2008). The Downtown Seattle Transit Tunnel, retrofitted for joint operation of buses and light rail, reopened in September 2007, providing access to downtown destinations while easing street congestion (King County Metro Transit 2007). In addition, bus service in the Seattle CBD is provided at no cost between 6 a.m. and 7 p.m. daily.

Sound Transit recently constructed a light rail transit project to connect Seattle and Sea-Tac Airport. The 13.9-mile Seattle-Tukwila segment opened on July 18, 2009, and the 1.7-mile extension to Sea-Tac Airport opened on December 19, 2009 (Sound Transit 2009a). Construction of a 3.15-mile light rail extension from downtown Seattle north to the University of Washington began in Fall 2009 and is

projected to open for service in 2016. In 2008, voters approved the construction of 36 miles of extensions north, east, and south. The anticipated openings of these light rail extensions are between 2020 and 2023 (Sound Transit 2009b).

4.2 Established Business Districts and Retail/Commercial Centers

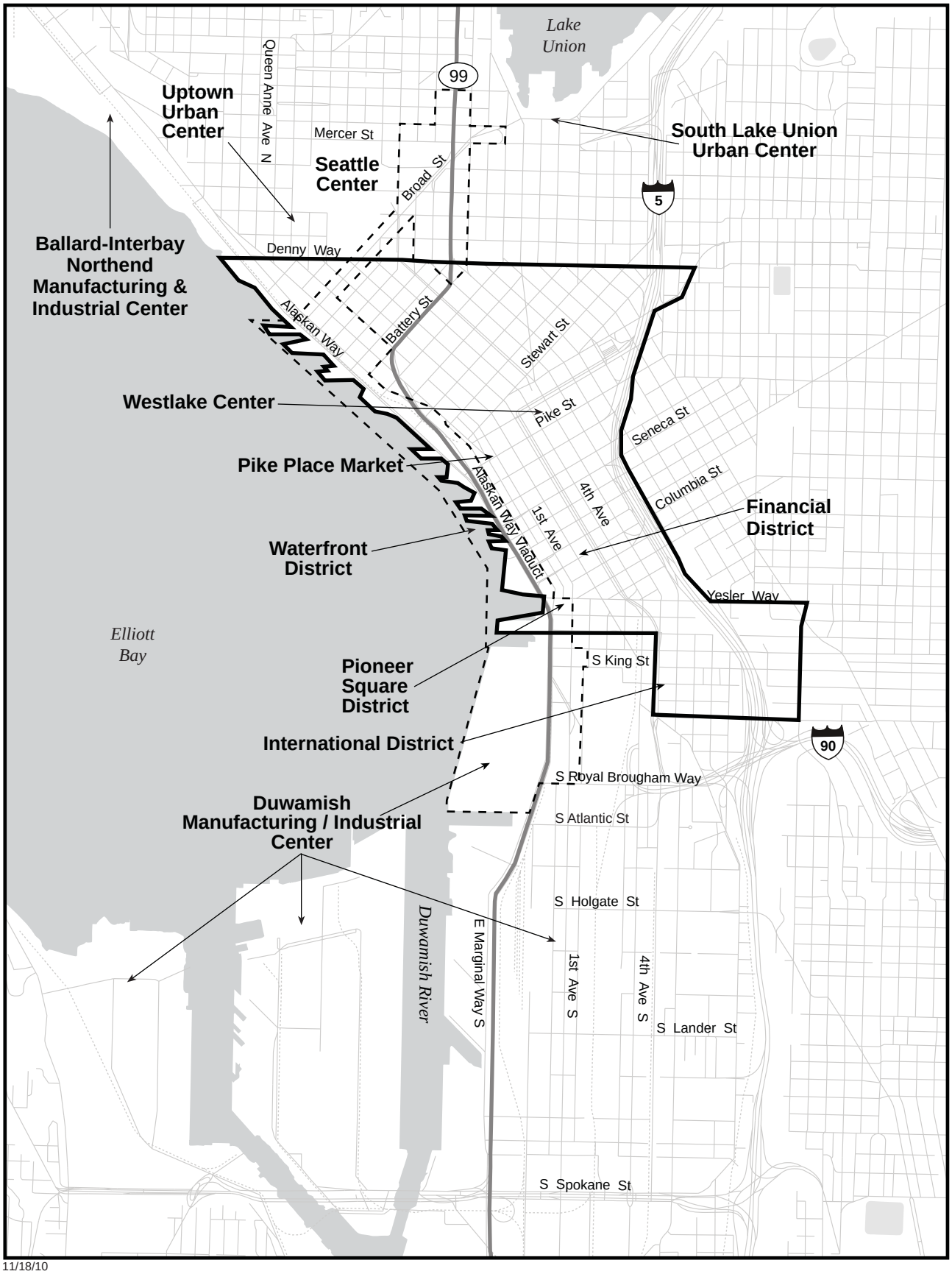
The study area is located within or near several business districts, retail/commercial centers, manufacturing/industrial centers, and urban centers (see Exhibit 4-2). These districts and centers include the Greater Duwamish MIC, International District, Pioneer Square Historic District, Financial District, Pike Place Market Historic District, waterfront district, Seattle CBD and Westlake Center, Seattle Center, South Lake Union Urban Center, Uptown Urban Center, and the BINMIC.

An independent office space research and information provider (Commercial Office Space 2008) describes the study area as follows:

> *The Seattle Central Business District…is the area bounded by Yesler Way to the south, Interstate 5 to the east, Stewart Street to the north and First Avenue to the west. This area functions as the financial hub of the region and is highly concentrated comprised mainly of high rise office buildings. This is the largest submarket in the Seattle area containing 80+ buildings totaling approximately 22.5 million rentable square footage (RSF) of space. A great diversity of buildings can be found in the CBD ranging from older historic brick-and-mortar structures to newer highly sophisticated upscale high-rise towers. This sub-market is the hub of the region's largest service-related industries including Bank of America, Wells Fargo, Washington Mutual [now Chase], Aetna Insurance, the law firms of Perkins Coie and Preston Gates & Ellis, and many others.*

4.2.1 Greater Duwamish Manufacturing and Industrial Center

The Greater Duwamish MIC comprises almost 5,000 acres of marine and industrial lands south of the Seattle CBD (PSRC 2002). In 1999, the Greater Duwamish MIC represented 84 percent of the industrial lands in Seattle (Greater Duwamish Planning Committee 1999). Key assets of the Greater Duwamish MIC include access to water for the transportation and seafood processing and storage industries, access to multimodal transportation (freeways, highways, rail, harbor facilities, and airports), proximity to Boeing facilities, and access to a large pool of highly skilled industrial workers (Greater Duwamish Planning Committee 1999). The Greater Duwamish MIC includes two major-league sports stadiums on its northern boundary: Qwest Field and Safeco Field.



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SCALE IN FEET

Central Business District

Project Area

Exhibit 4-2
Established Business Districts

4.2.2 Pioneer Square District

The Pioneer Square District, Seattle's oldest neighborhood, is located at the south end of the Seattle CBD (City of Seattle 2009c). The approximately 88-acre area is characterized by red brick buildings and art galleries, antique shops, and the Seattle Underground. This district also provides extensive nighttime entertainment, including sports bars, taverns, varying music venues, and restaurants. However, over the last dozen years, the Pioneer Square District has experienced economic challenges due to sports stadium construction, damage from the 2001 Nisqually earthquake, and the current regional and global economic downturn (Seattle Times 2009).

4.2.3 Financial District

The Financial District, located in the heart of the Seattle CBD, has considerable commercial office space available, with over 29 million square feet of rentable space distributed across 112 buildings (Resolve 2009). At the end of the first quarter 2010, 82.3 percent of the available office space was leased (17.7 percent vacancy rate) (Colliers International 2010). Most of these buildings include street-level businesses that are not commercial offices, including food service, retail sales, and services (Resolve 2009).

4.2.4 Pike Place Market

Pike Place Market is located in the commercial center of Seattle, with nearby department stores, specialty shops, hotels, theaters and cinemas, restaurants, and shopping centers. The market is a popular attraction for tourists and the oldest continually operating farmers market in the country (City of Seattle 2009b). It provides a place for farmers, craftspeople, and artists to display their goods, and it contains numerous eateries.

4.2.5 Central Waterfront

The central waterfront is the portion of downtown Seattle that fronts Elliott Bay, including the Seattle Ferry Terminal and the Bell Street Terminal cruise ship facility. The waterfront piers also support restaurants, small businesses, and other commercial tourist activities (City of Seattle 2009f). Nearly 28,000 passengers and 8,000 vehicles on the ferries pass through Seattle's waterfront each day.

Seattle's waterfront is also home to major regional attractions, such as the Seattle Aquarium and the Bell Harbor International Conference Center and Maritime Events Center, which attract nearly 11 million visitors each year (2006 statistics). The recent addition of the Olympic Sculpture Park and the expansion of the aquarium will likely increase this number in the future. These attractions are also vital cultural and educational resources for students from Puget Sound and other parts of Washington.

Seattle's waterfront is a significant contributor to the regional economy. In 2008, the cruise ship industry alone produced 1,675 direct jobs, $200 million in annual business revenue, and $13.2 million in state and local taxes to the region's economy (Port of Seattle 2009a). The Seattle Aquarium, Bell Harbor International Conference Center and Maritime Events Center, Pike Place Market, and other attractions also generate tourist revenue for Seattle, King County, and the state of Washington. The 11 million visitors to these and other waterfront destinations are likely to spend an average of $100 per person, resulting in approximately $1.1 billion in annual revenue, or around 28 percent of King County's $4 billion tourism revenue (City of Seattle 2006).

4.2.6 Seattle CBD and Westlake Center Retail Area

In the Seattle CBD, there were more than 4,900 street-level shops, restaurants, and service businesses in operation in 2009 (Downtown Seattle Association 2010). There were over 5.1 million square feet of retail inventory within the Center City, with an occupancy rate of 90 percent in 2009 (Downtown Seattle Association 2010). Most retail markets experienced little or no growth (less than 1 percent) from 2008 to 2009, including coffee shops, restaurants, cafes and bars, clothing and accessory shops, and arts and cultural businesses (Downtown Seattle Association 2010).

Westlake Center, a four-story retail and food pavilion located in the Seattle CBD, hosts local, national, and international retailers (Westlake Center 2009). Additional retail establishments (Nordstrom flagship store, Pacific Place, and Macy's) are located within several blocks of Westlake Center, which makes the area a destination retail center for Seattle-area residents and tourists.

4.2.7 Seattle Center

Seattle Center is an urban park and entertainment center located just north of the Seattle CBD. The 74-acre campus hosts more than 5,000 events each year and is home to more than 30 cultural, educational, sports, and entertainment organizations (Seattle Center 2006a). It hosted 4.6 million visitors in 2005 and is a social gathering place of international recognition (Beyers 2006).

In 2005, Seattle Center visitors and businesses created $1.15 billion in business activity and $387 million in labor income in King County and supported 15,534 jobs. In addition, state and local governments receive $41.1 million in tax revenues from business activity at Seattle Center. An estimated 6,489 people are directly employed by businesses at Seattle Center. Most of them are part-time or seasonal/temporary employees, but 32 percent (1,860) are full-time employees (Beyers 2006).

Key Arena's primary sports tenant is the Seattle Storm women's professional basketball team. In 2008, Seattle Center lost its other two anchor Key Arena tenants:

the Seattle Sonics, who relocated to Oklahoma City, and the Seattle Thunderbirds, who relocated to Kent, Washington (City of Seattle 2009d).

Seattle Center revenue comes from parking, facility rentals, concessions, and various sales from the year-round events held on the campus. However, this revenue covered about 70 percent of Seattle Center's operating costs for 2006 (City of Seattle 2006). Operating costs do not include the costs of debt service obligations for McCaw Hall and Key Arena. The total estimated revenue for the Seattle Center fund, as stated in the 2010 adopted and 2011 proposed budgets for the City, is about $38 million (City of Seattle 2010).

The first phase of the new Bill & Melinda Gates Foundation campus is projected to open in Spring 2011. When all the construction phases of the new campus, adjacent to Seattle Center, are completed, all of the foundation's operations will be housed in three six-story buildings, totaling approximately 0.9 million square feet of office space to accommodate approximately 2,250 employees. The site will also include a 15,000-square-foot visitor center, to be completed during the first phase, where "the public can see and learn about the foundation's work and its efforts to help people around the world live healthy and productive lives" (Bill & Melinda Gates Foundation 2010).

4.2.8 South Lake Union Urban Center

The South Lake Union Urban Center includes a 12-acre park that is designated as a cultural, educational, and recreational waterfront center. It also includes biotechnology and mixed-use office space and housing (City of Seattle 2009h). On April 20, 2009, City and state leaders gathered in the neighborhood to celebrate the groundbreaking of Amazon.com Inc.'s new headquarters campus, which could eventually span 1.7 million square feet (Puget Sound Business Journal 2009). By 2030, employment in the general Lake Union/Seattle Center area is projected to increase by over 69 percent from what it was in 2000, and the number of households is projected to increase by 35 percent (PSRC 2006a).

In December 2007, the South Lake Union streetcar began service from the South Lake Union neighborhood to the Westlake transit hub, where riders can transfer to regional and local buses, Link light rail, and the Seattle Monorail. The streetcar served more than 500,000 passengers in the first year, far exceeding the original estimates (City of Seattle 2009e). In addition, Metro routes 5, 5 Express (x), 16, 26, 26x, 28, 28X, and 358X serve the South Lake Union area. The all-day routes within the South Lake Union area attracted about 1 million boardings in 2009 (King County Metro Transit 2010).

4.2.9 Uptown Urban Center

The Uptown Urban Center includes mixed commercial and retail establishments and some residential areas. Seattle Center is the hub for the Uptown Urban Center. Local businesses provide services to Seattle Center visitors, including food and beverage establishments, entertainment facilities, and various retail outlets.

4.2.10 Ballard Interbay Northend Manufacturing and Industrial Center

The BINMIC is one of two manufacturing and industrial centers in Seattle. It is a 971-acre area with management goals that focus on several areas: marine, fishing, and waterfront businesses; smaller industrial manufacturing operations; and advanced technology industries (City of Seattle 2009a).

4.3 Employment

4.3.1 Employment by Industry

To characterize employment in the study area, several levels of analysis were compared. These economic elements are discussed in general terms for the region (King-Kitsap-Pierce-Snohomish Counties), King County, and Seattle. Three geographic areas were analyzed in more detail: the Seattle CBD,[3] Seattle Central,[4] and Seattle South[5] (see Exhibit 4-3). These geographic areas were selected based on FAZ groups that the project area crosses. An FAZ consists of one or more census tracts and is the basic geographic unit for demographic data and forecasts; an FAZ group is an aggregation of FAZs. Local agencies such as the Puget Sound Regional Council (PSRC) use these FAZs and census tract areas to characterize historical, existing, and projected population, housing, and employment trends and land use. This section describes the employment component of these data; a more detailed description of population and housing data is provided in Appendix H, Social Discipline Report.

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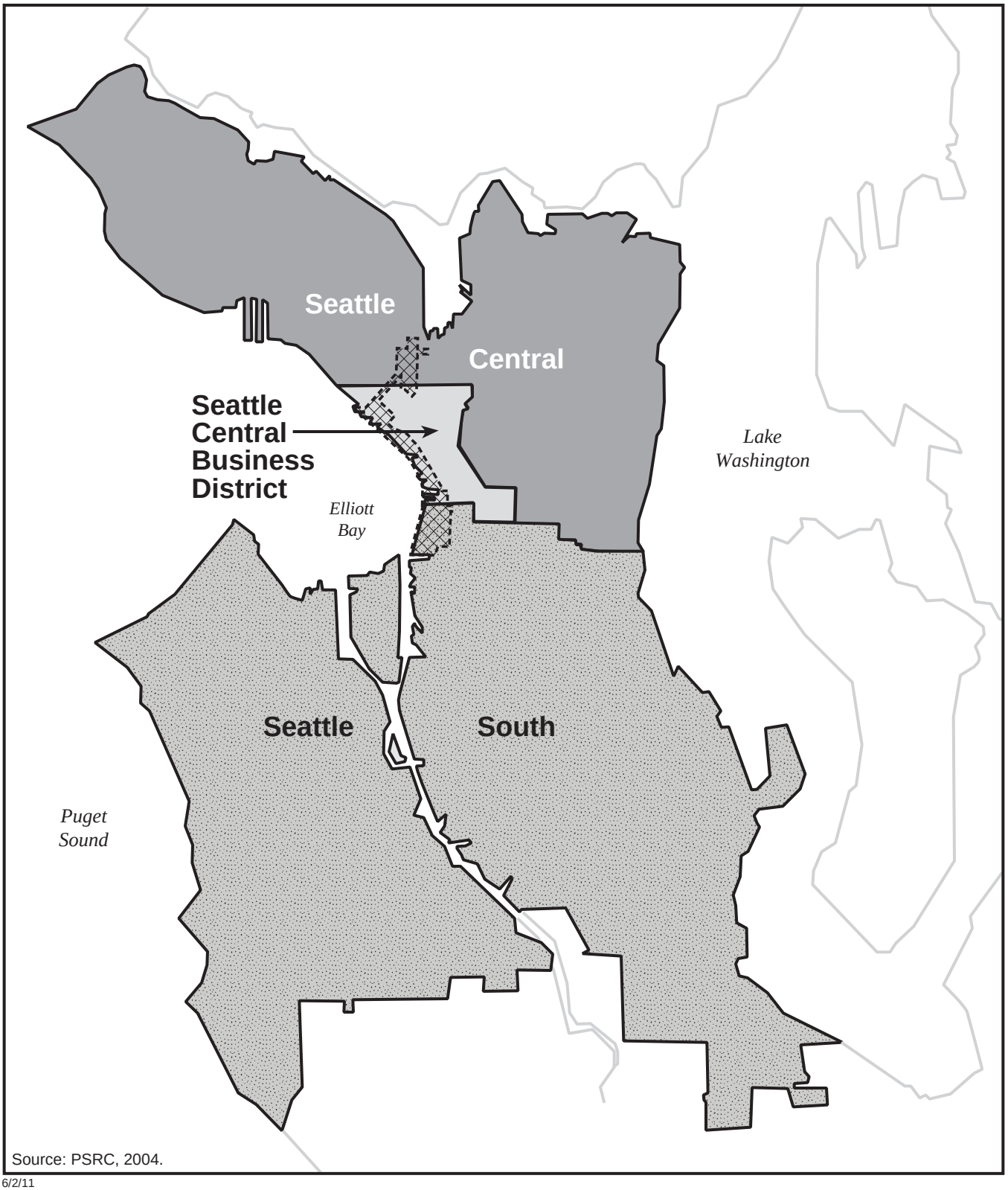
[3] The Seattle CBD is defined by the Washington State Employment Security Department as the downtown area bounded by Elliott Bay to the west, Denny Way to the north, I-5 to the east, and S. Dearborn Street to the south.

[4] Seattle Central extends north and east of the Seattle CBD. It is bounded by S. Dearborn Street/Denny Way/Interstate 90 to the south, Lake Washington to the east, the Lake Washington Ship Canal to the north, and Elliott Bay to the west.

[5] Seattle South is directly south of the Seattle CBD and Seattle Central; it is bounded by Lake Washington to the east; generally by Seola Beach Drive, S.W. Roxbury Street, S. Sixth Street, and S. Bangor Street to the south; and Elliott Bay to the west.



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SCALE IN MILES

Project Area

Exhibit 4-3
Forecast Analysis
Zone Groups

The regional economy is diverse, with an emphasis on the service industries. Employment derived from retail trade and the government/education sector also plays a major role in the regional economy, as shown in Exhibit 4-4.

Over the last three decades, the number of jobs in the region has nearly doubled, with an increasing percentage of jobs gained in the services sector. In 2000, 38.9 percent of the region's jobs were in the services sector. After the services sector, the employment sectors in the region ranked as follows: retail trade (18.2 percent), government/education (17.0 percent), manufacturing (13.6 percent), and trade/transportation/utilities (12.2 percent). Compared to the region as a whole in 2000, Seattle had a higher proportion of jobs (47.5 percent) in the services sector. Seattle's second largest employment sector was government/education, which provided 17.6 percent of the jobs.

In 2000, employment within and near the study area differed in several ways from the regional and citywide distribution of jobs across industry sectors. Most of the employment in Seattle Central and the Seattle CBD was in the services sector (55.6 and 60.0 percent, respectively), the percentage being substantially higher than the regional, King County, and Seattle averages. Government/education was the second leading job sector in Seattle Central and the Seattle CBD, with 13.7 and 16.3 percent, respectively.

In 2000, approximately 50 percent of the jobs in Seattle South were distributed across three sectors: manufacturing, retail trade, and government/education. The remaining approximately 50 percent of the jobs were distributed across the services and trade/transport/utilities sectors. The number of services sector jobs in Seattle South is projected to increase substantially, whereas the number of jobs in the other sectors is projected to decrease over time.

4.3.2 Unemployment Rates

Unemployment rates within the region have historically been lower than the statewide average, as shown in Exhibit 4-5. In 2010, the average civilian labor force in King County numbered 1,109,050, with approximately 92,780 (8.4 percent) unemployed (LMEA 2010b). The average statewide civilian labor force was 3,536,200, with 325,800 (9.2 percent) unemployed in 2010 (LMEA 2010b).

Exhibit 4-4. Employment (Number and Percentage of Jobs)

Area/Industry Sector	1980	1990	2000	2010 (Forecasted)	2020 (Forecasted)	2030 (Forecasted)	2040 (Forecasted)
Region							
King-Kitsap-Pierce-Snohomish Counties	1,033,407	1,445,243	1,760,043	1,934,713	2,224,597	2,497,678	2,789,293
Manufacturing	21.0%	18.3%	13.6%	11.3%	9.6%	8.4%	7.6%
Trade/transport/utilities[1]	12.7%	12.1%	12.2%	11.8%	11.6%	11.4%	11.3%
Retail trade	17.9%	18.0%	18.2%	18.2%	18.0%	17.8%	17.5%
Services	27.4%	33.4%	38.9%	41.3%	44.5%	47.1%	49.3%
Government/education	21.0%	18.2%	17.0%	17.5%	16.3%	15.3%	14.4%
County							
King County	697,401	972,567	1,196,043	1,311,186	1,498,043	1,664,780	1,830,535
Manufacturing	20.9%	17.8%	12.4%	9.9%	8.0%	6.8%	5.9%
Trade/transport/utilities[1]	15.1%	14.4%	14.4%	13.7%	13.2%	12.7%	12.3%
Retail trade	18.2%	17.4%	17.6%	17.3%	17.0%	16.7%	16.4%
Services	29.7%	36.3%	42.3%	45.3%	48.8%	51.7%	53.9%
Government/education	16.1%	14.0%	13.4%	13.8%	12.9%	12.1%	11.5%
City							
Seattle	386,684	469,802	540,419	580,713	653,514	708,348	762,395
Manufacturing	13.1%	10.2%	7.4%	5.9%	4.9%	4.1%	3.6%
Trade/transport/utilities[1]	15.6%	14.7%	12.6%	11.9%	11.4%	10.8%	10.3%
Retail trade	15.8%	13.8%	14.9%	15.0%	14.9%	14.9%	14.8%
Services	35.5%	43.5%	47.5%	48.1%	50.5%	52.4%	54.2%
Government/education	20.0%	17.8%	17.6%	19.1%	18.4%	17.7%	17.2%

Exhibit 4-4. Employment (Number and Percentage of Jobs) (continued)

Area/Industry Sector	1980	1990	2000	2010 (Forecasted)	2020 (Forecasted)	2030 (Forecasted)	2040 (Forecasted)
Forecast Analysis Zone Groups							
Seattle CBD	112,248	161,834	183,234	202,021	225,782	243,639	255,266
Manufacturing	4.9%	3.0%	2.1%	1.4%	0.9%	0.6%	0.5%
Trade/transport/utilities[1]	13.0%	12.7%	10.0%	9.5%	9.1%	8.4%	7.7%
Retail trade	14.8%	12.3%	11.6%	11.1%	10.8%	10.4%	10.0%
Services	44.1%	53.5%	60.0%	59.8%	61.0%	62.6%	63.7%
Government/education	23.2%	18.5%	16.3%	18.2%	18.2%	18.0%	18.1%
Seattle Central	101,213	111,390	132,883	142,380	161,767	169,875	179,294
Manufacturing	11.6%	9.9%	7.5%	5.6%	4.6%	3.8%	3.3%
Trade/transport/utilities[1]	18.3%	13.3%	10.3%	10.0%	9.5%	9.3%	9.0%
Retail trade	13.1%	10.8%	13.0%	14.1%	14.5%	15.4%	15.7%
Services	47.1%	54.8%	55.6%	55.2%	56.9%	57.2%	58.0%
Government/education	9.9%	11.2%	13.7%	15.2%	14.5%	14.3%	13.9%
Seattle South	88,976	97,737	110,718	116,099	128,461	142,885	161,010
Manufacturing	30.1%	25.9%	18.5%	16.4%	14.4%	12.5%	10.7%
Trade/transport/utilities[1]	23.5%	29.0%	26.7%	25.3%	24.1%	22.6%	21.4%
Retail trade	13.5%	11.3%	15.6%	15.1%	15.0%	14.9%	14.6%
Services	14.0%	18.7%	25.3%	28.8%	33.3%	38.2%	42.8%
Government/education	18.8%	15.1%	14.0%	14.3%	13.2%	11.7%	10.4%

Source: PSRC 2006a.
Note: Total employment does not include workers in resources (agriculture, forestry, fishing, and mining) and construction.
CBD = Central Business District
[1]The trade/transport/utilities category includes wholesale trade, transportation, communication, and utilities.

Exhibit 4-5. Unemployment Rates (Average Annual Percentage)

Area	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Washington State	5.0	6.2	7.3	7.4	6.3	5.5	5.0	4.5	5.3	9.0	9.2
King County	4.1	5.1	6.1	6.2	5.2	4.8	4.2	3.7	4.3	8.0	8.4
Kitsap County	5.0	6.0	6.8	6.8	5.8	5.2	4.7	4.3	5.0	7.6	7.6
Pierce County	5.0	6.5	8.1	8.2	7.1	5.9	5.2	4.7	5.7	9.3	9.6
Snohomish County	4.5	5.3	7.0	7.1	5.7	5.1	4.6	4.1	5.1	9.5	9.8

Source: LMEA 2010b.

Note: Unemployment rates are annual averages (not seasonally adjusted).
Kitsap County data are from the Bremerton primary metropolitan statistical area.
Pierce County data are from Tacoma Metropolitan Division.

Over the next decade, nonagricultural employment in the state is forecasted to continually increase, although at a slower rate (1.4 percent) than actual growth in the previous decade (1.7 percent) (LMEA 2008b). An increasing proportion of job growth is expected in the government sector, although this may be changing due to the current economy. The professional and business services sector is expected to remain the second largest sector (LMEA 2008b).

4.4 Parking

4.4.1 Parking Inventory

Parking is categorized as on-street and off-street parking throughout the study area. The available inventory of on-street parking is provided by the City and is quantified by the number of paid parking spaces, which is the majority of on-street parking. According to the SDOT Parking Strategic Advisor, there are more than 13,500 paid on-street parking spaces citywide. About 55 percent (7,425 parking spaces) of these spaces are in the Seattle CBD (which for the parking inventory is bounded by Denny Way to the north, I-5 to the east, S. Royal Brougham Way to the south, and Elliott Bay to the west). The total number of spaces in paid service at any time fluctuates somewhat depending on construction, temporary no-parking zones, holidays, and other variables that remove curb-space from use.

In 2004, the City began a 3-year process of converting a majority of the single-space parking meters to multi-space pay and display kiosks (City of Seattle 2009g). As of mid-2009, there were only about 100 meters still deployed in Seattle, primarily in the north downtown area.

The available inventory of off-street parking is provided by private property owners and operators of primarily private facilities. According to the 2006 Parking Summaries provided by PSRC (PSRC 2006b), there are 80,420 parking stalls in Seattle in the following districts: the Seattle CBD, the central waterfront,

the International District, Lower Queen Anne, First Hill, and the Denny Regrade. The average daily occupancy rate for off-street parking in Seattle is 62.9 percent (PSRC 2006b).

There are 25,965 off-street parking stalls within the Seattle CBD. The average daily occupancy rate for off-street parking within the Seattle CBD is 70.1 percent (PSRC 2006b).

Within the Seattle Center area, four parking lots provide 3,136 stalls (Seattle Center 2006b). This represents approximately 17 percent of the total parking stalls within the Lower Queen Anne area (PSRC 2006b). The 2006 occupancy rate for off-street parking within the Lower Queen Anne area was 47.4 percent (PSRC 2006b).

Short- and long-term on-street parking spaces (paid and unpaid) are present along most streets throughout the study area. In general, there are about 1,200 on-street parking spaces, of which about 900 are paid spaces, and about 560 off-street spaces that could be affected by construction of the three build alternatives. (Note that these are the upper bounds of numbers of parking stalls that could be affected and they take into account all of the three build alternatives study area boundary).

4.4.2 Center City Parking Program

The Center City Parking Program is SDOT's approach for addressing changes in the availability of and a growing demand for short-term parking in the Center City over the next several years. Marketing, way-finding, and technology measures aim to improve access to off-street short-term parking beginning in 2012. This approach aims to keep the Center City moving as more jobs and people come to Seattle and throughout the construction of the project.

One innovative component of the Center City Parking Program is e-Park, an electronic parking guidance system that uses signs to provide motorists with real-time parking space availability and direct them from main downtown access points to parking garages. The new technology will make it easy for shoppers and visitors to find parking, and it will reduce traffic congestion and pollution by reducing the amount of circling for vacant on-street parking. A pilot project began in Spring 2010 to test the concept and technology of the electronic system.

SDOT is developing a marketing strategy with a parking locator website, printed maps, and programs for participating garages, properties, and other organizations in the Center City. Phase I of e-Park was launched in Fall 2010. During Phase II of e-Park, the system will be extended to other downtown areas, including Pioneer Square and the central waterfront in 2011–2012.

4.5 Local Government Revenues

The state of Washington and the City rely on a variety of taxes to fund state and local government programs. These taxes include a combined state and local sales and use tax; B&O tax; public utility tax; property tax; and several other excise, real estate, and estate taxes.

4.5.1 Sales and Use Tax

A combined state and local retail sales tax is collected on the sale of tangible personal property. A use tax is assessed on the market value of using tangible personal property and services for which the sales tax has not been paid. The retail sales and use tax applies to most items purchased by consumers, but does not apply to food items or prescription drugs.

The amount of the retail sales and use tax varies by locality. The state tax base is 6.5 percent, but each locality can assess additional tax. The combined state and local tax rate for the study area is 9.5 percent, which also includes a Regional Transit Authority tax.

For the City's proposed 2011–2012 budget, retail sales tax revenues account for $151.1 million. This is 17 percent of the General Subfund Revenue (City of Seattle 2010). Utility services and most personal services (e.g., medical, dental, legal, and barber) and real estate are not subject to these taxes. However, construction services and building materials are subject to the retail sales tax.

Within King County, sales tax accounts for 13 percent of the total taxes collected as General Fund revenue. According to the 2011 Executive Proposed King County Budget, King County is estimated to collect $79.7 million in sales taxes for the 2011 fiscal year, a 5.3 percent decrease from the 2008 levels (King County Budget Office 2010).

In addition to the state and local retail sales tax, the King County food and beverage tax is collected for restaurants, taverns, and bars. This adds 0.5 percent to the 9.5 percent sales tax levied at these types of establishments.

4.5.2 Business and Occupation Tax and Public Utility Tax

Most businesses operating in the state are subject to the B&O tax, which is typically assessed on the gross income, proceeds of sales, or value of doing business. Contractors performing construction for federal agencies are classified as government contractors for B&O tax purposes and are subject to the B&O tax. Typically, the measure of tax is the gross contract price (Washington Administrative Code, Section 458-20-17001).

According to the City's proposed 2011 budget, B&O taxes account for $166.6 million (19 percent) of the General Subfund Revenue (City of Seattle 2010).

In addition, the City levies a tax on the gross income derived from sales of utility services by privately owned utilities within Seattle, including telephone, steam, cable communications, natural gas, and refuse collection. These business tax revenues on utilities account for $174.5 million (20 percent) of the General Subfund Revenue (City of Seattle 2010).

4.5.3 Property Tax

Real and personal property is subject to property tax. Real property includes land and any improvements, such as buildings attached to the land. The primary characteristic of personal property is mobility. Examples of personal property are machinery, equipment, supplies, and furniture. Personal property tax typically applies to personal property used when conducting business.

Property tax is a combined state and local tax. The 2010 property taxes in Seattle ranged from $9.04 to $11.42 per $1,000 of assessed value (King County Department of Assessments 2010). The state portion of these property taxes is $2.21 per $1,000 of assessed value, with the rest apportioned to many taxing districts (Washington State Department of Revenue 2010). Within King County, property taxes are projected to account for 42 percent of the total taxes collected as General Fund revenue in 2011 (King County Budget Office 2010). According to the 2011 proposed budget, King County has a proposed levy of $638 million in property taxes for the 2010 fiscal year (King County Budget Office 2010). Property tax revenues in the City's proposed 2011 budget account for $248.6 million, which is 28 percent of the General Subfund Revenue (City of Seattle 2010). This includes general property tax and a property tax levied for the Firefighters Pension Fund in accordance with Revised Code of Washington, Section 41.16.060.

4.5.4 Other Taxes and User Fees

Various other taxes are assessed at the state and local levels, including an excise tax on hotels and motels, admission to entertainment and recreation events, food and beverages, fuels, cigarettes, tobacco products, liquor, timber, rental cars, and other goods and services. In Seattle, a Convention and Trade Center tax (7.0 percent) is levied on all lodging establishments with 60 or more rooms. This tax is also levied in Bellevue and elsewhere in King County, with various tax rates.

Other local excise taxes include municipal business taxes and licenses. The sale of most real property is subject to a real estate tax that is paid by the seller. Other taxes levied by the state or local municipalities include an estate and transfer tax, vehicle licensing fee, and watercraft excise tax. No personal income tax is levied in the state of Washington.

4.5.5 Revenues From On-Street Parking and Public Garages

Revenues from on-street paid parking are deposited into the City's General Fund. These revenues are designated as "fees to cover the cost of installation, inspection, supervision, regulation, and maintenance involved in the control of traffic and parking upon the streets" (Seattle Municipal Code, Section 11.16.480 [SMC 11.16.480]). The Seattle Municipal Code also grants to the City's Traffic Engineer the authority to "establish areas where parking is regulated by parking payment devices, and the time limit for parking therein; order installation or removal of parking payment devices where it is determined upon the basis of an engineering and traffic investigation that the installation or removal of such devices is necessary to aid in the regulation, control, and inspection of the parking of vehicles" (SMC 11.16.300).

Beginning in mid-2004, the City began replacing single-space parking meters with multi-space pay stations to improve parking management efficiencies and address outdated meter technology (City of Seattle 2005, 2009h). There are typically one or two pay stations per block, depending on the block length and the amount of paid parking. Pay stations allow users to pay with coins, a credit card, or a debit card. The 2009 budget adopted by the City included an hourly on-street parking rate increase along with a three-tiered rate system. First implemented in the South Lake Union neighborhood in 2007, the three-tiered rate system ensures that on-street parking rates are set appropriately for the surrounding land uses, parking demand, and transportation conditions (City of Seattle 2009g). All of the on-street paid parking spaces within the central segment of the study area are in the highest tier of $2.50 per hour and are short-term parking stalls (City of Seattle 2009g). Within the north segment of the study area, on-street paid parking is dominated by spaces that cost $1.25 per hour. However, about eight blocks within the north segment charge $2.00 to $2.50 per hour for paid on-street parking. The average parking rate in the north segment is $1.85.

The City evaluated the annual revenue associated with parking spaces controlled by paid parking in the south, central, and north segments of the study area. Within each segment, an individual on-street parking space generates the following estimated annual revenue:

- South Segment – $2,530 per year
- Central Segment – $6,600 per year
- North Segment– $870 per year

Because of the increase in hourly rates, as well as changes in the behavior of motorists who use such parking, the City has realized a substantial increase in revenue per parking space per year over that for single-space meters that were previously used.

The 920 paid on-street parking spaces within the study area that could be affected by the construction of the build alternatives generate $3.7 million per year in revenue using the estimated revenue per space for each segment.

In August 2006, the City passed an ordinance that amended the Seattle Municipal Code (SMC 5.35.030) to impose "a tax for the act or privilege of parking a motor vehicle in a commercial lot within the city that is operated by a commercial parking business" (City of Seattle Ordinance 122192). Before this tax was imposed, the City collected an annual license fee: $90 per 1,000 square feet of floor or ground space contained in a parking garage or lot and used for parking or storage purposes. The purpose of this tax is to "provide an equitable means of generating revenue to support the City's transportation system, and to reduce the existing Public Garage and Parking Lot License Fee that [was] imposed by SMC Chapter 6.48" (City of Seattle Ordinance 122192). Currently, the tax rate is 10 percent of the parking fee (SMC 5.35.030). These taxes are collected by commercial parking businesses from the parking customer at the time payment is made.

4.6 Traffic Congestion and Its Cost

The Texas Transportation Institute has studied urban congestion trends for motor vehicle mobility since 1982. The study results are published annually in its *Urban Mobility Report*, which is cited nationwide for its catalog of congestion delays in the nation's busiest cities, congestion costs, and other related topics (TTI 2009a).

Data on traffic congestion and the cost of congestion in Seattle and other urban areas were compiled from the *2009 Urban Mobility Study* (TTI 2009b) for the following congestion measures:

- Annual delay – person-hours
- Number of "rush hours" – time when system has congestion
- Amount of congested travel – percentage of peak VMT
- Total annual congestion cost
- Annual congestion cost per peak hour road traveler
- Annual congestion cost per person

In 2005, the population of the Seattle urban area[6] reached 3 million, and the Seattle urban area is now categorized, along with 13 others, as a "very large urban area." This is defined as an area with an average of 14 individual urban areas and a population of 3 million or more. Before the *2007 Urban Mobility Study*, which detailed the 2005 data, Seattle was categorized with 25 others as a "large urban area." This is defined as an area with a population between 1 and 3 million. Because the transition

[6] The Seattle urban area consists of the greater Puget Sound region.

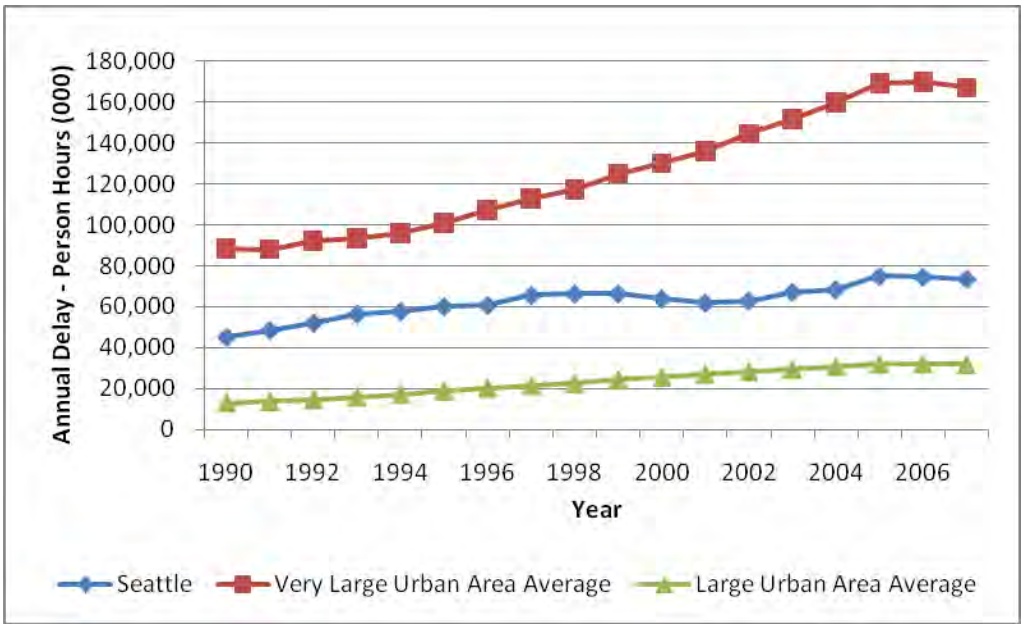
from "large" to "very large" is so recent, this section of the discipline report discusses the information related to congestion in Seattle relative to the statistics for both categories. Seattle's statistics contribute only to the "very large urban area" average.

Over the years, the costs to travelers associated with congestion in Seattle have increased each year. However, Seattle has seen a slowing trend, especially in the, last ten years; whereas, both large and very large urban areas have seen steady increases, particularly in annual congestion cost per peak hour road traveler and per person.

Annual Delay – Person-Hours

In 2007, the total annual person-hours of delay due to congestion in Seattle was 73,636,000 hours. This was less than half the average annual delay in other very large urban areas (166,900,000). Between 1990 and 2007, Seattle's annual delay grew from 45,056,000 to 73,636,000 person-hours (an increase of approximately 66 percent). During this time, the average annual delay in other very large urban areas grew from 88,365,000 to 166,900,000 person-hours (an increase of approximately 89 percent). The average annual person-hours of delay in large urban areas due to congestion increased by 146 percent between 1990 and 2005 (from 12,916,000 to 31,778,000). Although annual congestion-related person-hours of delay increased more quickly in large urban areas, the total number of hours of delay was much higher in Seattle and other very large urban areas in 2007 (132 and 425 percent higher, respectively). Trends in annual person-hours of delay for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-6.

Exhibit 4-6. Annual Delay – Person-Hours

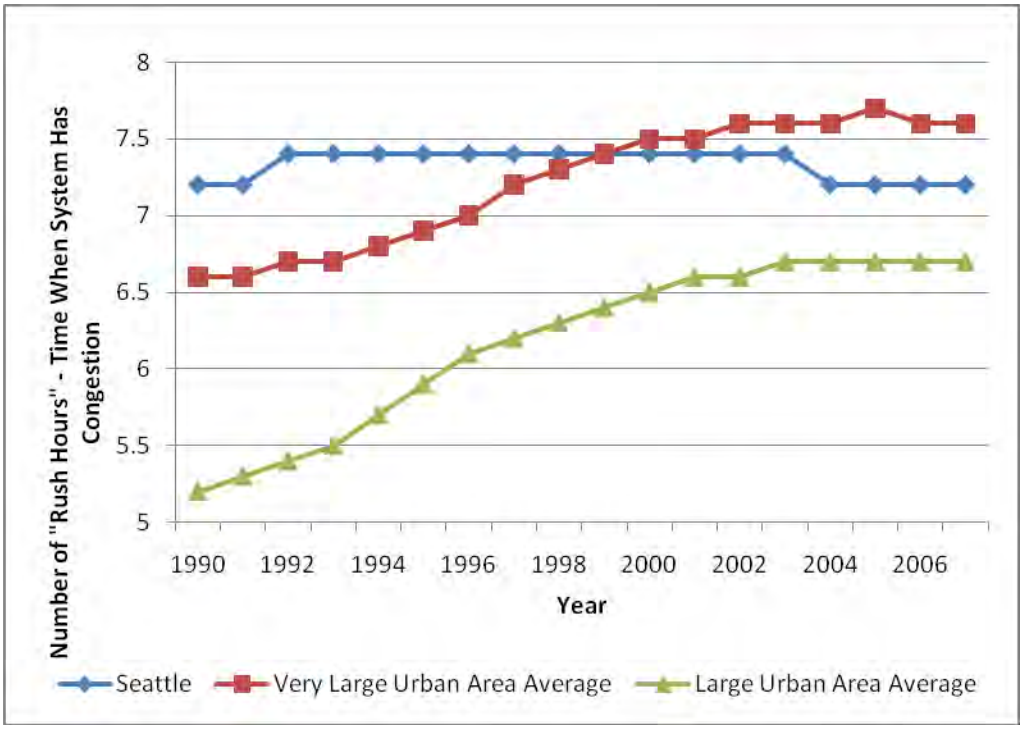


Source: TTI 2009b.
Note: Person-hours are in thousands.

Number of Rush Hours – Time When System Has Congestion

In 2007, the number of rush hours (or time when the roadway system has congestion) each day was 7.2 hours in Seattle. That same year, it was 7.6 hours in other very large urban areas. Between 1990 and 2007, the number of rush hours in Seattle remained essentially constant. In 1992, the number increased from 7.2 to 7.4 hours, held constant for 12 years, then decreased back to 7.2 in 2004, where it remained in 2007. Between 1990 and 2007, the average number of rush hours grew from 6.6 to 7.6 hours in other very large urban areas, an increase of 15 percent. During the same time period, the average number of rush hours in large urban areas increased from 5.2 to 6.7 hours, a 29 percent increase. Currently, Seattle has less than 1 rush hour more than the average for cities with less population. In the early to mid-1990s, Seattle experienced about 1 rush hour more than the number in very large urban areas. Patterns now indicate that Seattle has been experiencing a reduction in rush hours, while the number of rush hours in other very large urban areas continues to increase over that of Seattle. Trends in the number of rush hours for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-7.

Exhibit 4-7. Number of Rush Hours – Time When System Has Congestion

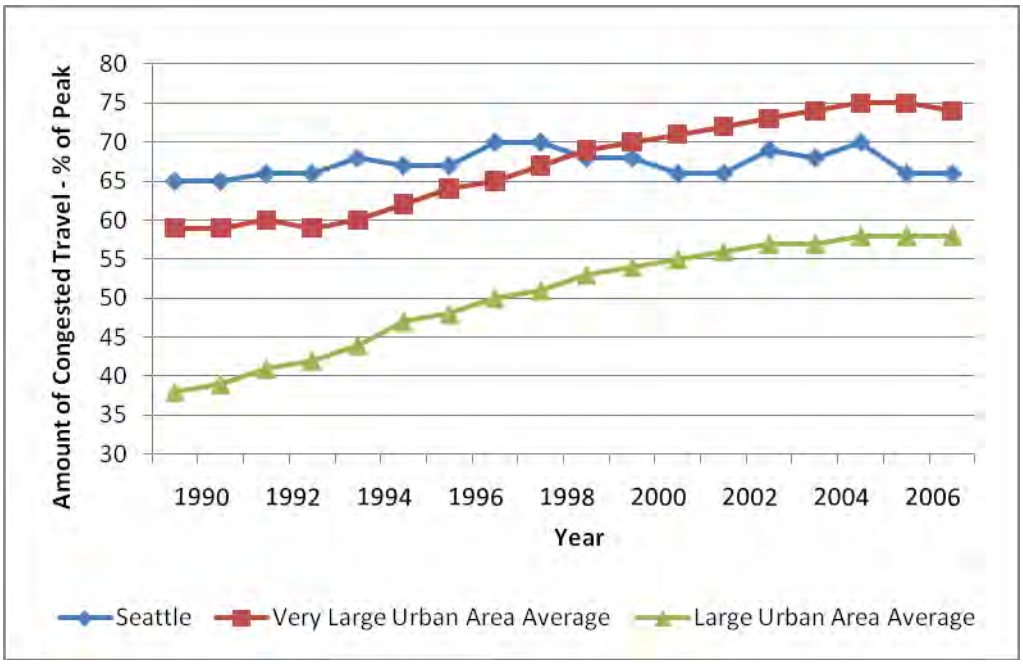


Source: TTI 2009b.

Amount of Congested Travel – Percentage of Peak VMT

In 2007, the amount of congested travel, defined as a percentage of peak VMT,[7] was 66 percent in Seattle and 74 percent in other very large urban areas. Between 1990 and 2007, the amount of congested travel in Seattle varied dramatically, but overall it increased only about 1.5 percent; in contrast, it grew from 59 to 74 percent in other very large urban areas (an increase of 25 percent). However, Seattle's average amount of congested travel from 1990 to 2007 was 67 percent, similar to that of other very large urban areas. During the same time period, the amount of congested travel in large urban areas grew from 38 to 58 percent (an increase of nearly 53 percent). As detailed in Exhibit 4-8, the amount of congested travel in Seattle has fluctuated between 65 and 70 percent between 1990 and 2007 whereas the average of all other very large urban areas and the average of large urban areas continue to increase at a steady pace and are only just experiencing signs of slowing. Trends in the amount of congested travel as a percentage of peak VMT for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-8.

Exhibit 4-8. Amount of Congested Travel – Percentage of Peak VMT



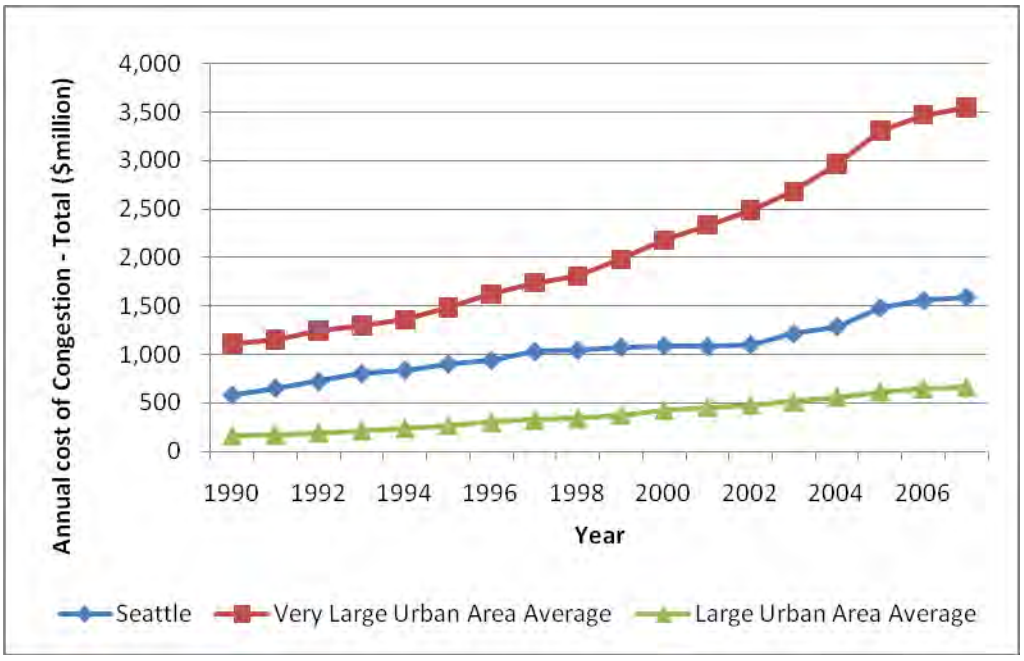
Source: TTI 2009b.

[7] Percent congested travel is the congested peak period VMT divided by total VMT in the peak period. It is a relative measure of the amount of peak period travel affected by congestion.

Total Annual Congestion Cost

In 2007, Seattle's total annual congestion cost[8] was $1,591,000,000. The same year, the average total annual congestion cost for other very large urban areas was $3,549,000,000. Between 1990 and 2007, Seattle's total annual congestion cost increased from $584,000,000 to $1,591,000,000, an increase of 172 percent. During this same period, the average total annual congestion cost for other very large urban areas increased from $1,113,000,000 to $3,549,000,000, an increase of 219 percent. Large urban areas experienced a 313 percent increase in average total annual congestion cost, from $160,000,000 to $661,000,000. Trends in total annual congestion cost for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-9.

Exhibit 4-9. Total Annual Congestion Cost



Source: TTI 2009b.

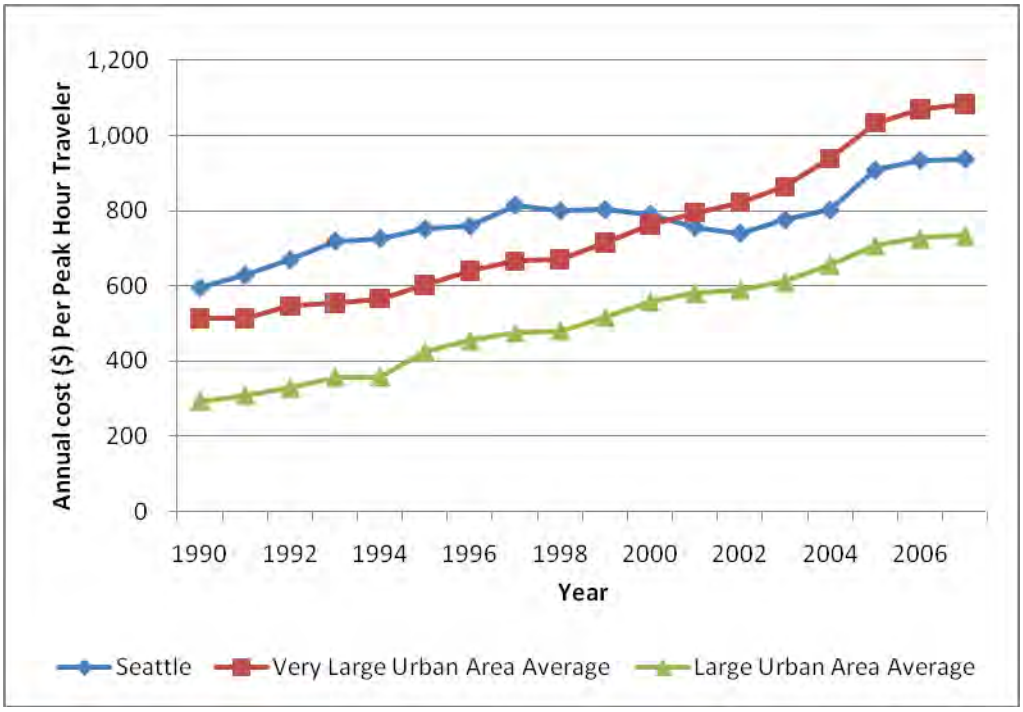
Annual Congestion Cost per Peak Hour Traveler

In 2007, the annual cost of congestion per peak hour traveler in Seattle was $938. The same year, the annual cost of congestion per peak hour traveler in other very large urban areas was $1,084. Between 1990 and 2007, the cost of congestion per peak hour

[8] The annual cost of congestion resulting from incidental and recurring delays includes the costs due to travel delay and wasted fuel. The delay cost is an estimate of the value of lost time in passenger vehicles and the increased operating costs of commercial vehicles in congestion. The wasted fuel cost is due to vehicles moving at speeds slower than free-flow during peak period travel.

traveler increased from $594 to $938 in Seattle (an increase of 58 percent), and from $513 to $1,084 in other very large urban areas (an increase of 111 percent). Large urban areas experienced an increase in average annual cost of congestion per peak hour traveler of 151 percent during the same period (from $293 to $734). Trends in annual congestion cost per peak hour traveler for Seattle, other very large urban areas, and large urban areas are illustrated in Exhibit 4-10.

Exhibit 4-10. Annual Congestion Cost per Peak Hour Traveler

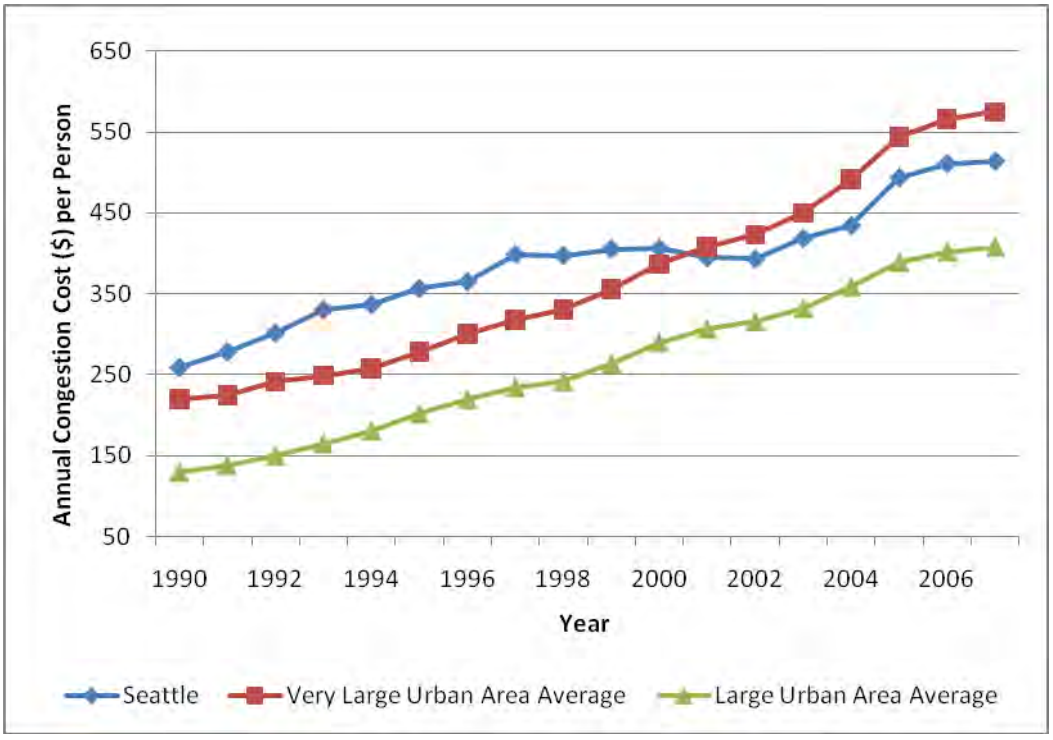


Source: TTI 2009b.

Annual Congestion Cost per Person

In 2007, the annual congestion cost per person in Seattle was $513. The same year, the annual congestion cost per person in other very large urban areas was $575. Between 1990 and 2007, Seattle's annual congestion cost per person increased from $260 to $513, an increase of 98 percent, while in other very large urban areas, the annual congestion cost per person increased from $220 to $575, an increase of 161 percent. In 1990, the annual congestion cost per person in large urban areas was $129; from 1990 to 2007, the annual congestion cost per person in large urban areas increased to $408 (an increase of 216 percent). In 2007, the annual cost of congestion per person in Seattle was 12 percent lower than that in other very large urban areas, but 26 percent higher than that in large urban areas. Trends in annual congestion cost per person for Seattle, other very large urban areas, and other large urban areas are illustrated in Exhibit 4-11.

Exhibit 4-11. Annual Congestion Cost per Person



Source: TTI 2009b.

4.7 Ferry and Cruise Ship Facilities

Five main areas of the Seattle central waterfront are used for ferry and cruise ship operations (Port of Seattle 2009b):

1. **Pier 50/52, the Seattle Ferry Terminal at Colman Dock (801 Alaskan Way).** This facility provides ferry service to and from the Seattle CBD, Vashon and Bainbridge Islands, and Bremerton (Washington State Ferries 2009). Vehicles queue up for the automobile/passenger ferries on Pier 52; the Vashon passenger-only ferry operates from Pier 50. In 2006, over 6 million passengers and nearly 3 million vehicles on ferries passed through Seattle's waterfront, or about 25,000 riders per day (WSDOT 2006). Parking is available at the terminal for employees of the Washington State Ferries, but no public parking is available.
2. **Pier 66/Bell Street Cruise Terminal (2225 Alaskan Way).** This facility is located in the north waterfront area. The terminal is owned by the Port of Seattle and operated by Cruise Terminals of America. It provides berths for Norwegian Cruise Line and Celebrity Cruises between May and October. On-pier parking is not available for users of the facility; parking currently is provided at the Bell Street Pier Garage, between Alaskan Way and Elliott Avenue. However, short-term access is granted via street use

permits for taxi queuing in the southbound parking lane of Alaskan Way and provisioning truck queuing (in a limited manner to meet pier side appointments) in the northbound outside lane. Eighty-two cruise ship vessel calls were scheduled at Pier 66 for the 2008 cruise ship sailing schedule.

3. **Pier 69 (2711 Alaskan Way).** This facility is located in the north waterfront area. It is owned by the Port of Seattle and is home to the *Victoria Clipper*, a high-speed, passenger-only ferry that operates between Seattle and Victoria, British Columbia, Canada. The facility also provides berthing for several small cruise vessels specializing in local sightseeing tours and expeditions to Alaska. Pier 69 is also the headquarters for the Port of Seattle.
4. **Terminal 91 Cruise Facility (2001 W. Garfield Street).** This facility is located just north of the study area. It is owned by the Port of Seattle and provides berths for Holland America Line, Princess Cruises, and Royal Caribbean. There is a parking lot just north of the terminal, with shuttle service to and from the loading docks. Terminal 30, which serviced 128 vessel calls in 2008, was relieved from cruise ship use after the completion of Terminal 91.
5. **Argosy Cruises/Piers 55 and 56.** This facility is located in the central waterfront area, just west of the study area. Argosy Cruise Line at Pier 55 transports passengers to Blake Island State Park (about 5 miles offshore) and provides tours around Elliott Bay.

Other ferry and boat services leave from a few smaller piers along the waterfront. In 2009, the Port of Seattle hosted 875,000 cruise ship passengers and 218 cruise ship vessel calls (Port of Seattle 2010). Cruise ship passengers originating in Seattle potentially support the local economy by extending their pre- and post-cruise stays in or near the port of embarkation or by using local transportation. Port-of-call passengers potentially support the local Seattle economy by visiting local attractions.

4.8 Inventory of Existing Businesses

To support the 2004 Draft EIS, in January 2004, the environmental team performed an inventory of businesses within one block of the proposed changes to existing facilities or the proposed new facilities. The boundaries of the January 2004 inventory were Andover Street and SR 99 to the south and Roy Street and Aurora Avenue to the north. In August 2005, a minor additional area along Aurora Avenue was inventoried for businesses within one block of the proposed facility improvements from Roy Street to Lee Street (one block north of Comstock Street). In October 2006, the environmental team updated the entire existing

inventory. For areas that had already been inventoried in January 2004 and August 2005, the business inventory activity in 2006 was limited to verifying that the previously collected data were still accurate and updating the data to reflect current conditions. Similarly, a fourth inventory update was conducted to accommodate the design of the Bored Tunnel Alternative as of July 2009 for the 2010 Supplemental Draft EIS.

In June 2010, the City conducted a separate inventory of businesses along Alaskan Way to collect data for the City's Elliott Bay Seawall Project. The City's inventory used the latest business inventory data for the Alaskan Way Viaduct Replacement Project to determine whether the City's existing data were accurate; if they were not, the updates were noted. The City's inventory was performed along the east and west frontages of Alaskan Way, from Yesler Way to Broad Street. Most recently, an inventory update was performed in September 2010 for the areas that were updated in neither the July 2009 inventory nor the 2010 City inventory.

The area of direct effects during construction for the updated 2010 inventory included businesses within one block of proposed changes to existing facilities or proposed new facilities in the south, central, and north segments. The facilities included surface streets, aerial structures, tunnels, and the seawall. The inventory activity was limited to verifying that the data collected during the previous inventories were still accurate and updating the data to reflect current conditions. Data gathered during the previous inventories that were outside the boundaries of the subsequent inventory areas were included in the analysis where appropriate.

The inventory in the south segment covered the area from north of S. Jackson Street to Yesler Way, including the area within the eastern frontage of Alaskan Way S. and the western frontage of First Avenue S. The central segment was updated from Yesler Way to Stewart Street, along the western frontage of Western Avenue and the cross streets between Alaskan Way and Western Avenue. At Stewart Street, the inventory continued north to Wall Street, encompassing the area within the western frontage of Western Avenue and Elliott Avenue and the western frontage of First Avenue, including all cross streets. In the north segment, the inventory covered the area from Roy Street to Aloha Street, including the area within one block of Aurora Avenue (see Exhibit 4-15). All other areas were included in either the July 2009 inventory or the 2010 City inventory.

The physical inventory includes only information that was observed or inferred from pedestrian reconnaissance, which included entering publicly accessible portions of buildings to inventory tenants identified in building directories.

Data on the following parameters were collected to assess direct effects on individual businesses (or groupings of individual businesses):

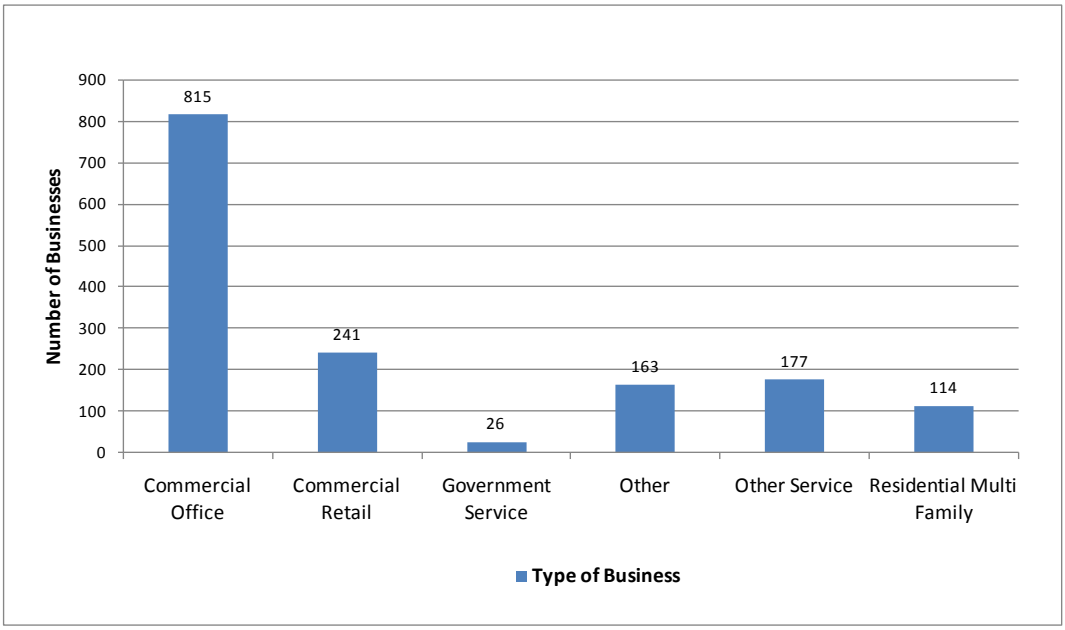
- Location and number of businesses within the area of direct effects

- Types of businesses
- Access and primary parking requirements for these businesses
- Estimate of size – small (fewer than 20 employees), medium (20 to 100 employees), large (more than 100 employees), or vacant

4.8.1 Results of Business Inventory

Approximately 1,400 businesses were identified within the area of direct effects for both tunnel alternatives (i.e., within the inventory area). The Elevated Structure Alternative could affect 1,540 businesses that are located along the Broad Street detour. The breakdown of the types of businesses within one block of the project is shown on Exhibit 4-12.

Exhibit 4-12. Types of Businesses Within One Block of the Project Area



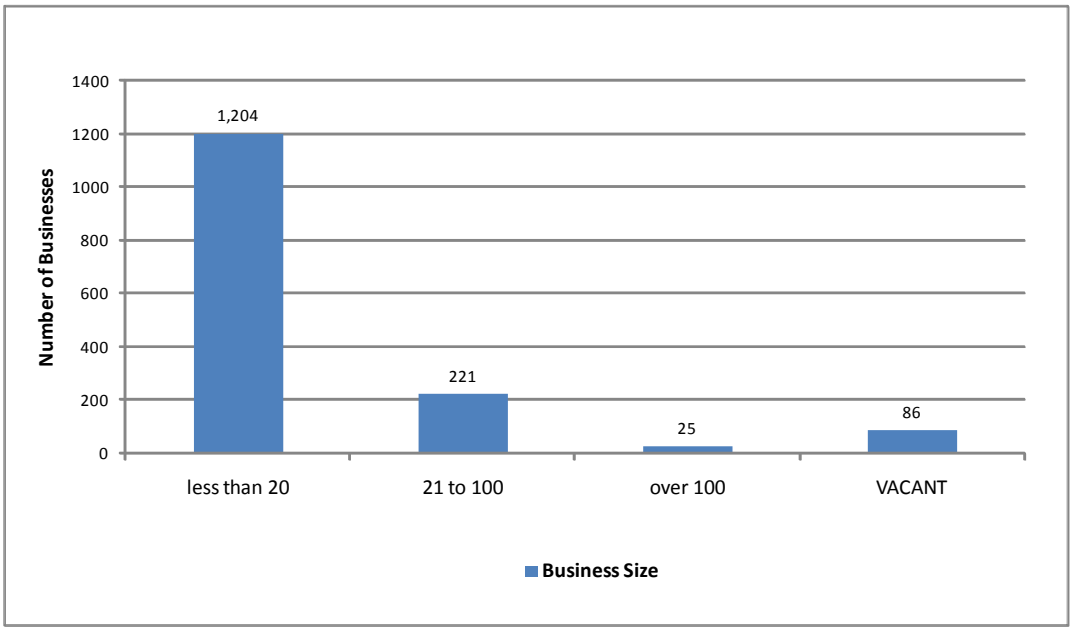
Note: Based on inventories conducted between 2006 and 2010.

Businesses operating in commercial office space accounted for more than half (53.0 percent) of those inventoried, while commercial retail accounted for 15.7 percent. "Other service" accounted for 11.5 percent of businesses; over half (64 percent) of the businesses in the "other service" category were involved in food service as opposed to retail grocery. "Other" represented 10.3 percent of the businesses; most of the "other" businesses identified were parking (42 percent).

Residential multifamily use represented 7.4 percent of the businesses. Government service[9] represented only 1.7 percent of the businesses.

The breakdown of the sizes of businesses within one block of the project area is shown on Exhibit 4-13. Most (78.4 percent) of the businesses were estimated to be small (fewer than 20 employees). Medium-sized businesses (20 to 100 employees) accounted for 14.4 percent of the businesses. The remainder of the businesses were split between large businesses (more than 100 employees), at 1.6 percent, and vacant businesses (no discernable business activity), at 5.6 percent.

Exhibit 4-13. Business Sizes Within One Block of the Project Area

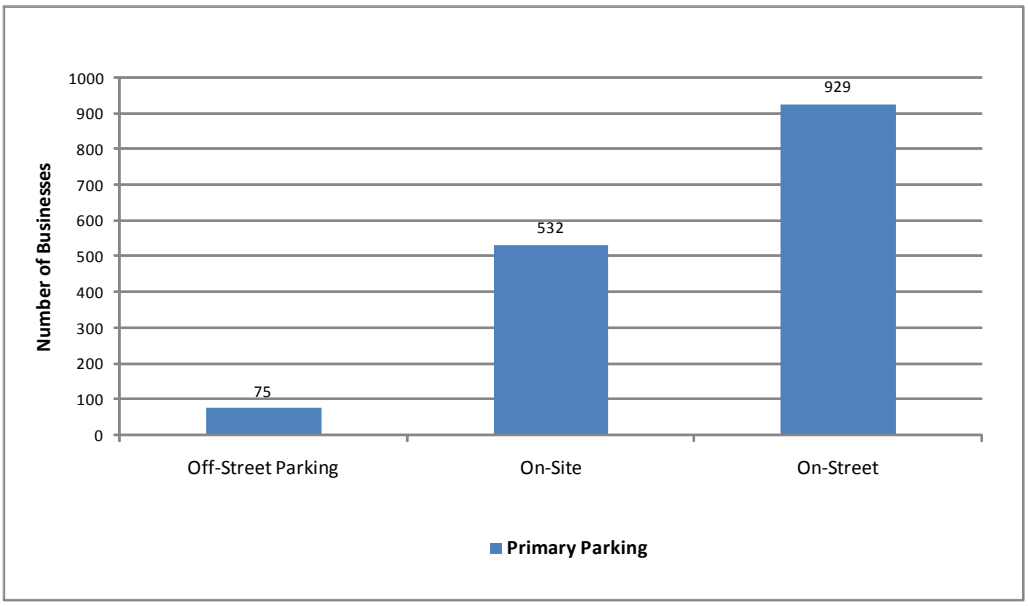


Note: Based on inventories conducted between 2006 and 2010.

The breakdown of primary parking availability for the businesses surveyed is shown on Exhibit 4-14. The visual survey indicated that most businesses (60.5 percent) in the area of direct effects had neither on-site nor readily identifiable off-street parking for their customers and employees. More than a quarter of all businesses (34.6 percent) provided on-site parking for employees and customers. The remainder had directly identifiable off-street parking (4.9 percent).

[9] Government service, while not a for-profit business, still operates in a businesslike manner and is included in this inventory. Government service includes municipal government offices and social service agencies.

Exhibit 4-14. Primary Parking Availability Within One Block of the Project Area



Note: Based on inventories conducted between 2006 and 2010.

4.8.2 Breakdown of Businesses by Geographic Area

The inventory area was generally broken down into the following geographic areas, which are shown on Exhibit 4-15:

- South segment survey area – S. Royal Brougham Way to Yesler Way (includes a portion of Pioneer Square): 412 businesses
- Central segment survey area – Yesler Way to Battery Street Tunnel south portal: 424 businesses
- North waterfront and seawall survey area – Terminal 46 to Pier 70: 133 businesses
- Broad Street detour survey area – Battery Street Tunnel south portal to Wall Street: 144 businesses
- North segment survey area – Denny Way to Aloha Street: 423 businesses

South Segment Survey Area

Within this survey area, 412 existing businesses were identified between Terminal 46 and Occidental Avenue S. and between S. Royal Brougham Way and Yesler Way. Commercial office accounted for more than half of the existing businesses (68.2 percent), followed by commercial retail at 14.1 percent and "other service" at 9.2 percent. "Other" constituted 4.1 percent of the businesses, and residential multifamily represented 3.4 percent. Only four government services were identified in this area.

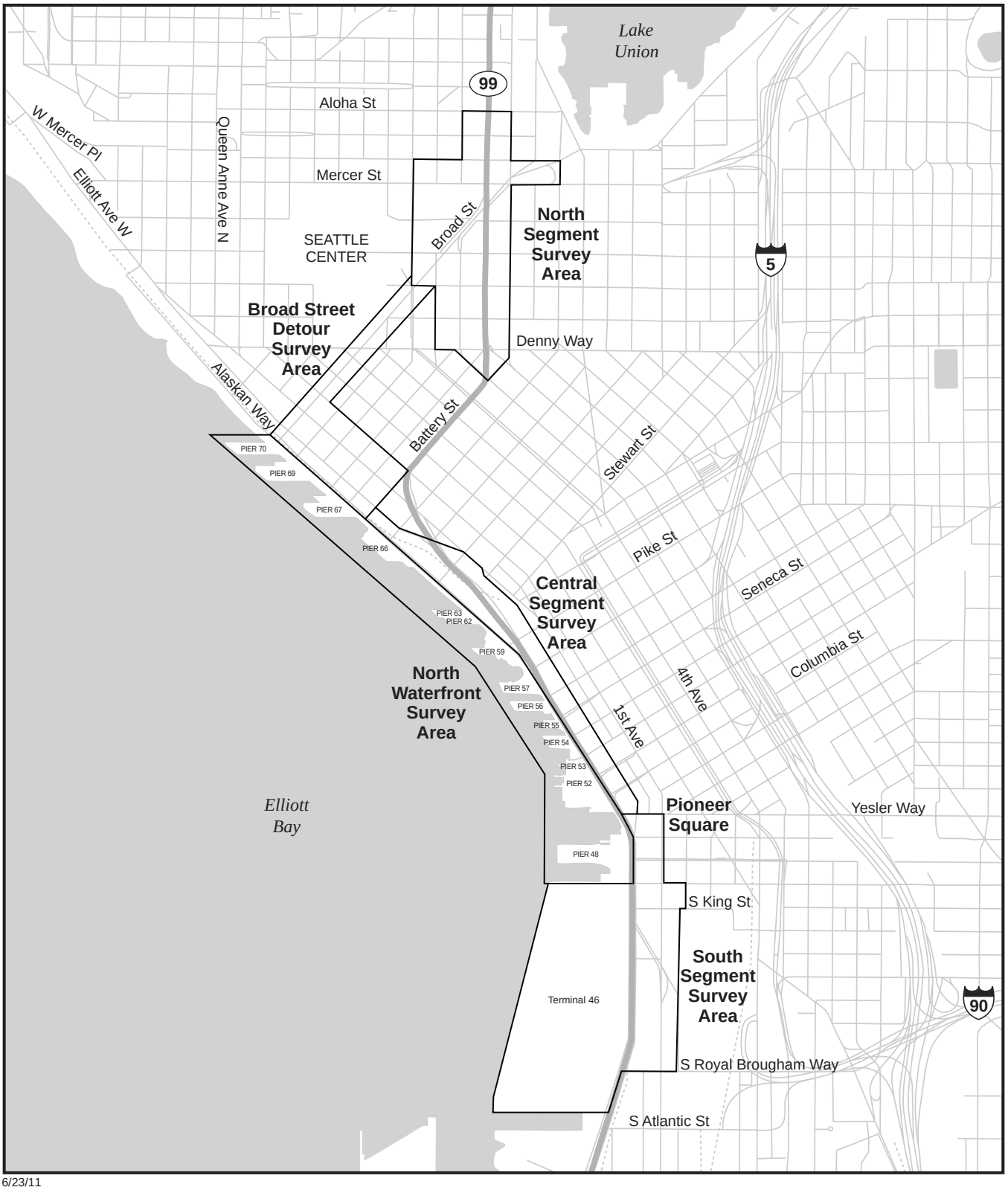


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Exhibit 4-15
Business Inventory Survey Areas

More than three-fourths of the businesses were characterized as small businesses (77.2 percent), and 16.7 percent were characterized as medium. Only two large businesses were identified. Twenty-three businesses appeared to be vacant. Parking is dominated by on-street parking, followed by on-site parking.

Although many of the businesses along the east side of First Avenue S. have public access oriented toward First Avenue S., many have rear freight and public access on Occidental Avenue S.

Central Segment Survey Area

Within this survey area, 424 existing businesses were identified along the east side of the Alaskan Way Viaduct between Yesler Street and Pier 59. Existing businesses along the west side of the viaduct were inventoried as part of the north waterfront and seawall survey area. This area is near the heart of Seattle's commercial core, as demonstrated by the density of businesses encountered. The mix of business types is dominated by commercial office (more than 60 percent), followed by commercial retail at 15.6 percent and "other" at 10.6 percent. There are 23 multifamily residential buildings in the area, along with 27 "other service" (primarily nonretail food service) businesses and 1 government service.

Almost all of the businesses were characterized as small (85.6 percent), with about 8 percent characterized as medium. Three businesses appeared to be large. Twenty-three businesses were vacant. Most businesses in this area (61.6 percent) rely on on-street parking, while 35 percent provide on-site parking.

North Waterfront and Seawall Survey Area

Within this survey area, 133 existing businesses were identified along the west side of the Alaskan Way Viaduct and along the east side of the Alaskan Way surface street north of Pier 59 (where the viaduct begins to shift eastward toward the west portal of the Battery Street Tunnel) to Broad Street. Existing businesses along the east side of the viaduct between Yesler Street and Pier 59 were inventoried as part of the central survey area. The City considers the waterfront an area of special economic concern because of its dependence on tourists and on-street parking. The mix of business types is distributed among commercial office (33.8 percent, primarily north of Pier 59), "other service" (27.1 percent, primarily nonretail food service), and commercial retail (22.6 percent). No industrial businesses (marine dependent and non-marine dependent) or residential multifamily buildings were identified. There were 14 "other" businesses and 8 categorized as government service.

More than 80 percent of the businesses were characterized as small, and the rest were characterized as medium (17.3 percent) or large (1.5 percent). No businesses appeared to be vacant. Most businesses along the waterfront rely on on-street

parking (70.7 percent), with off-site and on-site parking sharing the remaining parking requirements.

Broad Street Detour Survey Area

Within this survey area, 144 existing businesses were identified between Battery Street and Denny Way. Commercial office accounted for nearly half of the existing businesses (47.9 percent), followed by "other" at 16.7 percent and "other service" at 15.3 percent. Commercial retail constituted 10.4 percent of the businesses, and residential multifamily constituted 8.3 percent. Only two government service businesses were identified in this area.

Three-fourths of the businesses were characterized as small businesses (75.0 percent) and 16.7 percent as medium. Ten large businesses were identified. Only two businesses appeared to be vacant. Parking is dominated by on-site parking, followed by on-street parking.

North Segment Survey Area

Within this survey area, 423 existing businesses were identified. Commercial office dominated the north survey area at 37.4 percent. Commercial retail accounted for 17 percent of the business types in the area, and residential multifamily constituted 15.4 percent of the businesses. "Other" and "other service" represented 13.9 and 12.8 percent of the businesses, respectively. Typical businesses that fell into the "other" category included public parking, religious institutions, public event space, and City-owned property that is not considered a government service (such as a substation). "Other service" includes businesses like hotels and restaurants. Eleven government services and four "other" (industrial non-marine-dependent) businesses were identified in this area.

Most businesses were characterized as small (72.6 percent), with about 16.5 percent characterized as medium. Eight businesses appeared to be large, and about 9 percent of the spaces were vacant. On-site parking is the primary type in this area (56.7 percent). About 37.1 percent of businesses rely on on-street parking, and only 6.1 percent rely on off-street parking.

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Chapter 5 OPERATIONAL EFFECTS, MITIGATION, AND BENEFITS

This chapter discusses the potential effects and benefits associated with the long-term operation and maintenance of each of the three build alternatives without tolling. Chapter 6, Construction Effects and Mitigation, discusses the effects and benefits resulting from construction activities.

The Viaduct Closed (No Build Alternative) and the three build alternatives were evaluated with respect to the following highway-related measures of effectiveness that have a bearing on the economic performance of the project:

- Connectivity between other streets and highways
- Travel times for freight traffic between existing industrial areas
- Pedestrian access
- Parking
- Property acquisitions

5.1 Operational Effects of the Viaduct Closed (No Build Alternative)

Federal and Washington State environmental regulations require agencies to evaluate a No Build Alternative to provide baseline information about existing conditions in the project area. For this project, the No Build Alternative is not viable, since the existing viaduct is vulnerable to earthquakes and structural failure due to ongoing deterioration. Multiple studies of the viaduct's current structural conditions, including its foundations in liquefiable soils, have determined that retrofitting or rebuilding the existing viaduct is not a reasonable alternative. At some point in the future, the roadway will need to be closed.

The Viaduct Closed (No Build Alternative) describes the economic effects that could be expected if a build alternative were not implemented. If the existing viaduct is not replaced, it will be closed, but it is unknown when that would happen. However, it is highly unlikely the existing structure could still be in use in 2030.

The Viaduct Closed (No Build Alternative) describes the consequences of suddenly losing the function of SR 99 along the central waterfront based on the two scenarios described below. All vehicles that would have used SR 99 would either navigate the Seattle surface streets to their final destination or take S. Royal Brougham Way to I-5 and continue north. The consequences would be short-term and would last until transportation and other agencies develop and implement a

new, permanent solution. The planning and development of the new solution would have its own environmental review.

Two scenarios were evaluated as part of the Viaduct Closed (No Build Alternative):

- Scenario 1 – An unplanned closure of the viaduct for some structural deficiency, weakness, or damage due to a smaller earthquake event
- Scenario 2 – Catastrophic failure and collapse of the viaduct

The evaluation of the operational effects and benefits assumes Scenario 1, although qualitative assessments were performed for Scenario 2.

5.1.1 Scenario 1 – Unplanned Closure of the Existing Facility

Under this scenario, the viaduct would be out of service. As a result of complete closure, the loss of the viaduct could result in a substantial increase in traffic volumes on the surface street network and on I-5, because of the absorption of the viaduct's north-south traffic. The flow of goods and vehicles through this area would be significantly disrupted. Depending on the severity of the damage, all use of the roadway beneath the viaduct, including parking, may be taken out of service if all access to the structure is prohibited for public safety reasons. This would also restrict east-west traffic flows beneath the viaduct. Transportation agencies would be forced to deal with this closure as a crisis, and this response would necessarily be implemented with limited timelines and resources.

The viaduct closure would result in adverse economic effects for the region, for all transportation modes that use the viaduct, and for the local area. It would particularly affect businesses on the central waterfront and in Pioneer Square that rely on the viaduct, the parking beneath the viaduct structure, and the Alaskan Way surface street to provide access for their patrons. Although some contingency plans may be in place for this scenario, the City, WSDOT, and FHWA would not likely be in the position to develop thorough mitigation to minimize the adverse effects that would result from this unplanned loss.

5.1.2 Scenario 2 – Catastrophic Failure and Collapse of the Viaduct

A catastrophic seismic event could trigger failure and collapse of significant portions of the viaduct. Such an event would likely damage or cause the collapse of piers and buildings near the seawall due to movement of liquefiable soils that extend as far east as Western Avenue. The anticipated soil movements could disrupt utilities, including power, sanitary and storm sewer, natural gas, oil, steam, and fiber optic utilities.

This scenario would result in the complete closure of the viaduct, as well as a severe reduction in access to properties on the central waterfront. A number of the central

waterfront and Port of Seattle facilities could be rendered unusable due to the collapse of piers and buildings. Collateral damage to buildings and railroad facilities within the viaduct footprint and adjacent to the viaduct could occur as a result of falling aerial structures. Complete dismantling and removal of the entire collapsed structure would be required before access to the central waterfront and use of the roadway beneath the elevated structure could be restored. The loss of the viaduct could result in a substantial increase in traffic volumes on the surface street network and I-5, because these roadways would absorb the bulk of the north-south traffic that previously used the viaduct. The movement of goods and vehicles through this area would be severely curtailed even after the removal of the collapsed structure is completed. In addition, workers or visitors in the area could be seriously injured or killed during the viaduct collapse.

Adverse economic effects would occur to all transportation modes that use the viaduct, both regionally and locally, with particular effects on central waterfront and Pioneer Square businesses that rely on the viaduct and Alaskan Way surface street to provide patrons access to their businesses. The duration of this disruption and hardship on businesses would be long-term, until the area is secured and stabilized and a new facility is constructed. Although some contingency plans may be in place for this scenario, the City, WSDOT, and FHWA would not likely be in the position to develop thorough mitigation to minimize the adverse effects that would result from this catastrophic failure.

5.2 Indirect Effects of the Build Alternatives

5.2.1 Regional Economic Benefits

Any of the three build alternatives could result in regional economic benefits. Pedestrians would benefit from increased connectivity. Surface streets in the north segment of the project area (Thomas and Harrison Streets and possibly John Street, depending on the build alternative selected), would be connected over SR 99, linking South Lake Union and the Uptown Urban Center neighborhoods. To a lesser extent, the new cross street in the south segment, S. Dearborn Street, would link First Avenue S. to Alaskan Way S. along the central waterfront. Other improvements that would increase connectivity include the extension of Sixth Avenue N., closure of the existing Broad Street right-of-way, and reconstruction of the Mercer Street corridor, which would facilitate freight movement between the BINMIC and I-5.

Eventually, improved connections in the Seattle CBD could indirectly increase business interest there, which could also lead to new commercial use or retail shops. Where improved connections to the downtown core and the central waterfront may facilitate commute trips from surrounding neighborhoods, some development activity and/or increased shopping visits may be stimulated by the desirability of this connection.

The subsurface tunnel structure associated with either of the tunnel alternatives would have substantially fewer effects on visual quality and noise effects along the central waterfront than the structure associated with the Elevated Structure Alternative or the existing viaduct. These improved conditions would have the indirect effect of enhancing the viability and desirability of the central waterfront, which, in turn, would increase the economic vitality of the area.

According to the *Mayor's Recommendations: Seattle's Central Waterfront Concept Plan* (City of Seattle 2006), new development provides the opportunity to create public space and other amenities that complement the public realm. For the reasons discussed above, the Bored Tunnel Alternative and the Cut-and-Cover Tunnel Alternative likely would provide a substantially higher degree of investment opportunity along the central waterfront than the Elevated Structure Alternative or the Viaduct Closed (No Build Alternative).

5.3 Bored Tunnel Alternative

The operational effects of the Bored Tunnel Alternative were evaluated for four segments of the project area and the viaduct removal:

- South portal – S. Royal Brougham Way to S. King Street
- Bored tunnel – between S. King Street and Denny Way
- North portal – Denny Way to Roy Street
- Viaduct removal – S. King Street to the Battery Street Tunnel

5.3.1 South Portal

Under the Bored Tunnel Alternative, changes in traffic flow and access would have direct operational effects on the economic environment of the project area and the region. The efficient movement of goods between suppliers and customers would result in a net economic benefit for the region. Access to individual businesses is critical for their economic survival.

Duwamish/Harbor Island/SR 519 Connections – Overall, the new construction in the south portal area would provide improved connections to the Duwamish area, Harbor Island, and SR 519. The improvements in the south portal area would provide better access between the central waterfront and SR 99 via more direct ramps at S. Royal Brougham Way and S. Dearborn Street. In addition, access between the central waterfront and SR 519 would be improved. In the Pioneer Square/stadium area, congested conditions are still expected, although they would be somewhat improved compared to existing conditions.

Pedestrian Access – In the south portal area, pedestrian access would be improved by the construction of the Port Side Pedestrian/Bike Trail and the City Side Trail. These

trail upgrades, along with sidewalk improvements along First Avenue S., would improve pedestrian circulation in the south portal area.

Also, construction of a new east-west street, S. Dearborn Street, would improve pedestrian access and connectivity in the south portal area. These improvements would also benefit adjacent businesses and homes by improving accessibility for employees, customers, and residents.

Parking – There are about 190 existing on-street parking spaces in the south portal area (about 50 long-term and about 140 short-term spaces). Of these 190 spaces, about 110 are paid short-term parking spaces. With the Bored Tunnel Alternative, all 190 on-street parking spaces would be removed, and 80 spaces would be replaced in the south portal area.

It is likely that the replacement parking spaces would be paid short-term parking, consistent with the *City of Seattle Comprehensive Plan* C-3 goals TG18 and T42 (Seattle 2009i). Based on current paid parking, each parking space in the south segment of the study area generates approximately $2,530 per year in revenue. If this estimate holds true for the south portal area, and 110 paid on-street parking spaces are removed, approximately $278,000 would be lost each year from the City's General Fund. This is approximately 7 percent of the revenue currently being collected in the study area, as described in Section 4.5.5.

Property Acquisition – As shown in Exhibit 5-1, project improvements in the south portal area would require two full and three partial property acquisitions. Parcels subject to partial acquisition would retain any existing buildings, maintain their current function, and continue to pay property taxes. The amount of property taxes paid may change for the properties subject to partial acquisition if they are reassessed by the King County Department of Assessments. Because these reassessments would be on a case-by-case basis and would occur sometime after the right-of-way acquisition, an estimate of the changes in property taxes is not possible at this time.

Exhibit 5-1. Property Acquisitions in the South Portal Area for the Bored Tunnel Alternative

Property and Business Elements	South Portal
Number of parcels subject to acquisition	5
Number of parcels subject to full acquisition	2
Number of buildings acquired	2
Approximate area of work space relocated or displaced	14,925 square feet
Estimated number of permanent jobs relocated or displaced	33
Approximate property tax paid by fully acquired parcels	$0
Approximate area of fully acquired tax-paying parcels	0 square feet

The economic effect of full parcel acquisition is typically its permanent conversion from private to public ownership. Parcels in public ownership are exempt from paying property taxes on the assessed value of the parcel. The total amount of land to be fully acquired in the south portal area is approximately 173,000 square feet (4 acres). However, the two properties to be acquired are currently owned by WSDOT; therefore, King County and other state and local governments would not lose any tax money from two of these properties.

Two buildings (approximately 14,925 square feet of built space) would have to be demolished for the south portal improvements and long-term staging at Terminal 46 associated with the Bored Tunnel Alternative. The loss of parcels with buildings would permanently displace an estimated 33 workers. The permanent displacement of 33 workers represents about 0.01 percent of the total 2010 (forecasted) Seattle CBD workforce (see Exhibit 4-4).

In addition to relocated or displaced businesses and workers, potential losses in sales and use and B&O tax revenues would occur. The potential loss of these tax revenues from the general tax revenue stream could be minimized if the displaced businesses relocate within the city (see Appendix G, Land Use Discipline Report), because these businesses would then continue to pay B&O taxes. The businesses and workers in these businesses would continue to pay sales and use taxes related to the expenditure of earnings within the regional economy. Even if the relocated or displaced businesses leave the city but remain in the region, the jurisdiction of the new location would continue to collect B&O taxes that would contribute to the regional economy. The regional economy would lose B&O revenue only if the businesses close or relocate outside of the region.

After construction, WSDOT could sell the fully or partially acquired parcels that are not part of the permanent roadway right-of-way as surplus property and return them to private ownership. Parcels returned to private ownership would pay property taxes and could provide opportunities as replacement properties for displaced businesses, allowing owners to remain in the community. Some remnant parcels, however, may not be sold and redeveloped after construction because of potential access constraints resulting from the proposed roadway changes under the Bored Tunnel Alternative.

5.3.2 Central Segment

Downtown Seattle Connections – Under the Bored Tunnel Alternative, the access provided by the new portal ramps to the central and northern portions of downtown from the south would be somewhat less direct than the existing ramps. Drivers destined for the southern portions of downtown would be closer to the south portal ramps. The north and south portal ramps would also offer an advantage by

distributing traffic to any number of downtown streets (from Alaskan Way) rather than to or from a single intersection at Columbia Street or Seneca Street.

The downtown ramps that would be removed include a southbound off-ramp and northbound on-ramp at First Avenue S., the Columbia Street southbound on-ramp, and the Seneca Street northbound off-ramp. Instead, new ramps would be built in the north and south portal areas.

Ballard/Interbay Traffic and Freight Travel Times – The Bored Tunnel Alternative would remove the on- and off-ramps at Elliott and Western Avenues. SR 99 trips to and from the northwest Seattle communities (Ballard and Magnolia) would have several travel options. One option would be to use Alaskan Way or other downtown arterials to reach the Elliott/Western corridor in Belltown. Another option would be to continue through the bored tunnel to the South Lake Union exits at Republican or Roy Street and then use various combinations of Mercer, Harrison, Broad Streets, and Denny Way to reach the Elliott/15th Avenue corridor.

Under the Bored Tunnel Alternative, travel between Ballard and S. Spokane Street via Mercer Street and the bored tunnel is projected to be 1 to 6 minutes longer than travel via this same route with the 2015 Existing Viaduct included in the traffic analysis (see Appendix C, Transportation Discipline Report), which includes the existing Elliott/Western ramps. (The 2015 Existing Viaduct assumes that the existing viaduct will continue to be part of the transportation network between S. King Street and Denny Way in the year 2015.) Under the Bored Tunnel Alternative, travel times along this route would be somewhat longer with no connections from Elliott/Western Avenues to the central waterfront. However, with the use of Mercer Street and the bored tunnel, the travel time for Bored Tunnel Alternative is expected to be only 1 minute longer in the southbound direction during the morning (AM) peak hour.

The increase in freight travel time on SR 99 would have a negligible effect on economic conditions in the Puget Sound region. However, freight containing hazardous materials would not be permitted in the bored tunnel and would have to use an alternative route. The addition of up to 6 minutes of travel time for these trips could contribute to an unavoidable loss of economic productivity for the businesses affected by these conditions. For additional detail on travel times, see Chapter 5 of Appendix C, Transportation Discipline Report.

Pedestrian Access – The bored tunnel would not affect pedestrian access throughout downtown because it would be located beneath the city. However, the removal of the Columbia and Seneca Street ramps would improve pedestrian flow on First Avenue.

Parking – For changes in parking in the south portal area, see Section 5.3.4, Viaduct Removal.

Property Acquisition – No properties would be acquired in this segment because the tunnel would be located underground. There would be numerous permanent tieback easements along the extent of the bored tunnel. During tunnel boring, there may be temporary inconveniences for building occupants in the form of vibrations. For more information about these effects and relocations, see Appendix G, Land Use Discipline Report.

5.3.3 North Portal

BINMIC Connections – In the north portal area, a new SR 99 northbound off-ramp and southbound on-ramp would be constructed at Republican Street. A likely travel pattern for freight traffic destined for the BINMIC from northbound SR 99 would be to exit at Republican Street and turn north on Dexter Avenue N. Freight traffic would then turn west onto Mercer Street and pass under SR 99. Freight traffic accessing SR 99 would likely travel from Mercer Street to Sixth Avenue N. to use the Republican Street on-ramp. Other corridors that would be used to access the BINMIC include Westlake Avenue N., Nickerson Street, Leary Way, and N. 39th Street.

An exception to these travel routes would be those used by vehicles carrying hazardous or combustible materials, which would be prohibited from using the bored tunnel, just as they are currently prohibited from using the Battery Street Tunnel. Vehicles hauling hazardous materials would likely use I-5 or Alaskan Way. The increase and/or decrease in freight travel time on SR 99 would have a negligible effect on economic conditions in the Puget Sound region. However, for freight trips carrying flammable or hazardous materials, the increase in travel time could contribute some increment of reduced productivity for the businesses subjected to these conditions.

Downtown Seattle Connections – The north portal would provide SR 99 on- and off-ramps at Republican Street and Harrison Street. Access to northbound SR 99 would be at Aurora Avenue and Harrison Street, which is also where southbound SR 99 travelers would exit the new facility before entering the bored tunnel. Southbound SR 99 access in the north portal area would be via a new on-ramp at Sixth Avenue N. and Republican Street. Northbound SR 99 travelers exiting the bored tunnel would use the Republican Street exit, which would provide direct access to Dexter Avenue N. Via existing and improved city streets and the new SR 99 infrastructure improvements, these ramps would provide access to and from downtown Seattle that is comparable to the access provided today.

Improvements to the Aurora Avenue surface street would enhance downtown connections for southbound and northbound SR 99 travelers destined for South Lake Union, Seattle Center, or Uptown. Surface street improvements in the north portal area would provide downtown connections that are better than the

connections currently provided for SR 99 traffic from the Alaskan Way Viaduct and the Battery Street Tunnel.

Pedestrian Access – Currently, Mercer Street, Broad Street, and Denny Way are the only east-west crossings of Aurora Avenue in the north portal area. The improvements for the east-west crossings of John, Thomas, and Harrison Streets would enhance pedestrian access with sidewalks throughout the area. Although the removal of Broad Street would change the pedestrian circulation patterns, it would not decrease accessibility to adjacent businesses and residences.

Parking – There are approximately 320 existing on-street parking spaces in the north portal area (about 230 long-term and 90 short-term spaces). Of these 320 existing spaces, about 270 are paid, 230 of which are long-term spaces. Under the Bored Tunnel Alternative, all 320 on-street parking spaces would be removed, and 40 spaces would be replaced in the north portal area.

It is currently unknown whether the replaced parking spaces would be paid or unpaid, or short- or long-term parking. Based on current paid parking in the north segment, each parking space generates approximately $870 in revenue per year. If this estimate holds true for the north portal area and 280 paid on-street parking spaces are removed, approximately $244,000 would be lost each year from the City's General Fund. This is approximately 6 percent of the revenue currently being collected in the study area, as described in Section 4.5.5.

Property Acquisition – As shown in Exhibit 5-2, improvements in the north portal area would require full acquisition of four parcels and partial acquisition of three parcels. The parcels subject to partial acquisition would retain any existing buildings, maintain their current function, and continue to pay property taxes. Tax amounts may change for the properties subject to partial acquisition if the property is reassessed by the King County Department of Assessments. Because any reassessments would be on a case-by-case basis and would occur sometime after the right-of-way acquisition, an estimate of changes in property taxes is not possible at this time.

Exhibit 5-2. Property Acquisitions in the North Portal Area for the Bored Tunnel Alternative

Property and Business Elements	North Portal
Number of parcels subject to acquisition	7
Number of parcels subject to full acquisition	4
Number of buildings acquired	1
Approximate area of work space relocated or displaced	51,500 square feet
Estimated number of permanent jobs relocated or displaced	119
Approximate property tax paid by fully acquired parcels	$105,600
Approximate area of fully acquired tax-paying parcels	131,500 square feet

The total amount of non-exempt (taxable) land to be fully acquired in the north portal area is approximately 131,500 square feet (3 acres). Consequently, King County and other state and local governments would lose taxes from properties that currently pay approximately $105,600 in annual property taxes. This estimate is based on actual amounts collected in 2010 by King County Finance and Business Operations for all of the parcels to be acquired. This estimate is for 1 year and represents less than 0.02 percent of all property tax revenue collected by King County in 2010. Construction of the north portal would slightly but permanently decrease the number of available parcels across which the property tax load is distributed.

One building representing approximately 51,500 square feet of built space would have to be demolished for the north portal improvements associated with the Bored Tunnel Alternative. In addition to the economic effect associated with the loss of property tax revenue, the loss of the parcel with this building would permanently displace an estimated 119 workers. The permanent displacement of 119 workers represents less than 0.06 percent of the total 2010 (forecasted) Seattle CBD workforce (see Exhibit 4-4).

In addition to relocated or displaced businesses and workers, potential losses of sales and use and B&O tax revenues would occur. The potential loss of these tax revenues from the general tax revenue stream could be minimized if the displaced businesses relocate within the city (see Appendix G, Land Use Discipline Report), because these businesses would continue to pay B&O taxes. The businesses and workers in these businesses would also continue to pay sales and use taxes related to the expenditure of earnings within the regional economy. Even if the relocated or displaced businesses leave the city but remain in the region, the jurisdiction of the new location would continue to collect B&O taxes that would contribute to the regional economy. The regional economy would lose B&O revenue only if the businesses close or relocate outside of the region.

After construction, WSDOT could sell the fully or partially acquired parcels that are not part of the permanent roadway right-of-way as surplus property and return them to private ownership. Parcels returned to private ownership would pay property taxes and could provide opportunities as replacement properties for displaced businesses, allowing owners to remain in the community.

5.3.4 Viaduct Removal

Duwamish/Harbor Island/SR 519 Connections – The viaduct removal would not significantly affect connections to the Duwamish area, Harbor Island, and SR 519. Many of the access issues would be improved as a result of the S. Holgate Street to S. King Street Viaduct Replacement Project. Furthermore, the viaduct would be removed only after the bored tunnel is in use.

BINMIC Connections – The viaduct removal would not significantly affect connections to the BINMIC because it would be demolished only after the bored tunnel is completely functioning. However, freight trucks transporting hazardous or combustible materials would not be permitted to use the bored tunnel; currently these vehicles use Alaskan Way/Alaskan Way S. for local trips or I-5 for regional and interstate trips, and they would continue to use these alternate routes after the completion of the bored tunnel.

Downtown Seattle Connections – The viaduct removal would temporarily affect local connections between Seattle's waterfront and downtown during construction. Chapter 6 describes the construction effects.

Travel Time – The viaduct removal would not have significant effects on travel time, because the viaduct would be removed only after the bored tunnel is completely functioning.

Parking – Parking beneath the viaduct north of S. King Street would be removed in phases before the phased demolition of the viaduct begins; some parking near the existing viaduct might be reinstated after completion of the waterfront promenade and the new Alaskan Way surface street, but the quantity and timing of the reinstatement of parking is unknown at this time.

Property Acquisition – No properties would be acquired in association with viaduct removal.

5.3.5 Operations and Maintenance Costs

The calculation of gross or net economic effects attributable to the implementation of the Bored Tunnel Alternative requires isolating the O&M expenditures specific to the alternative from current O&M expenditures. It is likely that current O&M expenditures would be funded from local revenue sources; therefore, they would not contribute to net economic effects. The distribution of O&M costs for existing conditions and the Bored Tunnel Alternative is provided in Exhibit 5-3.

Exhibit 5-3. Operations and Maintenance Costs for the Bored Tunnel Alternative Compared to Existing Conditions

	O&M Cost Estimate ($ millions per year)	Increase in O&M Costs Over Existing Conditions
Existing conditions	$1.87	0
Bored Tunnel Alternative	$5.4	+$3.5 million (+66%)

O&M = operations and maintenance

The O&M costs are based on current WSDOT tunnel and bridge experience on the Interstate 90 (I-90) system and WSDOT/SDOT expenses on the existing viaduct.

Average unit O&M costs for the bored tunnel were provided by these transportation agencies. These unit costs were converted to annual costs.

Economic Effects of Operations and Maintenance Costs

The Bored Tunnel Alternative would result in an increase in O&M costs compared to existing conditions. The annual O&M expenditures would increase by $3.5 million (about 66 percent) over the O&M costs for maintaining the existing viaduct.

5.3.6 Operational Mitigation

The proposed mitigation measures for the operational effects of the Bored Tunnel Alternative are general. Specific mitigation measures will be determined based on specific needs of individual businesses, and the ability of individual businesses to withstand the adverse economic effects of the Bored Tunnel Alternative.

Potential mitigation measures to reduce permanent adverse economic effects include the following:

- Minimize the extent and number of businesses, jobs, and access that would be permanently affected.
- Compensate for right-of-way acquisition, displacement and relocation of businesses, and loss of property value in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act and applicable state and local policies.
- Encourage relocated businesses to remain in Seattle so that B&O taxes would continue to be collected by the City.

WSDOT and the City will work closely with affected business owners to minimize the level of disruption that may result from displacements and relocations along the project alignment. Efforts will be made to help business owners find suitable replacement locations, especially those closer to the project alignment. For businesses that are required to relocate, the lead agencies will work with owners to ensure that moves can be made in a timely manner, thereby reducing the overall expenses, inconveniences, and amount of time a business must remain closed during relocation.

5.3.7 Operational Benefits

Substantial operational benefits would result from the Bored Tunnel Alternative compared to the Viaduct Closed (No Build Alternative). The benefits of the Bored Tunnel Alternative would include a transformed central waterfront environment, which would result in three categories of economic value: enhanced value to central waterfront users, new visitor spending locally and regionally, and

increased downtown property values. The new facility would have a long life—at least 75 years. Over the lifetime of the facility, the Seattle region would benefit from the reduced congestion and delay that would result from the Bored Tunnel Alternative compared to the Viaduct Closed (No Build Alternative).

Enhanced Pedestrian Access – Pedestrian access would be enhanced in several locations, including the south portal area, the north portal area, and along the central waterfront.

- **South portal.** Within the south portal area, the Bored Tunnel Alternative would improve First Avenue S. from south of S. Royal Brougham Way to S. King Street. Landscaping, trails, and sidewalk improvements would be incorporated into the new S. Dearborn Street connection of First Avenue S. and Alaskan Way S. and between S. Royal Brougham Way and S. King Street. The improvements associated with the south portal would enhance the pedestrian experience relative to existing conditions and provide better access to and from businesses, residences, and public spaces.
- **North portal.** In the north portal area, the Bored Tunnel Alternative would reestablish pedestrian sidewalks along both sides of Aurora Avenue and all other surface street improvements. Also, the connection of John, Thomas, and Harrison Streets across SR 99 would provide pedestrian crossing connections in three new locations. The improvements associated with the north portal would enhance the pedestrian experience relative to existing conditions and provide better access to and from businesses, residences, and public spaces.
- **Central waterfront/viaduct removal.** The Bored Tunnel Alternative would include demolition of the viaduct structure from S. King Street to the Battery Street Tunnel. Currently, the viaduct is a psychological barrier between the Seattle waterfront and downtown. The pedestrian environment beneath the viaduct is not welcoming, and the structure casts large shadows. Viaduct removal would allow the City to improve Alaskan Way, as discussed in Chapter 7 (Cumulative Effects Analysis) of the Final EIS, and would enhance pedestrian connections between the central waterfront and downtown Seattle.

Maintenance of Regional Mobility – The Bored Tunnel Alternative would maintain local and regional mobility by replacing the existing viaduct with a facility that would serve as an alternative route to I-5 and Seattle's surface streets. Local connections near the south and north portals would improve mobility for drivers, pedestrians, and bicyclists, with enhanced surface street connections compared to existing conditions.

Improved Safety – The Bored Tunnel Alternative would improve safety on SR 99. The design of the bored tunnel would comply with current seismic standards and other design standards to withstand an earthquake, flooding, or other disasters. The tunnel would also include additional safety features and current technology in tunnel ventilation, fire detection and suppression, and lighting systems.

Transferring traffic from the existing viaduct to the bored tunnel would increase the safety of travelers using SR 99 because the new facility would be much safer than the existing viaduct, which is deteriorating and at risk of failing in an earthquake. The design for the SR 99 corridor would include safety improvements that would have a net positive effect on the economy. The design deficiencies of the existing viaduct result in higher collision rates on some sections of SR 99 and, in turn, more congestion and associated economic costs as documented in Section 4.6.

The design of the bored tunnel would include safety features such as emergency passages to safety refuges, fire suppression systems, communication with vehicles from a central station, and emergency ventilation systems that meet federal standards. WSDOT would monitor the tunnel 24 hours a day, similar to the current monitoring of the I-90 tunnel. These improvements would substantially enhance safety relative to existing conditions (for a more extensive discussion of the safety improvements in the design of the Bored Tunnel Alternative, see Section 5.12 of Appendix C, Transportation Discipline Report).

5.4 Cut-and-Cover Tunnel Alternative

The operational effects of the Cut-and-Cover Tunnel Alternative were evaluated for three segments of the project area and the viaduct removal:

- South – S. Royal Brougham Way to S. King Street
- Central – S. King Street through the Battery Street Tunnel
- North – Denny Way to Aloha Street
- Viaduct removal

5.4.1 South Segment – S. Royal Brougham Way to S. King Street

Under the Cut-and-Cover Tunnel Alternative, .changes in traffic flow and access would have direct operational effects on the economic environment of the project area and the region. The efficient movement of goods between suppliers and customers would result in a net economic benefit for the region. Access to individual businesses is critical for their economic survival.

Downtown Seattle Connections – In the south segment, downtown connections from SR 99 would be provided by the northbound off-ramp to S. Dearborn Street and the southbound off-ramp at S. Royal Brougham Way. The southbound

off-ramp would provide access similar to that of the existing off-ramp just north of S. Royal Brougham Way. The northbound off-ramp would provide a new travel option to travelers destined for the southern downtown Seattle area near the Pioneer Square/stadium area. Under the existing SR 99 configuration, downtown access is provided by exiting SR 99 before the Alaskan Way Viaduct and continuing northbound on East Marginal Way S. or by exiting SR 99 north of the south segment at Columbia Street.

BINMIC Connections – Northbound travelers to the BINMIC that are transporting hazardous materials would exit SR 99 via the northbound SR 99 exit at S. Dearborn Street and travel north on the improved Alaskan Way/Alaskan Way S. surface street (for more information about connections to the BINMIC, see the description of the central segment in Section 5.4.2). The Cut-and-Cover Tunnel Alternative would provide connections to the BINMIC comparable to those under existing conditions.

Duwamish/Harbor Island/SR 519 Connections – Overall, the improvements in the south segment provided by the Cut-and-Cover Tunnel Alternative would result in improved connections to the Duwamish area, Harbor Island, and SR 519. These improvements would provide better access between the central waterfront and SR 99 via more direct on- and off-ramps at S. Royal Brougham Way and S. Dearborn Street. Access between the waterfront and SR 519 would also be improved. In the Pioneer Square/stadium area, congested conditions are still expected, although they would be somewhat improved relative to existing conditions.

Pedestrian Access – In the south segment, pedestrian access would be improved by the construction of the Port Side Pedestrian/Bike Trail and the City Side Trail. Both trails will be built as part of the S. Holgate Street to S. King Street Viaduct Replacement Project, with modifications to the City Side Trail as part of this project. S. Royal Brougham Way would no longer provide east-west pedestrian access under SR 99; however, S. Atlantic Street and S. Dearborn Street would continue to provide access. The trail upgrades, new sidewalk connections across SR 99, and the sidewalk improvements along Alaskan Way S. would improve pedestrian circulation in the south segment.

Parking – In the south segment**,** there are about 370 existing on-street parking spaces (about 60 long-term and about 310 short-term spaces). Of these 370 spaces, about 280 are paid short-term parking spaces. Under the Cut-and-Cover Tunnel Alternative, all 370 on-street parking spaces would be removed, and 150 spaces would be replaced within the south segment.

It is likely that the replacement parking spaces would be paid short-term parking, consistent with the *City of Seattle Comprehensive Plan* C-3 goals TG18 and T42 (Seattle 2009i). Based on current paid parking in the south segment, each parking

space generates approximately $2,530 per year in revenue. If this estimate holds true for the south segment and 220 paid on-street parking spaces are removed, approximately $557,000 would be lost each year from the City's General Fund. This is approximately 14 percent of the revenue currently being collected in the study area, as described in Section 4.5.5.

Property Acquisition – As shown in Exhibit 5-4, project improvements in the south segment would require no full property acquisitions and three partial acquisitions. Parcels subject to partial acquisition would retain any existing buildings, maintain their current function, and continue to pay property taxes. The amount of property taxes paid may change for the properties subject to partial acquisition if they are reassessed by the King County Department of Assessments. Because these reassessments would be on a case-by-case basis and would occur sometime after the right-of-way acquisition, an estimate of the changes in property taxes is not possible at this time.

Exhibit 5-4. Property Acquisitions in the South Segment for the Cut-and-Cover Tunnel Alternative

Property and Business Elements	South Segment
Number of parcels subject to acquisition	3
Number of parcels subject to full acquisition	0
Number of buildings acquired	0
Approximate area of work space relocated or displaced	0 square feet
Estimated number of permanent jobs relocated or displaced	0
Approximate property tax paid by fully acquired parcels	$0
Approximate area of fully acquired tax-paying parcels	0 square feet

After construction, WSDOT could sell the partially acquired parcels that are not part of the permanent roadway right-of-way as surplus property and return them to private ownership. Parcels returned to private ownership would pay property taxes and could provide opportunities as replacement properties for displaced businesses, allowing owners to remain in the community. Some remnant parcels, however, may not be sold and redeveloped after construction because of potential access constraints resulting from the proposed roadway changes under the Cut-and-Cover Tunnel Alternative.

5.4.2 Central Segment – S. King Street Through Battery Street Tunnel

Downtown Seattle Connections – Under the Cut-and-Cover Tunnel Alternative, the midtown access ramps at Columbia and Seneca Streets would be removed. New ramps would be built in the south segment and the north segment.

The new north and south ramps would provide less direct access to the central portion of downtown from the south than that provided by the existing ramps; trips destined for the central portion of downtown would have to travel farther on arterial streets to access the new ramps. For trips destined for the southern portion of downtown from the south, the new south ramp would be closer. An advantage of the north and south ramps would be the distribution of traffic to any number of downtown streets (off Alaskan Way), rather than to or from a specific, single intersection at Columbia Street or Seneca Street.

Although northbound SR 99 trips could exit the cut-and-cover tunnel at Western Avenue, there would be no northbound on-ramp in the vicinity. Similarly, trips could enter southbound SR 99 via the Elliott Avenue on-ramp, but there would be no southbound exit ramp in the vicinity. The downtown access provided by the Cut-and-Cover Tunnel Alternative would not be comparable to existing conditions.

BINMIC Connections – Under the Cut-and-Cover Tunnel Alternative, SR 99 would be rebuilt over the BNSF Railway tracks and then pass under Elliott and Western Avenues. Only the Western Avenue off-ramp and the Elliott Avenue southbound on-ramp would be rebuilt. Most trucks traveling northbound to and southbound from the BINMIC would use the same route as they currently do. The exception would be trucks carrying flammable liquids, which would be prohibited from using the cut-and-cover tunnel by the Seattle fire code. Improvements to the Elliott/Western ramps would improve most freight connections compared to the existing facility.

One alternative route to or from the BINMIC is along Alaskan Way, which runs through areas where trucks are in potential conflict with urban residential and commercial land uses. In addition, a steep grade on Broad Street and an at-grade crossing of the BNSF Railway mainline would present obstacles to truck use of Alaskan Way, which would be the likely route for trucks carrying flammable liquids.

Ballard/Interbay Traffic and Freight Travel Times – The removal of several exits from SR 99 would somewhat affect freight trucks destined for the downtown core and the BINMIC and the Duwamish industrial area. Under the Cut-and-Cover Tunnel Alternative, travel between Ballard and Spokane Street via Alaskan Way is projected to be 5 to 7 minutes longer in both directions during the afternoon (PM) peak hour than travel via this same route under the 2015 Existing Viaduct, which includes the existing Elliott/Western ramps (see the traffic analysis in Appendix C, Transportation Discipline Report). (The 2015 Existing Viaduct assumes that the existing viaduct will continue to be part of the transportation network between S. King Street and Denny Way in the year 2015.) However, during the AM peak hour, northbound travelers would experience a quicker trip, by 4 minutes.

Vehicles carrying hazardous or combustible materials would be prohibited from using the cut-and-cover tunnel, similar to the current restrictions in the Battery Street Tunnel and on the Alaskan Way Viaduct during peak travel hours. Freight carrying hazardous or combustible materials would likely use Alaskan Way for trips between the Interbay and Duwamish industrial areas. The increase and/or decrease in freight travel time on SR 99 would have a negligible effect on economic conditions in the Puget Sound region. However, the use of alternative routes by freight carrying prohibited hazardous materials would result in the unavoidable addition of up to 8 minutes in travel time, which could contribute to a loss of economic productivity for the businesses affected by these conditions. This is discussed in more detail in Appendix C, Transportation Discipline Report.

Pedestrian Access – Under the Cut-and-Cover Tunnel Alternative, pedestrian access to the central waterfront would be provided from Victor Steinbrueck Park via the Pike Place Market lid structure over SR 99. Also, the Lenora Street pedestrian bridge would be removed and replaced. The cut-and-cover tunnel would not affect pedestrian access throughout downtown because it would be contained beneath the city. However, removal of the Columbia and Seneca Street ramps would improve pedestrian flow on First Avenue.

Parking – In the central segment**,** there are about 510 existing on-street parking spaces, all of which are short-term spaces. Under the Cut-and-Cover Tunnel Alternative, all 510 on-street parking spaces would be removed, and 270 would be replaced with paid short-term parking within the central segment, consistent with the *City of Seattle Comprehensive Plan* C-3 goals TG18 and T42 (Seattle 2009i).

Based on current paid parking along the central waterfront, each parking space generates approximately $6,600 per year in revenue. If this estimate holds true for the central segment and 240 paid on-street parking spaces are removed, approximately $1.6 million would be lost each year from the City's General Fund. This is approximately 39 percent of the revenue currently being collected in the study area, as described in Section 4.5.5.

Property Acquisition – As shown in Exhibit 5-5, project improvements within the central segment would require 5 full property acquisitions and 12 partial acquisitions. Parcels subject to partial acquisition would retain any existing buildings, maintain their current function, and continue to pay property taxes. The amount of property taxes paid may change for the properties subject to partial acquisition if they are reassessed by the King County Department of Assessments. Because these reassessments would be on a case-by-case basis and would occur sometime after the right-of-way acquisition, an estimate of the changes in property taxes is not possible at this time.

Exhibit 5-5. Property Acquisitions in the Central Segment for the Cut-and-Cover Tunnel Alternative

Property and Business Elements	Central Segment
Number of parcels subject to acquisition	17
Number of parcels subject to full acquisition	5
Number of buildings acquired	2
Approximate area of work space relocated or displaced	18,900 square feet
Estimated number of permanent jobs relocated or displaced	24
Approximate property tax paid by fully acquired parcels	$32,000
Approximate area of fully acquired tax-paying parcels	30,200 square feet

The economic effect of full acquisition of five parcels would be their permanent conversion from private to public ownership. Parcels in public ownership are exempt from paying property taxes on the assessed value of the parcel. The total amount of non-exempt (taxable) land to be fully acquired in the central segment is approximately 30,200 square feet (0.73 acre). Consequently, King County and other state and local governments would lose taxes from properties that currently pay approximately $32,000 in annual property taxes. This estimate is based on actual amounts collected in 2010 by the King County Finance and Business Operations for all of the parcels to be acquired. This estimate is for 1 year and represents less than 0.005 percent of all property tax revenue collected by King County in 2010. Under the Cut-and-Cover Tunnel Alternative, construction in the central segment would slightly but permanently decrease the number of available parcels across which the property tax load is distributed.

Two buildings representing approximately 18,900 square feet of built space would have to be demolished for the central segment improvements that are part of the Cut-and-Cover Tunnel Alternative. In addition to the economic effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace an estimated 24 workers. The permanent displacement of 24 workers represents about 0.01 percent of the total 2010 (forecasted) Seattle CBD workforce (see Exhibit 4-4).

In addition to relocated or displaced businesses and workers, potential losses in sales and use and B&O tax revenues would occur. The potential loss of these tax revenues from the general tax revenue stream could be minimized if the displaced businesses relocate within the city (see Appendix G, Land Use Discipline Report), because these businesses would then continue to pay B&O taxes. The businesses and workers in these businesses would continue to pay sales and use taxes related to the expenditure of earnings within the regional economy. Even if the relocated or displaced businesses leave the city but remain in the region, the jurisdiction of

the new location would continue to collect B&O taxes that would contribute to the regional economy. The regional economy would lose B&O revenue only if the businesses close or relocate outside of the region.

5.4.3 North Segment – Denny Way to Aloha Street

Downtown Seattle Connections – On- and off-ramps at Denny Way would provide access to and from downtown Seattle that is comparable to the access provided today.

Pedestrian Access – The construction of Thomas and Harrison Streets across Aurora Avenue would link the Uptown Urban Center business district with the South Lake Union business district for pedestrians, bicyclists, and automobiles.

Parking – In the north segment**,** there are about 330 existing on-street parking spaces (about 170 long-term and about 160 short-term spaces). Of these 330 spaces, about 220 are paid short-term parking. Under the Cut-and-Cover Tunnel Alternative, all 330 on-street parking spaces would be removed, and only 100 would be replaced within the north segment.

It is currently unknown whether the replaced spaces would be paid or unpaid, or short- or long-term parking. Based on current paid parking in the north segment, each parking space generates approximately $870 per year in revenue. If this estimate holds true for the north segment and 230 paid on-street parking spaces are permanently removed, approximately $200,000 would be lost each year from the City's General Fund. This is approximately 5 percent of the revenue currently being collected in the study area, as described in Section 4.5.5.

Property Acquisition – As shown in Exhibit 5-6, project improvements in the north segment would require 11 full property acquisitions and 9 partial acquisitions. Parcels subject to partial acquisition would retain any existing buildings, maintain their current function, and continue to pay property taxes. The amount of property taxes paid may change for the properties subject to partial acquisition if they are reassessed by the King County Department of Assessments. Because these reassessments would be on a case-by-case basis and would occur sometime after the right-of-way acquisition, an estimate of the changes in property taxes is not possible at this time.

The economic effect of full acquisition of 11 parcels would be their permanent conversion from private to public ownership. Parcels in public ownership are exempt from paying property taxes on the assessed value of the parcel. The total amount of non-exempt (taxable) land to be fully acquired in the north segment is approximately 249,000 square feet (5.7 acres). Consequently, King County and other state and local governments would lose taxes from properties that currently pay approximately $478,900 in annual property taxes. This estimate is based on actual

amounts collected in 2010 by the King County Finance and Business Operations for all of the parcels to be acquired. This estimate is for 1 year and represents less than 0.08 percent of all property tax revenue collected by King County in 2010. Under the Cut-and-Cover Tunnel Alternative, construction in the north segment would slightly but permanently decrease the number of available parcels across which the property tax load is distributed.

Exhibit 5-6. Property Acquisitions in the North Segment for the Cut-and-Cover Tunnel Alternative

Property and Business Elements	North Segment
Number of parcels subject to acquisition	20
Number of parcels subject to full acquisition	11
Number of buildings acquired	9
Approximate area of work space relocated or displaced	291,600 square feet
Estimated number of permanent jobs relocated or displaced	100
Approximate property tax paid by fully acquired parcels	$478,900
Approximate area of fully acquired tax-paying parcels	249,000 square feet

Nine buildings representing approximately 291,600 square feet of built space would have to be demolished for the north segment improvements that are part of the Cut-and-Cover Tunnel Alternative. In addition to the economic effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace an estimated 100 workers. The permanent displacement of 100 workers represents less than 0.05 percent of the total 2010 (forecasted) Seattle CBD workforce (see Exhibit 4-4).

In addition to relocated or displaced businesses and workers, potential losses in sales and use and B&O tax revenues would occur. The potential loss of these tax revenues from the general tax revenue stream could be minimized if the displaced businesses relocate within the city (see Appendix G, Land Use Discipline Report), because these businesses would then continue to pay B&O taxes. The businesses and workers in these businesses would continue to pay sales and use taxes related to the expenditure of earnings within the regional economy. Even if the relocated or displaced businesses leave the city but remain in the region, the jurisdiction of the new location would continue to collect B&O taxes that would contribute to the regional economy. The regional economy would lose B&O revenue only if the businesses close or relocate outside of the region.

5.4.4 Viaduct Removal

Under the Cut-and-Cover Tunnel Alternative, the operational effects of the viaduct removal would be the same as those described for the Bored Tunnel Alternative in Section 5.3.4.

5.4.5 Operations and Maintenance Costs

The calculation of gross or net economic effects attributable to implementation of the Cut-and-Cover Tunnel Alternative requires isolating the O&M expenditures specific to the alternative from current O&M expenditures. It is likely that current O&M expenditures would be funded from local revenue sources; therefore, they would not contribute to net economic effects. The distribution of O&M costs for existing conditions and the Cut-and-Cover Tunnel Alternative is provided in Exhibit 5-7.

Exhibit 5-7. Operations and Maintenance Costs for the Cut-and-Cover Tunnel Alternative Compared to Existing Conditions

	O&M Cost Estimate ($ millions per year)	Increase in O&M Costs Over Existing Conditions
Existing conditions	$1.87	0
Cut-and-Cover Tunnel Alternative	$4.0	+$2.13 million (+53%)

Note: O&M = operations and maintenance

The O&M costs are based on current WSDOT tunnel and bridge experience on the I-90 system and WSDOT/SDOT expenses on the existing viaduct. Average unit O&M costs for the cut-and-cover tunnel were provided by these transportation agencies. These unit costs were converted to annual costs.

Economic Effects of Operations and Maintenance Costs

The Cut-and-Cover Tunnel Alternative would result in an increase in O&M costs compared to existing conditions. The annual O&M expenditures would increase by $2.13 million over the O&M costs for maintaining the existing viaduct.

5.4.6 Operational Mitigation

The mitigation of long-term operational effects of the Cut-and-Cover Tunnel Alternative would be the same as those described for the Bored Tunnel Alternative in Section 5.3.6.

5.4.7 Operational Benefits

The operational benefits of the Cut-and-Cover Tunnel Alternative would be very similar to those described for the Bored Tunnel Alternative in Section 5.3.7. The

differences would be the enhanced pedestrian access resulting from the removal of the viaduct, as described below:

- **South segment.** Pedestrian operations in the south segment would be the same as those described for the Bored Tunnel Alternative.
- **Central segment.** There would be no enhanced pedestrian operations in the central segment. The existing pedestrian operations are adequate.
- **North segment.** Pedestrian operations in the north segment would be the same as those described for the Bored Tunnel Alternative.
- **Viaduct removal.** The Cut-and-Cover Tunnel Alternative would include demolition of the existing viaduct structure from S. King Street to Pike Street. The cut-and-cover tunnel would transition to an aerial structure between Pine Street and Lenora Street (northbound)/Virginia Street (southbound). It would then transition back to a cut-and-cover tunnel and connect to the Battery Street Tunnel. A pedestrian walkway lid structure would be constructed above the cut-and-cover tunnel between Union Street and just north of Virginia Street. Pedestrian access would also be provided across SR 99 at Lenora Street via the replaced Lenora Street pedestrian bridge. Currently, the viaduct is a psychological barrier between the Seattle waterfront and downtown. The pedestrian environment beneath the viaduct is not welcoming, and the structure casts large shadows. The viaduct removal would allow the City to improve Alaskan Way, as discussed in Chapter 7 (Cumulative Effects Analysis) of the Final EIS, and it would enhance pedestrian connections between the central waterfront and downtown Seattle.

5.5 Elevated Structure Alternative

The operational effects of the Elevated Structure Alternative were evaluated for three segments of the project area and the viaduct removal:

- South – S. Royal Brougham Way to S. King Street
- Central – S. King Street through the Battery Street Tunnel
- North – Denny Way to Aloha Street
- Viaduct removal

5.5.1 South Segment – S. Royal Brougham Way to S. King Street

Under the Elevated Structure Alternative, changes in traffic flow and access would have direct operational effects on the economic environment of the project area and the region. The efficient movement of goods between suppliers and customers would result in a net economic benefit for the region. Access to individual businesses is critical to their economic survival.

Downtown Seattle Connections – The Elevated Structure Alternative would provide the same connections as the existing viaduct structure but with somewhat improved geometric conditions.

BINMIC Connections – Northbound travelers destined for the BINMIC that are transporting hazardous materials would exit SR 99 via the northbound SR 99 exit at S. Dearborn Street and travel north on the improved Alaskan Way/Alaskan Way S. surface street (for more information about connections to the BINMIC, see the descriptions for the central and north segments in Section 5.5.2 and 5.5.3).

Duwamish/Harbor Island/SR 519 Connections – These connections would be the same as those described for the Cut-and-Cover Tunnel Alternative in Section 5.4.1.

Pedestrian Access – In the south segment, pedestrian access would be improved by the addition of the Port Side Pedestrian/Bike Trail and the City Side Trail. Both trails will be built as part of the S. Holgate Street to S. King Street Viaduct Replacement Project, with modifications to the City Side Trail as part of this project. Pedestrian access would be provided at most east-west streets between S. Atlantic Street and Yesler Way via crosswalks across Alaskan Way.

Parking – In the south segment, there are about 370 existing on-street parking spaces (about 60 long-term and about 310 short-term spaces). Of these 370 spaces, about 280 are paid short-term parking spaces. Under the Elevated Structure Alternative, all 370 on-street parking spaces would be removed, and 130 spaces would be replaced within the south segment.

It is likely that the replacement parking spaces would be paid short-term parking, consistent with the *City of Seattle Comprehensive Plan* C-3 goals TG18 and T42 (Seattle 2009i). Based on current paid parking along the central waterfront, each parking space generates approximately $2,530 per year in revenue. If this estimate holds true for the south segment and 240 paid on-street parking spaces are removed, approximately $607,000 would be lost each year from the City's General Fund. This is approximately 15 percent of the revenue currently being collected in the study area, as described in Section 4.5.5.

Property Acquisition – Similar to the Cut-and-Cover Tunnel Alternative, the Elevated Structure Alternative would require no full property acquisitions and three partial property acquisitions in the south segment. The effects of these partial acquisitions are the same as those described in the discussion of property acquisition for the Cut-and-Cover Tunnel Alternative in Section 5.4.1.

5.5.2 Central Segment – S. King Street Through Battery Street Tunnel

Downtown Seattle Connections – Under the Elevated Structure Alternative, downtown connections from SR 99 via the Columbia Street and Seneca Street on-

and off-ramps would be provided in their current locations but with somewhat improved geometric conditions. The southbound on-ramp from Elliott Avenue and the northbound on-ramp from Western Avenue would be rebuilt. The northbound on-ramp from Bell Street and the southbound off-ramp at Battery Street and Western Avenue would be closed and used for maintenance and emergency access only.

BINMIC Connections – For the Elevated Structure Alternative, the primary truck route serving the BINMIC would be 15th Avenue W., Western and Elliott Avenues, and the elevated structure. Connections would be provided between the elevated structure and Elliott and Western Avenues. The northbound off-ramp to Western Avenue is expected to improve, because the southbound off-ramp would be eliminated from use. The elevated structure also would provide good connections between the BINMIC and the Duwamish area. One alternative route to or from the BINMIC would be along Alaskan Way, which runs through areas where trucks are in potential conflict with urban residential and commercial land uses. A steep grade on Broad Street and an at-grade crossing of the BNSF Railway mainline would present obstacles to truck use of Alaskan Way.

Freight travel times between Ballard and Spokane Street via Alaskan Way would be about 4 minutes shorter in both directions during the PM peak hour when compared to the same route with the 2015 Existing Viaduct included in the traffic analysis (Appendix C, Transportation Discipline Report). However, during the AM peak hour, the travel times for northbound and southbound trips would be about 1 to 3 minutes shorter. Similar to the other build alternatives, the decrease in freight travel time on SR 99 would have a negligible effect on economic conditions in the Puget Sound region.

Pedestrian Access – Under the Elevated Structure Alternative, access between the central waterfront and the Seattle CBD would be provided at most east-west streets between S. King Street and Pine Street via crosswalks across Alaskan Way. In addition, pedestrian bridges at Bell and Madison Streets would provide above-grade crossings of Alaskan Way, and a pedestrian bridge at Lenora Street would provide access from Western Avenue and Pike Place Market across the BNSF Railway tracks on the east side of Alaskan Way. Overall, pedestrian access would be similar to existing conditions.

Parking – In the central segment, there are about 510 existing on-street parking spaces, all of which are short-term spaces. Under the Elevated Structure Alternative, all 510 on-street parking spaces would be removed, and 260 spaces would be replaced with paid short-term parking within the central segment, consistent with the *City of Seattle Comprehensive Plan* C-3 goals TG18 and T42 (Seattle 2009i).

Based on current paid parking along the central waterfront, each parking space generates approximately $6,600 per year in revenue. If this estimate holds true for the central segment and 250 paid on-street parking spaces are removed, approximately $1.65 million would be lost each year from the City's General Fund. This is approximately 42 percent of the revenue currently being collected in the study area, as described in Section 4.5.5.

Property Acquisition – As shown in Exhibit 5-8, project improvements in the central segment would require five full property acquisitions and seven partial acquisitions. Parcels subject to partial acquisition would retain any existing buildings, maintain their current function, and continue to pay property taxes. The amount of property taxes paid may change for the properties subject to partial acquisition if they are reassessed by the King County Department of Assessments. Because these reassessments would be on a case-by-case basis and would occur sometime after the right-of-way acquisition, an estimate of the changes in property taxes is not possible at this time.

Exhibit 5-8. Property Acquisitions in the Central Segment for the Elevated Structure Alternative

Property and Business Elements	Central Segment
Number of parcels subject to acquisition	12
Number of parcels subject to full acquisition	5
Number of buildings acquired	3
Approximate area of work space relocated or displaced	94,100 square feet
Estimated number of permanent jobs relocated or displaced	70
Approximate property tax paid by fully acquired parcels	$91,200
Approximate area of fully acquired tax-paying parcels	41,700 square feet

The total amount of non-exempt (taxable) land to be fully acquired for the central segment is approximately 41,700 square feet (0.96 acre). Consequently, King County and other state and local governments would lose taxes from properties that currently pay approximately $91,200 in annual property taxes. This estimate is based on actual amounts collected in 2010 by the King County Finance and Business Operations for all of the parcels to be acquired. This estimate is for 1 year and represents less than 0.01 percent of all property tax revenue collected by King County in 2010. Under the Elevated Structure Alternative, construction in the central segment would slightly but permanently decrease the number of available parcels across which the property tax load is distributed.

Three buildings representing approximately 94,100 square feet of built space would have to be demolished for the central segment improvements that are part

of the Elevated Structure Alternative. In addition to the economic effect associated with the loss of property tax revenue, the loss of parcels with buildings would permanently displace an estimated 70 workers. The permanent displacement of 70 workers represents less than 0.03 percent of the total 2010 (forecasted) Seattle CBD workforce (see Exhibit 4-4).

In addition to relocated or displaced businesses and workers, potential losses in sales and use and B&O tax revenues would occur. The potential loss of these tax revenues from the general tax revenue stream could be minimized if the displaced businesses relocate within the city (see Appendix G, Land Use Discipline Report), because these businesses would then continue to pay B&O taxes. The businesses and workers in these businesses would continue to pay sales and use taxes related to the expenditure of earnings within the regional economy. Even if the relocated or displaced businesses leave the city but remain in the region, the jurisdiction of the new location would continue to collect B&O taxes that would contribute to the regional economy. The regional economy would lose B&O revenue only if the businesses close or relocate outside of the region.

5.5.3 North Segment – Denny Way to Aloha Street

Downtown Seattle Connections – On- and off-ramps at Denny Way would provide access to and from downtown Seattle that is comparable to the access provided today.

Pedestrian Access – The addition of two roadway bridges (at Thomas and Harrison Streets) over Aurora Avenue would link the Uptown Urban Center business district with the South Lake Union business district for pedestrians, bicyclists, and automobiles.

Parking – Under the Elevated Structure**,** the parking effects in the north segment would be the same as those in the discussion of parking for the Cut-and-Cover Tunnel Alternative in Section 5.4.3.

Property Acquisition – Similar to the Cut-and-Cover Tunnel Alternative in the north segment, the Elevated Structure Alternative would require full acquisition of 11 properties and partial acquisition of 9 properties. The effects of these acquisitions would be the same as those in the discussion of property acquisition for the Cut-and-Cover Tunnel Alternative in Section 5.4.3.

5.5.4 Operations and Maintenance Costs

The calculation of gross or net economic effects attributable to implementation of the Elevated Structure Alternative requires isolating the O&M expenditures specific to the alternative from current O&M expenditures. It is likely that current O&M expenditures would be funded from local revenue sources; therefore, they would

not contribute to net economic effects. The distribution of O&M costs for existing conditions and the Elevated Structure Alternative is provided in Exhibit 5-9.

Exhibit 5-9. Operations and Maintenance Costs for the Elevated Structure Alternative Compared to Existing Conditions

	O&M Cost Estimate ($ millions per year)	Increase in O&M Costs Over Existing Conditions
Existing conditions	$1.87	0
Elevated Structure Alternative	$5.2	+$3.33 million (+64%)

O&M = operations and maintenance

The O&M costs are based on current WSDOT tunnel and bridge experience on the I-90 system and WSDOT/SDOT expenses on the existing viaduct. Average unit O&M costs for the elevated structure were provided by these transportation agencies and converted to annual costs.

Economic Effects of Operations and Maintenance Costs

The Elevated Structure Alternative would result in an increase in O&M costs compared to existing conditions. The annual O&M expenditures would increase by $3.33 million over the O&M costs for maintaining the existing viaduct.

5.5.5 Operational Mitigation

The mitigation of long-term operational effects of the Elevated Structure Alternative would be the same as those described for the Bored Tunnel Alternative in Section 5.3.6.

5.5.6 Operational Benefits

Operational benefits would result from the Elevated Structure Alternative compared to the Viaduct Closed (No Build Alternative). These benefits would include a new highway facility with a lifespan of at least 75 years. Over the lifetime of the facility, the Seattle region would benefit from the reduced congestion and delay that would result from the Elevated Structure Alternative compared to the Viaduct Closed (No Build Alternative) or existing conditions.

Enhanced Pedestrian Access – The Elevated Structure Alternative would not noticeably change pedestrian access compared to existing conditions. The structure would be larger than the existing viaduct, creating an even larger psychological barrier between the downtown core and the Seattle waterfront.

Maintenance of Regional Mobility – The Elevated Structure Alternative would maintain local and regional mobility by replacing the existing viaduct with a facility that would provide an alternative route to I-5 and Seattle's surface streets. Local connections near the south and north segments would improve mobility for

drivers, pedestrians, and bicyclists, with enhanced surface street connections compared to existing conditions. The Elevated Structure Alternative would maintain midtown on-ramps at Columbia Street and Elliott Avenue and off-ramps at Seneca Street and Western Avenue, similar to existing conditions. The retention of these ramps would allow trips that currently use them to maintain their current routes. This would be especially beneficial for BINMIC truck traffic because it would be able to continue using travel routes similar to those under existing conditions. Also, similar to existing conditions, trucks hauling hazardous materials would use the Elliott and Western on- and off-ramps to access SR 99 instead of avoiding the larger segment of SR 99, which would be necessary under the Bored Tunnel Alternative and the Cut-and-Cover Tunnel Alternative.

Improved Safety – The Elevated Structure Alternative would improve safety on SR 99. Similar to the other build alternatives, the elevated structure would comply with current seismic standards and other design standards to withstand an earthquake, flooding, or other disasters. Also similar to the bored tunnel and the cut-and-cover tunnel, the elevated structure would be designed with safety improvements and congestion-reducing measures that would have a net positive effect on the economy.

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Chapter 6 CONSTRUCTION EFFECTS AND MITIGATION

6.1 Construction Effects Common to All Build Alternatives

Construction of the Bored Tunnel Alternative would last about 65 months (5.5 years), the Cut-and-Cover Tunnel Alternative would last over 105 months (8.75 years), and the Elevated Structure Alternative would last 120 months (10 years). For more specific information about construction traffic stages associated with each alternative, see Chapter 6 of Appendix C, Transportation Discipline Report.

6.1.1 Regional Economic Activity

Beneficial economic effects for the region and the state would result from the construction of any of the three build alternatives relative to the Viaduct Closed (No Build Alternative). This section assesses the likely overall economic effects that would be attributed to construction, as measured by increases in regional and state activity, employment, and associated job earnings. The detailed analysis, including the methodology associated with the RIMS II input-output model, is presented in Attachment A.

Construction expenditures would occur over a number of years, directly creating new demand for construction materials and labor. These direct effects would lead to indirect effects as the production of output by firms in other industries increases to supply the demand for inputs to the construction industry. Both the direct and indirect effects of construction expenditures typically cause firms in all industries to employ more workers to meet the increased demand. The increase in employment leads to induced effects because the additional wages and salaries paid to workers generally foster greater consumer spending.

Project Total Costs

The project costs for the alternatives, including right-of-way acquisition, sales tax, and construction costs, were developed in September 2010 (Exhibit 6-1). Implementation costs, including design and construction management, risk, and escalation, are grouped with the construction costs. Because the individual projects are included with the Cut-and-Cover Tunnel Alternative and the Elevated Structure Alternative (see Exhibit 1-1), the estimated costs of these alternatives are substantially higher than those of the Bored Tunnel Alternative.

Exhibit 6-1. Total Project Costs of the Build Alternatives

Alternative	Total Project Cost Estimate ($ millions)	Project Cost Component ($ millions and share)	
		Right-of-Way Acquisition	Construction Cost[1, 2]
Bored Tunnel Alternative	1,960	172 (8.8%)	1,788 (91.2%)
Cut-and-Cover Tunnel Alternative	3,518	146 (4.2%)	3,372 (95.8%)
Elevated Structure Alternative	1,971	140 (7.1%)	1,831 (92.9%)

Notes: [1] The sales tax portion of the construction cost for each of the build alternatives is estimated to be the following: $100 million for the Bored Tunnel Alternative; $197 million for the Cut-and-Cover Tunnel Alternative; and $110 million for the Elevated Structure Alternative.
[2] Construction cost includes the cost of preliminary engineering.

Project Capital Costs

For the purposes of assessing the economic effects on output, earnings, and employment, the focus is placed on the project capital costs (construction and right-of-way acquisition) of the alternatives as an accurate measure of the capital investment that would likely occur for the project. It is assumed that no project capital costs would be incurred for the Viaduct Closed (No Build Alternative) (Scenario 1 only).

The project capital cost estimates and distribution of funding sources for the build alternatives are indicated in Exhibit 6-2. The distribution of funding sources was developed by the design team and constitutes the list of potential funding mechanisms currently available.

Exhibit 6-2. Capital Costs and Funding Sources of the Build Alternatives

Alternative	Capital Cost Estimate ($ millions)	Funding Source ($ millions and share)	
		Federal Committed (% of total cost)	State Committed (% of total cost)
Bored Tunnel Alternative	1,960	130 (7.0%)	1,830 (93.0%)
Cut-and-Cover Tunnel Alternative	3,518	130 (4.0%)	3,388 (96.0%)
Elevated Structure Alternative	1,971	130 (7.0%)	1,841 (93.0%)

For purposes of examining the regional economic effects, all of the federal earmark grants and federal general funding are assumed to be new funds that would otherwise not be spent either regionally or within the state in the absence of the project. All state and local funding is assumed to be expended with or

without the project, because these funds are raised by taxing local and/or state residents and are specifically earmarked for transportation projects within the region or state.

Summary of Benefits for Regional Economic Activity

The cost associated with the construction of any of the three build alternatives would result in additional (gross) activity throughout all economic sectors within the Puget Sound region and the state of Washington. This gross economic activity is derived from the multiplier effects on the capital expenditures for the project. Examples of capital expenditures include the direct hiring of temporary construction workers, the purchase of construction materials and equipment, and the expenditure of capital funds to acquire new rights-of-way.

Exhibit 6-3. Net New-Money Total Economic Effects

Alternative and Expenditure Category	Direct Gross Expenditures ($ millions)	Percentage of Contribution Due to New-Money Funds[1]	Seattle-Tacoma Region Net Total Effects		Statewide Net Total Effects	
			Output ($ millions)	Earnings ($ millions)	Output ($ millions)	Earnings ($ millions)
Bored Tunnel Alternative	**1,960**	**7.0**	**277**	**79**	**291**	**84**
Construction	1,788		258	76	272	81
Right-of-way	172		19	3	19	3
Cut-and-Cover Tunnel Alternative	**3,518**	**4.0**	**288**	**84**	**303**	**89**
Construction	3,372		279	82	294	87
Right-of-way	146		9	2	9	2
Elevated Structure Alternative	**1,971**	**7.0**	**280**	**81**	**294**	**86**
Construction	1,831		264	78	279	83
Right-of-way	140		16	3	15	3

Notes: Includes only effects directly associated with the expenditure of construction and right-of-way funds and does not include indirect economic benefits presented in Chapter 7 (Cumulative Effects Analysis) of the Final EIS.

[1] Includes committed new-money funds (see Exhibit 6-2).

The amount of new economic activity directly associated with the Bored Tunnel Alternative (for both construction and right-of-way acquisition) that is the result of new money entering the Puget Sound regional economy would be $277 million. The amount of new earnings (wages) entering the Puget Sound regional economy would be $79 million. The portion of new money contributed to overall construction costs is 7 percent.

The amount of new economic activity directly associated with the Cut-and-Cover Tunnel Alternative (for both construction and right-of-way acquisition) that is the result of new money entering the Puget Sound regional economy would be

$288 million. The amount of new earnings (wages) entering the Puget Sound regional economy would be $84 million. The portion of new money contributed to overall construction costs is 4 percent.

The amount of new economic activity directly associated with the Elevated Structure Alternative (for both construction and right-of-way acquisition) that is the result of new money entering the Puget Sound regional economy would be $280 million. The amount of new earnings (wages) entering the Puget Sound regional economy would be $81 million. The portion of new money contributed to overall construction costs is 7 percent.

The amount of new money assumes that the committed federal funds are received for this project. If the committed federal funding is not provided, the net economic benefit associated with new money would be eliminated. All other funding would come from within either the state or the Puget Sound region (local sources) and would likely be spent in the local economy even in the absence of the project.

6.1.2 Construction Effects of the Build Alternatives and Concurrent Construction

Construction of the build alternatives (and other Program elements associated with the Bored Tunnel Alternative only) would contribute to effects on adjacent businesses in addition to the effects of other projects that have been implemented or may be implemented in the vicinity. Other key development projects located within the study area include the following:

- Alaskan Way Viaduct and Seawall Replacement Moving Forward projects
- Sound Transit projects (North, East, and University Links; First Hill Streetcar)
- S. Spokane Street Viaduct Widening
- SR 519 Intermodal Access Project, Phase 2 (completed in Spring 2010)
- SR 520 Bridge Replacement and High-Occupancy Vehicle (HOV) Program
- I-5 Improvements
- South Lake Union Redevelopment
- Washington State Ferries Seattle Terminal Improvements

These key development projects are expected to add to the economic effects in the study area that would occur during project construction. In addition, other smaller, private projects in the area, such as the Belltown/Queen Anne and the Seattle downtown proposed developments, are expected to occur during the construction period of the Bored Tunnel Alternative. Although the timelines for these projects would be staggered, taken together, adjacent businesses would likely be disrupted. What is unknown is the magnitude of the increased investment over the long term and when these projects would occur. Some of the

long-term effects would depend on local and regional economic cycles of growth and downturns.

If multiple transportation projects have overlapping construction schedules, the City would lead a coordination effort to minimize construction effects on businesses, residents, and visitors to Seattle. Organizational tools such as shared databases may be used to plan and implement effective mitigation plans. These tools include developing a tracking system for mitigation efforts, defining an adaptive mitigation management structure, establishing an independent oversight committee to include affected parties in mitigation planning, and leveraging unique aspects of the project setting to offset effects.

6.2 Bored Tunnel Alternative (Preferred)

6.2.1 General Effects of the Bored Tunnel Alternative

Temporary Economic Effects on Businesses and Neighborhoods Due to Disruption

Any major construction project, public or private, inconveniences or disturbs residents, businesses, and customers of businesses adjacent to the construction project. Construction-related effects can and would vary considerably over time and in their geographic coverage. Furthermore, effects can also vary according to the methods used to stage and construct a project, especially one as large as the Bored Tunnel Alternative.

From the inventory of existing businesses within one block of the existing alignment (see Section 4.8), the design team has identified approximately 1,400 businesses (including multifamily residential buildings) adjacent to the alignment that would experience disruption as a result of construction (the Elevated Structure Alternative could affect 1,540 businesses because of the businesses located along the Broad Street detour). These temporary effects include the following:

- The presence of construction workers, heavy construction equipment, and materials within the construction area
- An increase in traffic congestion around the work zone
- Temporary road closures, traffic diversions, and alterations in property access (see Appendix C, Transportation Discipline Report)
- Loss of parking, especially on-street short-term parking
- Airborne dust
- Noise and vibrations from construction equipment (including tunnel boring equipment) and vehicles (see Appendix F, Noise Discipline Report)

- Decreased visibility of businesses and alterations in access to businesses by customers
- Rerouted pedestrian walk-up access to primary business entrance

Up to about 160 active commercial and industrial buildings that are not candidates for acquisition under the Bored Tunnel Alternative are located within 50 feet of the existing viaduct. Many of these buildings in the central survey area covered by the inventory of businesses are occupied by multiple businesses. The period of active disruption in front of any one building depends on the build alternative (described below for each alternative). Disruptions could be caused by utility relocations before the viaduct demolition, loss of use of loading areas beneath the viaduct, and loss of private parking areas beneath the viaduct. Some of these businesses may suffer little or no adverse effect, whereas others may experience a noticeable decline in sales, increase in costs, and/or decrease in efficiency.

The fiftieth anniversary of Seattle Center and the 1962 World's Fair will be celebrated in 2012. Preliminary discussions and planning for events to commemorate Seattle Center's inception are underway. Any large celebration events would be anticipated during the planning of construction staging activities in the north segment of the project area. These events would be similar to other large annual events, such as the Northwest Folklife Festival over Memorial Day weekend and Bumbershoot over Labor Day weekend.

Without proper planning and implementation of mitigation measures, these construction-related effects could adversely affect the daily life of residents and inconvenience or disrupt the flow of customers, employees, and materials and supplies to and from these businesses in the 160 commercial and active buildings. Construction effects would be mitigated with the noise and vibration mitigation measures, public communications and notification outreach efforts, and the project's contract specifications and special provisions.

Temporary Changes in Vehicle Through-Traffic on SR 99

There would be eight construction traffic stages over the 65-month construction period of the Bored Tunnel Alternative. For an extensive description of the traffic stages and their effects, see Chapter 6 of Appendix C, Transportation Discipline Report.

The closure of SR 99 for up to 3 weeks for the crossover of traffic from the existing viaduct to the bored tunnel, as well as intermittent lane restrictions or surface street closures and periods of slower travel speeds on SR 99 and surface streets, would affect travel times and traffic throughput within the project area. During infrastructure construction, traffic congestion would increase compared to existing conditions and could affect the timeliness of business deliveries that rely on SR 99 for the transport of goods. To reduce the effects on businesses and

holiday travel, closures of SR 99 would not be implemented during the established annual construction moratorium between Thanksgiving and New Year's Day.

Economic Effects on Ferries and Cruise Ships

Motorists traveling to and from the Seattle Ferry Terminal at Colman Dock or the cruise terminals at the Bell Street Pier/Pier 66 or the Smith Cove Cruise Terminal/Pier 91 may experience delays during the demolition of the existing viaduct and the construction of surface street improvements in the north and south segments. Vehicle access to the ferry, cruise, and marine terminals may be rerouted at times but would be maintained during construction. Pedestrian access to and from Colman Dock and the terminals would also be maintained throughout construction but may have to be rerouted at times.

These temporary changes in access could decrease efficient performance of the ferry and cruise ship system. This could affect ferry ridership if other transportation options are not available to those who typically opt for this mode. The loss of ridership would decrease revenue for the Washington State Ferries. Furthermore, for commuters who continue to take the ferry to reach their place of work, a delayed or missed ferry could result in late arrivals at work or missed workdays and associated lost wages. However, it is unlikely that people would decide not to take a cruise because of project construction.

Locations for pedestrian access and bus and taxi cab queuing and pickups would likely vary throughout construction to accommodate construction activities. Ferry and cruise terminals rely on access; therefore, maintaining access for cruise ship provisioning and other related activities, or mitigating any adverse effects on access, is important to the economic vitality of these terminals.

Economic Effects of the Potential Loss of Available Parking

In the entire study area, the maximum number of parking spaces that would be affected at one time during construction and/or demolition of the existing viaduct would be about 1,210 on-street spaces and about 270 to 310 off-street spaces, for a total of up to about 1,520 spaces. However, the effects on parking would vary throughout the construction traffic stages (see Appendix C, Transportation Discipline Report). During Traffic Stages 1 through 3, about 760 on-street spaces would be affected, 610 of which are paid spaces. During Traffic Stages 4 and 5, about 740 on-street spaces would be affected, 580 of which are paid spaces. During Traffic Stage 6, about 640 on-street spaces would be affected, 490 of which are paid spaces; and during Traffic Stage 7, about 660 on-street spaces would be affected, 510 of which are paid spaces. Throughout construction during Traffic Stages 1 through 7, about 50 off-street parking spaces would be affected.

The viaduct would be demolished during Traffic Stage 8. During this stage, 1,210 on-street spaces and 310 off-street spaces would be affected at any given time. Of the 1,210 affected on-street spaces, 1,020 would be paid parking spaces. Therefore, for most of the construction period (except for the last year—Traffic Stage 8), 640 to 760 spaces would be affected. These spaces include a mix of short-term on-street (paid), long-term on-street, and off-street spaces. The existing spaces are broken down geographically as follows:

- **South area.** During Traffic Stages 1 through 7, approximately 310 to 390 on-street spaces and 50 off-street spaces in the south area would be affected during construction. Of these affected on-street spaces, 250 to 330 are short-term spaces, and 60 are long-term spaces. During Traffic Stage 8, when the viaduct would be demolished, the parking spaces beneath the viaduct would be removed. Several blocks of parking at a time along Alaskan Way would also be affected during viaduct demolition. During Traffic Stage 8, a total of about 410 on-street spaces would be affected in the south area.
- **Central area.** During Traffic Stages 1 through 7, up to 90 on-street parking spaces and no off-street spaces in the central area would be affected during construction. During Traffic Stage 8 (viaduct demolition), approximately 390 on-street parking spaces beneath the viaduct and ramps and along Alaskan Way would be removed. Immediately after viaduct demolition and removal, the City expects to begin work on the waterfront promenade and the reconfigured Alaskan Way surface street. Construction of these projects would likely affect parking availability until they are completed. During Traffic Stage 8 (viaduct demolition), about 40 off-street parking spaces would be affected at any given time. In addition to the public parking that would be affected during viaduct demolition, up to about 135 private/business/reserved parking spaces beneath the viaduct could be affected at the same time.
- **North area.** During Traffic Stages 1 through 7, approximately 320 to 370 on-street spaces and no off-street spaces in the north area would be affected during construction. Of these on-street spaces, 90 to 140 are short-term spaces, and 230 to 240 are long-term spaces.

For most of the construction period, about 630 to 850 on-street spaces would be affected. This would result in the annual loss of approximately $1.5 million to $1.8 million in parking revenue for the City.

The loss of approximately 340 to 560 short-term parking spaces (during Traffic Stages 1 through 7) represents about 7.5 percent of the short-term parking available within the Seattle CBD. The loss of 50 off-street parking spaces (during

Traffic Stages 1 through 7) represents less than 0.5 percent of the long-term parking available within the Seattle CBD. *Parking Trends for the Central Puget Sound Region, 2004-2006* (PSRC 2007) indicates that the parking occupancy rate for off-street parking in the Seattle CBD was 70.1 percent in 2006.

Businesses within one block of the existing viaduct alignment generally do not have readily identifiable short-term parking options other than on-street parking (see Section 4.8), including businesses in Pioneer Square, along the central waterfront, and in the commercial core. Almost 75 percent of the existing businesses inventoried in each of these areas rely on on-street parking for meeting their customers' needs (see Section 4.8). All three of these areas would be affected by the temporary loss of up to 150 short-term spaces in Pioneer Square and 90 short-term spaces in the central waterfront, as described above for the south and central areas.

Customers and freight pickup and delivery service providers who routinely use on-street parking, including parking beneath the viaduct, would have to find alternative parking. This could result in indirect economic effects on businesses along the corridor because of the decreased number of customers willing to patronize these businesses. The degree to which alternative nearby parking can be identified and used by customers and business operators in the central waterfront and Pioneer Square areas would be one factor in determining the degree of economic effect on businesses in these economically fragile districts. Other factors include the degree to which construction activities inhibit the business environment.

During construction, the project would employ about 450 construction workers in the Seattle area. Construction worker parking would be accommodated at two of the construction staging areas: Terminal 106 and Pier 48. Shuttles would transport the workers to the appropriate construction sites.

This construction worker parking plan would allow downtown workers, shoppers, business customers, and tourists continued access to parking lots and parking spaces in the Seattle CBD area.

Construction Effects and Benefits – Cost of Congestion

As described in Section 4.6, the cost of congestion is typically measured in time or dollars and has the potential to affect travelers, businesses, and the regional economy. The existing viaduct and the Battery Street Tunnel would be open during most of the project-related construction, except for short-term closures to connect existing SR 99 structures to detours and during the cross-over to open the bored tunnel. In addition, there would be various lane restrictions on surface streets or periodic closures and reduced speeds. Although detour routes would be available throughout project construction, the disruption of travel speeds and

traffic flow would contribute to the existing congestion in the area. However, the congestion associated with the construction of the Bored Tunnel Alternative is not expected to contribute substantially to the urban area statistics presented in Section 4.6.

Construction Effects – Staging Areas

Under the Bored Tunnel Alternative, a number of staging areas would be used to prepare for construction and store construction materials and excavated debris. The staging areas are described in Appendix B, Alternatives Description and Construction Methods Discipline Report. Increased truck traffic to and from these staging areas is expected, predominantly on truck routes. During the demolition of the existing viaduct, debris would be transported to areas where it would be compacted for use as backfill for the decommissioned Battery Street Tunnel. Cuttings extracted from the bored tunnel would be carried by conveyor system to Pier 46 and barged northwest across Puget Sound to Mats Mats Quarry near Port Ludlow, Washington.

6.2.2 South Portal

Construction in the south portal area would include the construction of a tunnel operations building and ramps providing north- and southbound on and off movements to and from SR 99. Temporary lane closures and restrictions may cause some reduced transit flow, speeds, and reliability.

Businesses on the east side of First Avenue S. would continue to have access from Occidental Avenue S.; however, the primary access for many of these establishments is from First Avenue S. This could mean that access, while maintained, would be less convenient. The south portal of the bored tunnel would be the launching point for the tunnel boring machine (TBM). The spoils generated during the tunnel excavation would be carried by an internal railcar system through the excavated portion of the tunnel back to the south portal launching point. From the south portal, they would transported by barge for disposal at Mats Mats Quarry near Port Ludlow, Washington.

The Washington-Oregon Shippers Cooperative Association (WOSCA) detour, which will be constructed as part of the S. Holgate Street to S. King Street Viaduct Replacement Project, is located between SR 99 and S. Royal Brougham Way. At the south end of the detour, near S. Royal Brougham Way, north- and southbound traffic will be at-grade. Both directions of traffic will travel on a temporary detour across the WOSCA property. At the north end of the detour, traffic will connect to SR 99 via temporary ramps that will link up to the existing First Avenue S. ramps. This detour would be used throughout the bored tunnel construction.

Businesses adjacent to the project construction would experience increased noise, dust, and vibrations associated with the tunnel excavation and street improvements. As the project develops and plans for construction methods become more defined, strategies would be developed to ensure local connectivity and access to buildings and businesses by pedestrians, bicyclists, motorists, and movers of freight. In addition, methods would be developed to provide access to public facilities and utilities that are not relocated before construction.

6.2.3 Central Segment

The launching point for the TBM would be at the south portal.

Tunnel boring may affect areas and buildings within the settlement trough of the bored tunnel. To identify and prepare for potential building and area settlement, a structural building inventory has been conducted and an assessment of existing conditions has been performed (WSDOT et al. 2010b). Before tunnel boring begins, monitoring instrumentation would be installed to detect any settlement that may occur during or after boring under sensitive buildings and structures.

Approximate areas and buildings with the highest potential to experience settlement are as follows:

- Alaskan Way S. between S. King and S. Main Streets.
- Alaskan Way at Yesler Way.
- Polson Building, Commuter Building, Western Building, the older Federal Office Building between Western Avenue and First Avenue, and a portion of the Harbor Steps complex. The Western Building would undergo a complex building protection process to strengthen its foundation and reinforce its structure.

In these potential settlement areas and for specific at-risk buildings, jet or compensation grouting could be used to mitigate settlement. Compensation grouting techniques stabilize or stiffen the soil.

Use of these mitigation measures would require acquisition of temporary property rights to complete the work. Any acquisitions would be completed according to the federal regulations in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, and guided by Revised Code of Washington, Chapters 8.04, 8.25, 8.26, and 47.12, which are the state laws that control the appraisal, acquisition, condemnation, relocation, and property management processes.

It is possible that the settlement risks for a specific building cannot be mitigated by means of jet or compensation grouting and that a building that has not previously been identified as at risk of settlement is later determined to have

sustained structural damage. In such cases, compensation to the building owners and tenants could include repair without temporary relocation, repair with temporary relocation, repair with permanent relocation, or condemnation of the building. Displaced businesses would be relocated as discussed in Chapter 5 for permanent relocation related to full acquisition of buildings. More details about the effects due to settlement are discussed in Appendix P, Earth Discipline Report.

6.2.4 North Portal

Tunnel boring operations would end just north of Thomas Street. The TBM would be dismantled and extracted at this location. An extraction pit would be excavated to remove the TBM. At the end of the bored tunnel, SR 99 would begin to unbraid and transition into a cut-and-cover segment between Thomas and Harrison Streets. The new SR 99 would become a side-by-side roadway at Harrison Street, connecting back to the existing SR 99 just north of Mercer Street. Southbound SR 99 would shift to the west outside of the existing right-of-way.

Businesses adjacent to project construction would experience increased noise and vibration associated with completing the tunnel and street improvements. Also, vehicle and pedestrian access to businesses adjacent to the construction would require rerouting (see Appendix C, Transportation Discipline Report).

Trucks accessing streets affected by construction would be subject to the same traffic delays that general-purpose vehicles would experience. Public parking would be restricted or eliminated on streets throughout the designated construction zone. Commercial trucks would have to park nearby on side streets.

6.2.5 Viaduct Removal

Demolition of the existing viaduct would require various surface street closures at several locations during the 9-month demolition period. Parking beneath the viaduct north of S. King Street would be removed before demolition begins. Some parking near the existing viaduct may be reinstated after the completion of the waterfront promenade and the new Alaskan Way surface street, but the quantity and timing of this reinstatement is currently unknown.

6.2.6 Battery Street Tunnel Decommissioning

The current proposal for decommissioning the Battery Street Tunnel would entail filling it with crushed concrete debris from the viaduct demolition. Material would be trucked into and out of the Battery Street Tunnel to fill it, which could increase noise and dust around the south portal of the Battery Street Tunnel. Effects on businesses are expected to be limited to temporary disruptions.

6.2.7 Concurrent Construction

Construction effects of the Program elements associated with the Bored Tunnel Alternative that would be constructed concurrently with the Bored Tunnel Alternative are discussed in the following subsections.

Alaskan Way Surface Street Improvements – S. King Street to Pike Street

The new Alaskan Way surface street would be six lanes wide between S. King and Columbia Streets (not including turn lanes), transitioning to four lanes between Marion and Pike Streets. Generally, the new Alaskan Way surface street would be located on the east side of the right-of-way where the viaduct is located today. The new street would include sidewalks, bicycle facilities, parking/loading zones, and signalized pedestrian crossings at cross streets. The new surface street would be a regional truck route that provides regional access to the Duwamish/ Harbor Island/SR 519 area, as well as connections to the BINMIC.

Pedestrian crosswalks would be present at every intersection to provide pedestrian access to the central waterfront, similar to today. Because it is likely that the new Alaskan Way surface street would be constructed in phases, not all vehicle and pedestrian access would be blocked at any given time.

Construction of the Alaskan Way surface street improvements would result in the following temporary effects:

- Increased noise, dust, and traffic congestion in the general areas where construction would occur
- Temporary lane restrictions and loss of on-street parking and freight loading zones
- Reconfigured access to businesses and restaurants abutting the construction areas

The Alaskan Way surface street improvements would occur after the demolition of the existing viaduct. Temporary traffic detours would affect freight traffic that cannot use the new SR 99 infrastructure due to restrictions on the transport of hazardous materials. This freight traffic would rely on the surface street network along the central waterfront and through downtown.

Comparable to the expenditure of construction funds for the Bored Tunnel Alternative described in Section 6.1.1, this capital improvement project would have similar multiplier effects on the regional economy. However, the magnitude of the effects would be less due to the smaller size of this project relative to the Bored Tunnel Alternative.

Elliott/Western Connector – Pike Street to Battery Street

The new roadway connecting the Alaskan Way surface street to Elliott and Western Avenues would be four lanes wide and would provide a grade-separated crossing of the BNSF Railway mainline tracks. The new roadway would include bicycle and pedestrian facilities. The Lenora Street pedestrian bridge is expected to remain as it is today. Where the bridge terminates on its east side, modifications would be made to provide an at-grade pedestrian crossing on Elliott Avenue.

The Elliott/Western Connector would provide a new connection from Pike Street to Battery Street. Currently, SR 99 enters the south portal of the Battery Street Tunnel at First Avenue and Battery Street. There is a southbound off-ramp from SR 99 to Battery Street and a northbound off-ramp to Western Avenue. The new connector would provide both north- and southbound local street access to Pike Street and Lenora Street and become reintegrated with the street grid at Bell Street. Southbound traffic would use Elliott Avenue and the new Elliott/Western Connector to Alaskan Way. The Elliott/Western Connector would improve local street connections and serve as an alternative route for traffic traveling to and from the Ballard/Interbay area.

This improved connection would also benefit truck freight, because some freight traffic would likely use the new Alaskan Way surface street for regional and local transport, as well as for industrial transportation to and from the BINMIC. Furthermore, the connector would provide an overpass of the BNSF Railway tracks, which currently disrupt east-west travel to and from Alaskan Way.

Construction of the Elliott/Western Connector would result in the following temporary effects:

- Increased noise, dust, and traffic congestion in the general construction areas
- Potential difficulties associated with surface street access to the Port of Seattle if a detour is implemented on Alaskan Way

Temporary traffic detours would affect freight traffic that cannot use the new SR 99 infrastructure due to restrictions on the transport of hazardous materials. Freight traffic would rely on the surface street network along the central waterfront and through downtown.

This capital improvement project would have multiplier effects on the regional economy that are comparable to the expenditure of construction funds described in Section 6.1.1. However, the magnitude of the effects would be less due to the smaller size of this project relative to the Bored Tunnel Alternative.

Mercer Street West Corridor Project – Fifth Avenue N. to Elliott Avenue

The Mercer Street West Corridor Project would be implemented under any of the three build alternatives. Mercer Street would be restriped and signalized between Fifth Avenue N. and Second Avenue W. to create a two-way street with turn pockets. The improvements would also include the restriping and resignalization necessary to convert Roy Street to two-way operations from Fifth Avenue N. to Queen Anne Avenue N. The Mercer Street route is being considered by the City for designation as a regional truck route to provide freight connections to the BINMIC.

Construction of the Mercer Street west corridor improvements would result in the following temporary effects:

- Increased noise, dust, and traffic congestion in the general areas where construction would occur
- Temporary lane restrictions and loss of on-street parking and freight loading zones
- Reconfigured access to businesses and restaurants abutting the construction areas

This capital improvement project would have multiplier effects on the regional economy that are comparable to the expenditure of construction funds described in Section 6.1.1. However, the magnitude of the effects would be less due to the smaller size of this project relative to the Bored Tunnel Alternative.

Elliott Bay Seawall Project

The Elliott Bay Seawall needs to be replaced to protect the shoreline along Elliott Bay, including Alaskan Way. It is at risk of failure due to seismic and storm events. The seawall currently extends from S. Washington Street in the south to Pine Street in the north, a distance of about 8,000 feet. The Elliott Bay Seawall Project limits extend from S. Jackson Street in the south to Broad Street in the north (also known as the central seawall).

Construction of the Elliott Bay Seawall Project would result in the following temporary effects:

- Increased noise, dust, and traffic congestion in the general areas where construction would occur
- Temporary traffic detours, along with temporary lane restrictions
- Loss of on-street parking and freight loading zones
- Reconfigured access to businesses and restaurants abutting the construction areas
- Temporary disruption of utility service to the piers while the utilities are being relocated

The presence of heavy construction equipment adjacent to the piers along the central waterfront could have an adverse effect on tourism and result in loss of revenue for businesses on the piers for a relatively short period. These effects could be mitigated by many of the same strategies presented in Section 6.5.

Alaskan Way Promenade/Public Space

A new expanded promenade and public space would be provided to the west of the new Alaskan Way surface street between S. King Street and Pike Street. Between Marion and Pike Streets, this space would be approximately 70 to 80 feet wide. This public space would be designed at a later date. Access to the piers would be provided by service driveways. Other potential open space sites would include a triangular space north of Pike Street and east of Alaskan Way and parcels created by the viaduct removal between Lenora and Battery Streets.

The waterfront promenade would serve Piers 48 through 59, which have various uses such as cruise ship and ferry terminals, restaurants, retail shops, hotels, and regional entertainment such as the Seattle Aquarium. These uses are all tourist and local destinations that would benefit from an investment to make the Seattle waterfront more pedestrian friendly, accessible, and attractive. In all, the waterfront promenade investment would encourage more people to visit Seattle's waterfront, either for the day or overnight. Such activities would result in increased revenue for the shops and restaurants along the promenade.

Construction of the promenade and public space would result in the following temporary effects:

- Increased noise and dust in the general areas where construction would occur
- Reconfigured access to businesses and restaurants abutting the construction areas

This capital improvement project would have multiplier effects on the regional economy that are comparable to the expenditure of construction funds described in Section 6.1.1. However, the magnitude of the effects would be less due to the smaller size of this project relative to the Bored Tunnel Alternative.

First Avenue Streetcar Evaluation

The First Avenue streetcar is currently planned to run between S. Jackson Street and Republican Street along First Avenue and may also link to the existing South Lake Union streetcar or the planned First Hill streetcar line. The maintenance base would likely be at the extension of the South Lake Union streetcar line or at a new maintenance base that would be built as part of the First Hill streetcar line.

This alignment would lie within several of Seattle's densest neighborhoods, including Pioneer Square, Seattle's commercial core, Belltown, and Uptown. In addition, there are many tourist and regional attractions along the alignment, such as Pike Place Market, the Seattle waterfront piers, the Seattle Art Museum, the Seattle Aquarium, and the Olympic Sculpture Park. Furthermore, the alignment would provide additional transit service to the Financial District within the Seattle CBD. The increased circulation provided by the First Avenue streetcar could boost economic conditions along the alignment by attracting more people to businesses in the area. Public transportation investment flows through all sectors of the economy, and the economic stimulus realized from the investment exceeds the original investment (APTA 2003).

Construction associated with the First Avenue streetcar would result in the following temporary effects:

- Increased noise, dust, and traffic congestion in the general areas where construction would occur
- Relocation of water and electrical utilities before the streetcar construction
- Temporary lane restrictions and loss of on-street parking and freight loading zones
- Reconfigured access to businesses and restaurants abutting the construction areas

This capital improvement project would have multiplier effects on the regional economy comparable to the expenditure of construction funds described in Section 6.1.1. However, the magnitude of the effects would be less due to the smaller size of this project relative to the Bored Tunnel Alternative. This project has the potential for greater net economic effects because of its potential to receive a larger portion of total construction costs from federal funds.

Transit Enhancements

A variety of transit enhancements would be provided to support planned transportation improvements associated with the Program and accommodate future demand. These include (1) the Delridge RapidRide line, (2) additional service hours on the West Seattle and Ballard RapidRide lines, (3) peak-hour express routes added to South Lake Union and Uptown, (4) local bus changes (such as realignments and a few additions) to several West Seattle and northwest Seattle routes, (5) transit priority on S. Main and/or S. Washington Streets between Alaskan Way and Third Avenue, and (6) simplification of the electric trolley system. RapidRide transit along the Aurora Avenue corridor would also be provided.

Development of the specific improvements is underway and is described in Appendix C, Transportation Discipline Report. Since about 31 percent[10] of all downtown workers rely on the bus to get to work, the transit boost would promote more bus ridership, resulting in less congested and safer project detour routes and city streets during construction. Furthermore, many of the additional post-construction trips to and from downtown would be accommodated by transit.

The effects of enhanced transit service could include increased noise from buses along enhanced bus routes. Any adverse effects of enhanced transit service could be offset by the increase in potential customers traveling through these corridors and patronizing local businesses.

6.3 Cut-and-Cover Tunnel Alternative

Businesses adjacent to the construction associated with the Cut-and-Cover Tunnel Alternative would experience increased noise, dust, and vibrations associated with the tunnel excavation and street improvements.

6.3.1 General Effects of the Cut-and-Cover Tunnel Alternative

Temporary Economic Effects on Businesses and Neighborhoods Due to Disruption

Existing businesses within one block of the existing SR 99 alignment would experience temporary effects more severe than those noted for the Bored Tunnel Alternative. The temporary effects would take place over a longer period of time because of the demolition of the existing viaduct and construction of SR 99 in the cut-and-cover tunnel.

Construction of the Cut-and-Cover Tunnel Alternative would take place over a time period of 105 months (8.75 years). Although the temporary construction effects would be experienced throughout this period, they would be most notable for the surrounding businesses and neighborhoods along the alignment between S. Spokane Street and Denny Way during the 27-month (2.25-year) complete closure of SR 99 and the Alaskan Way surface street to vehicle traffic. Access to the central waterfront businesses would be provided throughout construction.

Up to about 160 active commercial and industrial buildings that are not candidates for acquisition under the Cut-and-Cover Tunnel Alternative are located within 50 feet of the existing viaduct. Many of these buildings in the central survey area covered by the inventory of businesses are occupied by multiple businesses. The period of active disruption in front of any one building

[10] Based on 2005 existing conditions; the share is probably larger due to ridership growth up to 2009.

is estimated to be the duration of the cut-and-cover tunnel construction, which is 105 months (8.75 years).

Without proper planning and implementation of mitigation, the construction-related effects could adversely affect the comfort and daily life of residents and inconvenience or disrupt the flow of customers, employees, and materials and supplies to and from these businesses. Mitigation of the construction effects would be integrated into the project mitigation measures.

Temporary Changes in Vehicle Through-Traffic on SR 99

There would be six traffic stages over the 105-month construction period of the Cut-and-Cover Tunnel Alternative. For an extensive description of the traffic stages and their effects, see Chapter 6 of Appendix C, Transportation Discipline Report.

Traffic restrictions associated with the Cut-and-Cover Tunnel Alternative may include complete closure of SR 99 for about 27 months for construction of the cut-and-cover tunnel, as well as intermittent lane restrictions or surface street closures and periods of slower travel speeds on SR 99 and surface streets for the duration of construction (105 months). The Alaskan Way surface street would be closed for about 51 months, with additional lane restrictions for another 12 months. These roadway closures and lane restriction would affect traffic and transit travel times and throughput within the project area. During project construction, traffic congestion would increase compared to existing conditions and could affect the timeliness of business deliveries that rely on SR 99 for the transport of goods. Complete closure of SR 99 would take place during the 2017 and 2018 holiday season from Thanksgiving to New Year's Day, which would have effects on businesses and holiday travel.

Economic Effects on Ferries and Cruise Ships

The Cut-and-Cover Tunnel Alternative would include the construction of a temporary over-water ferry access bridge from Pier 48 to Colman Dock (between S. Washington Street and Yesler Way). The temporary ferry access bridge would be needed for the Cut-and-Cover Tunnel Alternative and the Elevated Structures Alternative during construction to maintain access and egress for ferry operations. Once project construction is completed, this over-water bridge would be removed. The temporary ferry access bridge would not preclude the Washington State Ferries' planned expansion of Colman Dock and would accommodate a range of potential terminal modification or expansion plans, while not requiring any of these improvements to be built before the viaduct and seawall replacement. The temporary ferry access bridge could accommodate the existing or expanded (1,000- to 1,300-car capacity) Colman Dock. Under both the

Cut-and-Cover Tunnel Alternative and the Elevated Structure Alternative, this over-water crossing would connect to a relocated ferry holding area east of SR 99.

Vehicles would be able to enter the relocated ferry holding area from Yesler Way and egress would be provided at Yesler Way and Marion Street. Pedestrian access would be maintained during construction. Pedestrian bridges from the Seattle Ferry Terminal at Colman Dock to downtown Seattle would be reconstructed at Marion Street, with a second pedestrian bridge potentially added at Madison Street (although this may change as the Washington State Ferries continues the planning process for the Seattle Ferry Terminal Project).

It is expected that the temporary ferry access road would be constructed as part of the preliminary site preparation activities, before any major viaduct and seawall replacement construction and demolition.

Motorists traveling to and from Colman Dock may experience delays due to a reduced number of lanes. Although pedestrian access to Colman Dock may be rerouted at times, it would be maintained throughout construction.

For the cruise ship terminals, pedestrian access would be maintained, and roadway access on the Alaskan Way surface street would always be provided with one lane in each direction. Locations for pedestrian access and bus and taxi pickups would likely vary throughout construction to accommodate construction activities.

Economic Effects of the Potential Loss of Available Parking

In the entire study area, the maximum number of parking spaces that would be affected at one time during construction and/or demolition of the existing viaduct would be about 1,320 on-street spaces and about 480 off-street spaces, for a total of up to about 1,800. All parking spaces would be affected from the first construction traffic stage of the Cut-and-Cover Tunnel Alternative through the last stage, for a total of 8.75 years. These parking spaces include a mix of short-term on-street (paid), long-term on-street, and off-street spaces. The existing spaces are broken down geographically as follows:

- **South segment.** During construction in the south segment, approximately 460 total spaces would be affected, 50 of which would be off-street parking. Of the affected on-street spaces, 350 are short-term and 60 are long-term. This would result in the annual loss of approximately $885,500 in parking revenue for the City during the duration of construction (8.75 years).
- **Central segment.** During construction in the central segment, approximately 620 total spaces would be affected, 110 of which would be off-street parking. The other 510 affected spaces would be short-term

on-street parking. This would result in the annual loss of approximately $3.4 million in parking revenue for the City during the duration of construction (8.75 years).

- **North segment.** During construction in the north segment, approximately 720 total spaces would be affected, 320 of which would be off-street parking. Of the 400 affected on-street spaces, 230 would be short-term and 170 would be long-term. This would result in the annual loss of approximately $200,000 in parking revenue for the City during the duration of construction (8.75 years).

The loss of approximately 1,090 short-term parking spaces represents about 15 percent of the short-term parking available within the Seattle CBD. The loss of 480 off-street parking spaces represents 1.8 percent of the long-term parking available within the Seattle CBD. The *2006 Parking Inventory for the Central Puget Sound Region* (PSRC 2007) indicates that the parking occupancy rate for off-street parking in the Seattle CBD was 70.1 percent in 2006.

The economic effects of the loss of parking spaces and on-street parking revenue would be similar to those described for the Bored Tunnel Alternative; the difference would be the duration of construction, which would be 3.25 years longer for the Cut-and-Cover Tunnel Alternative. This would extend the period during which short-term parking would be difficult to find.

Construction Effects and Benefits – Cost of Congestion

As described in Section 4.6, the cost of congestion is typically measured in time or dollars and has the potential to affect travelers, businesses, and the regional economy. The existing viaduct and the Battery Street Tunnel would be closed for about 27 months during the project-related construction. In addition, there would be various lane restrictions on surface street or periodic closures and reduced speeds. Although detour routes would be available throughout project construction, the disruption of travel speeds and traffic flow would contribute to the existing congestion in the area. The increased level of congestion associated with the 27-month closure of SR 99 and the Alaskan Way surface street would likely result in a substantial deterioration of the urban area congestion conditions described in Section 4.6.

Construction Effects – Staging Areas

Similar to the Bored Tunnel Alternative, numerous staging areas would be located throughout the project area to support the construction of the Cut-and-Cover Tunnel Alternative. The staging areas are described in Appendix B, Alternatives Description and Construction Methods Discipline Report. Increased truck traffic to and from these staging areas is expected, predominantly on truck routes. Under the Cut-and-Cover Tunnel Alternative, debris extracted during the

tunnel excavation would be transported to an off-site disposal site. Debris from the demolition of the viaduct structure would also be hauled away for disposal because, unlike the debris resulting from the Bored Tunnel Alternative, it would not be compacted and used as backfill for the Battery Street Tunnel.

6.3.2 South – S. Royal Brougham Way to S. Dearborn Street

Under the Cut-and-Cover Tunnel Alternative, temporary construction effects in the south segment would be similar to those described for the Bored Tunnel Alternative in the south segment. The WOSCA detour would be used during the first 39 months (3.25 years). During the last 9 months of its use, the western northbound off-ramp would be closed; travelers who previously exited SR 99 in the area would need to use the ramp before or after this exit ramp.

The Cut-and-Cover Tunnel Alternative would maintain First Avenue S. at nearly full capacity throughout construction. However, the Alaskan Way surface street in the south segment would be reduced to one lane in each direction throughout construction, with complete closure for 51 months (4.25 years). The closure of the Alaskan Way surface street to through traffic, together with the presence of construction materials, equipment, and activities, would make access to businesses along the corridor difficult and would inhibit pedestrian use of the Alaskan Way surface street. These traffic effects could result in indirect economic effects on businesses along the corridor by decreasing the number of customers willing to patronize them.

6.3.3 Central – S. Dearborn Street Through Battery Street Tunnel

The lane reductions and closure of the Alaskan Way surface street described for the south segment would extend north to Pike Street. Pedestrian and vehicle access to the central waterfront businesses would be provided, but the closure of the Alaskan Way surface street to north-south traffic, together with the presence of construction materials, equipment, and activities, would make access to businesses along the corridor very difficult and would inhibit pedestrian use of the Alaskan Way surface street. These traffic effects could result in indirect economic effects on businesses along the corridor by decreasing the number of customers willing to patronize them.

The immediate corridor would also have to absorb the haul trucks associated with excavation of the stacked tunnel (estimated at 1 million cubic yards of material) and the haul trucks associated with the delivery of equipment and materials for the tunnel construction. This level of activity would affect all businesses along the construction corridor; however, the severity of the effects would be felt most by businesses on the central waterfront piers.

The freight traffic between industrial centers would also be displaced from the immediate corridor and would likely use north-south streets paralleling the immediate corridor through the Seattle CBD. Travel on these alternative routes may add to the cost of congestion due to delays in freight delivery.

Battery Street Tunnel

During the construction period of the Cut-and-Cover Tunnel Alternative, the south and north portals of the Battery Street Tunnel would be rebuilt, including the north and south maintenance buildings; the tunnel would also be improved to incorporate fire, life, and safety system upgrades. Construction of these improvements would result in localized temporary effects on businesses and pedestrian and vehicle traffic similar to those described in Section 6.2.4 for the north portal of the bored tunnel under the Bored Tunnel Alternative.

6.3.4 North – Denny Way to Aloha Street

Construction in the north segment would last approximately 5 years. Businesses adjacent to the project construction would experience increased noise, dust, and vibrations associated with the SR 99 and local street improvements. Also, vehicle and pedestrian access to businesses adjacent to the construction would require rerouting (Appendix C, Transportation Discipline Report).

Trucks accessing streets affected by construction would be subject to the same traffic delays that general-purpose vehicles would experience. Public parking would not be available on streets throughout the designated construction zone, preventing the unrestricted use of curbside lanes for truck parking and loading or unloading. Alternatively, trucks would have to park nearby on side streets.

Mercer Street would be widened between Dexter Avenue and Fifth Avenue, and the detours associated with the closing and backfilling of Broad Street would be in effect. As with the other project construction, adjacent businesses would experience increased noise, dust, vibrations, and potential disruption to direct access associated with local street improvements.

Because of the duration of the construction, as well as the loss of short-term parking and access disruptions, the economic environment for the businesses adjacent to the construction would be adversely affected. Some of these businesses may suffer little or no adverse effect, whereas others may experience a noticeable decline in sales, increase in costs, and/or decrease in efficiency.

6.4 Elevated Structure Alternative

Businesses adjacent to the construction associated with the Elevated Structure Alternative would experience increased noise, dust, and vibrations associated with the construction of the new elevated structure and street improvements.

6.4.1 General Effects of Elevated Structure Alternative

Temporary Economic Effects on Businesses and Neighborhoods Due to Disruption

Existing businesses within one block of the existing SR 99 alignment would experience temporary effects more severe than those noted for the Bored Tunnel Alternative. The temporary effects would take place over a longer period of time because the duration of demolition and construction for the Elevated Structure Alternative would be longer than that of the other build alternatives.

Construction of the Elevated Structure Alternative would take place over 120 months (10 years). SR 99 would be closed to vehicle traffic for up to 4 months. As many as about 160 active commercial and industrial buildings that are not candidates for acquisition under the Elevated Structure Alternative are located within 50 feet of the existing viaduct. Many of these buildings in the central survey area covered by the inventory of businesses are occupied by multiple businesses. The period of active disruption in front of any one building has the potential to be the entire duration of construction (10 years). Disruptions could be caused by utility relocations before the viaduct demolition/construction, loss of use of loading areas beneath the viaduct, and loss of private parking areas beneath the viaduct. Some of these businesses may suffer little or no adverse effect, whereas others may experience a noticeable decline in sales, increase in costs, and/or decrease in efficiency.

Temporary Changes in Vehicle Through-Traffic on SR 99

There would be eight traffic stages over the 120-month construction period of the Elevated Structure Alternative. For an extensive description of the traffic stages and their effects, see Chapter 6 of Appendix C, Transportation Discipline Report.

Transit and traffic travel times and throughput within the project area would be affected by the closure of SR 99 for up to 4 months to demolish the upper level of the existing viaduct (S. King Street to Pike Street) and the reduction of Alaskan Way surface street to one lane for the duration of construction. Furthermore, other intermittent lane restrictions or surface street closures and periods of slower travel speeds on SR 99 and surface streets would contribute to reduced roadway service. During the infrastructure construction, traffic congestion would be increased compared to existing conditions and could affect the timeliness of business deliveries that rely on SR 99 for the transport of goods. To reduce the effects on businesses and holiday travel, closures of SR 99 would not be implemented during the established annual construction moratorium between Thanksgiving and New Year's Day.

Economic Effects on Ferries and Cruise Ships

Under the Elevated Structure Alternative, the effects on ferries and cruise ships would be similar to those described for the Cut-and-Cover Tunnel Alternative in Section 6.3.1.

Economic Effects of the Potential Loss of Available Parking

In the entire study area, the maximum number of parking spaces that would be affected at one time during construction and/or demolition of the existing viaduct would be about 1,280 on-street and about 740 off-street, for a total of about 2,020 spaces. All parking spaces would be affected from the first construction traffic stage through the last stage, for a total of 10 years. These spaces include a mix of short-term on-street (paid), long-term on-street, and off-street spaces. The existing spaces are broken down geographically as follows:

- **South segment.** During construction in the south segment, the Elevated Structure Alternative would have the same temporary effects on parking as those described for the Cut-and-Cover Tunnel Alternative in the south segment in Section 6.3.1.
- **Central segment.** During construction in the central segment, approximately 620 total spaces would be affected, 110 of which would be off-street parking. The other 510 affected spaces would be on-street parking. This would result in the annual loss of approximately $3.4 million (same as the Cut-and-Cover Tunnel Alternative) in parking revenue for the City during the duration of construction (10 years).
- **North segment.** During construction in the north segment, the Elevated Structure Alternative would have the same temporary effects on parking as those described for the Cut-and-Cover Tunnel Alternative in the north segment in Section 6.3.1.

The loss of approximately 1,090 on-street short-term parking spaces represents about 15 percent of the on-street parking available within the Seattle CBD. The loss of 610 off-street parking spaces represents 2.3 percent of the long-term parking available within the Seattle CBD. The *2006 Parking Inventory for the Central Puget Sound Region* (PSRC 2007) indicates that the parking occupancy rate for off-street parking in the Seattle CBD was 70.1 percent in 2006.

The economic effects of the loss of parking spaces and on-street parking revenue would be similar to those described for the Bored Tunnel Alternative; the difference would be the duration of construction, which would be 4.5 years longer for the Elevated Structure Alternative. This would extend the period during which short-term parking would be difficult to find.

Construction Effects and Benefits – Cost of Congestion

As described in Section 4.6, the cost of congestion is typically measured in time or dollars and has the potential to affect travelers, businesses, and the regional economy. The existing viaduct and Battery Street Tunnel would be open during most of the project-related construction, except for a period of up to 4 months to demolish the upper level of the existing viaduct. In addition, there would be various lane restrictions on surface street or periodic closures and reduced speeds. Although detour routes would be available throughout project construction, the disruption of travel speeds and traffic flow would contribute to the existing congestion in the area. However, the congestion associated with the construction of the Elevated Structure Alternative is not expected to contribute substantially to the urban area congestion conditions described in Section 4.6.

Construction Effects – Staging Areas

Similar to the Bored Tunnel Alternative, numerous staging areas would be located throughout the project area to support construction of the Elevated Structure Alternative. The staging areas are described in Section 3.1 of Appendix B, Alternatives Description and Construction Methods Discipline Report. Increased truck traffic to and from these staging areas is expected, predominantly on truck routes.

6.4.2 South Segment – S. Royal Brougham Way to S. Dearborn Street

With the Elevated Structure Alternative, temporary construction effects in the south segment would be similar to those described for the Bored Tunnel Alternative in the south portal area (Section 6.2.2). The WOSCA detour would be used throughout the construction period.

However, the Alaskan Way surface street in the south segment would be reduced to one lane in each direction throughout construction of the Elevated Structure Alternative.

The Elevated Structure Alternative would not have to address the excavation needs or vibrations associated with the Bored Tunnel Alternative, which are described in Section 6.2.2. However, businesses adjacent to the project construction would experience increased noise, dust, and vibrations associated with the construction of street improvements. As the project develops and plans for construction methods become more defined, strategies would be developed to ensure local connectivity and access to buildings and businesses by pedestrians, bicyclists, motorists, and movers of freight. In addition, methods would be developed to provide access to public facilities and utilities that are not relocated before construction.

6.4.3 Central Segment – S. Dearborn Street Through Battery Street Tunnel

Under the Elevated Structure Alternative, SR 99 traffic would convey two lanes in each direction, except for a 4-month complete closure in Traffic Stage 4 to demolish the upper level of the existing viaduct. The Alaskan Way surface street would be reduced to one lane in each direction during the entire construction period. East-west access across the Alaskan Way surface street to central waterfront businesses would be maintained.

The 4-month closure of SR 99 would force traffic to use the existing surface street network. This could result in economic effects in the project area as a result of increased traffic and congestion on these streets. The potential economic effects would be less severe than those described for the Cut-and-Cover Tunnel Alternative due to the shorter duration of the SR 99 closure. Businesses would likely be able to accommodate a 4-month complete closure of SR 99 more readily than a 27-month complete closure. The economic effect of a 4-month closure could be absorbed within 1 fiscal year and would potentially allow businesses to rebound within a single fiscal year. A 27-month SR 99 closure would affect businesses for about 2.5 consecutive fiscal years; few businesses that rely on SR 99 to transport freight or to provide convenient customer access would be able to sustain this duration of diminished productivity.

Battery Street Tunnel

The Broad Street detour would be constructed between Aurora Avenue and the Alaskan Way surface street along Broad Street and then south along the Alaskan Way surface street almost to Union Street, where the detour would join the lower level of SR 99. The Broad Street detour would allow traffic to be diverted from the immediate corridor to allow the lowering of the Battery Street Tunnel. During construction of the detour, which would require about 9 months, businesses along Broad Street would experience construction noise, dust, and possibly vibrations. Once the detour is in place, the businesses along Broad Street would experience increased traffic on SR 99 consisting of vehicles diverted from the Battery Street Tunnel.

6.4.4 North Segment – Denny Way to Aloha Street

The duration of construction in the north segment would be 55 months (4.6 years). Businesses adjacent to the project construction would experience increased noise, dust, and vibrations associated with the street improvements. Also, vehicle and pedestrian access to businesses adjacent to the construction would require rerouting (see Appendix C, Transportation Discipline Report).

Trucks accessing streets affected by the construction would be subject to the same traffic delays that general-purpose vehicles would experience. Public parking

would not be available on streets throughout the designated construction zone, preventing the unrestricted use of curbside lanes for truck parking and loading or unloading. Alternatively, trucks would have to park nearby on side streets.

Similar to the Cut-and-Cover Tunnel Alternative in the north segment, Mercer Street would be widened between Dexter Avenue and Fifth Avenue, and detours would be in place for the closing and backfilling of Broad Street. As with the other project construction, adjacent businesses would experience increased noise, dust, vibrations, and potential disruption to direct access associated with local street improvements.

Because of the duration of the construction, as well as the loss of short-term parking and access disruptions, the economic environment for the businesses adjacent to the construction would be adversely affected. Some of these businesses may suffer little or no adverse effect, whereas others may experience a noticeable decline in sales, increase in costs, and/or decrease in efficiency.

6.5 Construction Mitigation for the Build Alternatives

A traffic management plan will be developed for the selected alternative to ensure that construction effects on local streets, property owners, and businesses are minimized. For more detailed information on mitigation measures relating to transportation, traffic effects, and parking, see Appendix C, Transportation Discipline Report.

The potential mitigation measures listed in Exhibit 6-4 are intended to offset the effects on the commercial environment for businesses adjacent to the area of direct effects. These measures would maintain access and the general setting for businesses and potential customers that existed before the project-related construction.

For the Cut-and-Cover Tunnel and the Elevated Structure Alternatives, a potential mitigation measure was developed specifically for businesses abutting the project area and for businesses in the manufacturing and industrial centers. This potential measure consists of making business marketing experts available to affected businesses for technical assistance related to operations during potentially disruptive portions of the project.

6.6 Construction Benefits

The primary economic benefit of implementing any of the three build alternatives would be increased employment and economic stimulation for the local economy due to construction activities and demand for construction supplies. This would include the collection of sales tax revenue by local municipalities.

Exhibit 6-4. Potential Mitigation Measures for Economic Effects During Construction

Mitigation Measure	Bored Tunnel Alternative	Cut-and-Cover Tunnel Alternative	Elevated Structure Alternative
Business Assistance			
Minimize obstructions and/or delays along the routes to facilitate access to businesses, homes, cruise ships, ferry terminals, and central waterfront attractions.	X	X	X
Coordinate the construction schedule to avoid major construction activities during prime shopping times and the City's construction moratorium to the extent reasonable and prudent.	X	X	X
Locate temporary construction sheds, barricades, and material storage in areas that avoid or minimize the obstruction of views of area businesses to the extent possible.	X	X	X
Construction Information Outreach			
Provide pedestrian and parking maps in advance of and during construction for businesses (at no cost to the businesses) to mail to clients and vendors.	X	X	X
Provide advance notice of construction activities to adjacent neighbors and businesses based on construction schedules.	X	X	X
Information about construction-related changes needed by businesses: • Provide information about major construction changes, such as viaduct closures, ramp closures, and major detours at least 30 days in advance of the change. • Consider highway advisory radio for disseminating construction information. • Post changeable message signs before access points for alternate routes that are suitable for freight. • Where appropriate, host stakeholder meetings on topics such as maintenance of traffic or establish community working groups. • Ensure that project staff continues to provide briefings with the latest project information to business organizations.	X	X	X

6.6.2 Construction Expenditures on Sales Tax Revenue

Sales tax would be generated by the purchase of construction-related goods and materials. The estimated amount of sales tax generated by each of the build alternatives is based on the cost of construction materials only. Sales tax estimates were not generated for costs unrelated to construction, such as right-of-way acquisition and engineering.

The Bored Tunnel Alternative, with a total construction cost of $1,788 million, would generate $100 million in sales tax. At $3,372 million in total construction costs, the Cut-and-Cover Tunnel Alternative would generate $197 million in sales tax. The Elevated Structure Alternative would generate $110 million in sales tax based on a total construction cost of $1,831 million.

These sales tax estimates are related only to direct construction expenditures. This analysis did not include an evaluation of the change in sales tax revenue collected by businesses that could be affected by construction activities in the study area.

6.6.3 Temporary Jobs Created During Construction

Construction associated with any one of the build alternatives would create temporary jobs, the duration of which would vary according to the construction plan, which ranges from 5.4 years to 10 years depending on the alternative.

An estimate of the direct labor force needed for construction associated with each of the build alternatives was prepared in August 2010. The estimates were calculated on the basis of the approximate cost for construction contracts, assuming that the average labor rate in 2011 would be $65 per hour.

For all three build alternatives, the average number of jobs directly related to construction would be 450 per year, although up to 480 workers per day could be required during the most intense period of construction. The direct jobs needed to construct the alternatives would generate approximately $60.8 million in direct wages per year.[11]

Assuming that the construction duration for the Bored Tunnel Alternative is approximately 65 months, the total construction labor would be about 2,500 person-year jobs. With an approximate construction duration of 105 months, the total construction labor for the Cut-and-Cover Tunnel Alternative would be about 4,000 person-year jobs. About 4,500 person-year jobs would be

[11] This wage rate is a forecasted escalated rate including all benefits and insurance for a typical tunnel crew and non-manual staffing plan.

created by the Elevated Structure Alternative, the construction duration of which would be approximately 120 months.

Bored Tunnel Alternative

Under the Bored Tunnel Alternative, new demand for construction would generate gross direct effects equal to the capital cost of $1,788 million in construction dollars. The gross multiplied effect on output would total approximately $3,688 million for all industries in the Puget Sound region that are not directly involved in the replacement of the viaduct. Of this amount, $1,089 million would be paid to the 6,598 workers as wage and salary earnings for the jobs generated beyond those directly involved in the replacement of the viaduct. The amount of new indirect and induced earnings (wages) as a result of money entering the Puget Sound economy would be $79 million.

Cut-and-Cover Tunnel Alternative

Under the Cut-and-Cover Tunnel Alternative, new demand for construction would generate gross direct effects equal to the capital cost of $3,372 million in construction dollars. The gross multiplied effect on output would total approximately $6,955 million for all industries in the Puget Sound region that are not directly involved in the replacement of the viaduct. Of this amount, $2,055 million would be paid to the 10,557 workers as wage and salary earnings for the jobs generated beyond those directly involved in the replacement of the viaduct. The amount of new indirect and induced earnings (wages) as a result of money entering the Puget Sound economy would be $82 million.

Elevated Structure Alternative

Under the Elevated Structure Alternative, new demand for construction would generate gross direct effects equal to the capital cost of $1,831 million in construction dollars. The gross multiplied effect on output would total approximately $3,777 million for all industries in the Puget Sound region that are not directly involved in the replacement of the viaduct. Of this amount, $1,116 million would be paid to the 11,876 workers as wage and salary earnings for the jobs generated beyond those directly involved in the replacement of the viaduct. The amount of new indirect and induced earnings (wages) as a result of money entering the Puget Sound economy would be $78 million.

Summary of Benefits for Employment

Compared with the existing conditions, the employment associated with construction of any of the three build alternatives would result in additional (gross) employment throughout all economic sectors within the Puget Sound region and the state. This gross employment was derived from the multiplication effects of the capital expenditures for the project. Examples of capital

expenditures include direct hire of temporary construction workers, purchase of construction materials and equipment, and expenditure of capital funds to acquire new rights-of-way.

The number of new jobs directly associated with the Bored Tunnel Alternative that would be the result of new money entering the Puget Sound regional economy is 583 jobs, and new money would constitute 7 percent of the overall construction costs (see Exhibit 6-2). Under the Cut-and-Cover Tunnel Alternative, about 4 percent of the overall construction cost would be funded by new money entering the Puget Sound regional economy; 481 new jobs would be directly associated with this alternative. The number of new jobs directly associated with the Elevated Structure Alternative due to new money entering the Puget Sound regional economy would be 930, because new money would constitute 7 percent of the overall construction cost. All other funding would come from the state or the Puget Sound region and would likely be spent in the local/state economy even without this project.

6.6.4 Surplus Parcels

After construction of the project (and Program elements for the Bored Tunnel Alternative), WSDOT or the City could sell as surplus property the fully or partially acquired parcels that are not part of the permanent roadway right-of-way, returning them to private ownership. Parcels returned to private ownership would pay property taxes and could provide opportunities as replacement properties for displaced businesses, allowing owners to remain in the community. Some remnant parcels, however, may not be sold and redeveloped after construction because of potential access constraints resulting from the proposed roadway changes under any of the three build alternatives.

Chapter 7 TOLLING

7.1 Description of Tolling

Tolling the SR 99 facility represents an additional source of funding for the Alaskan Way Viaduct Replacement Project other than those identified in Exhibit 6-2. Tolling is considered a local source of funds and would not increase the net economic effects of this project as described in Section 6.1. The funds generated by tolling are expected to pay back some of the state funds that would be used for construction. Project construction for tolled facilities is typically financed by bonds that are backed by future toll revenues. Tolling the SR 99 facility would allow the state to sell bonds to fund a portion of the construction, and the bonds would be paid back by the collection of tolls over the operational life of the facility. If the SR 99 facility is not tolled, the state would not be able to recoup any of the capital cost from the direct users of the facility. The non-tolled condition for the build alternatives would place a higher burden on the state to use gas tax and other state funds on the project, rather than using the funds for other projects in the state.

7.2 Build Alternatives With Tolling

All three build alternatives would be subject to tolling. Because the Bored Tunnel Alternative would have the earliest day of opening of all three build alternatives, the Bored Tunnel Alternative could begin collecting tolls sooner than the other two alternatives. This would allow the state to begin earlier repayment of the financing bonds for the Bored Tunnel Alternative compared to the other two alternatives.

If the SR 99 facility is tolled, most tolls are expected to be paid by the residents of the Seattle and King County who routinely use the existing viaduct. Although some non-local traffic uses the existing viaduct and would be expected to use the new facilities, this contribution of non-local funds to the toll revenue is considered quite small compared to the revenue that would be generated by local traffic. Trucks carrying hazardous cargo would not be able to use the facility constructed by either of the tunnel alternatives; therefore, they would not be paying tolls under these alternatives.

Under tolled conditions for each of the build alternatives, the potential traffic diversion resulting from motorists seeking to avoid the toll facilities would have an effect on the traffic patterns and volumes on the local Seattle street network as presented in Appendix C, Transportation Discipline Report. The increase in congestion as a result of traffic diversion would in turn increase the cost of congestion as compared to the non-tolled condition for each of the build alternatives. The increase in congestion would also adversely affect the movement of freight due to the increased travel times, especially during the PM peak period of traffic.

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ATTACHMENT A

RIMS II Detailed Model Analysis for Construction Effects

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RIMS ll Detailed Model Analysis for Construction Effects

Regional Economic Activity

Construction of any of the three build alternatives for the Alaskan Way Viaduct Replacement Project (project) would result in significant regional and state economic effects compared to the Viaduct Closed (No Build Alternative). This analysis was performed to assess the likely overall economic effects that would be attributed to construction, as measured by increases in regional and state economic activity, employment, and associated job earnings.

Terminology and Methods

To analyze the economic effects of the project capital investment, it is necessary to examine the economic reactions that result from an increase in the demand for construction goods and services. Economists use input-output models to analyze how changes in the production of a specific firm or industry alter the flow of funds into and out of all other industries, as well as households. Input-output analysis facilitates the calculation of multipliers by tracing how production in one economic sector consumes the output of other sectors as production inputs and how each of these other sectors in turn influences the demand for the output of yet other sectors. These multipliers provide a quantitative estimate of changes in economic activity, employment, and job earnings within the local economy (state or region) that are compounded from initial new expenditures.

The following terms are used to describe how project construction would lead to multiplied economic effects on the economies of the central Puget Sound region and the state of Washington.

- Direct effects: The increases in demand for roadway construction and related materials and services within a defined regional or state economy resulting from the project. Direct effects are usually measured as construction expenditures but also can be expressed as the number of new construction jobs or job earnings.
- Indirect effects: The sum of all interfirm and interindustry transactions that filter through the regional or state economy as a result of the purchase of material and labor inputs by the firms directly affected in the course of producing their construction-related output.
- Induced effects: The increases in household consumption of goods and services of all firms within the regional or state economy by the workers who receive additional earnings resulting from either the direct or indirect effects of construction.

- Total effects: The sum of the direct, indirect, and induced economic effects as measured by the overall increase in economic activity, employment, and/or earnings within the regional or state economy. Total effects are also referred to as the *total multiplied effects*, where the multiplier is the factor ratio of total to direct effects.
- Gross effects: The economic effects of total project expenditures—in terms of direct, indirect, and induced effects—before assessing what proportion of those expenditures and subsequent effects would likely have still occurred in some other manner in the absence of the project that is being evaluated.
- Net or "new money" effects: Only those economic effects—in terms of direct, indirect, and induced effects—attributable to funds that are uniquely available for expenditure on the subject project. These funds would otherwise not enter the regional or state economy. Economists tend to emphasize the net or new-money effects as more accurate measures of the true increases in output, employment, and earnings.

Construction expenditures would occur over a number of years, directly creating new demand for construction materials and labor inputs. These direct effects would then lead to indirect effects as the production of output by firms in other industries increases to meet the demand for inputs to the construction industry. Both the direct and indirect effects of construction expenditures cause firms in all industries to employ more workers to meet the increases in demand; this leads to induced effects as the additional wages and salaries paid to workers results in increased consumer spending.

The economic effects at the regional and state levels due to the influx of capital construction funds are quantified as direct and indirect effects. The direct and indirect effects are calculated using multipliers provided by the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II) for the central Puget Sound region and the state of Washington. The central Puget Sound region is defined as King, Pierce, and Snohomish Counties. The detailed application of these RIMS II multipliers is described below.

Economic Effects

For purposes of assessing the economic effects on output, earnings, and employment, the focus is placed on the project capital costs (construction and right-of-way acquisition) for each of the build alternatives as an accurate measure of the likely capital investment that would be made if the alternative is implemented. It is assumed that no project capital costs would be incurred with the Viaduct Closed (No Build Alternative) (Scenario 1 only).

The estimated project capital costs (Exhibits A-1 and A-2) are based on possible ranges of construction and right-of-way costs based on overall risk. The process used to estimate project costs and durations for this project is called the Cost Estimate Validation Process (CEVP®). The cost estimates in this attachment represent the 90th percentile of costs calculated by means of the CEVP. This means that 90 percent of the time, a construction activity would cost the same as or less than the estimated cost. The most recent CEVP review of the Bored Tunnel Alternative occurred in September 2010. CEVP reviews for the Cut-and-Cover Tunnel Alternative and the Elevated Structure Alternative were performed in 2006 and were escalated to the midpoint of construction (2014 for the Cut-and-Cover Tunnel Alternative and 2013 for the Elevated Structure Alternative) for this analysis.

Exhibit A-1. Capital Costs and Funding Sources of the Build Alternatives

Alternative	Capital Cost Estimate ($ millions)	Funding Source ($ millions and share)	
		Federal Committed	State Committed
Bored Tunnel Alternative	1,960	130 (7.0%)	1,830 (93%)
Cut-and-Cover Tunnel Alternative	3,518	130 (4.0%)	3,388 (96%)
Elevated Structure Alternative	1,971	130 (7.0%)	1,841 (93%)

Exhibit A-2. Total Project Costs of the Build Alternatives

Alternative	Total Project Cost Estimate ($ millions)	Project Cost Expenditure Category ($ millions and share)	
		Right-of-Way Acquisition	Construction Cost[1, 2]
Bored Tunnel Alternative	1,960	172 (8.8%)	1,788 (91.2%)
Cut-and-Cover Tunnel Alternative	3,518	146 (4.2%)	3,372 (95.8%)
Elevated Structure Alternative	1,971	140 (7.1%)	1,831 (92.9%)

[1] The sales tax portion of the construction cost for each of the build alternative is estimated to be the following: $100 million for the Bored Tunnel Alternative; $197 million for the Cut-and-Cover Tunnel Alternative; and $110 million for the Elevated Structure Alternative.
[2] Construction cost includes the cost of preliminary engineering.

The project capital cost estimates, distribution of funding sources, and regional and state new-money estimates for each build alternative are indicated in Exhibit A-1. The distribution of funding sources, which was developed by the design team, is the list of potential funding mechanisms currently available. Percentage shares of

the capital cost estimates are also provided. For the purpose of examining the regional economic effects, all of the federal earmark grants and federal general funding sources are assumed to be new money that would otherwise not be spent either in the region or in the state in the absence of the project. All state, regional, and city funds are assumed to be expended with or without this project and are not considered to be new money. All state, regional, and city funding sources, including local improvement district taxes, are tax-based funding from local and/or state residents or property owners specifically earmarked for transportation projects within the region or the state. The difference between the capital cost and new-money net direct effect is assumed to be expended with or without the project, thereby qualifying the difference only as a gross effect.

Application of RIMS II Multipliers

Three classes of RIMS II final demand multipliers and one class of direct effect multipliers were used to estimate the gross and net effects:

1. Final demand output multipliers translate the initial project capital expenditures (demand) for construction outputs into the total multiplied effect on the demand for output of all firms/industries (in dollars) within the regional and state economies.
2. Final demand earnings multipliers translate the same direct project expenditures into the total multiplied effect on wage and salary earnings within the regional and state economies.
3. Final demand employment multipliers convert project expenditures into the total multiplied effect on employment within the regional and state economies, expressed in person-year jobs. This is generally used when there is no estimate of direct employment available.
4. Direct effect employment multipliers translate direct employment into the total multiplied effect on employment within the regional and state economies, expressed in person-year jobs.

For the application of the RIMS II final demand multipliers, capital costs were divided into two industry expenditure/multiplier categories: right-of-way acquisition and construction cost. The capital cost distribution between these two categories for each of the build alternatives is indicated in Exhibit A-2. Final demand multipliers, as well as direct effect multipliers, for both the central Puget Sound region and the entire state of Washington are indicated in Exhibit A-3. All construction labor, construction materials, and right-of-way acquisitions were assumed to be obtained locally.

Exhibit A-3. Capital Costs Multipliers

Expenditure Category	Bureau of Economic Analysis RIMS II Multiplier Industry Classification and Number	Final Demand Multipliers			Direct Effect Multipliers	
		Output ($)	Earnings ($)	Employment (no. of jobs)	Earnings ($)	Employment (no. of jobs)
State of Washington						
Construction	11.0400 Highways and Streets	2.1764	0.6486	17.5	2.1609	2.7379
Right-of-way	71.0201 Real Estate Agents, Managers, Operators, and Lessors	1.5792	0.2508	10.0	2.8422	2.2966
Central Puget Sound Region						
Construction	11.0400 Highways and Streets	2.0627	0.6093	16.4	2.0837	2.6392
Right-of-way	71.0201 Real Estate Agents, Managers, Operators, and Lessors	1.5920	0.2517	10.1	2.8933	2.3467

RIMS II= Regional Input-Output Modeling System

The gross total (direct, indirect, and induced) effects on output and earnings can be calculated by multiplying the expenditure in millions of dollars by expenditure category in Exhibit A-2 by the appropriate final demand multiplier in Exhibit A-3. Using the Bored Tunnel Alternative as an example, expenditures of $1,788 million in the construction category would yield a gross output effect on all regional economy industries of $3,688 million ($1,788 million × 2.0627).

Some of this regional economic output would have occurred even without the construction of this alternative. The more realistic measure of net effects on economic output can be calculated by multiplying the gross output effect by the percentage of general construction expenditures representing new money (committed and anticipated) to the region listed in Exhibit A-1. This calculation results in $295 million ($1,788 million × 7.0% × 2.0627), which represents the net increase in economic output attributable to new money entering the central Puget Sound region. The gross and net effects become the upper and lower boundaries within which the true effects would likely fall, with net effects being the lower boundary. Although the true magnitude of the effects would be closer to the net effects in the absence of the project, some of the non-new-money tax and/or consumer dollars spent elsewhere may result in multipliers that are smaller than those with the project. Similar calculations can be performed for the other expenditure categories.

Summary of Economic Effects

The gross and net total effects on output and earnings for both the central Puget Sound region and the state are provided in Exhibits A-4 and A-5. Exhibit A-4 presents the gross total economic effects for both the central Puget Sound region and the entire state. Under the Bored Tunnel Alternative, new demand for

construction would generate gross direct effects equal to the capital cost of $1,788 million of construction dollars. Adding in the indirect and induced effects on the output of other regional firms, the gross multiplied effect on output would total approximately $3,688 million over the construction period. In addition, $1,089 million would be paid to workers as wage and salary earnings for the jobs generated. By defining a larger boundary for the affected economy and therefore capturing a greater portion of the multiplied effects before the funds leak out, the statewide figures exceed the regional economic effects projected in Exhibit A-4.

Exhibit A-4. Gross Total Regional and Statewide Economic Effects

Alternative and Expenditure Category	Direct Gross Expenditures ($ millions)	Seattle-Tacoma Region Gross Total Effects		Statewide Gross Total Effects	
		Output ($ millions)	Earnings ($ millions)	Output ($ millions)	Earnings ($ millions)
Bored Tunnel Alternative	**1,960**	**3,962**	**1,133**	**4,163**	**1,203**
Construction	1,788	3,688	1,089	3,891	1,160
Right-of-way	172	274	43	272	43
Cut-and-Cover Tunnel Alternative	**3,518**	**7,188**	**2,091**	**7,569**	**2,224**
Construction	3,372	6,955	2,055	7,339	2,187
Right-of-way	146	232	36	231	37
Elevated Structure Alternative	**1,971**	**4,000**	**1,151**	**4,206**	**1,223**
Construction	1,831	3,777	1,116	3,985	1,188
Right-of-way	140	223	35	221	35

Note: Includes only effects directly associated with the expenditure of construction and right-of-way funds and does not include indirect economic benefits presented in Chapter 7 (Cumulative Effects Analysis) of the Final EIS.

Exhibit A-5 presents the net total economic effects attributable to new money for both the central Puget Sound region and the entire state. Under the Bored Tunnel Alternative, the same new demand for construction expenditures would generate net direct effects equal to $258 million (7.0 percent of $1,788 million) in midyear construction dollars, after accounting for local funds that would otherwise still be spent in the regional economy with similar multiplied effects. Adding in the indirect and induced effects on the output of other regional firms, the net multiplied effect on output would total $277 million over the construction period. Of this amount, $79 million would be paid to workers as wage and salary earnings for the net new jobs created. As with the gross economic effect, the statewide figures exceed the regional economic effects projected in Exhibit A-5.

Exhibit A-5. Net New-Money Total Economic Effects

Alternative and Expenditure Category	Direct Gross Expenditures ($ millions)	Percentage of Contribution Due to New-Money Funds[1]	Seattle-Tacoma Region Net Total Effects		Statewide Net Total Effects	
			Output ($ millions)	Earnings ($ millions)	Output ($ millions)	Earnings ($ millions)
Bored Tunnel Alternative	**1,960**	**7.0**	**277**	**79**	**291**	**84**
Construction	1,788		258	76	272	81
Right-of-way	172		19	3	19	3
Cut-and-Cover Tunnel Alternative	**3,518**	**4.0**	**288**	**84**	**303**	**89**
Construction	3,372		279	82	294	87
Right-of-way	146		9	2	9	2
Elevated Structure Alternative	**1,971**	**7.0**	**280**	**81**	**294**	**86**
Construction	1,831		264	78	279	83
Right-of-way	140		16	3	15	3

Note: Includes only effects directly associated with the expenditure of construction and right-of-way funds and does not include indirect economic benefits presented in Chapter 7 (Cumulative Effects Analysis) of the Final EIS.

[1] Includes committed new-money funds (see Exhibit A-1).

While the gross total economic effects are useful for examining the overall magnitude of the effects of the alternative, the net total economic effects represent more generally accepted and appropriate estimates of the true economic effects that would arise solely from project construction. The gross and net effects represent the upper and lower boundaries within which the true effects would likely fall, with net effects being the lower boundary. Although the true magnitude of the effects would be closer to the net effects, in the absence of this project, some of the non-new-money tax and/or consumer dollars spent elsewhere may result in multipliers that are smaller than those with this project.

Summary of Benefits for Regional Economic Activity

This discussion of benefits includes only benefits directly associated with the expenditure of construction and right-of-way funds during the construction period and excludes indirect economic benefits after construction is completed, as presented in Section 5.2. The cost associated with the construction of any of the three build alternatives would result in additional (gross) activity throughout all the economic sectors within the central Puget Sound region and the state of Washington. This gross economic activity is derived from the multiplication effects on the capital expenditures for the particular alternative. Examples of capital expenditures include the direct hire of temporary construction workers, the purchase of construction materials and equipment, and the expenditure of capital funds to acquire new rights-of-way.

The amount of new economic activity directly associated with the build alternatives that are the result of new money entering the Puget Sound regional economy is roughly equivalent for the three build alternatives and ranges between $277 million and $288 million (Exhibit A-5). The amount of new earnings (wages) entering the Puget Sound regional economy ranges from $79 million to $84 million.

These estimates assume that all of the committed new-money funds are received for the project. The contribution of new money to overall construction costs ranges from 4.0 to 7.0 percent, depending on the build alternative. All other funding sources are located within either the state or the Puget Sound region, and the funds would likely be spent in the local economy, even in the absence of the project.

Temporary Economic Effects on Businesses, Including Construction Expenditures on Sales Tax Revenue

Sales Tax Revenue

Sales taxes would be generated by the purchase of goods and materials related to construction. The estimated amount of sales tax generated by each of the build alternatives based on construction costs only is indicated in Exhibit A-6. Sales tax estimates were not generated for non-construction costs such as right-of-way acquisition.

Exhibit A-6. Total Capital Costs and Sales Tax Generated

Alternative	Total Capital Cost ($ millions)	Total Sales Tax Generated ($ millions)
Bored Tunnel Alternative	1,960	100
Cut-and-Cover Tunnel Alternative	3,518	197
Elevated Structure Alternative	1,971	110

The sales tax estimates for the three build alternatives are based on the construction cost estimates. These estimates will be refined once additional information regarding the project design and funding becomes available.

These sales tax estimates are related only to direct construction expenditures. This analysis does not include an evaluation of the change in sales tax revenue collected by businesses in the project area that potentially would be affected by construction activities.

Disruption to Businesses and Neighborhoods

Any major construction project, public or private, inconveniences or disturbs the residents, businesses, and business customers adjacent to that construction project. On the basis of the inventory of existing businesses (see Section 4.8)

within one block of the existing SR 99 alignment, the design team has identified approximately 1,400 business for both tunnel alternatives and 1,540 businesses for the Elevated Structure Alternative (including multifamily residential buildings) adjacent to the project area that would be disrupted by the construction. The potential temporary effects on these businesses include the following:

- Presence of construction workers, heavy construction equipment, and materials, both within the construction area and along haul routes
- Temporary road closures, traffic diversions, and changes in property access (see Appendix C, Transportation Discipline Report)
- Loss of parking, especially on-street short-term parking (see Section 6.2.1)
- Airborne dust (see Appendix M, Air Discipline Report)
- Noise and vibrations from construction equipment and vehicles (see Appendix F, Noise Discipline Report)
- Decreased visibility and loss of access to businesses by customers

Up to 160 active commercial and industrial buildings located within 50 feet of the existing viaduct are not candidates for acquisition. Many of these buildings in the central section of the project area are occupied by multiple businesses. Some businesses located in these buildings may suffer little or no adverse effect, while others may experience a noticeable decline in sales, increase in costs, and/or decrease in efficiency.

Without planning, these construction-related effects could adversely affect the daily life of some businesses and neighborhood residents through inconveniences. There could be disruptions in the flow of customers, employees, and/or materials and supplies to and from businesses.

Temporary Change in Vehicle, Transit, and Pedestrian Access to Existing Businesses in the Construction Area

A detailed analysis of the effects on the existing roadway system during construction is presented in Appendix C, Transportation Discipline Report. In general, the three build alternatives would result in severe traffic effects during construction in the corridor. However, the effects would be most severe during periods of closure of SR 99 and the Alaskan Way surface street, which would be up to 3 weeks for the Bored Tunnel Alternative, up to 4 months for the Elevated Structure Alternative, and 27 months for the Cut-and-Cover Tunnel Alternative. As discussed in Appendix C, Transportation Discipline Report, there would be temporary effects on access to businesses, as expected for any major roadway construction in a dense metropolitan setting.

Temporary Jobs Created During Construction

Implementation of any of the three build alternatives would result in the creation of temporary construction-related jobs. The duration of these temporary jobs would vary by alternative, duration, and construction plan, between 5.4 years for the Bored Tunnel Alternative and 10 years for the Elevated Structure Alternative; the Cut-and-Cover Tunnel Alternative would take about 8.75 years to construct.

A hybrid approach was used to estimate the gross and net increases in employment attributable to new money entering the central Puget Sound region and the state of Washington. Both direct effect and final demand multipliers (see Exhibit A-3) were used to estimate the employment effects of the three build alternatives. Direct effect multipliers were used on the estimates of the direct labor force to be employed in project-related construction as presented in Exhibit A-7. Final demand multipliers were used to estimate capital costs for right-of-way acquisition, because no direct labor estimates have been generated by the project design team for this expenditure category.

The design engineers estimated the number of direct jobs generated by each alternative on the basis of a bottom-up staffing plan. The direct effect of these temporary construction jobs on the regional and state economies would result in the indirect effect of additional job creation throughout the central Puget Sound region and state. The direct effect multipliers for highway and street construction presented in Exhibit A-3 can be used to calculate the indirect effect of regional and statewide job creation in the manner used to calculate the gross output and earnings using only the direct gross expenditures.

The project design team did not estimate the direct labor force needed to perform right-of-way acquisition; consequently, the capital costs associated with right-of-way acquisition were used to quantify employment effects in the same manner that gross output and earnings were estimated for all capital costs using the final demand multipliers presented in Exhibit A-3.

Using the Bored Tunnel Alternative as an example, direct gross expenditures of $172 million in the right-of-way category would yield a gross employment effect on all regional industries of 1,737 person-year jobs ($172 million × 10.1).

For the construction expenditure category, a direct generation of 2,500 person-year jobs would yield a gross employment effect on all regional economies of 6,598 person-year jobs (2,500 person-year jobs × 2.6392). Adding these gross employment effects together yields the total gross employment effect on the central Puget Sound regional economy of 8,335 person-year jobs for the Bored Tunnel Alternative.

Exhibit A-7. Gross Regional and Statewide Total Employment Effects and Net New-Money Total Employment Effects

Alternative and Expenditure Category	Direct Gross Expenditures ($ millions)	Central Puget Sound Region Final Demand Employment (prs-yr jobs)	Statewide Final Demand Employment (prs-yr jobs)	Annual Average Construction Employment (no. of jobs)	Construction Duration (years)	Total Construction Labor (prs-yr jobs)	Central Puget Sound Region Direct Effect Employment (prs-yr jobs)	Statewide Direct Effect Employment (prs-yr jobs)	Central Puget Sound Region Gross Employment (prs-yr jobs)	Statewide Gross Employment (prs-yr jobs)	Average Percentage of Contribution Due to New-Money Funds	Central Puget Sound Region Net Employment (prs-yr jobs)	Statewide Net Employment (prs-yr jobs)
Bored Tunnel Alternative									**8,335**	**8,565**	**7.0%**	**583**	**600**
Construction				450	5.5	2,500	6,598	6,845					
Right-of-way	172	1,737	1,720										
Cut-and-Cover Tunnel Alternative									**12,031**	**1,2412**	**4.0%**	**481**	**496**
Construction				450	8.75	4,000	10,557	10,952					
Right-of-way	146	1,475	1,460										
Elevated Structure Alternative									**13,290**	**13,721**	**7.0%**	**930**	**960**
Construction				450	10.0	4,500	11,876	12,321					
Right-of-way	140	1,414	1,400										

Notes:

Construction duration assumes 5.4 years for the Bored Tunnel Alternative, 8.75 years for the Cut-and-Cover Tunnel Alternative, and 10 years for the Elevated Structure Alternative.
Central Puget Sound region is defined as King, Pierce, and Snohomish Counties.
Final Demand Employment shows the translation from right-of-way gross expenditures into direct, indirect, and induced employment.
Direct Effect Employment shows the translation from temporary construction employment into direct, indirect, and induced employment.
Gross Employment represents all direct, indirect, and induced employment; it is the sum of Final Demand Employment and Direct Effect Employment.
Net Employment is the fraction of Gross Employment that represents all direct, indirect, and induced employment associated with new money (committed and anticipated).
prs-yr jobs = person-year jobs

Some of these jobs would occur without the construction of the Bored Tunnel Alternative. The more realistic measure of net effects on employment can be calculated by multiplying the total gross employment effect by the percentage of capital expenditures representing new money (committed and anticipated) for the region listed in Exhibit A-1. This calculation results in 583 person-year jobs ([$172 million × 10.1] + [2,500 person-year jobs × 2.6392] × 7.0%), which represents the net increase in employment attributable to new money entering the central Puget Sound region.

Summary of Benefits for Employment

Compared with existing conditions, the employment associated with the construction of any of the three build alternatives would result in additional (gross) employment throughout all economic sectors within the central Puget Sound region and the state of Washington. This gross employment is derived from the multiplication effects on capital expenditures for the project. Examples of capital expenditures include the direct hire of temporary construction workers, the purchase of construction materials and equipment, and the expenditure of capital funds to acquire new rights-of-way. Therefore, the higher the capital cost, the greater the number of direct, indirect, and induced jobs generated within the central Puget Sound region.

The number of new jobs directly associated with the three build alternatives is the result of new money (committed and anticipated) entering the central Puget Sound regional economy. About 583 new jobs would be attributed to the new money under the Bored Tunnel Alternative, whereas the Cut-and-Cover Tunnel Alternative would bring 481 new jobs and the Elevated Structure Alternative would bring 930 new jobs. The portion of overall construction costs that would be new money is 7.0 percent for the Bored Tunnel Alternative, 4.0 percent for the Cut-and-Cover Tunnel Alternative, and 7.0 percent for the Elevated Structure Alternative. All other funding sources would be within either the state or the central Puget Sound region, and the funds would likely be spent in the local economy even without this project.